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ARTICLE 401 - CRUSHED AGGREGATE BASE COURSE

401.1 General.

401.1(a) Description.

This item shall consist of a dense compacted base course composed of two or more courses or layers of coarse aggregate, either crushed stone or crushed concrete, fine aggregate and surface or filler blended as necessary to produce an intimate mixture, of the required gradation and stability, constructed on the prepared foundation in accordance with the specifications and in conformity with the lines, grades, thickness and typical cross sections shown on the plans or established by the Engineer.

401.1(b) Materials.

The aggregates shall conform to Article 301 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation, except as modified herein or in the Special Provisions of the contract.

The aggregates shall consist of hard, durable particles of crushed stone resulting from the artificial crushing of rock, boulders, large cobble stones, or concrete substantially all faces of which have resulted from the crushing operation. The material shall be free from dirt, debris, frozen materials, vegetable matter, shale, and lumps or balls of clay.

The determination of the acceptability of the aggregates will be made by field evaluation and/or laboratory test. The Engineer reserves the right to prohibit the use of material from any source, plant, pit, quarry or deposit where the character of the material or method of operation is such as to make improbable the furnishing of aggregates conforming to the requirements of these Specifications, unless satisfactory evidence is shown that material conforming to specification requirements is produced.

Unless specified in the Contract or permitted by the Engineer, crushed asphalt pavements, and mixtures thereof shall not be used for constructing Crushed Aggregate Base Course.

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The aggregates shall be well graded between the limits specified and shall conform to the following gradation requirements:

PERCENT BY WEIGHT PASSING					
Sieve Size	Gradation No. 1 (3" Maximum)	Gradation No. 2 (1-1/4" Maximum)	Gradation No. 3 (3/4" Maximum)	Gradation No. 4 (9" Maximum)	Gradation No. 5 Breaker Run (5" Maximum)
9"	----	----	----	100	----
6"	----	----	----	70 - 90	----
5"	----	----	----	----	90 - 100
3"	100	----	----	10 - 25	----
2-1/2"	90 - 100	----	----	----	----
2"	----	----	----	----	----
1-1/2"	25 - 60	100	----	----	20 - 50
1-1/4"	----	95 - 100	----	----	----
1"	----	----	100	0 - 5	----
3/4"	0 - 20	70 - 90	90 - 100	----	----
1/2"	----	----	----	----	----
3/8"	0 - 5	45 - 75	40 - 75	----	----
No. 4	----	30 - 60	25 - 60	----	----
No. 10	----	20 - 40	15 - 45	----	0 - 10
No. 40	----	7 - 25	----	----	----
No. 200	----	2 - 12 see notes 1, 2	3 - 12	0 - 3	----

1. Limited to a maximum of 8% for base placed between old and new pavement.
2. 3.0 – 10.0% if base is > 50% crushed gravel.

NOTE: That Gradation #4 is to be a sorted or screened blast or shot rock.

Unless otherwise provided in the contract, aggregates for the top layer of base course shall be Gradation No. 2, and the aggregates for the bottom layer shall be Gradation No. 1. Gradation No. 3 shall be used for top dressing and final finishing.

401.1(c) Equipment.

Equipment and tools necessary for performing and maintaining all parts of the work, satisfactory as to design, capacity and mechanical condition for the purpose intended, must be on the job before the work is started. Any equipment which is not maintained in full working order, or which as used by the Contractor is inadequate to obtain the results prescribed, shall be repaired, improved, replaced, or supplemented to obtain the progress and quality of work contemplated by the contract.

401.2 Construction Methods.

401.2(a) Preparation of Foundation.

The foundation shall be so prepared and constructed that it will have uniform density throughout. It shall be brought to the required alignment and cross section with equipment and methods adapted for the purpose. Upon completion of the shaping and compacting operations, the foundation shall be

smooth, at required density, and at the proper elevation and contour to receive the course to be constructed on it.

The right is reserved to make such minor adjustments in the finished grade line from that shown on the plans as may be necessary or desirable to maintain the characteristics of a stabilized foundation by minimizing the amount of cutting into or filling over such stabilized foundation, provided such adjustments do not impair the riding qualities, drainage, or appearance of the finished pavement or cause, in effect, a deviation from a grade established by appropriate municipal ordinance. Areas of yielding or unstable material shall be excavated and backfilled with approved material as ordered by the Engineer. This work shall be measured and paid for under the appropriate contract items, or as Extra Work, in the absence of such a contract item or items.

Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. Base material shall not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations shall have water applied to them and shall be reworked or recompacted if necessary.

401.2(b) Spreading and Shaping.

Equipment used for spreading and shaping the crushed aggregate base course shall be designed and operated so as to spread the material in uniform layers without undue segregation. Power graders and blade graders used for spreading and shaping shall have weight, rigidity and design suitable for the work. Power graders shall have sufficient power to properly perform the work. Other types of equipment for spreading and shaping the material will be permitted, provided the work performed or produced by them is equivalent to or better than the work obtainable from blade machines. All equipment necessary for spreading and shaping, compaction, and water sprinkling of the base material shall be on the site prior to beginning the work of installing the base material.

Crushed aggregate base course shall not be installed until curbs and gutters and other concrete structures have cured per Standard Specifications to withstand hauling and placing operations. No crushed aggregate shall be placed between the curbs until the curbs have been adequately backfilled.

The material shall be deposited on the foundation or previously placed layer in a manner to minimize segregation and to facilitate spreading to a uniform layer of the required dimensions. Excessive manipulation which will cause segregation between the coarse and fine materials shall be avoided. The work shall, in general, proceed from the point on the project nearest the source of supply of the aggregate in order that the hauling equipment will travel over the previously placed material, and the hauling equipment shall be routed as uniformly as possible over all portions of the previously constructed courses or layers of the base course. Stockpiling of the aggregates shall be performed in such a manner as to facilitate the recovery of the maximum amount of stockpiled material and to minimize segregation of the material.

The crushed aggregate base course shall be constructed in two or more layers as directed by the Engineer. The material shall be spread in uniform uncompacted lifts, not to exceed five (5) inches in depth for Gradation No. 1 (3" maximum size) crushed aggregate, not to exceed three and one-half (3-1/2) inches for Gradation No. 2 (1-1/2" maximum size) crushed aggregate, and not to exceed one and one-half (1-1/2) inches for Gradation No. 3 (3/4" maximum size) crushed aggregate.

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When directed by the Engineer, the Contractor shall spread a layer of Gradation No. 3 (3/4" maximum size) crushed aggregate over the subbase before the application of the Gradation No. 1 (3" maximum size) crushed aggregate. It shall not be necessary to compact the lift of Gradation No. 3 crushed aggregate when placed directly on the subbase.

Top dressing and final finishing of the crushed aggregate base course shall be performed with Gradation No. 3 (3/4" maximum size) crushed aggregate after compaction of the surfaces of the base is complete, and after depressions and high points in the crown and along the gutter edges have been brought to grade. This material shall also be water sprinkled and compacted. The maximum compacted depth of this material shall be one (1) inch.

401.2(c) Compaction and Water Sprinkling.

Prior to and during compaction operations the material shall be shaped and maintained to proper dimensions and contour by means of blade graders or other suitable equipment. The surface of each layer shall be kept true and smooth at all times.

All crushed aggregate shall be thoroughly water sprinkled before spreading begins to prevent segregation.

The crushed aggregate base course shall be placed in two or more layers, each layer being water sprinkled to the satisfaction of the Engineer to provide the required compaction. After leveling and water sprinkling, each layer of crushed aggregate shall be compacted to the degree that no further appreciable consolidation or movement of the base is evidenced under the action of the compaction equipment. The required compaction shall be attained for each layer before any material for a succeeding layer is placed thereon.

The compaction shall be performed by means of tamping rollers, pneumatic rollers, vibratory rollers, or other types of equipment which will produce the required results in the materials encountered, and be subject to the approval of the Engineer. Tandem or three wheel rollers, if used on the project, shall weigh at least ten (10) tons. Hauling and leveling equipment shall be routed and distributed over each layer of crushed aggregate in such a manner as to make use of the compaction afforded thereby.

All areas where proper compaction is not obtainable due to segregation of materials, excess fines, or other deficiencies in the crushed aggregate, shall be reworked as necessary or the material in them removed and replaced with material that will yield the required results. The complete cost of such reworking and replacement shall be at the Contractor's expense.

401.2(d) Driveways.

Where shown on the plans or directed by the Engineer, the Contractor shall construct driveways of Gradation No. 2 (1-1/2" maximum size) crushed aggregate. Unless otherwise specified, driveways shall be six (6) inches in depth.

401.3 Measurement and Payment.

401.3(a) Method of Measurement.

The item of Crushed Aggregate Base Course shall be measured by the ton. The quantity to be measured for payment shall be the amount of material required and incorporated in the work in accordance with the contract.

The Contractor shall furnish and deliver to the Engineer a ticket with each load showing the net weight of the load of crushed aggregate. 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 shall be rejected due to inability to substantiate actual use of the materials on the project. Each ticket shall include the truck number and the name of the driver and a unique code identifying the driver of the truck. The code can be the driver's initials and the last four digits of the driver's social security number or the first seven digits of their driver's license. For example 'AA1234', 'F560477'.

Aggregates which contain total moisture at the time of delivery in excess of seven (7) percent shall have moisture content in excess of seven (7) percent deducted from the measured weight. Determination of the moisture content of the aggregates shall be based on and expressed as a percent of the dry weight of the aggregates.

401.3(b) Basis of Payment.

The quantity of crushed aggregate measured as provided above will be paid for at the contract unit price per ton for Crushed Aggregate Base Course, complete in place, which price shall be full compensation for furnishing, placing, watering, drying, compacting, and maintaining the crushed aggregate base course; for preparing foundation; for stockpiling, if required; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

ARTICLE 402 - ASPHALT CONSTRUCTION

402.1 Materials for Asphalt Construction.

The materials intended for use in base, lower, and upper layer mixtures, tack and seal coats, surface treatments, and similar work, shall comply with the requirements of Part 4, "Pavements" of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation, except as modified herein or in the Special Provisions of the contract.

Wherever the terms "Division", "Divisions", "Department" or "Departments" appear in the above mentioned specifications, such terms shall be understood to mean "City" or "City's" respectively.

The Contractor shall provide Asphalt Pavement mix designs in accordance with the aforementioned Part 4 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation. The asphaltic materials used shall be PG64-22 for E-1 and E-3 mixes and PG58-28 for E-0.3 mixes, unless otherwise specified in the Special Provisions of the contract. The Engineer reserves the right to designate a grade of asphalt at the time of construction other than that specified in the contract.

402.2 Placing Asphalt Mixtures.

402.2(a) Description.

Asphalt mixtures shall not be placed when the air temperature approximately three (3) feet above ground at the site of the work, in the shade and away from the effects of artificial heat, is less than 40°F except that lower layer and base course mixtures may be placed at a lesser temperature approved by the Engineer in writing.

Asphalt mixtures shall not be placed during the calendar period between October 15th and May 1st of the next succeeding year, except with written approval or order of the Engineer. In the event of such approval or order, the conditions and restrictions as to placement set forth in the preceding paragraphs shall apply. The fact that the Engineer does not grant such approval shall not be construed as substantiating an extension of contract time for the completion of the work. Whenever such approval to extend the paving season has been denied, the Contractor shall ramp all access structures, catchbasins and water valve castings, ends of pavements, and curb edges with asphalt material to facilitate maintenance of the pavement area during the suspension of paving operations. Prior to the installation of succeeding layers of asphalt pavement, all such ramping shall be removed as directed by the Engineer and disposed of by the Contractor. All costs of installing and removing such ramping shall be at the Contractor's expense.

When placing of asphalt paving mixtures is continued after October 15th, either at the request of the Contractor or with the Engineer's approval in order to complete the work to the stage required by the provisions of the contract, the asphalt paving work so performed will be construed to have been done at the Contractor's risk. Final inspection thereof will be deferred until May of the succeeding year. Prior to final acceptance of pavement so placed, the Contractor shall repair, restore or replace at no additional cost to the City and in a manner approved by the Engineer, all damage or defects in the asphalt paving which, in the opinion of the Engineer, are attributable to temperature and weather conditions which prevailed after October 15th or before May 1st, as the case may be.

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After all layers have been thoroughly compacted, they may be tested for smoothness by means of a fourteen (14) foot straightedge placed parallel to the center line of the pavement, parallel to the grade line in each lane, and touching the surface. Ordinates measured from the face of the straightedge to the lower layer shall at no place exceed one-fourth (1/4) inch. Variations exceeding one-fourth (1/4) inch in the lower layer shall be corrected as directed by the Engineer. Ordinates measured from the face of the straightedge to the upper layer shall not exceed one-eighth (1/8) inch. For each variation in the upper layer greater than one-eighth (1/8) inch but less than one-fourth (1/4) inch, where directed by the Engineer, the area affected shall be removed and replaced with fresh upper layer mixture at the expense of the Contractor. If variations in the upper layer exceed one-fourth (1/4) inch, the entire area affected shall be removed and replaced with fresh upper layer mixture at the expense of the Contractor.

The Contractor shall be responsible for and maintain the work during the several stages of construction and until the acceptance thereof. Such maintenance shall include protection and repair of the foundation, tack coat, base, and surface. Any rich or bleeding areas, any breaks, any raveled spots, or other unsatisfactory areas shall be corrected during such maintenance period.

The Contractor shall protect all sections of the newly placed and compacted mixture from traffic until the material has cooled and hardened to the satisfaction of the Engineer. The Contractor shall furnish, install and maintain barricades to protect the surfaces tack coated and the pavement laid from traffic. Barricades may be removed only with the Engineer's approval. Barricades and fencing shall be designed and installed so as not to mark or otherwise damage the completed pavement.

Paving equipment shall not be cleaned with kerosene, fuel oil or gasoline on newly laid asphalt pavement, crushed stone base course prepared for asphalt pavement, or on existing asphalt pavements, unless the pavement or base is protected with a material, acceptable to the Engineer, which shall prevent cleaning oils or fluids from coming in contact with the pavement or base.

The Contractor shall maintain on the project suitable fire fighting equipment, or other equipment of similar purpose, and an adequate supply of hand brooms, shovels, mechanical tampers, hand tampers, lutes, and iron rake for use at places which are inaccessible to pavers and rollers. The Contractor shall not commence paving on each day unless the above equipment is on the paver or readily available for use. A steel plate will also be required and utilized when paving over open grates and inlets.

Prior to beginning the installation of the asphalt upper layer on any project, the Contractor shall complete the final adjustment of all water valve castings to finished grade.

The Contractor shall thoroughly clean all hard surfaces immediately before applying tack material to areas overlaid with HMA mixtures. Such cleaning to remove all dust, debris, or other objectionable material shall be done using a street sweeper with vacuum or regenerative pickup head or equal. Unsatisfactory areas shall be hand cleaned by sweeping or compressed air as directed by the Engineer.

402.2(b) Personnel.

The Contractor shall provide competent workers who are capable of performing the duties assigned to them in the work of placing and compacting asphalt mixtures in accordance with the specifications. The paving crew shall be under the supervision of an experienced supervisor who shall be on the project at all times, and who shall not operate equipment, such as paving machines or

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rollers, at any time during the paving operation. Under no circumstances shall the workers, or others, be allowed to walk across recently laid asphalt mixture behind the paving machine and ahead of the roller.

402.2(c) Equipment.

A mechanical vibratory plate compactor shall be available on the job site at all times during asphalt pavement placement and shall be used for compaction around access structures, catchbasins, water valves and other castings which appear in the paved areas. The mechanical vibratory plate compactor shall be equipped with a working water reservoir and shall be of sufficient size and capability to attain the compaction requirements of these specifications.

402.2(d) Spreading and Finishing.

Pave at a constant speed, according to the paver specifications and mixture, for uniform spreading and strike-off with a smooth, dense texture and no tearing or segregation.

In any event, the speed of placing asphalt mixtures shall not exceed that which coincides with the average rate of delivery to the paver, so as to provide as nearly as possible continuous operation of the paver.

The roller shall pass over an unprotected end of freshly laid mixture only when the laying of the course is to be discontinued long enough to permit the mixture to become cooled. In the event of such discontinuance, the end of the course shall be treated as a transverse construction joint as specified below.

402.2(e) Compaction.

Where the edges are not supported by a curb and gutter or similar structure, the outside edges of the lower and upper layers shall be sloped and pressed in place by means of a self adjusting constant pressure edge plate held in proper position on the finishing machine. A string line shall be used as a guide for the finishing machine in order to maintain a uniform edge alignment. If any other method is used, it shall meet the approval of the Engineer. The edge of the pavement shall be sloped approximately one (1) inch from the vertical and no material shall extend beyond the limits of the base. Irregularities in alignment along the outside edges and along the longitudinal joints shall be corrected by adding or removing paving mixtures before the edges are rolled.

The mixture shall be spread sufficiently so that after compaction the finished surface shall be one-eighth (1/8) to one-fourth (1/4) inch above the edges of curbs, gutters, access structures and similar structures.

Each roller, while the paving is under way, shall be kept as nearly as practicable in continuous operation and the speed shall at all times be slow enough to avoid undue displacement of the mixture. When pneumatic-tired rollers are used, they shall be operated continuously at a rate of speed which will not cause damage to the mat and which will provide the maximum number of coverages possible while the temperature of the mat is conducive to densification and surface sealing. Rollers shall be operated with the drive roll or wheels nearest the paver.

MINIMUM REQUIRED DENSITY*			
Location	Layer	Percent of Target Maximum Density	
		Mixture Type	
		E-0.3, E-1, E-3	E-10
Traffic Lanes	Lower**	91.5	92.0
Traffic Lanes	Upper	91.5	92.0

*The table values are for average lot density. If any individual density test result falls below 87% of the target density, the engineer may investigate the acceptability of that material.

**Minimum reduced by 2% for < 3 million ESALs and 1% for > 3 million ESALs, for that lower layer constructed directly on crushed aggregate or recycled base courses.

402.2(f) Joints.

Joints for lower and upper layers constructed after September 1st, except in the case of “hot” joints produced by concurrent paving of adjacent lanes, shall be treated to insure a tightly bonded and sealed joint. Such treatment shall consist of painting with hot asphalt cement, cutback or emulsified asphalt.

402.3 Asphalt Pavement.

Unless otherwise specified or directed by the Engineer, asphalt driveways and asphalt terrace paving shall be constructed of three (3) inches of upper layer pavement installed in one (1) lift on select fill, or as directed by the Engineer. E-0.3 mixture with 9.5mm nominal aggregate size or an approved commercial mix shall be used.

The composition for the various asphalt mixtures shall conform to the limits specified in Part 4 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation, except as modified herein or in the Special Provisions of the contract.

The mixture shall be laid and compacted so that the average yields in pounds per square yard shall conform to the following charts showing the various thicknesses of installation:

Unless otherwise specified in the contract, or directed by the Engineer, the upper layer mixtures shall be installed in one course of one and one-half (1-1/2) inches in depth.

UPPER & LOWER LAYER(S) YIELD - #/S.Y.		
Thickness	Min.	Max.
1.5”	172	180
1.75”	201	210
2”	230	240
2.5”	287	300
3”	345	360
4”	460	480
5”	575	600

For installations of the upper layer which are specified to be other than one and one-half (1-1/2) inches in depth, the allowable yields for such installations shall be in proportion to the allowable yields specified above.

Whenever the yields fall below the minimum allowable yields specified above, the Engineer shall determine the corrective action to be taken. The corrective action may include removal and replacement of the area of deficient thickness, an overlay with approved material of the area of deficient thickness, or such other action as the Engineer shall determine including a reduction in payment up to 50% of the unit price for the deficient amount. The area of deficient thickness shall be determined on the basis of street area, project area, or area covered in one day's operation, whichever is less. The Engineer's determination will be based on the circumstances of the area involved, and will include a determination of the distribution of costs of the corrective work required.

402.4 Asphalt Tack Coat.

Unless otherwise specified in the contract, or directed by the Engineer, the types and grades of asphalt materials and rates of applications in gallons per square yard shall conform to the following requirements:

1. The tack coat material shall be type MS-2, SS-1, SS-1h, CSS-1, or an approved modified emulsified asphalt.
2. For existing concrete or asphalt pavements, the rate of application shall be between 0.05 and 0.10 gallons per square yard.

402.5 Recycled Asphalt Pavement.

This work shall consist of the construction of a plant mixed recycled asphalt mixture furnished and placed all in accordance with Article 460 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation, except as listed below.

The City of Madison shall approve the sources of recycled asphalt material.

402.6 Measurement and Payment.

402.6(a) Asphalt Pavement Mixtures.

Asphalt mixtures of the type or types included in the contract, shall be measured by the ton of mixed aggregate and asphalt material, or by the square yard of area paved. The quantity measured for payment shall be the amount of material furnished, delivered to and incorporated in the accepted work, or the area paved, including cleaning and maintenance, and for all labor, tools, equipment, and incidentals necessary to complete the work contemplated by the contract. Deductions shall be made for any quantities which are wasted, which are not actually incorporated in the work in accordance with the contract, and for those materials which do not conform to the requirements of these specifications.

Asphalt mixtures intended for use on City projects will be tested by the City in order to determine aggregate gradations, asphalt content, air voids and VMA. Asphalt mixtures shall be tested per

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section 460.2.8 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation.

When the average yield on a project exceeds the maximum allowable yield, as specified in Section 402.3, all excess material shall be paid for at the rate of one-half (1/2) the contract unit price for the type of material involved. The average yield for this purpose shall be computed on a daily basis, a project basis, or a street area, whichever covers the smallest area of paving.

When the average yield on a project is below the minimum yield allowable, as specified in Section 402.3, the quantity of material below the minimum shall be paid at a rate no less than one-half (1/2) the contract unit price for the type of material involved if required by the Engineer. The average yield for this purpose shall be computed on a daily basis, a project basis, or a street area, whichever covers the smallest area of paving.

The Contractor shall furnish and deliver to the Engineer a ticket with each load showing the net weight of the load of crushed aggregate. 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 shall be rejected due to inability to substantiate actual use of the materials on the project. Each ticket shall include the truck number and the name of the driver and a unique code identifying the driver of the truck. The code can be the driver's initials and the last four digits of the driver's social security number or the first seven digits of their driver's license. For example 'AA1234', 'F560477'.

402.6(b) Asphalt Tack Coat, and Asphalt Seal Coat.

The asphalt materials required for and incorporated in the work of applying asphalt tack coat or in the work of constructing Asphalt Seal Coat shall be measured by volume in gallons as provided in the contract. Deductions shall be made for any quantities which are wasted or are not actually incorporated in the work in accordance with the contract.

The quantity of asphalt material measured as provided above will be paid for at the contract unit price per gallon for the item of asphalt tack coat, which price shall be full compensation for furnishing; heating, unloading, hauling, and applying the asphalt material; for maintenance of the tack coat; and for all labor, tools, equipment, and incidentals necessary to complete the work contemplated by the contract.

The quantity of asphalt material measured as provided above will be paid for at the contract unit price per gallon for the item of asphalt material for seal coat, which price shall be full compensation for all work required for the cleaning and sweeping of the existing surface, for furnishing, heating, unloading, hauling, and applying the asphalt material; and for all labor, tools, equipment and incidentals to complete the work of applying the asphalt material required for the seal coat and maintaining such work.

402.6(c) Aggregate for Seal Coat Cover.

Aggregate for seal coat cover furnished and incorporated in the work in accordance with the contract shall be measured by the ton.

The quantity of aggregate for seal coat cover, measured as provided above, shall be paid for at the contract unit price per ton for said item, which price shall be full compensation for furnishing,

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processing, drying, transporting and spreading the aggregate; for brooming, rolling, finishing, and maintaining the surface; and for all labor, tools, equipment, and incidentals necessary to complete the work.

ARTICLE 403 - RESURFACING

403.1 General.

The following specifications cover the work involved in the asphalt pavement resurfacing program of various streets. The resurfacing program includes: contract(s) to replace curb & gutter and utility castings; grind or pulverize various streets; patch and resurface various streets.

The proposed listing of streets and proposed quantities of work listed in the contract shall be subject to additions or deletions by the Engineer. The Engineer shall give written notice to the Contractor of any such additions or deletions. The work to be done on the various streets shall be itemized on "standard walk sheets" included in the Special Provisions.

The City of Madison reserves the right to add or delete streets from the contract dependent on funds available. The Contractor shall not be entitled to additional compensation in the event streets are added or deleted.

The City reserves the right to decrease or increase any of the quantities of the items bid upon without any change in the unit price bid, unless by mutual agreement by both the Contractor and the City.

If the quantities of any item is reduced, such decrease **SHALL NOT** constitute a claim for damages by the Contractor for loss of anticipated profits, **NOR** shall the Contractor be compensated for any overhead, equipment, material and labor charges, or any other costs incurred in the expectation of any quantity of work originally estimated in the Contract.

The various public and private utilities, including, but not limited to, sanitary sewers, storm sewers, water, gas, electric, telephone, traffic signals, street lighting, and cable television, may have facilities within the limits of the streets to be resurfaced which will require repairs or alterations. All such repairs or alterations which are required shall be completed before the installation of the asphalt upper layer. The Contractor shall so schedule his work that those utilities which have to make repairs or alterations to their facilities will not cause the final completion date of all work included with the contract to extend beyond the specified time of completion.

The Contractor shall so schedule its work with the Engineer so as not to interfere with the work of other concurrent City contracts for reconstructing curb and gutter, base patching, adjusting utility castings, grinding, or paving of the various streets. All other work shall be completed on the street prior to starting the paving operations, unless otherwise approved by the Engineer.

If a specific operation (i.e., grinding) will not take place within two (2) days of the preceding specified operation (i.e., base patching) the Contractor shall remove the No Parking signs and re-post the No Parking signs before the next specific operation begins.

The Contractor shall notify the Traffic Engineer at 266-4761 before moving to and starting work on each of the various streets. The Contractor shall also notify the bus utility before starting work on a designated bus route.

The Contractor shall notify the Engineer daily of all work to be performed. If the Contractor performs work without notification of the Engineer said work and materials shall be at no cost to the City. The Contractor shall designate one person on each work crew, including subcontractors, to supervise the work crew and to be responsible to the Engineer for traffic control settings, marking

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and measuring work, acquisition of construction materials, systematic scheduling, etc. The said designated person shall be familiar with the work and may be a member of the work crew.

All traffic signing and barricading shall conform to the Federal Highways Administrations "Manual on Uniform Traffic Control Devices" (MUTCD) and City of Madison Supplements for sidewalk and bikeway closures and the State of Wisconsin Standard Detail Drawing S.D.D. 15c 11-5.

The Contractor shall submit an acceptable Traffic Control Plan and a list of names and emergency phone numbers for individuals who are responsible for the maintenance of traffic control for this project to the office of the City Traffic Engineer, a minimum 48 hours prior to the start of work on this project.

Section 107.7 - Maintenance of Traffic, Section 107.8 - Notification when Closing Street, Section 107.9 – Barricades, Warning Signs and Flagging and Section 107.10 – Opening of Section of Highway to Traffic shall govern over Section 403.1 paragraphs six through twelve.

On street parking may be removed by the contractor to facilitate construction, resurfacing and maintain traffic flow. The contractor shall notify the traffic Engineering Division, forty-eight (48) hours in advance of proposed parking removal. The contractor shall obtain from the City and place "No Parking" portables, "No Parking" cardboard signs or meter bags whichever is applicable for the particular street. "No Parking" restrictions must be placed a minimum of 48 hours in advance of the beginning of construction. On streets where Zone Parking, (2-hour) is in effect or signed loading zones in effect, the contractor shall cover these signs with black plastic bags when No Parking portables or signs are placed in the same area.

On streets where there is not time restriction on parking, the Contractor shall post said streets at least forty-eight (48) hours prior to beginning work with "No Parking" signs legibly marked with the date and time of restricted parking. The Contractor shall notify the Police Department Traffic Bureau at 266-4622 during regular hours or the Police Dispatcher after regular hours stating the construction company name, the contract number, the street or streets posted, the time and date posted, and shall request that Police Department Personnel check the posting.

On all streets where there is a time restriction on parking, the Contractor shall post said street at least twelve hours prior to beginning work with "No Parking" signs legibly marked with the date and time of restricted parking. The Contractor shall notify the Police Department Traffic Bureau the same as above.

On streets where residential permit parking is allowed, the Contractor shall post said street at least forty-eight (48) hours prior to beginning work with "No Parking" signs legibly marked with the date and time of restricted parking. Residential permit parking zones are indicated with a zone number located in the lower corner of the permanent time restriction sign. The Contractor shall notify the Police Department Traffic Bureau the same as above.

The Contractor shall post "no parking" signs at the beginning, midpoint, and the end of each block plus additional signs as needed. "No parking" signs shall be posted a minimum of three (3) feet above curb elevations. If no work is begun on the posted street within two (2) days of the posted start date, the Contractor shall remove the "no parking" signs and repost the street when ready to begin work on that street.

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The Contractor shall be responsible for erecting, re-erecting, maintaining, and removing those “No Parking” controls devices stated above.

The Contractor shall maintain two-way traffic on all two-way streets governed by the contract. Traffic lanes shall be a minimum of eleven (11') feet in width. When necessary, because of certain construction operations, the Contractor may reduce the roadway width to twelve (12') feet with two way traffic maintained by flag persons in accordance with the Federal Highways Administration “Manual on Uniform Traffic Control Devices” (MUTCD).

Construction on one way streets will require a minimum fifteen (15') feet traffic lane.

The Contractor shall observe peak hour traffic restrictions on certain streets between the hours of 7:00 A.M. to 8:30 A.M. and 4:00 P.M. to 5:30 P.M. Peak hour traffic restrictions apply to all signalized intersections and arterial streets. During these hours, no work shall be performed in or adjacent to the roadway where traffic is being maintained or deliveries being made to the site that will in any way interfere with the movement of traffic. The list of streets with peak hours restrictions shall be listed in the Special Provisions. Exceptions to this time restriction require approval of the Engineer.

All openings made in the existing base course shall be backfilled or plated on the same day as the base course is removed. Temporary backfilling and the removal and disposal of temporary backfill material shall be at the expense of the Contractor.

The Contractor shall furnish, install and maintain all provisions for traffic control as specified in Article 107 of these specifications. The Contractor shall also furnish, install and maintain additional traffic control devices as specified in the special provisions of the contract or as directed by the Engineer in order to control and divert traffic to the proper travel lanes of the street being worked on.

The Contractor shall provide a pickup, a stake truck, or a similar vehicle designated for the sole purpose of transporting traffic control devices. One person, or more as needed, on each work crew, including subcontractors, shall be designated to properly set up traffic control devices, to maintain and move them as needed, and to pick up the traffic control devices at the end of the work day or when the work is completed. This designated person can also function as a flag person as needed provided the traffic control devices are in position. The said person designated for traffic control shall be familiar with the work.

Electric lighting (Type A flashers) shall be used for lighting of all work areas. Type II barricades shall be used for all work in the street, sidewalk, drive apron, including castings and curb and gutter area. The Contractor shall protect all work as required until after the installation of approved wedging. The Contractor shall be responsible for and shall furnish wedging to protect the adjusted castings until the roadway is paved. Wedging shall consist of cleaning the surface area around the casting, tacking the entire surface area to be wedged, and placing hot mix asphalt mixture compacted to a depth within one-quarter (1/4) inch of the top of the adjusted casting and to a minimum radius width of one (1) foot for each one-half (1/2) inch of adjusted vertical height, or as directed by the Engineer. All costs for protecting and wedging castings shall be incidental to the contract unless specified.

All cost pertaining to the above Traffic Control work shall be paid under **BID ITEM 10701 - TRAFFIC CONTROL.**

The time of completion of the work shall be in work days. A work day shall be any calendar day during which weather and other conditions not under the control of the Contractor will permit construction operations to proceed for at least six (6) hours of the day with the normal working force engaged in performing the work in progress at this time. Days when less than six (6) hours of work is performed shall be considered 1/2 work days in the time of completion. It shall be considered a work day whether any single operation is being performed such as casting adjustments, or whether multiple concurrent operations are being performed. Only when approved by the Engineer in writing in advance shall contract time not be assessed during complete suspension of operations. If operations are suspended with approval of the Engineer, the Engineer shall also state in writing to the Contractor the date that operations shall resume. Work days from this date on shall be included in the time of completion.

The Contractor shall limit his work day to 7:00 P.M. unless otherwise approved by the Engineer in writing. All rolling of new pavements, brooming and cleaning up of debris, and removing the traffic control devices shall be completed by this time, or as designated by the Engineer. No Sunday or legal holiday work will be allowed and no contract time will be assessed for Sundays and legal holidays not worked.

The Contractor shall contact any railroad involved at least seventy-two (72) hours before starting work in a railroad track area. The Contractor shall request the railroad to furnish a flag person for the railroad crossing work. As directed by the Engineer, the Contractor shall excavate between the rails to the ties, remove and salvage any existing mud rails to the railroad, and backfill with asphalt paving materials. No crushed stone will be allowed on the railroad ties. The patch area, including between the rails, shall be measured and paid for as asphalt base patch. Removing rails and ties completely shall be considered extra work. No work days will be charged for any railroad work that extends beyond the completion of all other work included with this contract.

Replacement castings for storm and sanitary sewers and steel adjusting rings shall be picked 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 valve access structures shall be picked up 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 picked up 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 castings which are replaced 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.

403.2 Grinding.

403.2(a) Description.

Grinding shall consist of “milling”, or “cold planning” the existing pavement surface to establish a new surface profile and cross section in preparation for an asphalt overlay. The surface after grinding shall have a grooved or ridged finish, uniform and resistant to raveling or traffic displacement. This textured surface shall have grooves of one-fourth (1/4) inch (+1/8”). The existing surface to be

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ground shall include asphalt pavement, concrete utility patches and small amounts of concrete pavement.

The grinding machine shall be a power operated, self-propelled machine, having a cutting drum with lacing patterns that will attain a grooved surface and produce grinding chips of less than two (2) inch in size. The grinding machine shall be equipped with a pressurized watering system for dust control. The equipment shall be of the type that has successfully performed similar work.

The Contractor shall use only approved grinders or milling machines for removing existing pavement failures so as not to disturb the existing subbase.

The cleaning equipment shall be of the type to efficiently remove all loosened material and load into trucks for hauling and spreading. Because of the nature of the streets to be ground and the traffic restrictions, a belt loader followed by a power sweeper and manual sweeping is most desirable. Flushing into the City's storm sewer system as a means of cleanup will not be allowed.

The Contractor shall haul the grindings from the milling operation to the Badger Road and Sycamore Avenue Street Division facilities, or where directed by the Engineer. The grindings shall be stockpiled or tailgate spread as directed. When specified in the contract or directed by the Engineer, the Contractor shall dispose of any undesirable or excess grinding material. The Contractor shall furnish the Engineer a daily load count for the removed material.

Wedge cut grinding shall consist of grinding the existing pavement surface a minimum of four (4) feet wide at the existing concrete gutter. The edge of gutter end of the finished wedge cut shall match the depth of the new asphalt overlay with a minimum **one and three-quarters (1-3/4)** inches below the edge of existing concrete gutter. The center-line-of-street edge of the wedge cut shall be cut one-eighth (1/8) inch. This item shall also include scoring the existing pavement surface at locations specified by the Engineer. Ramping utility castings shall be paid for under with **BID ITEM 40308 - RAMPING SAS**.

Full width grinding shall consist of grinding the existing pavement surface from edge to edge of gutter a minimum of one and three quarter (1.75) inch or as directed by the Engineer. Ramping utility castings shall be paid for under with **BID ITEM 40308 - RAMPING SAS**.

Base Patch grinding may be specified as the acceptable method to remove existing pavement and base failures as part of the work for base patch grinding. The Contractor shall grind patches to the width and length as marked in the field by the Engineer and recorded on the standard walk sheets. The minimum width of patches for removal by grinding shall be six (6) feet. There will be no minimum length. Fill shall be an approved asphalt material. Any additional width or depth, unless approved by the Engineer, shall be at the Contractor's expense and restored to the designated width and depth of patch with asphalt lower layer material at no cost to the City. There will be **four (4)** approved methods. Method #1 shall consist of 5" Base Patch Grinding, Method #2 shall consist of 5" Grinding with **3-1/4"** Asphalt Lower Layer material and **1-3/4"** Asphalt Upper Layer material, Method #3 shall consist of **3-1/2"** Grinding filled with **3-1/2"** Asphalt Upper Layer material, Method #4 shall consist of **2"** Grinding filled with **2"** Asphalt Upper Layer material. Patches shall be started and completed in the same day.

Pavement joint grinding shall consist of grinding or saw cutting and removing the existing asphalt overlay to expose the base course joint as directed by the Engineer. The Contractor shall remove and dispose of all loose and deleterious material including broken concrete. The joint exposure shall be a

minimum of eighteen (18) inches wide. Small or “mini” grinders are preferred for this work. The Contractor shall thoroughly clean and tack the exposed joint and place and compact the asphalt backfill material to one-half (1/2) inch above the existing asphalt surface. Any width greater than eighteen (18) inches shall be approved by the Engineer.

Grinding around utility castings to the depth of cut before and after encountering the castings shall be included in the area of the pavement surface ground. The Contractor may choose to remove the entire existing asphalt pavement around the castings where grinding is not completed and replace it with an asphalt mixture placed and compacted in three (3) inch lifts. The Contractor shall vertically cut the limits of area to be patched, mechanically compact the existing base course and tack the bottom and vertical edges before backfilling. All costs for the alternate to grinding around castings shall be considered incidental to grinding.

Any butt joint greater than one (1) inch shall be ramped with hot-mix asphalt material as directed by the Engineer. All castings exposed by grinding shall be ramped with hot-mix material before opening to traffic. Small or mini grinders are required for this work.

Ramping SAS shall consist of cleaning the surface area around the casting, tacking the entire surface area to be wedged, and placing hot mix asphalt mixture compacted to a depth within one-quarter (1/4) inch of the top of the adjusted casting and to a minimum radius width of one (1) foot for each one-half (1/2) inch of adjusted vertical height, or as directed by the Engineer.

403.2(b) Measurement and Payment.

Wedge cut grinding shall be measured by the square yard of pavement surface ground measured from the edge of concrete gutter to a maximum of four (4) feet from the edge of gutter. The depth of cut shall be determined by measuring to the top of the ridges by placing a five (5) foot straight edge perpendicular to the grooving pattern. On wedge cuts, widths of grinding greater than four (4) feet shall be at the Contractor’s expense. Widths less than four (4) feet shall be measured by the square yard of actual area of pavement surface ground. The Contractor shall grind all butt joints eight (8) foot wide and to a depth of one (1) inch, or as directed by the Engineer. Any butt joints ground greater than one (1) inch shall be ramped with approved material as directed by the Engineer. All costs for ramping butt joints shall be considered incidental to grinding.

Full width grinding shall be measured by the square yard of actual pavement ground to a minimum depth of one (1) inch. Any additional depth of existing pavement removed to obtain the depth necessary to allow for the proposed overlay shall be considered incidental to full width grinding. Any butt joints ground greater than one (1) inch shall be ramped with approved material as directed by the Engineer. All costs for ramping butt joints shall be considered incidental to grinding.

Full width and wedge cut grinding will be paid for at the contract unit price bid for Full width and wedge cut grinding respectively, which price shall be full compensation for grinding the existing pavement surface including around utility castings, disposal of material, for street cleaning and for all equipment, tools, labor and incidentals necessary to complete the work in accordance with this contract. Ramping utility castings shall be paid for under with **BID ITEM 40308 - RAMPING SAS.**

Base patch grinding shall be measured by the square yard for patches ground to the width and length as marked in the field by the Engineer. The area, measured as provided above, shall be paid for at the contract unit price per square yard for the specific Method of Base Patch Grinding, which price shall be

full compensation for grinding and disposal, backfilling with asphalt material as provided above and for all labor, tools, equipment and incidentals necessary to complete the work.

Pavement joint grinding shall be measured in lineal feet and paid for at the contract unit price bid for pavement joint grinding. The unit price bid shall include all costs for grinding or saw cutting, removal and disposal of the existing asphalt overlay to expose the base course joint, cleaning and tacking the joint, furnishing and placing backfill material, finishing and protecting, and for all labor, tools, equipment and incidentals necessary to complete the work.

Ramping SAS shall be measured as units of each and paid for at the contract unit price bid. The unit price bid shall include all costs for cleaning and tacking the surface to be wedged, supplying, placing and compacting hot mix asphalt mixture as described above including finishing and protecting, and for all labor, tools, equipment and incidentals necessary to complete the work.

403.3 Pulverize and Shape.

403.3(a) Description.

This work shall consist of pulverizing the existing asphalt surface and a portion of the crushed stone base course to a blended uniform well-graded material. The pulverized material shall be reduced to a minimum of 97 percent passing a 2-inch screen. The pulverized material shall then be graded and reshaped as directed by the Engineer to provide for the required depth of asphalt pavement.

For a compacted lift thickness of pulverized material, up to 6-inches, compaction equipment shall be in accordance with Section 401.2 of the Standard Specifications.

For a compacted lift thickness of pulverized material, greater than 6-inches and up to 8-inches, a minimum 25,000-pound pad foot vibratory roller and a minimum 8-ton vibratory steel roller shall be used.

Butt joints shall be sawcut and ramped with pulverized material for depths greater than 1”(inch). Before the grading and shaping operation begins, the pulverized aggregate shall be watered sufficiently to provide the required stabilization and compaction of this material.

The Contractor shall remove excess material.

403.3(b) Method of Measurement.

Pulverize and shape shall be measured by area in square yards of surface pulverized and shaped.

403.3(c) Basis of Payment.

The square yard area for pulverize and shape, measured as provided above, shall be paid for at the contract unit price per square yard, which price shall be full compensation for all preparation and any special construction required, removal of excess material, and for all labor, tools, equipment and incidentals necessary to complete the work including disposal of surplus material.

403.4 Undercut.

403.4(a) Description.

If base problems are encountered, undercut may be required. Undercut of depths up to 1' shall be measured in square yards. Depths over 1' shall be paid as an additional undercut for each (undercut excavation - 1' in depth). Excess pulverized material shall be used for backfilling the undercut areas, placed in 6" lifts and compacted.

Where directed by the Engineer, crusher run (Breaker) shall be used for backfilling undercut areas placed in six (6) inch lifts and compacted. Placement of crusher run shall be paid under **BID ITEM 20219 - BREAKER RUN.**

403.4(b) Method of Measurement.

Undercut shall be measured by area in square yards of surface excavated.

403.4(c) Basis of Payment.

The square yard area for undercut, measured as provided above, shall be paid for at the contract unit price per square yard, which price shall be full compensation as provided above and in accordance with Article 201 Excavation Cut of the Standard Specifications.

403.5 Asphalt Tack Coat.

The Contractor shall apply asphaltic tack coat to streets prior to placing asphalt pavement as directed by the Engineer. No tack coat shall be placed on the base course unless directed by the Engineer. In accordance with Section 402.4, the Contractor shall apply an asphaltic tack coat to all butt joints and all longitudinal joints meeting both existing pavements and new pavements on successive paving passes. All costs for furnishing and applying tack coat to butt joints and longitudinal joints as specified above shall be considered incidental to the bid item for asphalt tack coat.

403.6 Asphalt Lower Layer.

Asphalt lower layers shall consist of furnishing and placing asphalt pavement in accordance with Article 402.

The Contractor shall be responsible for the preparation of the street surface to be paved. Preparation shall include the removal of all asphalt patches, asphalt crack filler, vegetation along gutter edges, leaves, dirt, debris, etc. It shall be the Contractor's responsibility to assure proper cleaning of the street surface before tacking and paving. On all streets, the Contractor shall tack and fill any existing large voids with hot mix asphalt and compact the filler material before paving. All costs for filling large voids in existing pavement shall be incidental to asphalt lower layer. Where designated by the Engineer, the Contractor shall wedge low areas of the existing pavement with hot mix asphalt. Wedging shall be completed prior to paving. The cost for wedging shall be paid for at the unit price for asphalt lower layer. Material used for wedging shall not be included in the quantity for computing yield.

The Contractor may choose to utilize either one hundred (100%) percent virgin material or thirty (35%) percent recycled with seventy (65%) percent virgin material for plant hot-mix asphalt lower layer. The City of Madison shall approve the sources of recycled asphalt material.

Yield requirements shall be adhered to.

403.7 Asphalt Upper Layer.

Asphalt upper layer shall consist of furnishing and placing asphalt pavement in accordance with Article 402.

The Contractor may choose to utilize either one hundred (100%) percent virgin material or twenty (20%) percent recycled with eighty (80%) percent virgin material for plant hot-mix asphalt lower layer. The City of Madison shall approve the sources of recycled asphalt material.

The Contractor shall provide and use a minimum of two (2) vibratory rollers and one (1) static roller, unless otherwise approved by the Engineer prior to starting the work. If the Engineer determines that only two (2) rollers are required on a particular street, the third roller will be available for the next street to be paved.

The Contractor shall place an approved steel plate over all open grates inlets when paving over or near them to prevent the asphalt materials from falling into the inlet. The Contractor shall clean the inlets, gutters, and terraces of any excess material or debris by the end of the day following paving of that street or the contract operations shall be halted until the cleanup is complete and current.

Yield requirements shall be adhered to.

403.8 Asphalt Base Patching.

403.8(a) Description.

Asphalt base patching for the removal of pavement failures includes pavements on concrete base course and on crushed stone base course. The Contractor shall verify as to whether the proposed streets listed have existing concrete or crushed stone base course. When specified in the contract, the Contractor shall perform base patching by grinding with the removal of existing pavement failures in accordance with Section 403.2. All other base patching shall be excavated by backhoe or other approved equipment so as to minimize disturbing the existing subbase.

The depths of removal by backhoe of the pavement failures as determined by the Engineer and indicated on the standard walk sheets shall be **three and one-half (3-1/2) inches**, five (5) inches, eight (8) inches, and ten (10) inches. The removal by backhoe of pavement failures to a depth of five (5) inches is intended to include existing asphalt pavements on crushed stone base course. If concrete base course is encountered when removing the asphalt pavement failures on crushed stone base course, the Contractor shall notify the Engineer before removing the existing concrete material for the Engineer to change the classification to eight (8) inch patching or the base patch will be paid for at the depth and area listed on the standard walk sheet.

The removal by backhoe of pavement failures to a depth of eight (8) inches is intended to include existing asphalt pavements with concrete base course, and concrete pavements on crushed stone base course. If steel reinforcement is encountered, the Contractor shall cut all reinforcing steel flush to the

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patch limits. When the depth of removal necessary to remove the concrete base course or concrete pavement is greater than ten (10) inches, the Contractor shall notify the Engineer before removing the existing concrete material for the Engineer to change the classification to ten (10) inch patching or the base patch will be paid for at the depth and area listed on the standard walk sheet.

The Contractor may use crushed stone base course material to construct the subgrade to the bottom of the **three and one-half (3-1/2) inches**, five (5), eight (8) and ten (10) inch patches. The cost of furnishing, installing, and compacting the crushed stone base course material shall be considered as incidental to the items of **three and one-half (3-1/2) inches**, five (5), eight (8) and ten (10) inch patches.

The limits of the area to be patched shall be sawcut or milled vertically as directed by the Engineer. No concrete base course shall be removed prior to the removal of the asphalt pavement superimposed thereon without prior approval of the Engineer. All base patch limits in concrete base course shall be saw cut full depth before the concrete is broken and removed. All costs for cutting shall be considered incidental to asphalt base patching.

Hot mix asphalt, mixture type E-1 or E-3 with nominal aggregate size of 19.0 mm or 25.0 mm, shall be placed and compacted in lifts not to exceed **three and one-half (3-1/2) inches**, in thickness. The Contractor shall supplement vibratory plate compaction equipment with a vibratory steel-wheeled roller utilized for compaction of the asphalt lower layer mixture in the vibrating mode. The compaction equipment shall be equipped with working water reservoirs. Recycled asphalt material may be used as patch material if the mix design is performed in accordance with Section 402.4 and the stockpile of salvaged material for recycling is approved in advance by the Engineer. The Contractor is encouraged to use approved recycled material. Only material approved in advance shall be allowed for patch material.

The Contractor shall mechanically compact the existing base course and tack the vertical edges of the patch for dust control. All costs for mechanical compaction and tack coat shall be considered incidental to the asphalt base patch. On all patches outside of the limits for resurfacing, the patch material shall be upper layer material with the last lift placed by a paving machine and considered incidental to the bid item for asphalt base patch.

Patches shall be started and completed in the same day.

Asphalt mixtures shall not be placed when the air temperature approximately three (3) feet above ground at the site of the work, in the shade and away from the effects of artificial heat, is less than 32°F.

Asphalt base patching shall be paid for at the contract unit price per square yard based on the depth of patch, which price shall be full compensation for excavation and disposal of the excavated material, preparation of the subgrade, and backfilling with hot mix asphalt for maintenance and protection of the work and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

403.8(b) Method of Measurement.

Asphalt base patching shall be measured per square yard based on the depth of patch.

403.8(c) Basis of Payment.

The contract price for asphalt base patching as measured above shall be payment in full for the work as outlined above including excavation and disposal of the excavated material, preparation of the subgrade, and backfilling with hot mix asphalt for maintenance and protection of the work and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

403.9 Asphalt Drive And Terrace - Resurfacing.

403.9(a) Description.

Asphalt pavement for driveways and terrace paving shall comply with Section 402.3 of the Standard Specifications.

The removals of concrete or asphalt material shall include excavation and saw cutting of the concrete and asphalt material. All material shall be hauled from the site. At no time shall any material be deposited on private property or terrace areas.

After the new asphalt pavement has been placed the excavated areas adjacent to the new pavement shall be back filled immediately with the appropriate material: topsoil, seed and mulch.

403.9(b) Method of Measurement.

Asphalt drive and terrace shall be measured by the area in square yards.

403.9(c) Basis of Payment.

The contract price for asphalt drive and terrace, measured as provided above, shall be payment in full for the work as outlined above, including: excavation, disposal of removed material, sawcutting concrete and asphalt pavement; for furnishing and placing asphalt material, finishing and protecting; fill, topsoil, seed and mulch, and for all labor, tools, equipment and incidentals necessary to complete the work.

403.10 HMA Material For Curb Front Fill.

403.10(a) Description.

The area in front of the new curb and gutter and/or inlets shall be filled full depth with approved asphalt material within two (2) inches of the new gutter edge. Existing pavement shall be sawcut as designated by the Engineer on streets that will not be milled or pulverized.

403.10(b) Method of Measurement.

The item of Asphalt Material for Curb Front Fill shall be measured by the lineal foot.

403.10(c) Basis of Payment.

The lineal footage of Asphalt Material for Curb Front Fill, measured as provided above, shall be paid for at the contract unit price bid for lineal foot which price shall be full compensation for furnishing, installing, and compacting the asphalt material, sawcutting and for all labor, tools, equipment, and incidentals necessary to complete this item of work.

403.11 SAS Adjusting Ring.

403.11(a) Description.

The Contractor shall install steel access structure adjusting rings, height shall be as directed by the Engineer, on those access structures indicated on the walk sheets or as directed by the Engineer. Each ring shall be secured with an adhesive approved by the Engineer.

403.11(b) Method of Measurement.

SAS adjusting ring shall be measured as units of each.

403.11(c) Basis of Payment.

The SAS adjusting ring, measured as provided above, shall be paid for at the contract unit price per each. Which price shall include full compensation for hauling, placing, finishing and protecting, and for all labor, tools, equipment and incidentals required to complete the work.

403.12 Adjust Access Structure Casting - Resurfacing.

403.12(a) Description.

Castings having an opening of twenty-four (24) inches or less shall be considered access structure castings. Adjusting castings shall consist of raising the frame to final grade. Castings shall be installed 1/4 inch below the final grade. Castings that are 3/4 inch, or more, below the final grade shall be repaired. The entire opening in the pavement around the access structure frame shall be sawcut where designated by the Engineer. The entire opening in the pavement around the access structure frame shall be backfilled with slurry. No disturbed or excavated material shall be used as backfill. The mix design for the slurry shall be as follows (rates are per cubic yard of slurry mix):

Water	25 gallons
Torpedo Sand	1350 pounds
3/4 Max. Aggregate	2050 pounds
Cement	50 pounds
Fly Ash (Type C)	100 pounds

Type "M" air entrained mortar shall be used for adjustment to the required elevation.

Castings shall be protected from traffic for a minimum of thirty-six (36) hours after pouring. Protection and ramping of casting with hot mix asphalt shall comply with Section 403.1.

Adjusting access structure castings includes removing the existing casting, all existing adjusting blocks and bricking to a sound brick or block base, and installing new adjusting blocks or bricking to the required elevation. New adjusting blocks and bricking shall be solid concrete. The Contractor shall be paid twice the unit price for each access structure casting adjustment that exceeds thirty (30) inches vertical height of new adjusting blocks.

Where designated by the Engineer, the Contractor shall remove existing castings and replace them with new frames and covers furnished by the City of Madison.

403.12(b) Method of Measurement.

Adjustment of Access Structure Casting shall be measured as units of each.

403.12(c) Basis of Payment.

The adjustment of access structure castings, measured as provided above, shall be paid for at the contract unit price per each. Which price shall include full compensation for sawcutting, removing the existing access structure casting and frame, removing all existing adjusting blocks and bricking to a sound brick or block base, installing new adjusting blocks or two (2) inch adjusting rings to the required elevation, for excavating, backfilling with slurry, for disposal of removed material, for furnishing all materials except castings and frames supplied by The City of Madison, for hauling new and existing castings, for placing, finishing, ramping for protection and for all labor, tools, equipment and incidentals required to complete the work. The Contractor shall be paid twice the unit price for each access structure casting adjustment that exceeds thirty (30) inches vertical height of new adjustment blocks.

403.13 Adjust Catchbasin Casting - Resurfacing.

403.13(a) Description.

Castings having an opening with an inside dimension of over twenty-four (24) inches shall be considered catchbasin castings. Adjusting catchbasin castings shall consist of raising the frame to final grade. Castings shall be installed 1/4 inch below the final grade. Castings that are 3/4 inch, or more, below the final grade shall be repaired. The entire opening in the pavement around the access structure frame shall be sawcut where designated by the Engineer. The entire opening in the pavement around the access structure frame shall be backfilled with slurry. No disturbed or excavated material shall be used as backfill. The mix design for the slurry shall be as follows (rates are per cubic yard of slurry mix):

Water	25 gallons
Torpedo Sand	1350 pounds
3/4 Max. Aggregate	2050 pounds
Cement	50 pounds
Fly Ash (Type C)	100 pounds

Type "M" air entrained mortar shall be used for adjustment to the required elevation.

Castings shall be protected from traffic for a minimum of thirty-six (36) hours after pouring. Protection and ramping of casting with hot mix asphalt shall comply with Section 403.1.

Adjusting catchbasin castings includes removing the existing casting, all existing adjusting blocks and bricking to a sound brick or block base, and installing new adjusting blocks or bricking to the required elevation. New adjusting blocks and bricking shall be solid concrete. The Contractor shall be paid twice the unit price for each casting adjustment that exceeds thirty (30) inches vertical height of new adjusting blocks.

Where designated by the Engineer, the Contractor shall remove existing castings and replace them with new frames and covers furnished by the City of Madison.

403.13(b) Method of Measurement. METHOD OF MEASUREMENT

Adjustment of Catchbasin Casting shall be measured as units of each.

403.13(c) Basis of Payment.

The adjustment of catchbasin castings, measured as provided above, shall be paid for at the contract unit price per each. Which price shall include full compensation for sawcutting, removing the existing catchbasin casting and frame, removing all existing adjusting blocks and bricking to a sound brick or block base, installing new adjusting blocks to the required elevation, for excavating, backfilling with slurry, for disposal of removed material, for furnishing all materials except castings and frames supplied by The City of Madison, for hauling new and existing castings and frames, for placing, finishing, ramping for protection and for all labor, tools, equipment and incidentals required to complete the work. The Contractor shall be paid twice the unit price for each catchbasin casting adjustment that exceeds thirty (30) inches vertical height of new adjustment blocks.

403.14 Adjust Inlet Casting, Type "H" - Resurfacing.

403.14(a) Description.

This item shall consist of adjusting the inlet castings to a new final grade. Such adjustment shall include sawcutting, removing the existing inlet casting, removing existing adjusting blocks or brick to a sound brick or block base and installing new bricks or blocks using type "M" air entrained mortar to the required elevation. New adjusting blocks and bricking shall be solid concrete. Install concrete floor. The concrete curb and gutter removed along with inlet adjustment shall be marked by the Engineer prior to removal and paid for at the unit price bid for concrete curb and gutter. The lineal foot measurement of the curb and gutter shall exclude the distance through the inlets. The disturbed area behind the new curb and gutter shall be back filled with acceptable fill material, topsoil, seed and mulched. The disturbed area in front of the curb & gutter shall be backfilled and compacted with crushed stone. Inlet castings removed and replaced to the same grade for the Contractor's convenience or as directed by the Engineer shall be considered as incidental to other items.

Where designated by the Engineer, the Contractor shall remove existing castings and replace them with new frames and covers furnished by the City of Madison.

403.14(b) Method of Measurement.

Adjustment of type "H" inlet castings shall be measured as units of each.

403.14(c) Basis of Payment.

The adjustment of inlet castings, measured as provided above, shall be paid for at the contract unit price per each. Which price shall include full compensation for sawcutting, removing the existing inlet casting, removing the existing adjusting blocks or bricks, installing concrete floor, new bricks or blocks and inlet casting to the required elevations; for excavating; for disposal of removed material; for furnishing all materials except castings and frames supplied by The City of Madison, for hauling new and existing castings and frames; for backfill, topsoil, seed and mulch; for placing, finishing and protecting; and for all labor, tools, equipment and incidentals necessary to complete the work.

403.15 Adjust Inlet Casting, “Tub” Type - Resurfacing.

403.15(a) Description.

This item shall consist of sawcutting and removing the existing tub inlet casting, removing existing adjusting blocks, bricks or loose concrete to a sound concrete base. Install a concrete floor and a new “H” inlet casting to grade using such adjustments as; field pour walls, pre-cast box, or adjustment rings with a maximum of 4”(inches) of adjustment rings. Adjustments shall be made using type “M” air entrained mortar to the required elevation. The concrete curb and gutter removed along with the inlet adjustment shall be marked by the Engineer prior to removal and paid for at the unit price bid for curb and gutter. The lineal foot measurement of the curb and gutter shall exclude the distance through the inlets. The disturbed area behind the new curb and gutter shall be back filled with acceptable fill material, topsoil, seeded and mulched. The disturbed area in front of the curb & gutter shall be backfilled and compacted with crushed stone. Inlet castings removed and replaced to the same grade for the Contractor’s convenience or as directed by the Engineer shall be considered as incidental to other items.

Where designated by the Engineer, the Contractor shall remove existing castings and replace them with new frames and covers furnished by the City of Madison.

403.15(b) Method of Measurement.

Adjustment of “tub” type inlet castings shall be measured as units of each.

403.15(c) Basis of Payment.

The adjustment of “tub” type inlet castings, measured as provided above, shall be paid for at the contract unit price per each. Which price shall include full compensation for sawcutting, removing the existing inlet casting, removing the existing adjusting blocks or bricks, installing concrete floor, new bricks or blocks and inlet casting to the required elevations; for excavating; for backfilling and compacting; topsoil, seed and mulch; for disposal of removed material; for furnishing all materials except castings and frames supplied by The City of Madison, for hauling new and existing castings and frames; for backfill, topsoil, seed and mulch; for placing, finishing and protecting; and for all labor, tools, equipment and incidentals necessary to complete the work.

403.16 Adjust Valve Casting, Method #1 - Resurfacing, Adjust Valve Casting, Method #2 - Resurfacing.

403.16(a) Description.

The Contractor shall adjust water or gas valve castings to final grade by the following **three** methods as directed by the Engineer:

The Contractor shall install screw type adjusting valve castings at locations designated by the Engineer. The screw type adjusting valve castings will be provided by the City of Madison Water Utility.

Method #1

Valve casting adjustment shall consist of loosening the existing casting. The casting shall be set to proper grade by turning the top casting. If asphalt material is removed it shall be a minimum of 1' on either side of the casting and replaced with approved asphalt material compacted in place.

If the existing casting has been set in concrete the Contractor shall be paid one additional unit price bid for Adjust Valve Casting, Method #1. This work shall consist of removing the existing concrete to a sound base and back filling and compacting 1-1/2" crushed stone, level with the bottom of the existing asphalt, then ramping with compacted asphalt material.

When the Engineer directs the Contractor to replace or add a casting extension and the depth of excavation necessary to do this work exceeds 24" inches, the Contractor shall be paid one additional unit price bid for Adjust Valve Casting, Method # 1. The area that is excavated shall be back filled and compacted with 1-1/2" crushed stone. This does not apply to replacing a casting top or lid. Any disturbed or excavated material shall not be used as back fill.

Method #2

Adjusting monument castings and valve castings, when directed by the Engineer shall consist of raising the castings to final grade. The entire opening around the monument casting or valve casting shall be back filled with a slurry mix and shall be protected from traffic for a minimum of thirty-six (36) hours after pouring. The casting shall be ramped with asphalt material. Any disturbed or excavated material shall not be used as back fill.

The mix design for the slurry shall be as follows (rates are per cubic yard of slurry mix):

Water	25 gallons
Torpedo Sand	1350 pounds
3/4 Max. Aggregate	2050 pounds
Cement	50 pounds
Fly Ash (Type C)	100 pounds

Type "M" air entrained mortar shall be used for adjustment to the required elevation.

Install Adjustable Valve Water Box

The contractor shall install screw type, height adjustable, cast iron valve box risers furnished by the city.

City furnished adjustable valve box riser shall be model number VB2667, VB2668, VB2669, or VB 2670 as manufactured by Sigma Corporation or approved equal. Casting shall be produced from gray cast iron to ASTM Class 25 standards.

Installation shall consist of removing valve box cover, removing debris from threaded valve box top casting, threading adjustable valve box riser into top casting and setting to specified grade, replacing valve box cover.

403.16(b) Method of Measurement.

Adjustment of valve castings shall be measured as units of each as completed according to Method #1, Method #2 or Install Adjustable Valve Water Box as directed by the Engineer.

403.16(c) Basis of Payment.

The adjustment of valve castings, measured as provided above, shall be paid for at the contract unit price per each. Which price shall include full compensation for loosing casting, removing asphalt or concrete material, setting casting to grade, backfilling and compacting with crushed stone, adding an extension, backfilling with a slurry mix, ramping casting with asphalt material and protection of casting as described in Method #1, Method #2 or Install Adjustable Valve Water Box for furnishing all labor, tools, material, equipment and incidentals necessary to complete the work.

403.17 Adjust Monument Casting - Resurfacing.

Adjusting monument castings shall consist of raising monument castings to final grade. The entire opening around the monument casting shall be backfilled with high-early-strength concrete and shall be protected from traffic for a minimum of thirty-six (36) hours after pouring. No disturbed or excavated material shall be used as backfill.

All monument castings shall be adjusted and paid for as adjust valve castings per Section 403.17.

403.18 Adjust Private Utility Castings - Resurfacing.

The Contractor may be required to adjust private utility castings with this contract. If the private utility wishes to replace any existing castings with new frames and lids, the private utility will deliver the new castings to the job site.

Any modifications of the structure will not be included with this contract. If the private utilities chooses to modify any of their structures, the modification will be done by others or by direct agreement between the Contractor and the private utility. All modifications to private utility structures for the private utility will be at no cost to the City and with no additional work days added to the contract completion date.

The procedures for adjustment of private utility castings and the method of payment for the work shall be as specified above for sewer access structure castings and valve castings.

403.19 Rebuild Inlet - Resurfacing.

403.19(a) Description.

This item shall include sawcutting and removal of the old inlet, "tub" type or type "H", and constructing a new "H" inlet when required. Locations for this item shall be marked by the Engineer prior to removal. It is anticipated that all of these inlets will require pouring the inlet box and floor in place according to the standard detail drawing 5.7.11. Reconnection of leads shall be considered incidental to "Rebuild Inlet" and shall include repair of leads damaged from inlet removal. Rebuilds using pre-cast will be made at the discretion of the Engineer. Casting shall be placed to final grade using type "M" below grade mortar mix and air-entrained additives shall be considered incidental to this item. Any "HH" inlet rebuild shall be paid as one additional unit price bid for Rebuild Inlet.

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The concrete curb and gutter removed along with inlet rebuild shall be marked by the Engineer prior to removal, and paid for at the unit price bid for concrete curb and gutter. The disturbed area behind the new curb and gutter, including inlet, shall be back filled with acceptable fill material, topsoil, seed and mulched. Disturbed area in front of the curb & gutter shall be backfilled and compacted with crushed stone

Any inlets abandoned shall be paid as Rebuild Inlet - Resurfacing and include removal of inlet, removal of any necessary pipe, sealing the resulting hole or opening, and back filling and compacting excavated area.

403.19(b) Method of Measurement. METHOD OF MEASUREMENT

Rebuild Inlet shall be measured as units of each.

403.19(c) Basis of Payment.

Rebuild inlet measured as provided above shall be paid for at the contract price per each, which price shall be full compensation for sawcutting, removal of old casting; installing pre-cast or poured in place inlet box and floor; reconnecting leads; repair of damaged leads; adjustment of existing or City furnished casting; pipe removal; pipe plug; disposal of material; backfill and compaction; topsoil; seed; mulch; furnishing all materials; placing; finishing; protecting and for all labor, tools, equipment and incidentals required to complete the work.

403.20 Rebuild Access Structure Top - Resurfacing.

403.20(a) Description.

Rebuilding access structure tops shall consist of sawcutting, removing existing deteriorated access structure, catchbasin or inlet tops and replacing them with precast or cast-in-place top sections. The casting shall be installed to final grade and no payment will be made for casting adjustments. The entire opening in the pavement around the access structure or catchbasin top shall be backfilled with slurry.

The mix design for the slurry shall be as follows (rates are per cubic yard of slurry mix):

Water	25 gallons
Torpedo Sand	1350 pounds
3/4 Max. Aggregate	2050 pounds
Cement	50 pounds
Fly Ash (Type C)	100 pounds

The structure shall be protected from traffic for a minimum of three (3) days after pouring. No disturbed or excavated material shall be used as backfill. The Contractor shall furnish any precast sections used to rebuild access structure or catchbasin tops. New castings, if needed, will be furnished by the City the same as above.

403.20(b) Method of Measurement.

Rebuild sewer access structure top shall be measured as units of each.

403.20(c) Basis of Payment.

Rebuild sewer access structure top, measured as provided above shall be paid for at the contract price per each, which price shall be full compensation for sawcutting, removing the existing top, including casting; for installing new pre-cast or poured in place top; for adjusting existing or city furnished casting; for backfilling with slurry; for disposal of material; for furnishing all material; for placing, finishing and protecting; and for all labor, tools, equipment and incidentals necessary to complete the work

403.21 Remove and Replace Concrete Curb & Gutter, Machine Placed - Resurfacing; Remove and Replace Concrete Curb & Gutter, Hand Placed – Resurfacing.

403.21(a) Description.

Concrete curb and gutter shall consist of removing and replacing existing concrete curb and gutter where designated by the Engineer in accordance with The City of Madison Standard Specifications Section 302 except as modified herein.

When a portion of curb and gutter to be replaced contains an inlet, the cost of adjusting the inlet, if for the convenience of the contractor, in its same location shall be included in the unit price bid of remove and replace concrete curb and gutter.

Removal and replacement of concrete curb and gutter shall include excavating, replacement of disturbed sub-base material with four (4") of 3/4" crushed stone or crushed concrete, grade preparation, tree root removal, expansion joints and disposal. If directed by the Engineer, "Type X" curb will be required at various locations at no additional cost.

The Contractor shall place all curb & gutter with the use of a slip form paver as directed by the Engineer except where obstructions prevent the uses of a machine. Obstructions shall include but not be limited to: inlets; sidewalk; castings and trees.

Removal of concrete curb and gutter shall include excavation of existing material including asphalt material, up to one (1) foot on each side of the curb and gutter, as the case may be. All material shall be hauled from the site. At no time shall any material be deposited on private property or terrace areas.

Existing concrete, asphalt mixes or other types of material used to shim raised curb & gutter shall be removed from adjacent curb & gutter stones prior to placing new curb & gutter.

After the new curb and gutter has been constructed and the forms removed, the excavated areas adjacent to the curb and gutter shall be back filled immediately with the appropriate material; topsoil, crushed stone, concrete or asphalt mix.

All debris shall be removed from the excavated areas prior to placement of the topsoil.

Transverse full depth saw cuts shall be placed where directed by the Engineer.

Transverse full depth sawcuts shall be incidental.

The Contractor shall construct the curb cuts using a “profile curb cut” with the curb head removed by using a machine type concrete saw specifically designed for this type of work. The curb shall be cut off flush with the flow line through the ramp. Profile curb cut shall be paid under **BID ITEM 30330 - PROFILE CURB CUT.**

The Contractor shall take precautions during construction operations not to disfigure, scar, or impair the health of any tree on public or private property.

The Contractor shall remove tree roots from existing live trees to an elevation of five inches (5”) below the bottom of the concrete curb and gutter. Cutting shall not be closer than two feet (2’), from the trunk of the tree.

Tree roots ends one-half inch (1/2”) and up which are severed shall be cut with an axe, lopping shears or other means which will produce a clean cut on the same day of excavation. The tree root ends shall be back filled with soil or other suitable means immediately following the cutting.

403.21(b) Method of Measurement.

Concrete Curb and Gutter shall be measured by length in lineal feet in accordance with Subsection 302.3(a) of The City of Madison Standard Specifications.

403.21(c) Basis of Payment.

The contract unit price shall be paid as per Subsection 302.2(b) of The City of Madison Standard Specifications except that the unit price shall include removal for curb and gutter, sawcut, gravel, fill, topsoil, seed and mulch. Curb & Gutter placed with a slip form paver shall be paid under **BID ITEM 40381 – REMOVE EXISTING CONCRETE CURB & GUTTER AND CONSTRUCT CONCRETE CURB & GUTTER, MACHINE PLACED - RESURFACING.** Curb & Gutter placed by hand shall be paid under **BID ITEM 40382 – REMOVE EXISTING CONCRETE CURB & GUTTER AND CONSTRUCT CONCRETE CURB & GUTTER, HAND PLACED - RESURFACING.**

**403.22 Remove and Replace 5” Thick Concrete Sidewalk – Resurfacing;
Remove and Replace 7” Thick Concrete Sidewalk and Driveway-
Resurfacing.**

403.22(a) Description.

Concrete walk and drive apron shall consist of removing and replacing existing concrete walk and drive apron where designated by the Engineer in accordance with Section 303 of The City of Madison Standard Specifications except as modified herein.

Removal and replacement of sidewalk and drive aprons shall include all costs for excavating, replacement of disturbed sub-base material with four (4”) of 3/4” crushed stone or crushed concrete, grade preparation, tree root removal, expansion joints and disposal

Removal of sidewalks and drive aprons shall include excavation of existing material including asphalt material, up to one (1) foot on each side of the sidewalk or drive aprons, as the case may be.

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All material shall be hauled from the site. At no time shall any material be deposited on private property or terrace areas.

Existing concrete, asphalt mixes or other types of material used to shim raised sidewalks shall be removed from adjacent sidewalk stones prior to placing new sidewalk.

After the new sidewalks have been constructed and the forms removed, the excavated areas adjacent to the sidewalk shall be back filled immediately with the appropriate material; topsoil, crushed stone, concrete or asphalt mix.

All debris shall be removed from the excavated areas prior to placement of the topsoil.

Transverse full depth saw cuts shall be placed where directed by the Engineer.

Transverse full depth sawcuts at construction joints shall be incidental.

The Contractor shall take precautions during construction operations not to disfigure, scar, or impair the health of any tree on public or private property.

The Contractor shall remove tree roots from existing live trees to an elevation of five inches (5") below the bottom of the concrete sidewalk or driveways. Cutting shall not be closer than two feet (2'), from the trunk of the tree.

Tree roots ends one-half inch (1/2") and up which are severed shall be cut with an axe, lopping shears or other means which will produce a clean cut on the same day of excavation. The tree root ends shall be back filled with soil or other suitable means immediately following the cutting.

403.22(b) Method of Measurement.

Concrete sidewalk shall be measured by the Square Foot.

403.22(c) Basis of Payment.

The contract unit price shall be paid as per Subsection 303.3(b) of The City of Madison Standard Specifications except that the unit price shall include: removal of sidewalk or drive apron; fill; gravel, topsoil; seed and mulch.

403.23 Crushed Stone - Resurfacing.

Crushed stone shall consist of furnishing and placing crushed stone base course according to Article 401 of these Specifications. Where designated by the Engineer, the Contractor shall undercut the base patch area and backfill to the depth of the asphalt base patch with crushed stone. All costs for undercutting and furnishing, placing and compacting the crushed stone shall be considered incidental to crushed stone.

403.24 Remove Asphalt Surface - Resurfacing.

Remove asphalt surface shall consist of removing existing asphalt pavement from a concrete base by any means including, but not limited to, grinders, air compressors, hand picks, motor blades, end loaders, back hoes, etc.

403.25 Remove Concrete Utility Patch

403.25(a) Description.

The contractor shall remove concrete utility patches in accordance with Section 203.2 of The City of Madison Standard Specifications. This item is intended for the removal of concrete utility patches in excess of sixty (60) continuous lineal feet on streets scheduled for pulverizing. Concrete utility patches less than sixty (60) continuous lineal shall be considered incidental to **BID ITEM 40311 - PULVERIZE AND SHAPE**.

403.25(b) Method of Measurement

Remove concrete utility patch shall be measured by the unit of lineal feet along the centerline of the utility patch.

403.25(c) Basis of Payment

Remove concrete utility patch measured as provided above shall be paid for at the contract unit price per lineal foot in accordance with Section 203.4 of City of Madison Standard Specifications.

ARTICLE 404 - CONCRETE PAVEMENT

404.1 General.

The installation of concrete pavement, including materials, equipment, foundation, construction methods, method of measurement, and basis of payment shall be in accordance with Article 415 and 416, "Concrete Pavement", of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin, Department of Transportation, except as modified herein Part III of The City of Madison Standard Specifications or the Special Provisions of the contract.

404.2 Forms.

404.2(a) Flexible Forms.

When concrete pavement is constructed on a curve, flexible forms shall be used for all curves having a radius of two hundred (200) feet or less, unless otherwise directed by the Engineer.

404.2(b) Wood Forms.

Wood forms shall only be allowed when approved by the Engineer.

404.3 Steel Pins.

The Contractor shall furnish steel pins to use in setting grades for concrete pavement.

404.4 Concrete Speed Hump.

404.4(a) Description.

The work under this item shall consist of manually forming and pouring concrete speed humps in accordance as detailed in the plans. All dowel bars shall be epoxy coated and in accordance with Standard Details 3.10 and 3.11 of the Standard Specifications. All concrete curb and gutter adjacent to the speed hump shall be paid for separately under that associated bid item. Positive drainage shall be maintained in the flowline of all curb and gutter adjacent to the speed humps. Dowelling of curb and gutter for speed hump installation shall be considered incidental to Concrete Speed Hump.

404.4(b) Method of Construction.

Concrete Speed Hump shall be constructed at the location and to the dimensions as shown in the plans. The speed humps shall be poured in sections in order to maintain traffic flow. The concrete speed humps shall comply with all applicable sections "Section 415 Concrete Pavement" of the Wisconsin Department of Transportation Standard Specifications for Road and Bridge Construction, latest Edition, pertaining to Non-Reinforced Concrete Pavement, Doweled. Concrete Speed humps shall be doweled with epoxy coated dowels as shown on the detail drawing. It is anticipated that the speed humps will be hand formed and no additional compensation shall be given for any labor required to form the speed humps to the dimensions shown on the details.

The installation of Concrete Speed Hump, as described above and as detailed in the plans, will be measured in place by the square yard for completed and accepted work.

404.4(c) Basis of Payment.

This item, measured as provided above, will be paid for at the contract price per square yard of speed hump installed and for furnishing all labor, tools, materials, reinforcing, equipment, and incidentals necessary to complete the work.

404.5 Concrete Pavement Reconstruction.

404.5(a) Concrete Pavement Removal.

The size of the area to be removed shall be designated in the field by the Engineer. Removal of the concrete slab shall be accomplished by a lifting device. Full depth sawcuts shall be made with a diamond blade using a two phase sawing operation. The longitudinal sides of the patch shall also be sawed to provide for the lifting removal, whether this is full depth, or just deep enough to insure that the tie bars are severed. The use of the lifting device is intended to preclude any disturbance of the underlying base course and reduce spalling of the edges of the concrete remaining in place. The lifting operation shall follow the sawcutting as closely as practicable. Other methods of removing the pavement which will not disturb the base course or the adjacent edges may be used only if approved by the Engineer. Refer to Standard Detail Drawing 5.2.3 for additional requirements.

If the concrete adjacent to the lifted patch is damaged during the course of removal, hole drilling or replacement, the damaged area shall be repaired by removing the damaged area. A full depth sawcut will be required. Such repair of concrete damaged during the course of Concrete Pavement Reconstruction shall be considered incidental to that item of work, and no separate compensation shall be made.

Following the removal of the concrete pavement the area shall be cleaned with hand tools. Any disturbed base course shall be removed and poured back with additional depth of concrete.

404.5(b) Placement of Concrete Pavement.

Joints in the replaced section of concrete shall be doweled in accordance with the details on Standard Plate 3.11. Epoxy coated tie bars shall be installed to a tight driven fit. Epoxy coated dowel bars shall be coated with an approved bond breaker.

Concrete patches shall be installed per Standard Detail Drawing 5.2.3

When only one lane is to be patched, a bond breaker consisting of 1/8" thick felt shall be installed along the longitudinal joint of the patch between adjacent lanes of concrete in lieu of the #4 tie bars.

The concrete design mix shall be such that the concrete achieves a strength of at least 3,000 psi in forty-eight (48) hours. The concrete design mix shall be submitted to the Engineer for approval prior to pouring of concrete.

The opening of patches to traffic shall be controlled by cylinder tests, and shall be no earlier than forty-eight (48) hours.

The strike-off and consolidation shall conform to Section 416.3.9.4 of the latest edition of the Standard Specifications for Highway and Structure Construction of the State of Wisconsin,

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Department of Transportation. The concrete shall be consolidated in place by use of an immersion type vibrator or vibratory screed. The screed or template used for the surface strike-off shall be of an approved design constructed of metal, or with a metal edge, and sufficiently rigid to retain its shape.

The transverse edges of the finished patch shall be flush with the edges of the existing concrete pavement. The longitudinal surface shall form a straight line from edge to edge within a tolerance of +1/8 inch. Pavement patches not meeting the 1/8" tolerance allowance shall be removed and replaced immediately.

The final surface of the pavement shall have a burlap drag or broom finish.

Whenever possible, the concrete shall be placed on the same day that the old pavement is removed.

The Contractor shall re-seed any terraces or medians damaged or disturbed during construction. This item shall be considered incidental to the items of work involved.

In the event that it is necessary to leave an open pavement section at the end of the day's work, one Class III barricade shall be placed in front of the open hole.

Construction equipment and materials are not to be stored within the street right-of-way during non-working hours.

404.5(c) Method of Measurement.

Concrete Pavement Reconstruction shall be measured by the square yard in place.

404.5(d) Basis of Payment.

Concrete Pavement Reconstruction shall be paid for at the contract unit price per square yard which price shall be payment in full for full-depth sawcutting, removal and disposal of the existing pavement, placing, finishing and curing the concrete for furnishing and installing the #10 epoxy coated dowel bars and epoxy coated deformed #6 bars and the #4 epoxy coated tie bars in the longitudinal joints, or 1/8" felt bond breaker, for furnishing all barricading, labor, materials, equipment, tools, and incidentals necessary to complete the work.

All costs for maintaining traffic and traffic control shall be at the expense of the Contractor.

ARTICLE 405- INFRARED SEAMLESS PATCHING

405.1 General.

This Work shall consist of furnishing all materials, equipment and labor necessary to the application of Infrared Seamless Patching. Infrared Thermal Bond Seamless Asphalt Pavement Patching is a method of blending new asphalt concrete material with infrared heated existing surface material to form a joint free integral mix patch.

405.2 Personnel.

The Contractor's personnel shall be experienced in Infrared Seamless Patching work and shall be knowledgeable regarding the material and equipment to be used for Infrared Seamless Patching.

405.3 Materials.

New asphalt concrete material for patching shall be equal to the City of Madison Standard Specification for HMA type E-1, 12.5 mm mix design.

A minimum of 20% of new virgin material shall be added to all patched areas. Additional material shall be added as needed and as directed by the Engineer.

405.4 Equipment.

Pavement Restoration Vehicle (PVR) shall be a truck or trailer mounted, self contained pavement maintenance heating system equipped with a fuel system and heated chamber capable of maintaining the fresh virgin asphalt materials at a temperature of 275°F or higher. Any material with a laying temperature less than 265°F shall be discarded.

The adjustable height infrared heating unit may be a truck or trailer mounted to the PRV. The heating unit shall be equipped with a heating chamber or chambers capable of heating the existing asphalt pavement to a workable condition without oxidation or burning. There shall be no flames in direct contact with the existing asphalt surface.

Compaction shall be achieved with a self-propelled vibratory roller of sufficient size to provide complete compaction to the full heated depth of the patched area. The new surface shall match the elevation of the adjacent pavement. Compaction methods shall be subject to the approval of the Engineer.

405.5 Preparation and Installation.

Potholes, alligator cracks or other surface defects that are contiguous with cracks are considered to be crack related and are to be repaired by Infrared Seamless Patching. Each street segment labeled with an (Infra) on the proposal pages shall be patched using the infrared seamless patching method. If there are question about where to patch the streets, consult the Engineer.

The area to be patched shall be determined in the field by the Contractor and verified by the Engineer. The Contractor shall determine the starting point of the work and the sequence of the heater application so as to accomplish all the work as specified.

The infrared heating unit shall be lowered to within six (6") inches of the existing pavement. The heated area must extend at least six (6") inches outside the area of repair.

Apply heat continuously until the surface is heated to a depth of at least two (2") inches. When the heated surface can be worked with a rake, proper heat penetration has been achieved.

Remove enough existing asphalt material (as required by adjacent grades) to allow for the addition of 20% new virgin asphalt mix to achieve a blend of 20% new to 80% existing heated material within the area of the patch.

If the patch area is already low, less existing material need be removed prior to the addition of the new virgin mix. Remove only the old oxidized surface in the low areas.

Reshape the patched area by hand with a rake and lute to match the grade of the adjacent pavement.

Compact patched areas with the specified roller to the full depth of the heated patch. The compacted surface shall be smooth, in texture and shall have positive drainage, matching the slope of existing pavement.

The site shall be cleaned after paving. Remove all debris resulting from the patching operation to the satisfaction of the Engineer.

405.6 Method of Measurement.

Infrared Seamless Patching shall be measured by the square foot.

405.7 Basis of Payment.

Infrared Seamless Patching shall be paid for at the Contractors bid price which price shall be full compensation for furnishing; heating, unloading, hauling, infrared patching; and for all labor, tools, equipment, and incidental necessary to complete the work as provided in the contract.

ARTICLE 406 - PAVEMENT CRACK SEALING

406.1 Materials For Pavement Crack Sealing.

Crack sealing materials shall be a high performance specification petroleum based polymeric hot pour sealant. The sealant shall meet the requirements of ASTM D3405 or approved equal. Each batch of cracked filling materials delivered to the job site shall be accompanied by the manufacturer's certification stating that the material meets the requirements of the specification.

In order to conserve material in large cracks, the Contractor may insert a closed cell backer rod material or other material approved by the Engineer.

406.2 Preparation of the Crack Sealing Mixtures.

The Contractor shall deliver to the Engineer the manufacturer's literature and instructions dealing with the preparation and installation of the crack sealing material to be installed. The preparation, handling, and installation and clean up of the crack sealing materials shall be in accordance with the manufacturer's specifications. It shall be the Contractor's responsibility to remove and dispose of all containers used to transport the crack sealing mixture.

406.3 Installation of Crack Sealing.

406.3(a) General.

This work consists of routing, cleaning, street sweeping, preparing and filling pavement cracks 1/8" or wider in existing bituminous pavements. The Contractor shall provide a petroleum based crack sealant in accordance with the specifications for the work. Following these Special Provisions is a list of those streets proposed for crack sealing as a part of this contract. The Contractor will not be required to seal the existing edge of gutter joint unless specified in the list of street segments.

406.3(b) Personnel.

The Contractor's personnel shall be experienced in crack sealing work and shall be knowledgeable regarding the material and equipment to be used for crack sealing.

405.3(c) Equipment.

The Contractor shall furnish all equipment necessary to complete the routing, cleaning, street sweeping, preparing and sealing of cracks promptly and in accordance with the requirements specified. The equipment required for this operation shall include but not limited to:

1. High pressure air equipment capable of developing 100 lbs. per square inch air pressure and capable of blowing sand and other foreign material from the crack.
2. Air chisel or hand tools, which can remove loose or spalled material adjacent to the cracks.
3. A pressure distributor for applying the crack sealing material in accordance with the manufacturer's instructions.
4. Hot air lance to remove moisture.

406.3(d) Preparation of the Cracks.

The cracks shall be routed to a minimum width of 1/2 inch (1 inch maximum) and a minimum depth of 3/4 inch (1 inch maximum).

In those instances of cracks which have been previously sealed and for which the sealant has failed, the Contractor shall remove the sealant from the crack.

The crack shall be cleaned using high pressured air equipment and broken or spalled material which is unable to be removed by high pressured air shall be removed using an air chisel or hand tool. All vegetation and loose material shall be removed from the cracks.

The contractor shall be responsible for all street sweeping and removal of debris. All crack sealed streets (including sidewalks and driveways) shall be swept clean of all debris created from the routing of cracks within twenty-four (24) hours of being sealed.

In wide cracks, the Contractor may insert a closed cell backer rod material, or other material approved by the Engineer in the bottom of the crack in order to reduce the amount of seal material required. However, the Engineer may require depth of sealant equal to 1.5 times the width of the crack.

406.3(e) Installation of Sealant.

Crack sealant shall be prepared and applied per the manufacturer's recommendation. Immediately prior to filling, the crack shall be cleared of all loose material, dirt and vegetation with compressed air at a minimum pressure of 100 lbs. per square inch (psi). Debris is to be blown out in a manor so that the fresh sealant is not contaminated. The cracks shall be dry prior to filling. The Contractor may either allow the crack to dry by the air or through the use of a hot air lance.

A sealant overband of 1 to 2-inch wide is required on each side of the routed crack with a maximum of 1/8-inch thickness. At locations where the overband exceeds these limits the Contractor will be required to remove the sealant and replace it at their own expense.

At locations where the crack sealant settles in the crack opening more than 1/4" below the pavement surface, the Contractor will remove the sealant and replace it at their own expense.

The Contractor shall not allow traffic on the road until the sealant has properly set up and no danger of damage to sealant exists. The Contractor shall use traffic barriers or flagmen to prevent the tracking of uncured material. The Contractor may dust the newly sealed cracks with sand or other approved material when a proper cure time on the sealant is not attainable.

406.4 Method of Measurement.

Bid Item 40601 - Pavement Crack Sealing shall be measured per street segment installed. Each segment shall be considered as a lump sum unit.

Bid Item 40602 - Pavement crack Sealing shall be measured by the lineal foot installed.

406.5 Basis of Payment.

Crack sealing shall be paid for at the Contractors bid price. Which price shall be full compensation for furnishing; unloading, hauling, and for applying the crack sealing material; for the routing, cleaning of the cracks, street sweeping; for the filling of any wide cracks with a closed cell fill material, and for all labor, tools, equipment, and incidental necessary to complete the work as provided in the contract.

ARTICLE 407 - SPRAY PATCHING

407.1 General.

The work shall consist of repairing transverse and longitudinal cracks, alligator cracks, or potholes that cannot be repaired by crack sealing. The Contractor shall clean the area to be spray patched of all rock, dirt, sand, vegetation or other objectionable material, apply a tack material, fill the void with oil coated chips or other approved material and compact the mix if deemed necessary by the Engineer.

407.2 Personnel.

The Contractor's personnel shall be experienced in spray patching work and shall be knowledgeable regarding the material and equipment to be used for spray patching.

407.3 Equipment.

The Contractor shall supply all equipment necessary to complete the work. The equipment required includes but is not limited to the following:

1. High pressure air equipment capable of developing 100 lbs. per square inch air pressure and capable of blowing sand and other foreign material from the crack.
2. A proprietary or prototype machine capable of spraying the tack and spray patching material into the cracks or potholes.
3. Appropriate compaction equipment, if deemed necessary by the Engineer.

407.4 Preparation and Installation of Spray Patching.

Potholes, alligator cracks or other surface defects that are contiguous with cracks are considered to be 'crack related' and are to be repaired by spray patching. Each street segment labeled with an (SP) on the proposal pages shall be spray patched. If there is questions about where to spray patch the streets, consult the Engineer. There may be street segments, which are not labeled (SP), but shall be spray patched at the discretion of the Engineer.

Work shall not be preformed when the atmospheric temperature is below 36°Fahrenheit.

All objectionable material shall be removed from the open crack and surrounding area by blowing with high pressure air streams or other means acceptable by the Engineer.

Cleaned cracks shall be sprayed with the emulsified asphalt, or tack coat and sprayed with the approved patching material.

Some over-spraying of the crack will be required to ensure a smooth transition between the repaired areas and the adjacent undisturbed pavement surface.

The repaired area shall be compacted, if necessary, to ensure adequate embedment of the patch mixture into and over the repaired area.

All loose aggregate and debris shall be swept or removed from the pavement surface and disposed of, to the satisfaction of the Engineer, prior to spray patching.

407.5 Method of Measurement.

Spray Patching shall be measured by the square foot installed.

407.6 Basis of Payment.

Spray Patching shall be paid for at the Contractor's bid price. Which price shall be full compensation for furnishing; unloading, hauling, and for applying the spray patching and for all labor, tools, equipment, and incidental necessary to complete the work as provided in the contract.