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ARTICLE 201 - EXCAVATION CUT

201.1 General.

Excavation Cut shall consist of the loosening, loading, hauling and disposal of all materials of every description encountered in the performance of the work other than specific materials which have been classified and bid upon, including Rock Excavation, Removal of Miscellaneous Structures, and Clearing and Grubbing. This work shall include the removal and disposal of surface and base course and unsuitable materials, the trimming and finishing of the roadway, and maintaining such work in a finished condition until acceptance.

Rock excavation shall include all hard, solid rock in ledges, bedded deposits and unstratified masses and all conglomerate deposits or any other material so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that, as determined by the Engineer, it is not practical to excavate and remove same without blasting or the use of rippers. Rock excavation shall also include all rock boulders necessary to be removed having a volume of one cubic yard (27 cubic feet) or more. Rock excavation shall not apply to plain or asphalt bound bases or surface courses of macadam, gravel, or broken stone.

201.2 Construction Methods.

201.2(a) Excavation Cut.

All excavation as shown on the accompanying cross sections and plans shall be done by the Contractor to the line and grade established by the Engineer. All topsoil and organic materials shall be stripped from the project as shown on the cross sections, except all work done in the vicinity of any tree located in the terrace shall be completed in accordance with section 107.13 Tree Protection Specification and as directed by the Engineer. All earth subbase shall be compacted in accordance with the requirements for Standard Compaction, Section 202.3. The finished grade in the terrace shall be a straight line grade between the top of the curb and the top of the outside edge of the sidewalk. The Contractor shall make all major excavation of existing material in the area between the curb line and the property line before curb and gutter is installed.

All excavation terminating on clayey soils shall be accomplished with a backhoe equipped with a cleaning bucket. No rubber tire equipment shall be allowed on a subgrade terminating on clayey soils except for the purpose of test rolling as directed in Section 201.5.

No mechanical equipment or vehicles will be allowed over or on concrete curb and gutter, concrete sidewalk and concrete driveway aprons for at least seven (7) days after pouring of said structures or per Subsection 301.8(c), whichever is sooner; any damage caused by the Contractor shall be removed and replaced at the Contractor's expense. No material either from or for the area back of the curb line shall be dumped or shoved onto new asphalt pavement for rehandling by mechanical equipment.

Concrete curb and gutter, concrete sidewalk, concrete driveway aprons and pavements damaged or dislocated in line or elevation or both by the Contractor in the work of excavating, filling, rolling and grading shall be replaced by the Contractor immediately at the Contractor's expense. The Contractor shall operate equipment in such a manner that equipment tires or tracks do not discolor, mark, and damage existing curb and gutter, sidewalk or pavements. The Contractor shall take all necessary precautions to protect existing trees in the terrace. When the trees are to be removed, they shall be so designated by the Engineer and payment made as described under Clearing and Grubbing.

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The Engineer reserves the right to order additional excavation, when conditions of the subsoil require such extra work. The additional excavation shall be measured in the field and calculated from those measurements. Unless included as a bid item, payment for additional excavation shall be made on the basis of the unit price bid per cubic yard of Excavation Cut. Except when ordered by the Engineer, if the subbase has been undercut by the Contractor, then the Contractor shall, at no expense to the City, return the subbase under the roadway, curb and gutter and sidewalk to the correct grade with compacted crushed stone as directed by the Engineer.

Unless otherwise specified, the Contractor shall dispose of all excess excavation cut, broken concrete, and debris at a site to be provided by the Contractor at no additional cost to the City. When a point of disposal of excess excavation cut is specified in the contract, then all excess excavation cut shall be the property of the City and shall be hauled to and dumped and spread at the point of disposal noted in the contract to the satisfaction of the Engineer. All costs of disposal of excess excavation cut shall be included in the unit price bid for Excavation Cut. When directed by the Engineer, the Contractor shall dispose of excess excavation at a point of disposal other than that noted in the contract. Where the length of haul is decreased the City shall deduct \$0.20 per cubic yard per mile from the final payment for each cubic yard so disposed. When the length of haul is increased, the City shall add \$0.20 per cubic yard per mile to the final payment for each cubic yard so disposed. There shall be allowed a minimum length of haul of four miles for the determination of the increase or decrease of the length of haul. When excess excavation is delivered to private properties or other sites by the Contractor without the Engineer's permission, then the City shall deduct seven dollars (\$7.00) per cubic yard from final payment for each cubic yard so disposed. The Contractor shall dispose of stones, broken rock and boulders at no cost to the City.

During construction, the roadway, ditches and channels shall be maintained in a well drained condition at all times by keeping the excavation areas and embankments sloped to the approximate section of the ultimate earth grade. Blading or leveling operations will be required when placing embankments and during the process of excavation except when such excavation is in ledge rock or areas where leveling is not practical or necessary. If it is necessary, in the prosecution of the work, to interrupt existing surface drainage, sewers, or under-drainage, temporary drainage shall be provided until permanent drainage work is completed. The construction of all temporary drainage installations shall be considered as incidental to the construction of the work. The Contractor shall be responsible for and shall take all reasonable and necessary precautions to preserve and protect all existing tile drains, sewers, and other sub-surface drains, or parts thereof, which in the judgment of the Engineer may be continued in service without change. Any and all damages to such facilities resulting from negligence or carelessness on the part of the Contractor's operations shall be repaired at the Contractor's expense.

All suitable material removed from excavation shall be used in the construction of the terraces, as far as practicable, and at such other places as shown on the plans. All excavated slopes or areas and all embankment slopes or areas, designated to be covered with topsoil, shall be undercut or underfilled to the necessary depth to provide for the specified amount of topsoil to be placed and finished to the required grade lines and section. Excavating shall be so performed as to avoid removing or loosening any material outside the required slopes, and any such material which may be removed or loosened shall be replaced and thoroughly compacted to the required cross section. All intersecting roads, approaches, entrances and driveways shall be graded as shown on the plans or as laid out in the field by the Engineer. The work of constructing intersections and private entrances, trimming shoulders and slopes, finishing and blading the earth subgrade and completing the ditches to proper alignment, grade and cross section shall follow the rough grading closely. Grading operations shall not be

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performed to the detriment of the work of trimming and finishing the roadway and blading and maintaining the roadbed and earth subgrade. The area of erosive land exposed to the elements by the grading operations at any one time shall be subject to the approval of the Engineer and the duration of such exposure prior to final trimming and finishing of the area shall be as short as practicable. Construction in and adjacent to storm sewers, rivers, streams, lakes, or other waterways shall be performed in such a manner as to avoid washing, sloughing or deposition of materials into such waterways which would obstruct or impair the flow thereof thus endangering the roadway or stream banks, or which would result in undue or avoidable contamination, pollution or siltation of such waterways. The Engineer shall have full authority to order the suspension of grading and other operations pending the adequate and proper performance of the trimming, finishing and maintenance work or to restrict the area of erosive land exposed to the elements.

The grading, trimming and finishing shall be completed prior to construction of the base course. Adjustment in slopes, to avoid injury to standing trees or to harmonize with existing landscape features, especially at the intersection of cuts and fills, shall be made and the transition to such adjusted slopes shall be gradual. The crests of earth cut banks shall be rounded as indicated on the plans or as directed by the Engineer. All earth slopes shall be constructed to a surface that will merge with adjacent terrain and be in substantial accordance with the cross sections. The horizontal serrated condition of slopes ordinarily left by excavating equipment shall be partially smoothed by means of blading or other operations so the slopes will have a general contour of the required slope but may be slightly rough and irregular. During grading operations and pending placement of base course, the Contractor shall provide continuous maintenance of the entire roadbed and perform all blading and repair work necessary to keep the grade smooth and to the required grade and cross section. Washouts caused by erosion shall be refilled with acceptable material and properly compacted.

No project shall be accepted until all excess mud, terrace dirt, asphalt material, rocks and crushed stone have been removed from the sidewalk, terrace, gutter and pavement. Work days may be charged against the Contractor until all cleanup is complete and to the satisfaction of the Engineer.

Excavation for sidewalks, and driveways and placement of topsoil is not included in excavation cut but shall be subsidiary work to the respective bid items.

The volume of concrete curb and gutter and concrete pavement to be removed is included in the total excavation.

The work involved with the placement of suitable fill obtained on site through excavation cut shall be considered as subsidiary work pertaining to excavation cut. The work shall include the formation, compaction, shaping, sloping, trimming, finishing and maintaining of embankments consisting of fill materials obtained on site and all other work incidental thereto.

The work involved with the placement of salvable select fill materials obtained on site through excavation cut shall be considered as subsidiary work pertaining to excavation cut unless the Proposal includes separate bid items for such materials.

The Contractor shall limit the excavation at all tree locations in accordance with section 107.13 Tree Protection Specification. All costs shall be considered incidental to Excavation Cut.

201.2(b) Rock Excavation.

Rock, when encountered in excavation, shall be removed to a depth of six (6) inches below the earth subgrade between the outer limits of the shoulder slopes. In the event design details covering the depth of rock excavation are incorporated in the plans, the work shall conform thereto. When excavation methods chosen and employed by the Contractor leave undrained pockets in the rock surface, the Contractor shall, at no expense to the City, properly drain such depressions or, when permitted by the Engineer, fill the depressions with approved impermeable material. Excavation of rock cuts shall be performed by such methods and with such equipment that the resulting backslopes conform to the slopes shown on the plans or to the slopes designated by the stakes set for excavation, without creating depressions in or substantial displacement of material outside the lines, limits or slope planes defined by the stakes. The backslopes in rock cut shall be “scaled” to dislodge loose rock, and material so removed shall be disposed of in the manner prescribed for other excavation. The slopes of rock cuts when designated to receive topsoil shall be undercut the necessary depth to provide for placing the specified amount of topsoil and finished to the required section.

201.2(c) Test Rolling Street Subgrades and Base Course Preparatory to Paving.

All test rolling shall be on subgrade, unless test rolling on base course is authorized by the Engineer as provided herein.

The truck shall test roll the section in the presence of the Engineer. Test rolling shall be accomplished in a series of traverses parallel to the centerline of the street. The truck shall traverse in the general location of each lane of the street, but at least two traverses shall be performed in the roadway. (Streets measuring thirty-two (32) feet from face of curb to face of curb shall be considered as having three lanes.)

Additional passes along the traverse, as directed by the Engineer, shall be performed to fix the location of soft or yielding areas. Soft or yielding areas, rolling or wave action of the subgrade, depressions, transverse cracking and/or alligator cracking resulting from the test roll shall be indicative of an unsatisfactory subgrade. Such areas shall be repaired, consolidated, and retested as determined by the Engineer.

Unsatisfactory areas in fill sections shall be repaired at the expense of the Contractor. Unsatisfactory areas in cut sections shall be paid for as excavation cut and the applicable select fill item(s).

On private contracts the Developer and the Developer’s consulting Professional Engineer may jointly request the Engineer to permit test rolling on the installed base course rather than the subgrade. On City of Madison contracts the decision to test roll on the installed base course or the subgrade will be made by the Engineer. The construction methods for test rolling of the installed base course shall be the same as those methods prescribed for testing on the subgrade, except that the perceptible displacement or yielding of base course shall be considered indicative of an unsatisfactory subgrade.

201.2(d) Finish Grading.

Work under this item shall include final grading of the entire site to the finish grades as shown on the plan set or as directed in the field, preparing the site for seeding, matting and mulching. The seed bed and finish grades shall be set and approved by the field engineer or his designee prior to seeding the site.

201.3 Description.

201.3(a) Under Drain, 6 Inch, Wrapped.

This work shall include all labor, equipment, materials, and incidentals required to install and connect six-inch perforated pipe under drain, wrapped, including open graded base course and geotextile fabric, as shown on the plans or as directed by the Engineer. See the City of Madison Standard Specification for Public Works Construction, Standard Detail Drawing 4.05 for additional information.

All costs associated with the connection of the under drain to the inlet, as shown on the plans or as directed by the Engineer, shall be considered incidental to this item.

The work involved with the placement of the Geotextile Fabric, type SAS as herein provided, and the perforated pipe shall be in accordance with Sections 612 and 645 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation.

201.3(b) Geotextile Fabric, Type SAS (Non-Woven).

This work shall be in accordance with Section 645 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin Department of Transportation and as herein provided. Geotextile Fabric, Type SAS (Non-Woven) shall be used in undercut areas.

201.3(c) Test Rolling Street Subgrades and Base Course Preparatory to Paving.

This work shall be in accordance with the pertinent provisions of Article 201 and 202 of the Standard Specifications, unless revised by the Engineer

201.4 Materials.

201.4(a) Under Drain, 6 Inch, Wrapped.

The geotextile fabric shall comply with the requirements for Geotextile Fabric, Type SAS (Non-Woven).

The Perforated Pipe Under Drain shall comply with the requirements of Section 612.2.5 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation.

The Pipe Wrapping shall comply with the requirements of Section 612.3.2 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation.

Open Graded Base Course shall meet the requirements of size No. 2 of 501.2.5.4.4 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation.

201.4(b) Geotextile Fabric, Type SAS (Non-Woven).

The fabric shall comply with the following requirements:

Test	Method	Minimum Value
Tensile Strength (lbs)	ASTM D-4632	200
Puncture Strength (lbs)	ASTM-4833	95
Apparent Opening Size (U.S. Standard Sieve)	ASTM D-4751	70
Permittivity (Gal/min/ft ²) at 50 mm	ASTM-4491	25

201.4(c) Test Rolling Street Subgrades and Base Course Preparatory to Paving.

The Contractor shall furnish a fully loaded tri-axle dump truck for test rolling. The truck shall be equipped with tires used for highway use (non-floatation) with 100 psi or greater inflation pressure. Test rolling shall be conducted with the “pusher axle(s)” wheels off the roadway. The Contractor shall provide a ticket to document the gross weight of the truck.

201.5 Method of Measurement.

Unless otherwise specified in the Contract, the pay quantity for Excavation Cut will be the sum of the quantity for “unclassified excavation” and for additional excavation, including undercut.

The quantity of unclassified excavation to be paid for as Excavation Cut shall be set forth in the contract plans without measurement thereof. Any earthwork modifications to the contract plan quantity caused by corrections or revisions of the original contract plans which have been approved by the Engineer will be measured in cubic yards in its original position, computed by the method of average end areas. The contract quantity shall be adjusted upward or downward accordingly to determine the final pay quantity.

Additional excavation, including undercut, shall be measured in the field and the volume in cubic yards shall be computed from those measurements.

Rock Excavation shall be measured in the field, the vertical measurements for determining end areas extending from the surface of the rock to a depth of six (6) inches below the subgrade. Where Rock Excavation is encountered in an area previously included as Excavation Cut, the volume of Excavation Cut shall be reduced by the volume of Rock Excavation.

Boulders and surface stone of one (1) cubic yard or more in volume will be measured individually and the volume computed from average dimensions taken in three directions.

The installation of Under Drain, 6 Inch, Wrapped as described above shall be measured by the lineal foot of completed and accepted work.

Geotextile Fabric, Type SAS (Non-Woven) shall be measured by the square yard of surface area upon which the fabric has been placed and accepted.

Test rolling shall be measured for payment by stations (100 feet) of roadway test rolled.

Finish Grading shall be measured as a lump sum item.

201.6 Basis of Payment.

The contract price for all Article 201 items listed above shall be payment in full for furnishing and installing fabric, all equipment, tools, labor and incidentals necessary to complete the work of excavation and related work. This shall include placement of suitable materials within the project limits as specified in Subsection 201.2(1) and disposal of excess or unsuitable materials as specified.

ARTICLE 202 - FILL

202.1 Description.

This item shall consist of furnishing and placing and compacting materials in accordance with these Specifications, the Contract, as shown on the plans and cross sections, or as directed by the Engineer. The work shall be done at the locations and to the lines and grades as shown on the plans or as directed by the Engineer.

202.2 Materials.

202.2(a) Fill.

Suitable material for fill shall consist of earth which is free from boulders, masonry or other unacceptable materials. Earth containing sod, organic matter or humus shall not be included in this classification. This classification does not include Select Fill and Topsoil.

202.2(b) Select Fill.

Select Fill shall refer to processed or selected natural materials. The material shall consist of sand, a mixture of sand with gravel, crushed stone, or crushed concrete, more generally identified as pit run sand, pit run sand and gravel, crushed stone base course, crusher run crushed stone, and crushed concrete. The gradation of the material shall be such that not less than one hundred (100) percent passes a six (6) inch sieve, not less than eighty-five (85) percent by weight passes a three (3) inch sieve, and not less than twenty-five (25) percent by weight passes a Number 4 sieve. The material shall be free from dirt, debris, frozen materials, vegetable matter, and lumps or balls of clay. The source and the material to be used for the various purposes shall be subject to the approval of the Engineer.

The definitions set forth below shall apply to this material:

1. Sand (Pit Run Sand): granular material almost entirely passing the Number 4 sieve and predominantly retained on the Number 200 sieve. The gradation of the material passing the Number 4 sieve shall meet the requirements for 209.2.1 and Grade 1 or Grade 2 of Section 209.2.2, "Gradation of Material Passing the No. 4 Sieve", of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation.
2. Gravel: rounded to subangular granular material, predominantly retained on a Number 4 sieve, obtained from deposits created by the reduction or disintegration of rock.
3. Crushed Stone: hard, durable particles of crushed stone resulting from the artificial crushing of rock, boulders, or large cobble stones.
4. Crushed Concrete: granular material resulting from the artificial crushing of hardened concrete.
5. Crushed Aggregate (Gradation #4, 9" Maximum size): That Gradation #4 is to be a sorted or screened blast or shot rock. Gradation shall be such that not less than one hundred (100) percent passes a six (6) inch sieve, not less than eighty-five (85) percent by weight passes a

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three (3) inch sieve, and not less than twenty-five (25) percent by weight passes a Number 4 sieve.

6. Crushed Aggregate (Gradation #5, Breaker Run): Gradation shall be such that not less than one hundred (100) percent passes a six (6) inch sieve, not less than eighty-five (85) percent by weight passes a three (3) inch sieve, and not less than twenty-five (25) percent by weight passes a Number 4 sieve.

The materials to be used as Select Fill for the various purposes intended including constructing embankments, backfilling excavations for unsuitable materials, backfilling trenches, and backfilling excavations for structures, shall be as specified in the special provisions or on the Proposal page when Select Fill is included as a bid item.

202.2(c) Salvable Crushed Stone.

When directed by the Engineer, the Contractor shall segregate salvable crushed stone, free of earth, debris and vegetable matter, from the existing pavement, and shall use the same as a Select Fill material under concrete curb and gutter, concrete sidewalk and pavement. This work will be considered incidental to Excavation Cut unless the Proposal Page includes a bid item for Salvable Crushed Stone.

202.2(d) Clear Stone.

Clear stone shall conform to gradation no. 1 as specified in Section 401.1(b) - Materials.

202.2(e) Crushed Stone.

Crushed stone shall conform to either gradation no. 2 for 1-1/4" or gradation no. 3 for 3/4" as specified in Section 401.1(b) - Materials.

202.2(f) Topsoil.

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 and excesses of peat, sand, or clay.

202.2(g) Riprap Filter Fabric.

Riprap Filter Fabric shall consist of furnishing and installing geotextile fabric, Type HR in accordance with the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation and these special provisions.

202.3 Construction Methods.

202.3(a) General.

Where the terms "Standard Compaction" and "Special Compaction" appear herein, they shall be as defined in Subsections 202.3(b) and 202.3(c) below.

Fill materials except Select Fill, Salvable Crushed Stone and Topsoil shall be compacted in accordance with the requirements for Standard Compaction unless otherwise specified herein or in

the Contract. Select Fill materials and Salvable Crushed Stone materials shall be compacted in accordance with the requirements for Special Compaction unless otherwise specified in the Contract. Topsoil shall be lightly compacted in order to minimize future settlement.

The material to be used for backfilling the excavations for unsuitable materials shall be Breaker Run conforming to requirements of Subsection 402.2(f). The material for the backfilling of excavations for bridges, culverts, retaining walls and other structures shall be Select Fill as defined in Subsection 202.2(b) of these Specifications. Such materials shall be compacted in accordance with the requirements for Special Compaction.

Fill material to be used in the construction of embankments under sidewalks, curbs and pavements shall consist of suitable material for fill as defined in Subsection 202.2(a). The maximum size of the material in the upper portion of the embankment, within twelve (12) inches of the subgrade, shall be less than six (6) inches in any dimension. All areas under such embankments shall be stripped of all topsoil and organic materials, and shall be compacted in accordance with the requirements for Standard Compaction before the Fill material for the embankment is placed. Fill material for such embankments shall not be placed on frozen ground. Fill materials for such embankments shall be compacted in accordance with the requirements for Special Compaction.

Fill materials to be placed in those portions of embankments under sidewalks, curbs and pavements which lie beyond the limits of assumed two-to-one slopes extending outward and downward from the outer limits of the finished construction may consist of materials conforming to the requirements of Fill material as defined in Subsection 202.2(a) of these Specifications, except that such materials may contain sod, organic matter and humus. Such materials shall be compacted in accordance with the requirements for Standard Compaction. The Engineer may waive this density requirement for unstable materials permitted to be placed in embankments outside the above designated slopes.

Fill material shall not be compacted when the moisture content is such as to cause excessive rutting by the hauling equipment, or excessive displacement or distortion under the compacting equipment. Where such conditions exist, the fill material shall be allowed to dry prior to compacting. When necessary, drying of such fill material shall be accelerated by aeration or manipulation by means of blade graders, harrows, discs or other appropriate equipment.

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

Topsoil shall be placed at least four (4) inches thick, lightly compacted to minimize future settlement, and shall be graded and raked to the satisfaction of the Engineer. Finished Topsoil areas shall be free of stones, road materials or lumps of dirt.

202.3(b) Standard Compaction.

The fill material shall be deposited, spread and leveled in layers not exceeding twelve (12) inches in thickness before compaction. Each layer of the spread and leveled fill material shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be attained for each layer before any fill material for a succeeding layer is placed thereon.

Hauling and leveling equipment shall be routed and distributed over each layer of the fill material in such a manner as to make use of the compaction afforded thereby. Should the Engineer determine

that such compaction is satisfactory and sufficient, further compaction will not be necessary nor shall special compaction equipment be required. Should the Engineer determine that the compaction is not satisfactory or sufficient, special compaction equipment shall be used to accomplish the compaction. Such special compaction equipment shall include tamping rollers, pneumatic-tired rollers, vibratory rollers, or other types of equipment designed for compaction which will produce the required results in the materials encountered and be subject to the approval of the Engineer.

202.3(c) Special Compaction.

Upon the properly prepared ground surface, the fill material shall be deposited, spread and leveled in layers generally not exceeding twelve (12) inches in thickness before compaction. Each layer of the spread and leveled fill material shall be compacted, by means of suitable compaction equipment, to not less than the specified density before the succeeding layer is placed.

All fill material placed within the limits of assumed two-to-one slopes extending outward and downward from the outer limits of the finished construction shall be compacted to not less than the density specified below.

Fill material in embankments of six (6) feet or less in height shall be compacted to at least ninety-five (95) percent of maximum density for their full depth. Fill material in embankments over six (6) feet in height shall have the top six (6) feet compacted to not less than ninety-five (95) percent of maximum density, and those portions more than six (6) feet below the finished subgrade shall be compacted to at least ninety (90) percent of maximum density.

The maximum density shall be determined in accordance with the test method for Laboratory Compaction Characteristics of Soil Using Modified Effort, ASTM Designation D 1557. The density of compacted fill material shall be determined in accordance with the Test for Density of Soil-in-Place by the Sand-Cone Method, ASTM Designation D 1556, the Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods, ASTM Designation D 2922, or by other approved methods.

In the event the material in the density sample differs in percentage of aggregate retained on a No. 4 sieve from that in the sample upon which maximum density was determined, the maximum density shall be adjusted in accordance with approved procedure.

The foregoing density requirements will not apply to portions of embankments constructed of materials which, because of numerous large stones or high percentages of material retained on the No. 4 sieve, cannot in the determination of the Engineer be accurately tested in accordance with the above procedures for determining maximum or in place dry density.

202.3(d) Subgrade Compaction in Cuts.

The finished earth subgrade in cut sections for a width equal to the width of the proposed construction shall be compacted as provided for Standard Compaction, unless Special Compaction is called for in the Contract.

On grading projects where Special Compaction is required, the finished earth subgrade in cut sections to the width above described and to a depth of at least six (6) inches shall be compacted to at least ninety-five (95%) percent of maximum density. Determination of maximum density and attained density in the earth subgrade shall be in accordance with the methods prescribed for Special Compaction.

202.3(e) Riprap Filter Fabric.

The geotextile fabric shall be installed per the construction plan set or as directed by the Engineer in the field.

202.4 Method of Measurement.

Fill and select fill materials obtained on site through Excavation Cut will not be measured for payment but will be considered subsidiary to Excavation Cut as specified in Subsection 201.2(a) except that Salvable Crushed Stone, if included in the Proposal as a bid item will be measured in cubic yards in place in its final location by the method of average end areas or other methods acceptable to the engineer.

Fill obtained off-site as borrow shall be measured in cubic yards in place at the borrow site, computed by the method of average end areas with no correction for curvature or in tons based on tickets received by the Engineer for each load.

Select Fill shall be measured in cubic yards or tons, as designated in the Contract, based on tickets received by the Engineer for each load of Select Fill.

Topsoil shall be measured in square yards of actual area which has been topsoiled in the limits of construction or as designated by the Engineer.

Riprap Filter Fabric shall be measured by the square yard in place.

All tickets for materials delivered to a City of Madison project shall be presented to the City representative on the project within twenty-four (24) hours after delivery of the materials to the project. Tickets presented after the time specified may be rejected due to inability to substantiate actual use of the materials on the project. Payment for Fill Borrow per ton or Select Fill will not be made for any amounts not substantiated by a ticket received by the Engineer.

When materials specified to be measured by the cubic yard have been weighed, the weights will be converted to cubic yards for payment purposes. Fill materials will be considered to have a unit weight of 2,835 pounds per cubic yard.

202.5 Basis of Payment.

Fill items, measured as provided above shall be paid for at the contract unit price for Fill Borrow, Select Fill, Select Fill [Type], Crushed Stone, Clear Stone, Breaker Run. Such payment shall be considered full compensation for furnishing, hauling, placing, and compacting the specified material, including all equipment, tools, labor and incidentals necessary to complete the work as specified.

Salvable Crushed Stone, measured as provided above shall be paid for at the contract unit price per cubic yard only if the item is included in the Proposal. Such payment shall be considered full compensation for excavating, stockpiling, placing, and compacting the specified material, including all equipment, tools, labor and incidentals necessary to complete the work as specified.

Topsoil, measured as provided above shall be paid for at the contract unit price per square yard. Such payment shall be considered full compensation for furnishing, hauling, placing and fine grading the

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specified material, including all equipment, tools, labor and incidentals necessary to complete the work as specified.

Geotextile fabric, measured as provided above shall be paid for at the contract unit price per square yard for Riprap Filter Fabric. Such payment shall be considered full compensation for furnishing and installing the fabric, including all equipment, tools, labor and incidentals necessary to complete the work as specified.

ARTICLE 203 - REMOVAL OF MISCELLANEOUS STRUCTURES

203.1 Description.

This work shall consist of removing, wholly or in part, pavements, surface and base courses, curb and gutter, sidewalks, crosswalks, driveways, steps, masonry, surface drains, guard rail, fences, poles, buildings, **tree grates** access structures, catchbasins, inlets, storm and sanitary sewer pipes occurring within the right-of-way, whether specified or subsequently found necessary and required. This work shall also consist of salvaging and disposing of the resulting materials and backfilling the resulting trenches and pits; or, when specified, the abandoning of sewer access points, catchbasins, or inlets by closing, filling or sealing as hereinafter provided.

Removing Pavement shall consist of the removal of Portland cement concrete pavement or base (reinforced and non-reinforced) including all surface or other pavements superimposed thereon.

Removing Concrete Sidewalk shall consist of the removal of concrete sidewalk, crosswalks, and driveways, reinforced and non-reinforced.

Sawing Asphalt Pavement, Full Depth and Sawing Concrete Pavement, Full Depth shall consist of full depth sawing of old, existing, concrete or asphaltic pavement and curb and gutter. Sawcutting concrete curb and gutter, sidewalks and driveways shall be incidental to Remove Concrete Curb and Gutter, Sidewalk and Drive. Full depth sawcuts of concrete pavement shall be made with diamond blades.

203.2 Construction Methods.

203.2(a) Removing Structures.

All existing structures, with all attached parts and connections, shown on the plans to be removed, or that interfere with the new construction, shall be entirely removed within the limits shown, unless otherwise provided. No equipment or devices shall be used which might damage structures, facilities, or property which are to be preserved and retained. All operations necessary for the removal of any existing structure, which might endanger the new construction, shall be completed prior to the construction of the new work.

All walls, piers, surface drains, foundations and similar masonry structures shall be removed entirely unless otherwise directed by the Engineer.

In removing sewer access structures, catchbasins and inlets, all incoming and outgoing pipes shall be disconnected and any live sewers shall be rebuilt and properly reconnected and a satisfactory bypass service shall be maintained during such construction operations. **If the SAS is connected to CIPP, the contractor shall sawcut the host pipe and the liner before removing the existing SAS to avoid shifting. The contractor shall then remove the host pipe to expose the liner. If the liner is damaged during removal of the host pipe, the contractor is responsible for installing a short liner that's compatible with the existing liner in the affected section of pipe after the SAS is installed.** Proposed active sewer mains shall remain free of debris or concrete plugs throughout the duration of construction. The void area left from the structure removal shall be backfilled as specified in 203.2(e). Any pipe plugs required shall be **incidental to removing the sewer access structure.** The structure shall be removed and disposed of by the Contractor at a site to be determined by the

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Contractor. All castings shall be delivered by the Contractor to the Engineering Service Building storage area at 1602 Emil Street.

Sewer pipe designated for salvage shall be removed, stored, transported and handled in a manner that will preclude damage to the pipes.

When a portion of the existing structure is to be retained, care shall be taken during construction operations so as not to impair the value of the retained portion. Reinforcing bars which are to be left in place so as to project into new work as dowels or ties shall not be injured during removal of the concrete.

In removing pavement, curb, gutter, sidewalk, crosswalks, driveways, steps and similar structures, where portions of the existing structure is to be left in the surface of the finished work, the structure shall be removed to an existing joint, or full depth saw cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and connections to the new work.

In removing sewer pipe, the work shall include removing the pipe as called out on the plan set. Pipe to be removed that is in the same trench as a new pipe shall not be compensated as remove pipe and shall be considered to be part of the new pipe installation. This includes unidentified pipe that is smaller than 10 inches in diameter.

If the pipe to be removed ends along a pipe run, as opposed to ending at a structure, the Contractor shall end the removal with a saw cut of the existing pipe and plug the remaining end as directed by the Engineer. Plugging the structure or pipe to which the pipe being removed was connected shall be compensated for under a separate bid item (pipe plug). If the Contractor, for his convenience, decides to remove a section of pipe to a full section, the additional removal shall not be given consideration for additional compensation.

Where existing culverts, sewer access points, catchbasins and similar structures are to be extended or otherwise incorporated in the new work, only such part or parts of the existing structure shall be removed as are necessary to provide a proper connection to the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging the part of the structure to be retained.

Buildings to be removed shall be razed, all material and debris resulting therefrom disposed of, and any resulting openings backfilled. The building or buildings to be removed will be designated in the contract by a general description and with reference to a survey station. All buildings to be removed and all materials resulting from the razing of buildings shall become the property of the Contractor unless otherwise provided in the contract. The City assumes no responsibility for the condition of any building at any time, and no guarantee is made or implied that any building will remain in the condition the bidder finds it when the building is examined incident to preparing the proposal. The Contractor shall procure all permits necessary for razing and removing buildings, including those necessary where streets or alleys are obstructed by the work. The razing of buildings and the removal of the materials thereof shall be performed in a safe manner and in compliance with the requirements of the Wisconsin Department of Industry, Labor and Human Relations and any applicable City ordinances. Where hazardous conditions are created incidental to the contract operations, the Contractor shall furnish, erect and maintain suitable barricades to protect and safeguard the public. The Contractor shall notify public utility companies and the City Engineer serving the building in sufficient time, prior to razing operations, to permit them to disconnect, plug, and/or remove such of

their facilities as may be in the building. Municipal water service lines shall be shut off at the curb boxes and sewer connections shall be tightly plugged or sealed. Unless otherwise provided, the removal of a building shall include the removal of foundation walls and the basement floor. Before backfilling, all debris shall be removed. Holes shall be broken in basement floors to permit drainage.

203.2(b) Sawing Asphalt Pavement, Full Depth and Sawing Concrete Pavement, Full Depth.

The sawing operation shall be performed so that the surface to remain is generally vertical for its full depth.

Sawcuts shall not exceed into concrete pavement placed in the work under contract and shall not exceed into existing pavements more than six (6) inches beyond the limits designed by the Engineer.

The sludge from sawing shall be removed from the pavement upon completion of each sawcut by methods which minimize the amount of sludge flowing onto or being deposited on the pavement of any live traffic lane.

The Contractor shall note that it is unlawful to discharge sawcut sludge into lakes, streams, and storm sewer without a DNR permit. Illegal discharge into the storm sewer will not be permitted by the City and is subject to fines imposed by the Wisconsin DNR.

All traffic control devices shall be clean of any sludge deposits by darkness of the day in which the deposition occurs.

203.2(c) Abandoning Structures and Pipes.

If the contract calls for abandoning sewer access structures, catchbasins, or inlets, they shall be thoroughly cleaned and the existing pipe connections shall be plugged. Any pipe plugs required to abandon the sewer access structure shall be **incidental to abandoning sewer access structures and pipes**. The roofs of the structure shall be removed. The walls of the structures shall be removed to a depth of two feet or more below the finished grade. The void area left from the structure that was abandoned shall be backfilled as specified in 203.2(e).

Abandoning sewer pipe with slurry shall require the entire pipe be filled with slurry **and plugging both ends of the pipe shall be considered incidental to abandoning the sewer pipe**. Vent holes may be required by the Engineer to verify there are no voids left in the pipe. Sawcutting and removal of the existing pipe at the limits of abandonment shall be included in this item. The slurry shall conform to Type B Slurry Mix as specified in Section 301.9 of these specifications.

Sewer pipe shall be abandoned by plugging the end(s) of the pipe and shall be compensated for as pipe plug(s).

Abandoned pipes encountered in a trench while installing, removing or abandoning sewer pipes shall be plugged per this section. If the abandoned pipe is less than six (6) inches, plugging the pipe shall be considered incidental to installing, removing or abandoning sewer pipes.

Service shall be maintained in existing sewers until the replacement sewers or appropriate bypasses approved by the Engineer have been installed, at such time bulkheads or plugs may be placed.

Contractor shall contact and coordinate with other utilities so that they may plug their own facilities.

203.2(d) Disposing of Materials.

All materials having salvage value shall be carefully removed to avoid damage and shall be disposed of as follows:

1. Sewer access structures, catchbasin and inlet castings shall be hauled to the Engineering Service Building storage yard at 1602 Emil Street.
2. All privately owned corrugated culverts shall be placed on the owner's property at the time of grading.
3. All City owned pipe shall be hauled to the Engineering Service Building storage area at 1602 Emil Street.
4. All concrete, stone, brick and other materials shall be disposed of by the Contractor at a site to be furnished by the Contractor at no cost to the City.
5. All existing tree grates shall be carefully removed and delivered to the City of Madison Parks Division at 4600 Sycamore Avenue. The Contractor shall notify City Forestry, City of Madison, (608) 266-4891 to schedule delivery.

203.2(e) Backfilling.

All trenches, holes and pits resulting from the removal or abandoning of pipe and other miscellaneous structures shall be filled with satisfactory soil or select fill, placed in layers not more than twelve (12) inches in thickness. Select backfill shall be required for any structure or pipe within the roadway that will not be filled with another structure or pipe. All fill material required shall be considered incidental to the removal or abandonment. Each layer shall be thoroughly compacted by means of approved tampers, rollers or vibrators. Water shall not be used to expedite settlement of backfill except with the approval of the Engineer; this provision shall not be construed to require an excavation to be dewatered before placing backfill, if backfilling can be performed in such manner as to displace the water or prevent its entrapment in the backfill.

Unless otherwise provided in the contract, backfilling shall be made to the elevation of the natural ground, the proposed finished earth subgrade or finished slopes, as may be necessary due to the location of the removed structure.

203.3 Method of Measurement.

Unless otherwise provided, this work will be measured in the original position of the structures to be removed, as follows:

1. Removing concrete pavement will be measured by area in square yards irrespective of the depth or number of courses encountered. Where removing concrete pavement consists of a rigid base having an asphalt surface extending beyond the lateral limits of the rigid base, such as a widened pavement, only the area occupied by the rigid base will be measured as removing concrete pavement, and that portion of the asphalt surface beyond the rigid base shall be removed and will be measured as Excavation Cut.

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2. The removal of flexible bases or portions thereof will be measured as Excavation Cut.
3. Removing curb and gutter will be measured by length in linear feet, taken along the flow line of gutter for gutter or curb and gutter, and along face of curb for curb.
4. Removing sidewalk, crosswalks and driveways will be measured by area in square feet.
5. Removing steps shall be measured as the summation of the areas of the treads, computed by multiplying the width of the tread by the length of the tread out to out of integral wall, if any.
6. Removing guard rail will be measured by length in linear feet and including end sections or anchorages.
7. Removing surface drains will be measured as units.
8. Removing fence will be measured by length in linear feet.
9. Removing utility poles, pole stubs, access structures, catchbasins and inlets will be measured as units, including all attached parts and connections.
10. Removing building will be measured as a unit for each specified building removed.
11. Removing sewer pipes shall be measured by length in feet.
12. Abandoning access structures, catchbasins, or inlets will be measured by units.
13. Sawcutting will be measured in linear feet.
14. Abandon sanitary sewer pipe with slurry shall be measured by the cubic yard of slurry required to completely fill the void. Payment quantity shall not exceed the calculated void area.
15. Pipe plug shall be measured as a complete unit for every pipe opening plugged **as described above**.
16. Sawing asphalt pavement full depth and sawing concrete pavement, full depth, shall each be measured by the lineal foot of completed and accepted work. Overcuts beyond the limits shown on the plans or directed by the Engineer will not be measured for payment.
17. **Removing Tree Grate shall be measured by the unit each removed.**

203.4 Basis of Payment.

The contract price for removing or abandoning pipe and other miscellaneous structures, as the case may be, shall be payment in full for **sawcutting**, trimming and chipping; for breaking down, removing, or sealing; for cutting, protecting or removing reinforcing steel, if any, as required; for procurement of any required work permits; for disposal of materials; for backfilling; for furnishing any required concrete masonry; and for furnishing all labor, tools, equipment and incidentals necessary to complete the item of work in accordance with the requirements of the contract.

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If the contract does not include a separate item for removal or abandonment of miscellaneous pipes, the removal or abandonment of existing miscellaneous pipes shall be considered incidental to other items of work and there shall be no payment for their removal.

Sawcutting, measured as provided above, shall be paid for at the contract unit price bid for sawcutting, which price shall be payment in full for acquiring all permits, furnishing all labor, tools, equipment and incidentals necessary to complete the item of work in accordance with the requirements of the contract.

The contract price for pipe plug shall include all labor, materials and incidentals to install a twelve (12) inch thick minimum bulkhead that covers the entire opening. The pipe plug shall consist of either mortared concrete brick or block; concrete of the class and grade specified for structures; or as specified on the plans. The Engineer may require pipes larger than thirty (30) inch diameter to be abandoned with concrete and reinforced bars. The method of construction shall be approved by the Engineer.

Removing Tree Grate, measured as provided above, shall be paid at the contract unit price for work as described above.

No additional compensation shall be made for the removal of concrete encased sewer pipe.

When there is no unit price for Concrete Pavement Removal in the contract, it shall be understood and agreed that the contractor shall be paid \$5.00 per square yard of concrete pavement removed. The void shall be backfilled with select fill and paid for under the appropriate bid item.

ARTICLE 204 - CLEARING AND GRUBBING

204.1 Description.

Clearing and Grubbing shall consist of cutting and disposing of trees and the removing and disposing of stumps, where designated on the plan or directed by the Engineer.

Trees under three (3) inches in diameter, shrubs, brush, windfalls, logs and other vegetation within the right-of-way, where designated on the plan or directed by the Engineer, shall be removed at the Contractor's expense.

204.2 Construction Methods.

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

All desirable and structurally sound trees, saplings, or shrubs suitable for shade or street beautification purposes shall be saved unless otherwise ordered by the Engineer. Trees, saplings, and shrubs designated to be left in place shall not be damaged or injured by the Contractor. The absence of specific orders to remove trees, saplings, or shrubs shall be considered as orders to save the trees, saplings, or shrubs. Trimming of limbs of trees or saplings or trimming of shrubs shall not be done without the permission of the Engineer.

All tree stumps shall be completely removed by excavation under proposed concrete sidewalk, concrete curb and gutter, all types of pavement, permanent structures, and at such other places as directed by the Engineer. In street terraces, boulevards and tree grate locations, tree stumps shall be ground to a depth of at least twenty-four (24) inches. Tree stumps under other areas in the right-of-way may be removed with stump cutting machinery to a depth of at least twelve (12) inches below the original ground area in fill areas, and at least twelve (12) inches below the subgrade in cut areas.

The Contractor shall provide a disposal area for all trees, stumps, limbs, brush and vegetation from the project at no additional cost to the City.

Stumps, roots, brush, logs, limbs, and other debris resulting from clearing and grubbing shall not be burned on or near City property without the written permission of the Engineer, and the securing of permits for burning from the proper authorities.

204.3 Method of Measurement.

The quantity of Clearing or of Grubbing will be measured per inch diameter of tree or stump approximately 4-1/2 feet above the existing ground level but above the ground swell, and the diameter of the tree or stump shall be 1/3 of the measured circumference. The measurement for circumference and determination of diameter will be to the nearest full inch. Only trees or stumps in place, the circumference of which is nine (9) inches or more will be measured for payment.

204.4 Basis of Payment.

The contract unit price for Clearing or for Grubbing, per inch diameter, shall be payment in full for furnishing all labor and equipment for all clearing and grubbing actually required and performed, and the handling and disposal of all debris resulting from clearing and grubbing.

ARTICLE 205 - ADJUSTMENT OF CASTINGS

205.1 General.

The Contractor shall adjust all **existing** access structure frames, catchbasin frames, water and gas main valve boxes, water and gas service shutoff valve boxes, and lamp holes to the finished grade of the pavement, curb and gutter, terraces, sidewalks, and drive approaches. The Contractor shall notify the private and public utilities (water, gas, electric, telephone, cable television, Traffic Engineering, etc.) prior to commencing work on the project in order to allow the various utilities to locate and mark their facilities. The various utilities may bring main valve boxes and service shutoff valve boxes to grade, and they may adjust their access structure castings to grade, at the request of the Contractor. The Contractor shall make those adjustments not made by the various utilities. The Contractor shall furnish and maintain the necessary protection for the access structure frames, catchbasin frames, water and gas main valve boxes, water and gas service shutoff valve boxes and lamp holes to prevent damage either to the castings or to persons or property or others allowed to pass through the construction area. Upon completion of the work on the project, the various utilities will be notified to inspect, adjust and repair their facilities as required. The Contractor will be responsible for any damage to access structure frames, catchbasin frames, water and gas main valve boxes, water and gas service shutoff valve boxes, and lamp holes, and any costs of repair will be deducted from any payments made to the Contractor.

205.2 Construction Methods.

Adjusting sewer access structures and catch basin frames includes removing the existing casting; removing the existing adjusting blocks, bricking or rings to a sound brick, block, **concrete barrel section** or concrete roof base; installing new adjusting blocks, bricking, **or** rings to the required elevation; and reinstalling the existing casting to the rim elevation as indicated on the plan set or as directed in the field. The existing adjustments shall be disposed of off-site by the Contractor at a site to be determined by the Contractor. New adjusting blocks, bricking or rings shall be of solid concrete and shall be in accordance with the requirements of Standard Plate 5.7.15. Any “pin” type castings shall be removed and disposed of by the Contractor. If a new City of Madison Standard casting is required, one shall be salvaged from another structure on the job site designated for removal or if no acceptable castings are available on site, City Engineering shall provide one.

If a new cone section is required to maintain less than 9 (nine) inches of adjusting rings, the contractor shall be paid for Adjust Sewer Access Structure, Bid Item 20501, contractor shall not be paid for Adjust Sewer Access Structure Casting, Bid Item 20506.

The finished top elevation of castings in the paved area of streets shall be set with a string line at least forty (40) feet long set over the casting parallel to the street direction at the proposed finished grade of the street.

All salvaged castings shall be the property of the City. The Contractor shall haul such replaced castings to the Engineering Service Building storage area at 1602 Emil Street and deposit the castings as directed by the person in charge of the storage area.

Unless otherwise specified, the City shall furnish the new castings. The City shall issue replacement castings upon receipt of the Contractor’s written request and the Inspector’s certification. Replacement castings for storm and sanitary sewers shall be issued from the casting storage at the Engineering Service Building, 1602 Emil Street; the Contractor shall notify the Engineering Service

Building at telephone number 266-4430 at least one day in advance when new castings are required. Replacement castings for Water Utility access structures shall be issued from the casting storage at the Water Utility Operations Center, 110 South Paterson Street; the Contractor shall notify the Water Utility Operations Center at telephone number 266-4661 at least one day in advance when new castings are required. Replacement castings for Traffic Engineering electrical utility access structures shall be issued from the casting storage at the Traffic Engineering Shop, 1120 Sayle Street; the Contractor shall notify the Traffic Engineering Shop at telephone number 266-4767 at least one day in advance when new castings are required. The Contractor shall furnish all labor and equipment to load, transport and unload the castings from the site of the casting storage to the job site.

All castings shall be set to final grade prior to placement of the asphaltic lower layer.

205.3 Measurement and Payment.

The adjustment and protection of water and gas main valve boxes and water and gas service shutoff valve boxes shall be considered incidental to the work, and no compensation will be made for their adjustment and protection, unless otherwise specified.

The adjustment of access structure, catchbasin and castings shall be measured as units of each, and all costs, including labor, materials (except castings), loading, transporting and unloading both existing and replacement castings as specified in Section 205.2 above, disposal of materials, and incidentals necessary to complete the work shall be included in the unit prices bid for adjusting access structure castings or for adjusting catchbasin castings, as the case may be. Castings having an opening with an inside dimension of over twenty-four (24) inches shall be considered catchbasin castings.

When the adjustment of access structure and catchbasin castings are not listed in the proposal as items on which to submit unit prices, the City will pay the Contractor for each such adjustment at the rate of \$150.00 for each access structure casting adjusted, or \$200.00 for each catchbasin casting adjusted, plus \$20.00 per vertical inch for each inch of adjustment per casting in excess of six (6) inches, either up or down. These costs do not include the costs of castings.

The costs of adjustment of all access structure and catchbasin castings installed on new access structures and catchbasins which are constructed as a part of the project shall be included in the unit prices bid for the structures involved.

ARTICLE 206 - OBLITERATING STREET

206.1 Description.

Obliterating Street shall consist of grading portions of the street that are required to be abandoned, and shall include scarifying or plowing areas of the old roadway. It shall include the removal and disposal of all types of surfacing including removal of Portland cement concrete pavement, brick pavement and rigid base courses.

The removal and disposal or salvage of old bridges shall not be included under Obliterating Street.

When removal and disposal or salvage of miscellaneous structures within the limits of Obliterating Street is not covered by separate bid items, such work shall be included under Obliterating Street.

Seeding shall not be included under Obliterating Street.

Obliterating Street shall apply only to those portions of the street designated for obliteration.

206.2 Construction Methods.

The ditches shall be filled and the roadway graded, either to approximately restore the original contour of the ground or to produce a contour which will merge with the contour of the adjoining land. Where feasible, waste material shall be placed in cuts on the old road.

Pavements, curb and gutter, and similar rigid structures, for which no separate provision for disposal is included in the contract shall be removed.

Old road surfacing of gravel, crushed stone and other nonrigid type, for which no separate provision of salvage or disposal is included in the contract and when underlying the proposed finished surface by less than one foot, shall be scarified or plowed to effectively mix the material with soil, or where feasible such surfacing material shall be bladed into the old ditches and covered with suitable soil.

Rocks, boulders and surface stone encountered in the work shall be removed and disposed of. Stones of greater than six (6) inch size shall be placed not less than six (6) inches below the proposed finished surface, and within areas suitable for cultivation all stone shall be kept to a reasonable minimum in the upper eight (8) inches of completed embankment.

Clearing and grubbing necessary to properly obliterate the street shall be construed to be a part of the item of Obliterating Street.

After the rough grading is completed, the obliterated street shall be topsoiled. Upon completion of necessary topsoiling, the entire area of the old roadway as obliterated shall be harrowed, smoothed and seeded.

Material with salvage value shall be removed to avoid damage.

206.3 Method of Measurement.

Obliterating Street will be measured by length along the old street center line in stations of 100 feet and fractions thereof.

The removal of specific miscellaneous structures, when a bid item under the contract, will be measured as provided under Article 203, Removal of Miscellaneous Structures.

Seeding will be measured as provided under Article 207, Seeding.

206.4 Basis of Payment.

The item of Obliterating Street will be paid for at the contract unit price per station, which price shall be payment in full for all work specified herein, except as follows:

If the contract includes separate items for removal of specific miscellaneous structures, such removal will be paid for separately.

The item of Seeding will be paid for separately as provided in Article 207, Seeding.

ARTICLE 207 - SEEDING

207.1 Description.

This work shall consist of preparing seed beds, furnishing and sowing the required seed, furnishing and applying the required stabilizers, fertilizer, and mulching material on shoulders, slopes, pipe trenches, appurtenances and other areas, as shown on the plans or designated in the contract, or as ordered to be seeded by the Engineer, all in accordance with the requirements of these Specifications.

Trench restoration shall include segregation of topsoil during the pipe installation for re-use as a seed bed, the creation of the seed bed and seed, fertilize and mulch of the pipe trench area. Salvaged topsoil shall be placed in the pipe trench area for restoration to a thickness of 4 inches.

207.2 Materials.

207.2(a) Seed.

All seed shall conform to the requirements of the Wisconsin Statutes regarding noxious weed seed content. No seed shall be used on the work later than one year after the germination test date which appears on the label.

Seed shall be tested when required in accordance with the methods and procedures used in making purity analyses and germination tests as adopted by the U.S. Department of Agriculture in the Administration of the Federal Seed Act.

Seed Mixtures:

1. **Terrace Seed Mixes (Sun and Shade).** Seed for terrace seed mixes shall be clean, latest crop seed of the varieties required, labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect at the time of delivery of seed. Seed shall be properly mixed. The seed shall be delivered in sealed containers to which is affixed a statement of guaranteed analysis for each seed variety furnished. Seed shall meet the following requirements and shall be subject to test at the expense of the owner by the State Seed Laboratory of the Wisconsin State Department of Agriculture.

SUN TERRACE MIX			
Formulation	Variety	% Purity	% Germination
30%	Dawson Red Fescue	95	85
30%	Puccinella Distans	99	85
30%	Geronimo Kentucky Bluegrass	95	85
10%	SR 4000 Perennial Rye Grass	98	90

SHADE TERRACE MIX			
Formulation	Variety	% Purity	% Germination
60%	Creeping Red Fescue	95	85
30%	Glade Kentucky Bluegrass	99	85
10%	SR 4000 Perennial Rye Grass	98	90

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2. **Temporary Seed Mix.** Seed for temporary seeding shall be composed of seeds of the purity, germination, and proportions, by weight as given below:

Species	Date	Rate (ibs./ac.)	Proportion %	Purity %	Germination %
Oats	5/1 - 7/15	20	100	97	90
Oats	7/15 - 10/15	96	100	97	90
Regreen Sterile Wheat Hybrid	5/1 - 7/15 10/1 - 11/15	10	100	97	90
Winter Wheat or Rye Grain	10/15 - 11/15	87	100	97	90

3. **Infiltration Seed Mix.** Seed shall be native ecotypes. No improved varieties are allowed. Seed source shall be native ecotypes from Southeast Minnesota, Eastern Iowa, Southern Wisconsin, or Northern Illinois.

VARIETY	% BY WT.
FORBS (22.75%)	
Aster novae-angliae (New England Aster)	1.31
Cassia Hebecarpa (Wild Senna)	3.27
Eupatorium maculatum (Joe Pye Weed)	1.31
Helenium Autumnale (Sneezeweed)	1.31
Liatris pycnostachya (Prairie Blazing Star)	2.62
Lobelia Siphilitica (Great Blue Lobelia)	0.82
Pedicularis lanceolata (Marsh Betony)	1.31
Rudbeckia hirta (Black-eyed Susan)	1.31
Rudbeckia triloba (Brown-eyed Susan)	2.62
Silphium perforliatum (Cup Plant)	1.64
Solidago riddellii (Riddell's Goldenrod)	1.31
Verbena hastata (Blue Vervain)	0.65
Vernonia fasciculata (Common Ironweed)	1.31
Zizia aurea (Golden Alexanders)	1.96
GRASSES, SEDGES & RUSHES (77.25%)	
Andropogon Gerardii (Big Bluestem PLS)	52.37
Elymus Canadensis (Canada Wild Rye PLS)	10.47
Elymus virginicus (Virginia Wild Rye PLS)	10.47
Panicum virgatum (Switch Grass PLS)	2.62
Scirpus atrovirens (Dark-green Bulrush)	1.31

4. **Detention Basin Seed Mix.** Seed shall be native ecotypes. No improved varieties are allowed. Seed source shall be native ecotypes from Southeast Minnesota, Eastern Iowa, Southern Wisconsin, or Northern Illinois.

VARIETY	% BY WT.
FORBS (42.86%)	
Sweet Flag	1.43
Mud Plantain	.71
Nodding Onion	1.43
Canada Anemone	.36
Swamp Milkweed	5.00

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VARIETY	% BY WT.
New England Aster	.71
Flat-topped Aster	.34
False Aster	.34
Turtlehead	.57
Joe Pye Weed	.57
Boneset	.34
Cream/Bottle Gentian Mix	.71
Sneezeweed	.71
Early Sunflower	.71
Rose Mallow	2.86
Southern Blue Flag	2.86
Prairie Blazing Star	3.57
Great Blue Lobella	.71
Marsh Betony	.71
Obedient Plant	.71
Mountain Mint	.71
Black-eyed Susan	1.43
Sweet Black-eyed Susan	.36
Brown-eyed Susan	1.43
Compass Plant	2.86
Cup Plant	1.43
Prairie Dock	2.14
Riddell's Goldenrod	.71
Bog Goldenrod	.34
Purple Meadow Rue	2.14
Blue Vervain	.71
Common Ironweed	1.43
Culver's Root	.34
Golden Alexanders	1.43
GRASSES (57.4%)	
Big Bluestem	8.57
American Sloughgrass	7.71
Fringed Brome	5.14
Blue Joint Grass	.34
Bebb's Oval Sedge	1.43
Bristly Sedge	1.43
Porcupine Sedge	1.43
Common Hop Sedge	1.43
Common Fox Sedge	1.43
Brown Fox Sedge	1.43
Canada Wild Rye	5.14
Virginia Wild Rye	5.14
Reed Manna Grass	1.43
Common Rush	.71
Inland Rush	.29
Switch Grass	1.43
Dark-green Bulrush	.71

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VARIETY	% BY WT.
Wool Grass	.37
Great Bulrush	.71
Indian Grass	9.43
Cord Grass	1.43

5. **Tall Grass Prairie Mix.** Seed shall be native ecotypes. No improved varieties are allowed. Seed source shall be native ecotypes from Southeast Minnesota, Eastern Iowa, Southern Wisconsin, or Northern Illinois.

VARIETY	% BY WT.
FORBS (50%)	
Smooth Blue Aster	.85
New England Aster	.85
Canadian Milk Vetch	.43
White Wild Indigo	5.11
Pale Indian Plantain	1.70
Rattlesnake Master	7.62
Biennial Gaura	3.40
Cream Gentian	.85
Early Sunflower	1.70
Great St. John's Wort	.85
Prairie Blazing Star	5.11
Wild Bergamot	.85
Foxglove Beardtongue	.85
Yellow Coneflower	1.70
Black-eyed Susan	1.70
Sweet Black-eyed Susan	.43
Brown-eyed Susan	3.40
Compass Plant	5.11
Stiff Goldenrod	.85
Showy Goldenrod	.43
Purple Meadow Rue	3.40
Golden Alexanders	2.81
GRASSES (50%)	
Big Bluestem	18.72
Canada Wild Rye	12.50
Switch Grass	1.70
Indian Grass	15.37
Cord Grass	1.70

6. **No Mow Turf.** Unless specified otherwise, Contractor shall supply the No Mow with annual rye variety. The following formulation is as manufactured by the Prairie Nursery of Westfield, Wisconsin. Any substitution must have prior approval of the Engineer.

NO MOW	ORIGIN/GERM
SR5130 Chewings Fescue-Festuca commutata-24.74%	OR-85%
Sheep Fescue-Festuca Ovina-24.42%	Canada-85%

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NO MOW	ORIGIN/GERM
Chariot Hard Fescue-Festuca longifolia-12.44%	OR-85%
Heron Hard Fescue-Festuca rubra-12.35%	OR-85%
Sea Link Creeping Red Fescue-Festuca rubra-12.31%	OR-85%
SR5250 Creeping Red Fescue-Festuca rubra-12.17%	OR-85%

1.55% Inert matter
 .01% other crop seed
 0.1% Weed Seed
 Noxious Weed Seed-None

NO MOW WITH ANNUAL RYE	ORIGIN/GERM
SR5130 Chewings Fescue-Festuca commutata-23.75%	OR-85%
Sheep Fescue-Festuca Ovina-23.44%	Canada-85%
Chariot Hard Fescue-Festuca longifolia-11.94%	OR-85%
Heron Hard Fescue-Festuca rubra-11.85%	OR-85%
Sea Link Creeping Red Fescue-Festuca rubra-11.82%	OR-85%
SR5250 Creeping Red Fescue-Festuca rubra-11.68%	OR-85%
Annual Ryegrass-Lolium multiflorum-3.95%	OR-90%

1.53% Inert matter
 .02% other crop seed
 .02% Weed Seed
 Noxious Weed Seed-None

7. **Storage of Seed.** Any seed delivered prior to use shall be stored in such manner that it will be protected from damage by heat, moisture, rodents or other causes. Any previously tested and accepted seed that has become damaged shall be discarded and replaced by the Contractor.

207.2(b) Fertilizers.

Fertilizers, intended for use in connection with seeding, sodding, or other planting, shall be standard commercial products conforming to the requirements of the Wisconsin Statutes. Native plant seedings or temporary seeding to be followed by native seedings should not be fertilized. Each package of fertilizer shall be plainly marked with the analysis of the phosphoric acid and soluble potash. Fertilizers shall meet the following minimum requirements:

Nitrogen, not less than 10%
 Phosphoric Acid, not less than 10%
 Potash, not less than 10%

207.2(c) Mulching Material.

Mulching material shall consist of any straw, hay, wood excelsior fiber or other suitable material of a similar nature which is substantially free of noxious weed seeds and objectionable foreign matter.

Asphalt material, if used, shall be an emulsified asphalt meeting the requirements for the Type SS-1 of the Specifications for the Emulsified Asphalt, AASHTO Designation: M 140.

207.2(d) Soil Stabilizers.

Soil stabilizers are intended as soil bonding agents to prevent or minimize erosion. They must be environmentally benign; harmless to fish, wildlife, and plants; along with being non-toxic and non-combustible at the rate of application specified by the manufacturer. Asphalt based products will not be approved for use. Only products approved for field testing, and field tested by Wisconsin Department of Transportation will be approved for use. Soil stabilizers are considered a short term duration (6 months) erosion control device for use on slopes 3:1 or flatter. In addition to the above requirements soil stabilizers must meet the same vegetative density and sediment loss standards as required for erosion mats.

Soil Stabilizer, shall be a polyacrylamide (PAM) and calcium solution intended to reduce the erodability of bare soils during construction activities or to enhance the performance of mulching on permanent slopes. Polyacrylamide Soil Stabilizer shall have proven abilities to bond soil particles, effectively increasing the soil particle size to 1.0 millimeter or larger. It shall reduce the movement of soil through chemical bonding, increase the particle size thus making silt fence more effective, and increase the water absorption of the soil.

Polyacrylamide Soil Stabilizers shall conform to the Wisconsin Department of Transportation's Product Acceptability List (PAL) for Soil Stabilizers, Type B. Presently, the only acceptable product is Natural Earth PolyStable Plus manufactured by Earth & Road.

207.3 Construction Methods.

207.3(a) Traditional Turf Seeding.

The traditional turf seed mixes shall be applied at the following rates:

Seed Mix	Rate
Terrace (Sun & Shade)	3.5 lbs per 1000 s.f.
Temporary	4.0 lbs per 1000 s.f.

The seeded area shall be maintained, by watering or sprinkling, by the Contractor for a period of thirty (30) days after the perennial grass seed has germinated and grown to a height of one (1) inch. The Contractor shall repair all damaged or eroded areas as necessary and reseed during the required maintenance period.

Unless otherwise specified the Engineer shall specify in the field the use of Sun or Shade Terrace mix based on the project location.

Seeding shall be limited to the following period only:

April 15 to freeze up.

Seeding beyond September 15th shall be at the discretion of the Engineer and shall include an addition to the seed mix of a companion crop of Winter Wheat or Rye grass at the rate of 2 lb. per 1,000 S.F. Dormant seeding (beyond September 15th) shall not be used on slopes greater than 6% or adjacent to sensitive areas such as lakes, streams, wetlands or channels. Any seeding permitted beyond September 15th shall be reseeded in the spring at no additional cost to the City of Madison.

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Grading, shouldering, topsoiling, and fertilizing shall be completed before seeding, except that when equipment designed for the purpose is used, the fertilizer and seed mixture may be placed in one operation. The areas to be seeded shall be worked with discs, harrows or other appropriate equipment until it becomes a reasonably even and loose seed bed immediately in advance of the seeding.

Unless otherwise specified, seed may be sown at the option of the Contractor, by either Method A or Method B described below.

1. Method A. The seed mixture shall be sown by means of equipment adapted to the purpose, or it may be scattered uniformly over the areas to be seeded, and lightly raked or dragged to cover the seed with approximately one-fourth inch of soil. After seeding, the areas shall be lightly rolled or compacted by means of suitable equipment, preferably of the cultipacker type when such equipment can be operated, or by means of light hand tampers.
2. Method B. Upon the prepared seed bed, the seed shall be sown or spread by means of a stream of spray of water under pressure operated from an approved type of machine designed for that purpose. The selected seed mixture and water shall be placed into a tank, provided within the machine, in sufficient quantities that when the contents of the tank are sprayed on a given area the seed will be uniformly spread at the required rate of application. During the process the contents of the tank shall be kept stirred or agitated to provide uniform distribution of the seed.
3. Scattering seed by hand shall be done only with satisfactory hand seeders and only at such times when the air is sufficiently quiet to prevent seeds from blowing away.

207.3(b) Native Plant Seeding.

The native plant seed mixes shall be applied at the following rates.

Seed Mix	Rate
Infiltration	7.64 lbs per acre
Detention	9.53 lbs per acre
Tall Grass Prairie	8.00 lbs per acre

Proper site preparation is vital to successfully establishing native plants from seed. Existing vegetation must be removed before sowing seed. In major construction projects general site grading will accomplish this. If there is not grading involved it will be necessary to eliminate existing vegetation using an herbicide like Round-Up (glyphosate) at the labeled rate.

Plantings need a firm seedbed for successful establishment. The soil is too loose and will need additional packing if compaction of soil greater than 1/2-inch occurs as a result of walking on soil. Packing can be done with a culti-packer or similar implement.

Fall seedings must occur after October 15 to ensure that soil conditions are cold enough to prevent seed germination of native seeds. If seeds germinate at this time of year they will winter-kill.

Spring seedings shall occur between May 1 and June 30.

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Cover crops are planted to hold the soil while the native seeds become established. Acceptable cover crops are oats or Regreen (sterile wheat hybrid). Rye grass is not allowed because of allelopathic effects, which inhibit germination of native seeds.

Oats shall be applied at a rate of 96 lbs. per acre when planted between mid-July and early September. This will serve as a cover crop for a fall planting. A spring planting of oats shall be applied between May 1 and July 15 at a rate of 20 lbs. per acre.

Regreen shall be planted at a rate of 10 lbs. per acre. Fall seeding shall occur between October 1 and November 15. Spring seeding shall occur between May 1 and July 15.

While cyclone seeders are effective for planting cover crops they do not work with native seed mixes. The large variety of seed sizes and types plug the seeder.

Small areas (less than 1 acre) can be seeded by hand. To distribute the seed evenly across the site a filler must be added. Moistened sawdust, peat moss, or coarse grade vermiculite can be used as fillers to spread the seed. Use 1/2 to 1 bushel of filler per 1000 sq. ft. area seeded.

Larger areas (more than 1 acre) may be seeded by machine. A Brillion seeder with a brush attachment works well on newly worked soil. A Truax or similar drill designed specifically for native seed planting is also acceptable. Small seeds should be surface-sown and not drilled with larger seeds (to prevent the small seeds from being planted too deeply). Site should be lightly raked after planting by hand or machine.

Mowing is the main management tool used to prevent weeds from shading out native seedlings. During the first growing season the planting will need to be mowed several times. The cutting height should be 4 to 5 inches. The planting shall be mowed each time weed growth reaches 6 to 10 inches high to prevent weeds from setting seed.

During the second growing season one mowing may be required in late spring or early summer if weed growth is thick. Raise the cutting height to 6 to 12 inches for this mowing.

207.3(c) Fertilizing.

Fertilizer shall be applied at the rate of seventeen (17) pounds per 1,000 square feet of area for areas seeded with terrace seed mix, unless otherwise specified in the contract. Those areas which are specified for temporary seeding shall have fertilizer applied at the rate of ten (10) pounds per 1,000 square feet of area unless otherwise specified in the contract. No fertilizer shall be applied with native plant seedlings.

The fertilizer for the seeding areas shall be uniformly spread thereon and incorporated into the soil by light discing and harrowing. The fertilizer shall be pulverized and free from lumps when applied.

In the event fertilizer is incorporated with topsoiled areas, the fertilizer may be applied just prior to and in conjunction with the final discing or harrowing operations of the topsoil, or in the event the topsoil is manipulated by hand, just prior to the final raking and leveling.

In the event fertilizer is to be placed on surfaces on which no topsoil is placed, the soil shall be prepared by discing or harrowing to a depth of three (3) to four (4) inches and the fertilizer then incorporated as set forth above.

In the event fertilizer is to be placed on seeding areas where the seed is to be sown by means of a spray or stream of water under pressure, the required amount of fertilizer may be placed in the tank, mixed together with the water and the seed, applied in the seeding operation. Fertilizer applied by this method will not require discing and harrowing after being placed.

207.3(d) Mulching.

Mulch shall be placed on those areas which are specified for permanent seeding within three (3) days after the seeding has been completed unless the area is specified to receive erosion matting. Mulch is not required in areas to receive erosion matting provided matting is placed within three (3) days of seeding.

Mulching operations shall not be performed during periods of excessively high winds which would preclude the proper placing of the mulch.

The placed mulch shall be loose enough to allow some sunlight to penetrate and air to slowly circulate but thick enough to shade the ground, conserve soil moisture and prevent or reduce erosion.

The Contractor shall maintain the mulched areas and shall repair any areas damaged by wind, erosion, traffic, fire, or other causes prior to final or partial acceptance of work under the contract.

The Contractor shall perform the work with either Method A or Method B, at the direction of the Engineer.

1. Method A. The mulching material shall be uniformly spread over the designated areas to a loose depth of one (1) to two (2) inches, using seventy (70) to ninety (90) pounds of mulch per 1,000 square feet. The mulch material from compacted bales shall be well loosened or made fluffy before being spread in place. Unless otherwise directed, mulching operations shall begin at the top of the slopes and proceed downward.

The mulch cover, except when composed of wood excelsior fiber, shall be securely anchored in place by means of heavy twine fastened by pegs or staples to form a grid of from six (6) to ten (10) feet spacing.

2. Method B. Straw or hay shall be treated with asphalt material blown from a machine, and uniformly deposited over designated areas in one operation.

The mulch shall be placed uniformly over the area to a loose depth of one (1) to two (2) inches, using one and one-half to two tons of mulch per acre and 75 to 100 gallons of emulsified asphalt per ton of straw or hay. Within the above designated limits, the Engineer will determine, on the job, the rate of application of the mulch and the asphalt, and the right is reserved for the Engineer to vary the rates during mulching operations to produce the desired results.

The machine for placing the mulch shall be of an approved type, which will blow or eject by constant air stream a controlled amount of mulch and which will introduce into the air stream a spray of asphalt to partially coat the straw or hay, producing a spotty tack sufficient to hold together and retain in place the deposited straw or hay.

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Wood fiber shall be applied in the same manner as straw or hay except that the wood excelsior fiber shall not be treated with asphalt material.

Throughout the process, the mulch material shall be fed into the blowing machine to produce a constant and uniform ejection from the discharge spout, operated in a position to produce a mulch of uniform depth and coverage.

The mulch material shall not contain moisture in excess of that which will permit uniform feeding through the machine.

207.3(e) Watering.

All seeded areas shall be watered immediately after seeding and shall be kept moist by watering or sprinkling by the Contractor for a period of thirty (30) days after the perennial grass seed has germinated and grown to a height of one (1) inch.

207.3(f) Soil Stabilizers.

Soil stabilizers shall be used on all areas seeded.

Application is intended to be done with conventional hydraulic seeding equipment. Polyacrylamide Soil Stabilizer may also be placed through dry spreading. Application rates shall be as recommended by the manufacturer and shall meet the approval of the engineer. In general, rate of application shall be 20 lbs per acre (0.46 lbs per 1000 s.f.).

Where soil stabilizers are used in the terrace or near any other pedestrian walk areas the sidewalk and/or pedestrian walk areas shall be protected to keep the soil stabilizers from being deposited on them. After getting wet, any soil stabilizers on these surfaces can result in a slipping hazard. If soil stabilizers are deposited on a sidewalk the contractor shall clean the sidewalk sufficiently to remove the soil stabilizers. The Contractor shall be aware that conventional methods (sweeping) will not be sufficient to remove the polymer due to the nature of the polymer and other methods (vacuum) will be required to meet this requirement.

207.4 Method of Measurement.

The item of Seeding will be measured by the square yard or by the trench foot. The quantity to be measured for payment shall be the actual number of square yards of area or the lineal feet of trench which has been seeded in accordance with the contract, within the limits designated on the plans or in the contract or as ordered by the Engineer.

207.5 Basis of Payment.

Seeding, measured as provided above, will be paid for at the contract unit price per square yard of Seeding, or the trench foot of Seeding, which price shall be payment in full for furnishing, handling, and storing all seed; for preparing the seed bed and sowing the seed; for furnishing, hauling, handling, storing, placing, and incorporating the fertilizer into the work; for furnishing, hauling and placing soil stabilizers; for furnishing, hauling, treating, placing, spreading, and anchoring of the mulch material unless the area is to receive erosion matting, in which case mulch is not required; for maintenance of the work and the repair of all damaged areas; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

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Where seeding is not listed as an item on which to submit unit prices, it shall be understood and agreed that the Contractor shall seed with the appropriate terrace seed mix and be paid seventy-five cents (\$0.75) per square yard of seeding places in accordance with these Specifications.

ARTICLE 208 - SODDING

208.1 Description.

This work shall consist of preparing sod beds, furnishing and laying of live sod on the shoulders, slopes, ditches, or other locations as designated, and the construction of sod ditch checks or similar appurtenances, furnishing and applying the required fertilizer, as shown on the plans, in the contract, or as ordered and laid out by the Engineer, all in accordance with these Specifications.

208.2 Materials.

208.2(a) Sod.

The 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. At the time the sod is cut, the grass on the sod shall have a length of approximately two inches (if longer, the grass shall be cut to approximately this length) and the sod shall have been raked free from debris.

The sod shall be cut in uniform strips approximately one (1) square yard in area. The sod strips shall be uniform in thickness; shall have no holes in them; shall be free of weeds, insects and diseases; shall be uniformly green and not discolored due to drying or heating; and shall be moist.

The thickness of the sod shall be uniform, approximately 1/2 to 3/4 inch, depending on the nature of the sod, so that practically 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.

In the event the sod which is to be cut is in a dry condition so as to cause crumbling or breaking during cutting operations, at least twelve (12) hours before cutting the sod, the Contractor, at no additional cost to the City, shall apply water to the sod in sufficient quantities to provide a well moistened condition of the sod to the depth to which it is to be cut.

208.2(b) Fertilizer.

Fertilizer shall conform to the requirements set forth in Subsection 207.2(b) Fertilizers.

208.3 Construction Methods.

208.3(a) Preparation of the Earth Bed.

The area to be sodded shall have been previously constructed to the required cross section and contour, and the tops and bottoms of the slopes shall be rounded to a minimum four (4) foot radius curve.

The areas to be sodded shall be free from stones, roots or other undesirable foreign material.

The soil on the area to be sodded shall be loosened and brought to a reasonably fine granular texture, to a depth of three (3) to four (4) inches, by means of equipment or hand methods adapted to the purpose.

208.3(b) Placing the Sod.

The earth bed upon which the sod is to be placed shall be moistened to the loosened depth, if not naturally sufficiently moist, and the sod shall be placed thereon within approximately twenty-four (24) hours after the same has been cut.

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.

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

At points where water will flow over a sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over this juncture, which earth shall be thoroughly compacted to conduct the surface water over the upper edge of the sod.

At the limits of sodded areas, wherever practical or feasible, at 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.

Frozen sod shall not be placed, nor shall any sod be placed upon frozen soil.

208.3(c) Staking.

On all slopes steeper than one foot vertical to four feet horizontal the sod shall be staked or pegged with pieces of plasterers' lath or stakes equivalent thereto, twelve (12) inches in length, spaced as required by the nature of the soil and steepness of slope, from 18 inches to 36 inches apart along the longitudinal axis of the sod strip. Stakes shall preferably be placed near the top edges of the sod strip and shall be driven approximately plumb through the sod to be almost flush with the sod.

All sod placed in ditches, flumes or other appurtenances, where a concentrated flow of water may be expected, shall be staked regardless of the slope.

208.3(d) Top Dressing.

After the staking has been completed the surface shall be cleared of loose sod, excess soil, or other foreign material, and the areas shall then be thoroughly moistened by sprinkling with water.

208.3(e) Fertilizing.

When the fertilizing of areas to be sodded is required, the fertilizer shall be spread uniformly over the areas to be sodded at the rate of 17 pounds per 1,000 square feet of area unless otherwise specified in the contract. The fertilizer shall be pulverized and free from lumps when applied. The fertilizer shall be incorporated into the areas to be sodded by light discing or harrowing.

208.3(f) Watering.

After staking and cleanup, the sod shall be thoroughly moistened by sprinkling with water. All sodded areas shall be kept thoroughly moist by watering or sprinkling, when rainfall is not sufficient to achieve rooting of the sod to the earth bed, for a period of up to thirty (30) days after placement, but not less than ten (10) days, as determined by the Engineer. Water shall be applied in a manner to preclude washing to erosion.

208.4 Method of Measurement.

Sodding will be measured by the square yard, or by the trench foot and the quantity to be measured for payment under this item shall be the actual number of square yards of area or lineal feet of trench on which sod has been placed in accordance with the contract, within the limits of such construction designated on the plans or in the contract or as ordered by the Engineer.

208.5 Basis of Payment.

Sodding measured as provided above, will be paid for at the contract unit price per square yard of Sodding, or the trench foot of Sodding, which price shall be full compensation for preparing the earth bed; for furnishing, placing, staking, top dressing, and watering the sod; and for all labor, equipment, tools and incidentals necessary to complete the work in accordance with the contract.

ARTICLE 209 - TREES, SHRUBS, PERENNIALS AND GRASSES

209.1 Description.

This work shall consist of furnishing and planting plants of the species, varieties and sizes specified, complete in place at the locations designated on the plans or as directed by the Landscape Architect, City Forester, Inspector or designee herein referred to as Engineer. This work shall include furnishing all necessary materials and performing all necessary work such as excavation of plant holes, salvaging topsoil, potting, transplanting, backfilling, pruning, mulching, watering, heeling in, fertilizing, wrapping, support staking, rodent protection and anti-desiccant, disposing of surplus waste materials, necessary care and required replacements pending acceptance, and such work necessary or incidental thereto to complete the item in accordance with the plans, specifications and contract.

209.2 Materials.

209.2(a) General.

Unless otherwise provided for or approved by the Engineer, all materials used shall conform to requirements hereinafter set forth.

209.2(b) Plant Materials.

1. General. Unless otherwise specified, all plants shall be nursery grown stock that has been transplanted or root-trimmed two or more times, according to the species and size of plants.

Applicable Specifications and Standards:

American Standard for Nursery Stock, ANSI Z60.1., current edition.

Standardized Plant Names. 1942 American Joint Committee on Horticulture Nomenclature.

Pruning Standards for Shade Trees, current edition. National Arborist Association.

American Nursery Standard For Tree Care Operations, Tree, Shrub And Other Woody Plant Maintenance- Standard Practices; ANSI A300, current edition

All plants shall be typical of their species and have well-formed tops (crowns) and root systems and shall be free from injurious insects, plant diseases or other plant pests. All plants shall be grown within the States of Wisconsin, Minnesota, Iowa, Michigan, or the parts of Illinois, Indiana, or Ohio located within Zone 5 of the "Plant Hardiness Zone Map" of the USDA, Miscellaneous Publication No. 814 - Revised 1990. Plants furnished shall conform to the American Standard for Nursery Stock and be free from the following defects:

Serious injuries to leader, branches (crown), trunk, bark or roots.

Dried out roots.

Girdling or encircling roots.

Prematurely opened buds.

Thin or poor tops (crowns) or root systems.

Evidence of molding.

Dry, loose or broken ball of earth in Balled and Burlapped (B& B) stock.

Dried out or damaged soil mass in Bare Root (BR), Balled and Burlapped (B&B) or Container Grown (CG) stock.

2. Substitution. Where evidence is submitted that a specified plant cannot be obtained, substitution may be made, only upon specific approval of the Engineer.
3. Grading Standards. Plant stock shall conform to the code of standards set forth in the current edition of the American Standard for Nursery Stock.
4. Inspection and Approval of All Plant Material. All plants shall be subject to the approval of the Engineer. Trees that will be inspected and tagged at the nursery or place of collection will be done at a time agreeable to the Contractor and Engineer. Approval of plants at the source does not alter the right of rejection at the project site. It is the right of the Engineer to reject plant material(s) at the project site. It is the responsibility of the Contractor to notify the Engineer forty-eight (48) hours prior to any plantings, as to which plants are to be planted and their location(s). Contractor shall furnish to the Engineer an invoice or order form from each nursery indicating the sources from which he proposes to obtain plant materials for the work at this time confirming what will be delivered. This list shall include species name, cultivar, root condition (container, bare root or B&B) and size. All plants shall conform to the measurements specified in the plant list. Measurements specified shall be the minimum size acceptable for each variety. Plants that meet the requirements specified in the itemized plant list, but that do not possess a normal balance between height and spread, will not be accepted. Plants shall not be pruned prior to delivery. Tree branching shall be evenly spaced around the trunk without excessive gaps between the whorls. Trees with multiple leaders, unless specified, will be rejected. Central leaders shall be left intact.

209.3 Digging, Handling and Packing Plant Stock.

209.3(a) General.

All plant stock shall be freshly dug and handled with care and skill to prevent injuries to the leaders, branches, trunk and roots, and shall be packed in accordance with the requirements of the current edition of the State of Wisconsin DOT Standard Specifications for Road and Bridge Construction.

209.3(b) Digging and Handling of Plant Material.

Care shall be taken to prevent any damage to plant material during transit and handling. The Engineer shall check trees for any shipping or handling damages. Trees with excessive damage as determined by the Engineer shall be rejected.

Plant stock to be furnished Balled and Burlapped (B&B) shall be moved with a compact dug ball of earth so firmly wrapped in burlap that upon delivery the soil in the ball is still firm and compact about the root system. Each ball shall be of sufficient size to encompass all the fibrous roots necessary to insure successful recovery and development of the plant. Root balls shall not be allowed to dry out between digging and planting. The minimum sizes of balls, ball depth and diameters, and increased ball sizes for collected stock shall be in accordance with Recommended Balling and Burlapping Specifications as set forth in the current edition of the American Standard for Nursery Stock sponsored by the American Association of Nurserymen, Inc. No plant will be accepted when the burlap, twine, wire or ropes required to secure the root ball have been removed. Ropes, strings, wire baskets, burlap, and other wrappings shall be removed from the entire plant before installation is complete. The balance of the wrappings may be left intact around the bottom of the ball. All balled and burlapped plants that cannot be planted immediately on delivery shall be set on the ground and

the balls well covered with soil or other acceptable mulch material and shall be kept moist until planted.

Plant stock to be furnished Bare Root (BR) shall be dug with bare roots protected against drying out by use of moist sphagnum moss or other suitable material and covered with canvas or other suitable material in an approved manner.

Plants marked "CG" shall be container grown with a well-established root system. Container grown plants are to be well-established within the container, with a root system sufficiently developed to retain its shape and hold together when removed from the container. Roots should be noticeable when removed from the container, but not protruding outside the container. Soil within the container should be held together by the roots, in form and whole. Plants shall not be bound nor have kinked, circling, or bent roots.

All plants shall be handled so that the roots are adequately protected at all times. During shipment, all plants shall be properly protected by a tarpaulin or other suitable covering. No plant shall be so bound with rope or wire at any time as to damage the bark, break branches, or destroy its natural shape. All balled and burlapped and container grown plants which cannot be planted immediately on delivery shall be set on the ground and well-protected with soil or other acceptable material. Bare rooted plants shall be planted or heeled-in trenches immediately upon delivery. If heeled-in, all bundles of plants shall be opened and the plants separated before the roots are covered and care shall be taken to prevent air pockets among the roots. Until planted, all material shall be maintained.

Plants shall be marked for identification and for checking as designated on the plant list. Each bundle of plants and all separate plants shall have legible, waterproof labels securely attached thereto before delivery to the site.

Prior to any excavation, the Contractor shall notify Diggers Hotline at 1-800-242-8511 to determine the location of all electric, gas, water, sewer, oil and other utility lines, including tanks or other sub-surface encumbrances, and precautions shall be taken by the Contractor not to disturb or damage any utility lines. In the event of a conflict of a utility with the planting, the Contractor shall promptly request, in writing, from the Engineer a revised location for plant material.

209.4 Construction Methods.

209.4(a) General.

Unless otherwise specified on plans, the spring planting season for all plants is as follows: BR plants shall be planted from the time the frost is out of the ground to bud break; B&B plants shall be planted from the time frost is out of the ground to June 1st. Deciduous, grass or perennials container grown plants may be planted from the time frost is out of the ground through October 15th. Unless otherwise specified on plan, the normal fall planting season for all deciduous trees shall begin no earlier than October 1st. Fall evergreen tree and shrub planting shall be done between August 15th and September 15th. Unless otherwise approved, planting shall not be done where the ground is frozen or when soil is in an unsatisfactory condition for planting.

209.4(b) Delivery and Temporary Storage.

At least forty-eight (48) hours prior to each delivery of plant material to the potting, storing or project site, the Contractor shall notify the Engineer of delivery.

Insofar as practicable, plant stock shall be planted on the day of delivery at the project site. In the event this is not possible, the plant stock shall be temporarily stored by “heeling-in” or by placing in a well-ventilated, cool, moist storage place and shall be adequately protected against drying by the use of moist sphagnum moss, straw or other suitable covering around the roots of BR stock and balls of B&B stock.

Bare root plants, when “heelled-in”, shall be placed in a spade depth trench, have their roots fully covered with damp topsoil and be protected from the sun and wind. When “heelled-in”, all plants shall be properly cared for by the Contractor. Failure to protect stock shall be cause for rejection of plant material.

Upon delivery, the Contractor shall furnish a delivery receipt or invoice from the nursery that includes the species, cultivar, quantity and size of plants delivered.

209.4(c) Layout of Planting.

The Engineer will designate the location of all trees and shrubs marker stakes or paint marks on the ground. The Engineer shall receive notice 48 hours minimum will be required of Contractor for all plant site selection. The plant location and type will be staked as permanently as possible. The Contractor shall be responsible for maintaining these locations until planting occurs.

209.4(d) Excavation of Plant Holes.

The plant holes shall be centered at the location stake, unless otherwise permitted by the Engineer. Plant holes to be 3 times the ball/pot diameter.

The plant hole, except for Machine Transport (MT) stock, shall be excavated to the minimum dimensions shown on the plans or established by the Engineer, provided, however, that the plant hole shall be large enough to permit placing at least six (6) inches of backfill material around the root system of BR stock and the pots, balls or containers of B&B and CG stock. When a minimum size hole is excavated, the hole shall be excavated cylindrical in shape with vertical sides and a flat or saucer-shaped bottom.

Unless soil conditions make it impractical, planting holes for Machine Transport plants shall be done by the tree moving machine and shall be approximately the same size and shape as the soil mass containing the root system of the machine moved plant. The plant shall be dug set to match existing grade, backfilled with screened topsoil and watered in to eliminate all voids.

The topsoil suitable for backfilling shall be kept separate from the excavated subsoil and sod.

When planting on a slope the minimum depth of the plant hole shall be measured from the downward side of the slope at the hole.

209.4(e) Pruning.

Any plants requiring pruning shall be pruned at the planting site as specified by the Engineer. Prior to planting, damaged or broken parts of the fleshy roots shall be cut off smoothly to a point where they are clean and clear of rot, while preserving as much of the root system as possible. When/where specified or directed by the Engineer, for all BR, B&B, or CG plant stock, pruning shall consist of

removing only dead, damaged, or broken branching. Pruning shall be done so that the plant retains its natural form and leaving the central leader intact.

Except when heading back, all pruning cuts shall be made at the branch bark ridge and branch collar leaving both branch features intact without leaving stubs or damaging adjacent trunk or branch tissue. When heading back or reducing a branch back to another lateral branch, all pruning cuts shall be made by bisecting the angle between the branch bark ridge and an imaginary line which is perpendicular to the branch being removed. The branch bark ridge must be left intact without leaving a stub and without damaging adjacent branch tissue. Evergreen plants shall not be pruned except to remove dead, damaged, or broken branches. All pruning cuts shall comply with the ANSI A300 current edition. See Part VIII, Standard Plates 2.04 and 2.05 for Proper Pruning Cuts

209.4(f) Anti-Desiccant.

Anti-desiccant, when specified, shall be applied to evergreen plants prior to or at the time of planting and to BR plants prior to shipment from the storage place. It shall be applied to plants to be transplanted prior to transplanting. The rate and method of application of the emulsion shall be according to the manufacturer's recommendations.

209.4(g) Planting.

All planting of BR, B&B, and CG stock. When a minimum size hole is excavated, the hole shall be excavated cylindrical in shape with vertical sides and a flat or saucer shaped bottom. Scarification of the excavated hole will be required to prevent glazing (as per planting detail).

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 closest point where they are clean and free of rot. No other root pruning shall be done

For plants in plastic, biodegradable or metal containers, the container shall be removed before planting. If roots are crowded or coiled on the bottom, sides, or surface of the root ball, they shall be gently separated from the edges or surface. Ropes, strings, wire baskets, burlap, and other wrappings shall be removed from the top one-half (1/2) of the ball after the plant has been set. The balance of the wrappings may be left intact around the bottom of the ball. For all plants moved with a tree spade, all holes and cavities between the ball and the surrounding soil shall be filled. Glazed planting hole surface shall be sufficiently roughened prior to backfilling. The ball shall be thoroughly watered at planting time.

Plants shall be set with the root flare at the finished grade (root flare shall be determined 1" above the upper-most woody support root). Plants must be centered in the hole and set plumb. Plants shall be set so that they will be at the same depth at the end of the guarantee period.

Planting holes shall be backfilled with excavated soil. Salvaged topsoil shall be placed in layers around the roots or ball. Frozen or muddy soil will not be acceptable suitable backfill material. Backfilling shall be carefully done in a manner that avoid injury to the roots or ball or disturbing the position of the plant. When holes are approximately two-thirds full, they shall be thoroughly watered to eliminate air pockets. After this initial watering, excavated soil shall be installed to the top of the hole and thoroughly watered. Puddled soil conditions shall be avoided.

Planting areas shall be finish-graded to conform to drawings after full settlement has occurred.

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All plants shall be mulched with either shredded hardwood bark or wood chips over the root system from two (2) inches to a maximum depth of 4 inches immediately after planting. Mulching material shall be pulled back one (1) to two (2) inches away from the trunk of the tree. Mulch shall not be in contact with the trunks.

All twine rope, transit guards or wrappings, and plant labels secured around the trunk or branches shall be removed after the planting is completed.

209.4(h) Planting Large Caliper Tree Spade Stock.

The grading of the tree pit shall form a saucer at least four (4) inches in depth. Care shall be taken when lowering and raising the tree ball into the hole by use of a sling and an appropriate device as agreed upon by the Engineer. When centering the tree in the hole, the tree trunk is not to be used as the lever device to move the ball, rather some other lever method must be used at the approval of the Engineer. The center of the tree shall be centered within the tree grate to + 1" from the true center of the tree grate to the center of the tree trunk at the finished sidewalk grade.

209.4(i) Water Tubes.

Watering tubes shall not be routinely installed in any tree planting process. When directed by Engineer during the planting process, watering tubes shall be installed by contractor.

209.4(j) Fertilizer.

Unless otherwise specified, the Contractor shall furnish and place around trees and shrubs one ounce (1 oz.) root contact packets, place after plant hole has been two-thirds (2/3) backfilled. Number of packets to place shall be as follows: 1 packet - bare root shrubs, 2 packets - bare root trees and balled and burlapped shrubs, 4 packets - B&B trees up to three (3) inch caliper, 6 packets - B&B trees three (3) inch caliper and larger. Trees shall not be routinely fertilized when planted.

209.4(k) Mulching.

After planting operations have been completed, planted areas shall be entirely covered with a layer of mulch that is two (2) to four (4) inches deep at the rate of nine (9) cubic yards per 1,000 square feet. The mulch shall be applied one (1) to two (2) inches away from the trunk of the tree. Mulch shall not be in contact with the trunk and shall be maintained as such during the guarantee period. Mulch shall not come in contact with the trunk. When/where indicated on plan or by Engineer, a 6 oz. non-woven permeable landscape fabric/soil separator shall be placed between mulch and soil.

For trees in tree grates and when/where specified, #2 washed stone mulch shall be installed in the watering tubes and grate opening. Mulch shall be three (3) to six (6) inches deep, flush with the underside of the tree grate after settlement and compaction.

Landscape fabric, when/where specified, shall be placed within the layer of washed stone mulch at a depth of 2" below the finish grade of mulch prior to installing the tree grate. The landscape fabric should be cut and installed to the size and shape of the tree grate, including the tree trunk opening. The tree trunk opening of this landscape fabric shall be the same size as the grate opening to facilitate watering and root collar development.

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Following installation of the grate, additional stone mulch shall be installed around tree trunk until even with the top of the tree grate.

209.4(l) Wrapping.

Before trees are wrapped, the Engineer shall inspect the plant stock.

When specified to be wrapped, the trunks of trees shall be wrapped with wrapping material overlapping one and one-half inches, starting from the ground line to the lowest main branches. The wrapping shall be secured in at least three places with masking tape, including the top, middle and bottom. The wrapping shall be done as soon as practical after planting as specified by the Engineer.

209.4(m) Protection.

When required, a protective material shall be applied to plants. This shall consist of one of the materials permitted under Subsection 209.5(e) applied or installed according to Special Provisions and Details.

209.4(n) Support Staking.

When specified, trees shall be supported with at least two (2) stakes driven into the ground near the base of the tree to a depth of two (2) to three (3) feet or until sufficiently solid to support the tree, and shall extend upward to about six (6) inches below the lowest main branches. The tree shall be fastened to the stake by means of soft strapping at least one (1) inch wide, or banding in such a manner as to avoid injury to the tree. In no case shall the strap or banding extend completely around the trunk. Material should be attached loosely enough to allow a small amount of play at the trunk. Stakes are to be placed within the mulched area. Plant stakes shall be removed by the Contractor within a one year period subject to the approval of the Engineer.

209.4(o) Disposal of Excess and Waste Material.

All excess excavation, waste materials, or other debris shall be removed and disposed of by the Contractor.

209.5 Backfill Material.

209.5(a) Topsoil.

All plant holes shall be backfilled with excavated soil. Topsoil shall be salvaged from the planting site whenever suitable for reuse as determined by the Engineer. When holes are approximately two-thirds full, they shall be thoroughly watered to eliminate air pockets. Remaining/additional soil to be installed to the top of the hole and watered. Puddled soil conditions shall be avoided. Additional topsoil shall be of a reasonably fine granulated texture suitable for the purpose and acceptable to the Engineer. Additional topsoil will be supplied by the Contractor as required at no additional cost to the City. Topsoil used as backfill material for plant material to be amended with an acrylamide copolymer soil amendment when/where specified as approved by the Engineer.

The sod from the plant hole excavation may not be used for backfill.

209.5(b) Fertilizer.

Fertilizers when/where specified, shall be of the slow release type contained in polyethylene, perforated bags with micropore holes. Each bag shall contain a minimum of one(1) ounce of soluble fertilizer with an analysis of 16-8-16 per unit or approved equal. The minimum guaranteed analysis shall be total nitrogen 16%, 9% annomical nitrogen, 7% nitrate nitrogen. Available phosphoric acid P2 O5 (from ammonium phosphate) 8%, soluble potash (from potassium chloride) 16%.

209.5(c) Mulch.

Mulch shall consist of shredded hardwood bark or wood chips or an equivalent material as approved by the Engineer and shall be free of objectionable foreign material. Contractor shall furnish a sample of the mulch that will be used. Where shrubs or perennials/annuals or bulbs are installed in planting bed, shredded or ground hardwood bark shall be used or product approved by the Engineer prior to installation. When/where indicated on plan or by Engineer, a 6 oz. non-woven permeable landscape fabric/soil separator shall be placed between mulch and soil.

209.5(d) Wrapping.

Before trees are wrapped, the Engineer shall inspect the plant stock.

Wrapping, when/where specified, shall consist of a two-ply waterproofed crepe tree wrapping paper, laminated with a layer of pliable asphalt material. The wrap shall tightly cover the entire surface of the trunk, overlapped one and one-half inches in spiral fashion, starting at the base of the tree and extending to the height of the first branches. The wrapping shall be secured in at least three places with masking tape. The contractor will be responsible for removing and disposing of the tree wrap after a one year period.

209.5(e) Protection.

Protection, when/where specified, shall consist of galvanized hardware cloth, extruded aluminum mesh or a durable pre-formed plastic material. The hardware cloth or aluminum mesh, if used, shall have at least three meshes per linear inch and shall be used in conjunction with a steel rod having a minimum size of 3/8 x 48 inches. The plastic material shall be a durable, resilient, preformed plastic spiral acceptable to the Engineer. Such material shall have a natural, earth-tone color. . The contractor will be responsible for removing and disposing of the protection at the end of the guarantee period unless otherwise specified by the Engineer.

209.5(f) Support Staking Materials.

When/where specified, these materials shall consist of such wood or steel stakes, soft straps or banding material as needed to perform the work. Support stakes shall be of solid durable wood approximately two by two inches and of the required length.

In no case shall the strap or banding material extend completely around the tree trunk. Material should be attached loosely enough to allow a small amount of play in the trunk.

The Contractor will be responsible for removing all stakes and straps after a one year period, subject to approval of the Engineer.

209.5(g) Anti-Desiccant.

Anti-desiccant, when/where specified, shall be an approved emulsion which will provide a film over plant surfaces permeable enough to permit transpiration.

209.5(h) Watering Tubes.

Watering tubes shall not be routinely installed as part of any tree planting process. Watering tubes, when specified, shall be six (6) inch diameter perforated Poly (Vinyl Chloride) (PVC) pipe, twenty-four (24) to thirty (30) inches long and shall be filled with a 1-1/2 - 2 inch river-washed stone.

209.5(i) Watering Equipment.

The Contractor shall furnish and have available sufficient watering equipment, including tanks, pumps, hoses, root feeders and incidentals to fully perform all of the watering. Water will be furnished to the Contractor by the City from existing facilities if requested by the Contractor in accordance with Section 107.11 of these Specifications. When the Contractor chooses to use City of Madison water for any part of the project, then the Contractor must proceed as follows:

1. Request Water Utility to install valve on convenient hydrant.
2. Agree to pay Water Utility charges for installation, use and removal of the valve.
3. Notify Water Utility immediately when use of valve is no longer necessary.

The Contractor shall not make connections to Water Utility facilities without permission from the Water Utility.

209.6 Acceptance and Guarantee.

209.6(a) Acceptance.

Upon completion of all required planting, an inspection of the work will be made by the Engineer. All plants which are dead or found not to be in a normal, healthy condition or do not conform to specifications, in the judgment of the Engineer will not be accepted. All rejected work shall be replaced by the Contractor, including removal and repair of all work affected by the replacement, at no cost to the City.

209.6(b) Care.

The Contractor shall properly care for all plants while the payment and performance bond remains in effect. The performance and payment bond shall remain in effect for one year from the date on the certificate of completion.

Proper care of plants shall consist of doing such watering, weeding, cultivating, pruning, spraying, securing of braces and guys, wrapping, re-mulching and such other work as may be necessary to keep the plants in a neat appearance and in a healthy growing condition. Street trees shall be pruned by the City Forester. In addition to the waterings required in Subsection 209.4(g), entitled Planting, additional waterings may be ordered by the Engineer at any time, for the duration of the guarantee period. Should conditions require such waterings, Contractor shall water within three (3) days of notification. The volume of each watering and intervals between waterings shall depend upon weather conditions and soil moisture. Contractor shall monitor weather and soil condition of each planting.

Care must be taken when watering not to wash away mulch and topsoil. Mulch and topsoil displaced by the Contractor must be replaced immediately per section 209.4(k).

209.6(c) Guarantee.

At any time within the period of the guarantee, the Contractor shall replace any plant which, for any reason, has died or is in a dying condition, or which has failed to flourish in such a manner or to such a degree that its usefulness or appearance has been impaired. Replacement shall include removal and repair of all affected work. The decision of the City as to the necessity of replacing any plants shall be conclusive and binding on the Contractor. No more than two (2) replacements per plant shall be required after acceptance.

Following the completion of the replacements, a re-inspection will be made prior to final acceptance. The Contractor shall guarantee the plant material under this contract for a period of two (2) years from the date of final acceptance.

All replacement plantings are to be selected and tagged by the Engineer prior to being brought to the job site. It is the responsibility of the Contractor to notify the Engineer forty-eight (48) hours prior to any replacement plantings as to what they are to be planting and in what location.

Prior to the termination of the guarantee period, the Contractor shall request a final inspection by the City. All plants found unacceptable for reasons herein before stated shall be replaced at the first planting season and thereafter the responsibility for such plants or material shall lie with the City, no additional guarantee period will be required for these plantings.

209.6(d) Contract Time.

Contract time will not be charged when making replacements, unless other contract operations are in progress during said period.

209.7 Method of Measurement.

This work will be measured by the number of plants of each species, variety and size complete in place and accepted in accordance with the terms of the contract.

209.8 Basis of Payment.

The number of plants, furnished and planted, measured as provided above, will be paid for at the contract unit price each for Trees (Species and Size), Shrubs (Species and Size), or Vines (Species and Size) and Perennials/Grasses (Species and Size), as the case may be, which 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, guys and braces, rodent protection, herbicides and anti-desiccant spray; for removing guys and braces; for disposal of all excess and waste materials; for care; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work, except topsoil for use in planting, which will be paid for on a cubic yard basis.

ARTICLE 210 - EROSION CONTROL

210.1 Description.

Soil erosion and uncontrolled runoff from construction and land disturbing activities can have adverse impacts upon regional water resources and the health, safety, property and general welfare of the community. The Contractor shall conduct and schedule operations so as to avoid or minimize siltation of streams, lakes, reservoirs and other areas. The Contractor shall also take all necessary precautions to prevent pollution of streams, lakes, reservoirs and other areas with fuels, oils, bitumen, calcium chloride, or other harmful materials. Requirements for the treatment of runoff associated with dewatering Type I or Type II is addressed in section 502 of these Standard Specifications.

The Contractor shall have adequate erosion control measures available on site for erosion control as per the plans, special provisions and Standard Detail Drawings or as determined necessary by the Construction Engineer. The type and amount of erosion control materials required will be determined by the type and amount of open excavation and/or the erosion control plan. The Contractor shall schedule the work so that the amount of open excavation and the stockpiling of construction materials on the job site are minimized.

Excavated materials and imported backfill materials stockpiled at the project site shall be stored and protected in such a manner that will not result in transport of said materials by stormwater runoff into adjacent streets or drainage facilities. Unprotected excavated materials and imported backfill materials stored temporarily on street pavements to facilitate construction shall be removed and/or properly stored/protected by the end of the work period, which shall not extend past the end of the work day.

Backfilled trenches and other areas shall be left to the level of the adjacent area or slightly below until restored to reduce the potential for erosion. All excess excavated materials and imported backfill materials shall be promptly removed from the site and disposed of following completion of construction and/or restoration activities.

Tracking of foreign materials (mud, silt, etc.) on street and/or other paved surfaces shall be controlled during the working day as necessary and/or as directed by the Construction Engineer, but no later than the end of the working day, by one or more of the following methods:

1. Hand shoveling material off street or pavement surfaces.
2. Machine removal (such as with endloader or grader), provided that the results are equal to that of hand shoveling.
3. Mechanical sweeping of material off paved surfaces and adjacent streets.

Diversion berms or sediment filtration berms shall be constructed and maintained as determined necessary by the erosion control plan and/or the Construction Engineer in order to route off-site stormwater runoff around disturbed work areas.

Replacement/repair of pre-existing erosion control measures which are disturbed in the course of the work shall be completed promptly following completion of the work on the project causing such disturbance.

210.1(a) Erosion Control Implementation Plan.

Whenever a project requires erosion control permitting for land disturbance of 20,000 square feet or more the Contractor shall prepare and submit an Erosion Control Implementation Plan to the Construction Engineer. This plan shall be submitted at or before the preconstruction meeting for review and must be approved by the City Erosion Control Engineer prior to any land disturbance activities or beginning installation of erosion control measures. The Erosion Control Implementation Plan bid item shall include all work required to create, update, submit, obtain approval for, and initially field inspect an erosion control plan specific to the Contractor's proposed staging and planned methods of construction for the project. The individual erosion control measures necessary for construction of the plan shall be paid under the appropriate bid items.

The Contractor shall understand that a comprehensive phased plan showing the Contractor's approach to minimize the disturbed area at any given time is required to obtain approval of the Erosion Control Implementation Plan. The phasing shall consist of a minimum of two (2) phases for construction with no maximum number of phases. The Contractor shall not simply resubmit the erosion control plan provided with the plan set as what they intend to implement. Upon approval of the implementation plan it shall be provided to the WDNR, when applicable.

Prior to beginning any land disturbing construction activities the Contractor shall install all required erosion control practices for the first phase of the approved Erosion Control Implementation Plan and an initial implementation inspection (performed by City Engineering staff) must approve the installation. Prior to proceeding with work on each subsequent construction phase the appropriate erosion control measures from the Erosion Control Implementation Plan shall be installed and the installation approved by the Construction Engineer.

210.1(b) Erosion Control Inspection.

The Contractor shall complete an inspection of the erosion control practices on permitted projects with 20,000 square feet or more of land disturbance within 24 hours of the end any rain day exceeding 1/2" in total depth or as directed by the Construction Engineer. A rain day is defined as each 24-hour calendar day and shall be measured using a gauging station that shall be provided at the preconstruction meeting by City staff. The data from the rain gauging station shall be available on the internet to allow remote checking of the rain depth totals for each rain day.

Upon completion of the erosion control inspection the Contractor shall provide an email report indicating the status (Good, Failed, Maintenance Needed, etc) of each individual erosion control practice being used to the Construction Engineer or to the designated representative as identified at the preconstruction meeting. A digital photo or video of each individual erosion control practice requiring maintenance or repair shall be included in the inspection report. The inspection report shall be submitted and any needed maintenance or repairs completed by the Contractor within the same 24-hour period after the end of the rain day. The completed maintenance and repairs shall then be documented and a follow-up inspection report submitted within 24 hours following completion of the repairs. The follow-up inspection report shall include a summary of maintenance items by erosion control BMP maintenance pay item and digital photos or videos of each erosion control practice following maintenance or repair.

Erosion control inspections and reports that are completed more than 24 hours after the end of a rain day as defined above but not more than 48 hours will be paid at half the unit price. Any required erosion control inspection or inspection report that is completed more than 48 hours after the end of

rain day or report due date will be assessed a penalty equal to one (1) day of liquidated damages per the table in Section 109.9 Liquidated Damages of these Standard Specifications.

The Contractor shall continue erosion control inspections on a project until a minimum of 70% vegetation establishment has been obtained or other permanent surface restoration has occurred as determined by the Construction Engineer (matting, pavement, sod, etc.).

210.1(c) Construction Entrance, Street Construction Entrance Berm.

When required, either by the erosion control plan or the Construction Engineer, a Construction Entrance and/or Street Construction Entrance Berm shall be installed to provide mud tracking control at each construction access point to the project. The Construction Entrance and Street Construction Entrance Berm bid items shall include the installation of entrances per Standard Detail Drawings 1.07 and 1.08 respectively. Maintenance of the entrance, removal, restoration and/or repair of any disturbed or damaged area within the immediate limits of the entrance (including the curb and gutter, sidewalk and pavement) shall also be considered incidental to the entrance bid items.

210.1(d) Street Sweeping.

When required, either by the erosion control plan or the Construction Engineer, the Contractor shall perform street sweeping on all streets or paved surfaces affected by construction equipment, hauling or related construction activities that result in mud tracking or siltation. Street sweeping shall be completed as directed by the Construction Engineer and shall remove all loose material to the satisfaction of the Construction Engineer. Depending on site conditions, construction activities, and hauling methods utilized by the Contractor street sweeping may be required multiple times throughout the day with an absolute minimum that all streets are clean at the end of the work day.

210.1(e) Clear Stone Berm (Ditch Check), Street Construction Stone Berm.

When required, either by the erosion control plan or the Construction Engineer, a Clear Stone Berm (Ditch Check) and/or Street Construction Stone Berm shall be installed to reduce runoff velocities in areas of concentrated stormwater runoff flow. Clear Stone Berm (Ditch Check) and Street Construction Stone Berm shall be installed per Standard Detail Drawings 1.05 and 1.10 respectively. Maintenance and removal of stone berms shall be considered incidental to their respective bid items.

210.1(f) Silt Fence, Silt Sock, Erosion Bales.

When required, either by the erosion control plan or by the Construction Engineer, perimeter controls consisting of silt fence, silt sock or erosion bales shall be installed to protect down slope areas from silt laden runoff generated from disturbed work areas. Perimeter controls shall be installed per their respective Standard Detail Drawings (1.01 for Silt Fence, 1.09 for Silt Sock, and 1.03 for Erosion Bales).

210.1(g) Inlet Protection.

Inlet protection shall be used at both existing and new inlets that receive runoff from disturbed land areas. The type of inlet protection required at each structure shall be specified in the erosion control plan or determined by the Construction Engineer. Upon completion of the project and after the Construction Engineer has determined the site to be sufficiently stabilized all inlet protection shall be removed by the Contractor. Removal shall be completed prior to final acceptance of the project.

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Inlet Protection, Type C and Inlet Protection, Type C Modified shall be installed per Standard Detail Drawing 1.04.

Inlet Protection, Type D and Inlet Protection, Type D Modified shall be installed per Standard Detail Drawing 1.06.

Inlet Protection, Type D Hybrid shall be installed per Standard Detail Drawing 1.11.

210.1(h) Clean Sump.

Clean Sump is the vacuor removal of sediment that has accumulated in the sumps of Catchbasins constructed as part of the project. This work shall include but not be limited to removal of any sediments collected in the sump or on the erosion fabric, and disposal or reuse of the sediments at a location provided by the Contractor (this location shall be stable and have sufficient erosion control). The Construction Engineer shall have final determination if sump cleaning is required. If cleaning is required it shall be completed prior to final acceptance of the project.

210.1(i) Polymer Stabilization.

Polymer Stabilization shall include placing a polyacrylamide soil stabilizer on bare ground to stabilize the area. This item shall be used as directed by the Construction Engineer to stabilize areas that are prone to erosion during construction. Note that this item is not intended to cover polymer to be included with all seeding (which shall be compensated as part of the seeding bid items) but shall cover supplemental polymer stabilization of erosion-prone areas during construction. Polymer shall be applied in conformance with WDNR standard 1050 for Land Application of Anionic Polyacrylamide.

210.1(j) Erosion Matting.

When required, either by the erosion control plan or by the Construction Engineer, erosion matting shall be installed to reduce soil erosion caused by concentrated runoff or rainfall impact. The erosion mat supplied shall be one of the products listed on the PAL under the specified category, and shall conform to Wisconsin Department of Transportation requirements for the specified category.

210.1(k) Terrace Restoration.

Terrace Restoration shall include the provision, placement and finish grading of a minimum thickness of 4" of topsoil and the restoration with Shade or Sun Terrace Mix as directed in the field. The seeding work shall conform to the specifications in Article 207 - Seeding.

In greenways and detention basin areas, a minimum thickness of six inches (6") of topsoil shall be required.

210.2 Materials.

210.2(a) Silt Sock.

Silt sock provided shall be 8 or 12 inches in diameter as determined by the approved erosion control plan or as directed by the Construction Engineer. The silt sock shall be manufactured from a Multi-Filament Polypropylene (MFPP). The MFPP shall have a maximum mesh opening of 1/8 in, a minimum tensile strength of 202 psi, and a 100% original strength from ultraviolet exposure at 1000

hours (ASTM G-155). The silt sock shall be filled with either a compost filler material or a wood chip filler material with no pieces larger than 2 inches. Under no circumstances shall the compost filler material contain any animal waste or byproducts. Wooden posts for staking silt sock shall be 2 in X 2 in X 36 in and staking shall be at 10-foot intervals.

210.2(b) Polyacrylamide Soil Stabilizers.

Polyacrylamide Soil Stabilizers shall conform to the WDOT's Product Acceptability List (PAL) for Soil Stabilizers, Type B.

210.2(c) Erosion Matting.

Erosion Matting provided shall be of the Class and Type specified. The Class and Type requirements listed below match those of the Wisconsin Department of Transportation nomenclature. Products currently listed in the Wisconsin Department of Transportation's Product Acceptability List (PAL) for the Class and Type specified shall be considered to meet the City of Madison's Specifications for these products.

CLASS I Class I erosion mats shall be a light-duty, organic erosion control revegetation mat (ECRM). Non-organic netting is allowed for some Class I matting. Class I mat shall have an expected working duration of a minimum of six (6) months. There are four Types of Class I erosion mat.

URBAN TYPE A shall have a minimum permissible shear stress of 1.0 lbs/ft² for non-netted materials. No specified minimum permissible shear stress for netted products. Recommended for use on slopes 4:1 or flatter, and recommended for use in environmentally sensitive areas. Not recommended for use in channels.

URBAN TYPE B shall have a minimum permissible shear stress of 1.0 lbs/ft². Recommended for use on slopes of 2.5:1 or flatter, and recommended for use in environmentally sensitive areas. Not recommended for use in channels.

TYPE A shall have a minimum permissible shear stress of 1.0 lbs/ft². Recommended for use on slopes of 2.5:1 or flatter. Not recommended for use in channels.

TYPE B shall have a minimum Permissible Shear Stress of 1.5 lbs/ft² (70) Pa. Recommended for use on slopes of 2:1 for flatter.

CLASS II Class II erosion mats shall be long lasting, organic ECRM mats. Class II mat shall have an expected working duration of a minimum of three (3) years. There are three Types of Class II erosion mats.

TYPE A is a jute fiber mat. This type of matting shall only be used to reinforce sod and shall conform with Section 628.2.2 of the Wisconsin Department of Transportation Standard Specifications.

TYPE B shall have a Minimum Permissible Shear Stress of 2.0 lbs/ft² (95 Pa). Type B mat may utilize plastic netting in its construction. Recommended for used on slopes of 2:1 or flatter, or in channels.

TYPE C shall have a Minimum Permissible Shear Stress of 2.0 lbs/ft² (95 Pa). Type C shall be 100% organic including all netting used in its construction. Recommended for used on slopes of 2:1 or flatter, or in channels. Recommended for use in environmentally sensitive areas.

CLASS III Class III erosion mat shall be a 100% synthetic mat which shall be UV stabilized. There are four Types of Class III erosion mat.

TYPE A is an ECRM mat and shall have a Minimum Permissible Shear Stress of 2.0 lbs/ft² (95 Pa). Recommended for used on slopes of 2:1 or flatter, or in channels.

TYPE B is a Turf Reinforcement Mat (TRM) and shall have a Minimum Permissible Shear Stress of 2.0 lbs/ft² (95 Pa). Recommended for used on slopes of 2:1 or flatter, or in channels.

TYPE C is a TRM and shall have a Minimum Permissible Shear Stress of 3.5 lbs/ft² (170 Pa). Recommended for used on slopes of 2:1 or flatter, or in channels.

TYPE D is a TRM and shall have a Minimum Permissible Shear Stress of 5.0 lbs/ft² (240 Pa). Recommended for used on slopes of 1:1 or flatter, or in channels.

Note: When Class III, Types B, C or D are used, the affected areas shall be seeded and fertilized but not mulched. The affected area shall then have Class I matting installed over the affected area. The seeding and Class I matting will be measured and paid for separately.

210.3 Construction Methods.

210.3(a) Polymer Stabilization.

Application is intended to be done with conventional hydraulic seeding equipment. Polyacrylamide Soil Stabilizer may also be placed through dry spreading.

Application rates shall be as recommended by the manufacturer and shall meet the approval of the engineer. In general, rate of application shall be 20 lbs./acre.

210.3(b) Erosion Matting.

Erosion mat shall be installed in compliance with the Standard Plate "EROSION MAT" in the City of Madison Standard Specifications for Public Works Construction and/or in compliance with the manufacture's specifications. Erosion matting shall be installed within three (3) days of seeding.

The Contractor shall submit the name of the specified product proposed for use as well as the manufacturer's recommended installation instructions, including but not limited to: recommended anchoring devices, (i.e. type of stakes or staples); overlap; anchor trench configuration; and anchoring pattern. The Contractor shall provide this submittal at the preconstruction meeting. Where any discrepancy exists between installation methods called out on the Standard Plate and the manufacturer's specifications, the Construction Engineer shall have the final authority to specify the installation method used.

210.4 Method of Measurement.

210.4(a) Construction Entrance, Street Construction Entrance Berm.

Construction Entrance and Street Construction Entrance Berm shall be measured as a completed unit as installed, maintained and removed in the field. The Contractor shall be aware that the Standard Detail Drawings for Construction Entrance (SDD 1.05) and Street Construction Entrance Berms (SDD 1.10) specify these entrances to be a minimum of 50' long. Construction of an entrance not meeting this specification will result in no payment for this item, not a partial payment.

The quantity of clear stone required for these items shall be compensated separately under the clear stone bid item. The Contractor shall furnish and deliver to the Engineer a ticket with each load showing the net weight of the load of clear stone. All tickets for materials delivered to a City of Madison project shall be presented to the City representative on the project within twenty-four (24) hours after delivery of the materials to the project. Tickets presented after the time specified may be rejected due to inability to substantiate actual use of the materials on the project.

Any required restoration resulting from the removal of any Construction Entrance or Street Construction Entrance Berm after project restoration has been completed shall be considered incidental to the entrance item.

210.4(b) Clear Stone Berm (Ditch Check), Street Construction Stone Berm.

Clear Stone Berm (Ditch Check) and Street Construction Stone Berm, shall be measured as a completed unit as installed, maintained and removed in the field. Street Construction Stone Berms installed across the full width of the street shall be counted as two (2) units.

The quantity of clear stone required for these items shall be compensated separately under the clear stone bid item. The Contractor shall furnish and deliver to the Engineer a ticket with each load showing the net weight of the load of clear stone. All tickets for materials delivered to a City of Madison project shall be presented to the City representative on the project within twenty-four (24) hours after delivery of the materials to the project. Tickets presented after the time specified may be rejected due to inability to substantiate actual use of the materials on the project.

Any required restoration resulting from the removal of any Clear Stone Berm (Ditch Check) or Street Construction Stone Berm after project restoration has been completed shall be considered incidental to the stone berm item.

210.4(c) Erosion Matting.

Erosion Matting shall be measured by the square yard in place not including runout in anchor trenches or overlap.

210.4(d) Terrace Restoration.

Terrace Restoration shall be measured by the square yard or the trench foot as specified in the contract.

210.5 Basis of Payment.

210.5(a) Clear Stone.

The quantity of clear stone for Clear Stone Berm (Ditch Check), Street Construction Stone Berm, Construction Entrance, and Street Construction Entrance Berm shall be paid at the contract unit price per ton and compensated for under the clear stone bid item.

210.5(b) Silt Fence, Silt Sock, Erosion Bales.

Silt Fence - Complete (BID ITEM 21021), Silt Sock (8 inch) – Complete (BID ITEM 21017), Silt Sock (12 inch) – Complete (BID ITEM 21024), and Erosion Bales - Complete (BID ITEM 21027) shall be paid for at the contract unit price per linear foot, which price shall be full compensation for furnishing all materials; for constructing, reconstructing, erecting, re-erecting, maintaining, removal and any follow-up restoration; and for all labor, tools, equipment and incidentals necessary to complete the work. Half of the installed quantity shall be paid at the time of installation and the remaining half shall be paid upon removal and any required incidental restoration is completed.

Where silt fence, silt sock and erosion bales are not listed as an item on which to submit unit prices, it shall be understood and agreed that the Contractor shall be paid two dollars and fifty cents (\$2.50) per linear foot of silt fence, erosion bales, or silt sock furnished, installed, maintained and removed.

210.5(c) Inlet Protection.

Inlet Protection, Type C - Complete (BID ITEM 21031), Inlet Protection, Type C Modified - Complete (BID ITEM 21035), Inlet Protection, Type D - Complete (BID ITEM 21041), Inlet Protection, Type D Modified - Complete (BID ITEM 21045), and Inlet Protection, Type D Hybrid – Complete (BID ITEM 21055), shall be paid for at the contract unit price per each unit installed in the field, which price shall be full compensation for furnishing all materials; installing, reinstalling, maintaining, removal and any follow-up cleanup; and for all labor, tools, equipment and incidentals necessary to complete the work. Half of the installed quantity shall be paid at the time of installation and the remaining half shall be paid upon removal and any follow-up cleanup has been completed.

210.5(d) Erosion Matting.

The area of erosion matting, measured as provided above, shall be paid for at the contract unit price per square yard for erosion matting, which price shall be full compensation for furnishing and placing all materials; for constructing, reconstructing, maintaining and anchoring; and for all labor, tools, equipment and incidentals necessary to complete the work. Any matting installed incorrectly shall result in all matting be paid at half the contract price. Incorrectly installed matting shall be defined as matting which is not installed in compliance with the conditions as laid out in these standard specifications. Seeding is not included in this item and will be measured and paid separately per Section 207 of these Standard Specifications.

ARTICLE 211 - TERRACE RAIN GARDEN

211.1 Description.

Work under this item shall include all work (including but not limited to excavation, removal and disposal of existing material, provision and placement of engineered material), all materials (including but not limited to castings, pipes, engineered fill and mulch), labor, and incidentals required to construct the rain garden system meeting the sizes, locations, specifications, and detail drawings contained in this document and in the plan set.

The Contractor shall review the detail drawings for each system in detail. The size of each garden is specific as is the means of providing stormwater to the system. This item does not include planting of the rain garden system. Planting will be completed by others.

The City reserves the right to add or remove rain gardens from the contract. The Contractor shall not be compensated in any matter for the removal or addition of rain gardens from the contract. The addition of rain gardens shall be consistent with the already designed gardens as indicated in the plan set.

211.2 Materials.

211.2(a) Engineered Soil

The soil mixture shall consist of a mixture of sand, compost and topsoil. The mix shall be designed to approximate the following percentages, by volume. The mix shall be free of rocks, stumps, roots, brush or other material over 1 inch in diameter. No other materials shall be mixed with the planting soil that may be harmful to plant growth or prove a hindrance to planting or maintenance.

Engineered Soil Component	% Composition by Volume
Sand	45-55%
Topsoil	10-15%
Compost	30-50%

211.2(a)(1) Sand

The sand used in the engineered soil mix shall meet the following gradation requirements:

1. Crushed & screened sandstone
2. 100% passing a #4 sieve
3. Maximum of 5% passing a #200 sieve

211.2(a)(2) Topsoil

The topsoil component shall be a USDA classified sandy loam, loamy sand or loam texture. The topsoil component textural class shall be verified by a laboratory analysis or a professional acceptable to the jurisdiction having authority. The topsoil shall be pulverized prior to mixing with the other materials. No soil particle size over 1" diameter shall be accepted and will require removal of all material from the site and a new mix being provided.

211.2(a)(3) Compost

The compost component shall meet the following requirements:

1. Particle Size – 98% of the compost shall pass through a 0.75-inch screen.
2. Physical Contaminants – Less than 1% combined glass, metal and plastic.
3. Organic Matter/Ash Content – At least 40% organic matter; less than 60% ash content.
4. Carbon to Nitrogen Ratio – 10-20:1 C:N ratio.
5. pH – Between 6 and 8.
6. Soluble Salts – Electrical conductivity below 10 dS m⁻¹ (mmhos cm⁻¹)
7. Moisture Content – Between 35% and 50% by weight.
8. Maturity – The compost shall be resistant to further decomposition and free of compounds, such as ammonia and organic acids, in concentrations toxic to plant growth.
9. Residual Seeds & Pathogens – Pathogens and noxious seeds shall be minimized.
10. Pathogens – The compost shall meet the Class A requirements for pathogens as specified in s. NR 204.07(6)(a), Wis. Adm. Code.
11. Other Chemical Contaminants – The compost shall meet the high quality pollutant concentrations as specified in s. NR 204.07(5)(c), Wis. Adm. Code.

211.3 Construction Methods.

211.3(a) Excavation, Fill, Grading.

Construction shall include all excavation, removal and disposal offsite, at a location provided by the Contractor, of existing material to the bottom of rain garden system grade shown on the detail drawings.

Standard excavation shall begin at the outer polygon shown on the detail drawings and shall be on a continuous slope from the existing elevation to the finish horizontal location and elevation as depicted by the inner polygon. This inner polygon represents the bottom of the rain garden. Excavation below finish grade and replacement of existing material with engineered fill is required only below the inner polygon. Excavation below finish grade inside the inner polygon shall consist of two (2) feet of excavation below the finish grade shown on the detail drawings. This volume shall then be filled with engineered fill (meeting the specifications below) to the finish grade noted on the detail.

The Contractor is responsible for the provision of all required engineered fill as called out on the typical section including compost, topsoil, sand, and shredded mulch to be placed upon complete construction of the garden. All finishing work required to provide a finished engineered soil layer prior to placement of mulch. The mulch work shall consist of furnishing and installing three (3) inches of double shredded hardwood mulch. Mulch shall only be installed once the garden has been brought to finish grade. The 3” of mulch is to be added on top of engineered fill and above the finish grade noted in the plan set.

Each of these materials shall meet the specifications in 211.2 Materials.

211.3(b) Utilities.

All ULO's needed to construct each rain garden; there are utilities (gas, sanitary & water) near or in all of these features. All work necessary to locate and work around these utilities is included in the

price for these items. If any utility is located within the excavation depths of engineered fill, the contractor shall excavate with caution and use proper construction methods. The contractor shall install Rock Shield around the existing utility to provide protection and shall be included in this item.

If a water valve is located within the limits of the rain garden, this item shall include all materials, labor, and incidentals required to lower the top of the valve such that it is flush with the new finished grades of the rain garden.

211.3(c) Curb Inlet.

The curb inlet casting to the rain garden system shall be a Neenah casting R-3268 poured into the curb with a 6" PVC pipe draining from the casting into the rain garden system. The piping and all couplings and fittings required for the 6-inch PVC pipe shall be included.

This casting system requires the curb flow-line at the casting be depressed 3" to force water from the curb to enter the casting and move toward the rain garden system. The curb flow-line depression shall be completed over three (3) feet on either side of the casting and the additional handwork associated with the curb pour is included in with this bid item. Upon placement of the PVC pipe into the bioretention system the pipe shall be capped (temporarily – no glue) such that water does not enter the system.

211.4 Method of Measurement.

Terrace Rain Garden shall be measured as each system is completed in the field.

211.5 Basis of Payment.

Terrace Rain Garden shall be measured as described above which shall be full compensation for all work, materials and incidentals to complete the work as described above.

ARTICLE 212 - RIPRAP

212.1 Description.

This item shall consist of furnishing and placing riprap in accordance with these specifications, the Contract, as shown on the plans and cross sections, or as directed by the Engineer. The work shall be done at the locations and to the lines and grades as shown on the plans or as directed by the Engineer.

212.2 Materials.

212.2(a) Riprap Stone.

Riprap stone shall be durable field or quarry stone that is sound, hard, dense, resistant to the action of air and water, and free of seams, cracks, or other structural defects. Use stone pieces with a length and width no more than twice the thickness. Stone pieces for riprap are subject to approval by the Construction Engineer.

The Construction Engineer shall determine the average dimension of stone pieces by averaging measurements of thickness, width, and length. Furnish stones conforming to the size requirements for the riprap grade the plans show. Size requirements are expressed as the percent of the gross in-place riprap volume occupied by stones within average dimension size ranges for each riprap grade as follows.

Average Dimension Ranges For Each Riprap Grade				Fraction Of Gross In-Place Riprap Volume Occupied By Stones
Light Riprap	Medium Riprap	Heavy Riprap	Extra-Heavy Riprap	
inches	inches	inches	inches	
> 16	> 20	> 25	> 30	0%
11-13	14-16	18-20	22-25	10%-14%
9-11	11-14	14-18	18-22	15%-21%
4-9	5-11	6.5-14	8-18	20%-28%
< 4	< 5	< 6.5	< 8	5%-7%
< 1	< 1	< 1	< 1	1% or less

212.2(b) Riprap Grout.

Riprap grout shall be an air-entrained Portland cement mortar or concrete to fill the voids between riprap stones in grouted riprap. Conform to the physical requirements for component materials as specified in section 501.2 of the latest edition of Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation except furnish fine aggregate or a combination of fine and coarse aggregate with a gradation that results in a grout with a consistency that allows complete filling of the riprap voids.

Grout shall conform to the following mixture requirements:

- Contains 470 pounds or more of Portland cement per cubic yard of grout. The Contractor may substitute class C fly ash for up to 30% of required Portland cement.

- Contains only enough water to achieve a three (3) inch slump. Any additional workability required to completely fill the riprap voids must be achieved with admixture without increasing the water/cement ratio.
- Contains 9% or more air for mixes with a nominal top size aggregate less than 3/8 inch or 7% or more air for a mix with 3/8 inch or larger aggregate.

212.3 Construction Methods.

212.3(a) General.

Prepare a bed for the riprap by excavating, shaping the slopes, and constructing the toe for riprap installation. After placing the riprap, restore the surface of adjacent work and dispose of surplus material.

212.3(b) Riprap.

Stone shall be laid with close broken joints and shall be firmly bedded in the slope and against the adjoining stones. The stones shall be laid perpendicular to the slopes with ends in contact. The Riprap shall be thoroughly compacted as construction progresses and the finished surface shall present an even, tight surface. The larger stone shall be placed in lower course. Interstices between stones shall be chinked with spall firmly rammed into places. All riprap shall be laid on filter fabric as described, which shall be paid for separately under that item.

Unless otherwise specified, light riprap shall be a minimum of 12 inches thick, medium riprap a minimum of 18 inches thick, heavy riprap a minimum of 24 inches thick and extra-heavy riprap a minimum of 30 inches thick. All riprap thicknesses shall be measured perpendicular to the bed slope.

212.3(c) Placing Grouted Riprap.

If the plans specify using grouted riprap, stone shall be laid as specified above under 211.3(b). Fill the spaces between the stones with cement mortar. Use sufficient mortar or concrete to completely fill all voids, except leave the face surface of the stone exposed.

Place grout from the bottom to the top and then sweep the surface with a stiff broom.

212.4 Method of Measurement.

212.4(a) Riprap.

Riprap shall be measured by the cubic yards or ton in place as specified in the contract.

212.4(b) Grouted Riprap.

Grouted riprap shall be measured by the cubic yard of riprap or ton of riprap in place as specified in the contract. Grout required shall be considered incidental to this item and not measured.

212.5 Basis of Payment.

Riprap, measured as provided above, shall be paid for at the contract price unit price. Such payment shall be considered full compensation for furnishing, hauling, placing, and compacting the specified

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material, including all equipment, tools, labor and incidentals necessary to complete the work as specified. Grout shall be considered incidental to riprap and not be paid for.

ARTICLE 213 - MISCELLANEOUS

213.1 General.

This article shall consist of miscellaneous work in accordance with these Specifications, the Contract, as shown on the plans and cross sections, or as directed by the Engineer. The work shall be done at the locations and to the lines and grades as shown on the plans or as directed by the Engineer.

213.2 Description

213.2(a) Mailboxes.

The mailboxes shall be removed from each driveway and temporary placed at one end of the project limits. The temporary placement location will be determined by the City Construction Engineer. Access will be provided to the temporary placement location area at all times. At the end of the project, the contractor shall re-install the mailboxes to their original location or a location determined by the City Construction Engineer. The contractor shall replace the original post and mailbox if any damage occurs.

213.3 Method of Measurement.

Unless otherwise provided, this work will be measured in the original position of the structures to be removed and replaced, as follows:

1. Remove and Replace mailbox shall be measured by each completed unit in place.

213.4 Basis of Payment.

Remove and Replace Mailbox shall be paid at the contract price for work as described and measured above including all work, materials, labor, and incidentals.