



# City of Kettering

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Kettering, Ohio 45429  
Montgomery County  
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## **CONSTRUCTION AND MATERIAL SPECIFICATIONS**

**EFFECTIVE JANUARY 1, 2023**

**REVISIONS IN RED**

CITY OF KETTERING  
CONSTRUCTION AND MATERIAL  
SPECIFICATIONS

JANUARY 1, 2023

THESE SPECIFICATIONS ARE BASED ON THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT), CONSTRUCTION AND MATERIAL SPECIFICATIONS, MOST CURRENT EDITION.

CITY OF KETTERING SPECIFICATIONS ARE DESIGNATED WITH A “K” PRECEDING THE ITEM NUMBER. SOME OF THESE SPECIFICATIONS REFLECT ADDITIONS AND/OR MODIFICATIONS TO AN ODOT SPECIFICATION.

IF A CONFLICT OCCURS BETWEEN A CITY SPECIFICATION AND AN ODOT SPECIFICATION OR REFERENCED SECTION, THE MORE STRINGENT SPECIFICATION WILL APPLY, UNLESS APPROVED OTHERWISE BY THE CITY.

THE CITY OF KETTERING RESERVES THE RIGHT TO USE ODOT SPECIFICATIONS, BUT TO USE BID UNITS OF ITS CHOOSING.

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\*INDICATES 2023 REVISIONS

## **ITEM K-202 REMOVAL OF STRUCTURES AND OBSTRUCTIONS**

### **Description**

This item shall consist of removal of structures and obstructions according to Item 202 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Construction**

All backfill shall be made with granular material or low strength mortar backfill, per the engineer's direction.

The removal of existing pipes, manholes, catch basins, and other drainage structures within the limits of excavation required for the installation of a proposed item, shall be paid for as part of the proposed item unless otherwise noted in the plans.

The removal of concrete flatwork shall include the removal of any vegetative roots necessary to prepare for full depth placement of flatwork shall be paid for as part of the proposed item unless otherwise noted in the plans.

Any necessary saw-cutting shall be paid for as part of a proposed removal item unless otherwise noted in the plans. Saw a neat joint at the removal limit, as marked by the Engineer.

### **Payment**

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-203A ROADWAY EXCAVATION AND EMBANKMENT**

### **Description**

This item shall consist of performing Roadway Excavation and Embankment, including channels, according to Item 203 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT). If explosives are used, all Federal, State and Local regulations covering the use of explosives shall be observed.

### **Compaction**

The compactive effort shall meet the specification in Sections 203.06 and 203.07 of the Construction and Material Specifications of ODOT.

### **Existing Storm Sewers**

Contractors shall use care not to damage any existing storm structures that are to remain in place. In the event a storm structure is damaged, it will be the full responsibility of the contractor to fix and replace that structure to the satisfaction of the engineer. The contractor shall bear all costs of that repair or replacement.

### **Payment**

The basis for payment shall be as set forth in the Construction and Material Specifications of ODOT Section 203.10 and shall include those items specified in the General Notes for payment as part of this item.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-203B ROCK EXCAVATION**

### **Description**

This item shall consist of performing the excavation and disposal of rock encountered within the limits of the work necessary for the construction of roadways, structures, and the installation of pipes and appurtenances, in accordance with the specifications and in reasonably close conformity with the lines, grades and typical cross sections shown on the plans or established by the Engineer.

### **Definition**

Rock excavation is defined as the removal of material which is either solid or stratified and which cannot be removed by recognized standard excavating methods. This material will require drilling, blasting, or some other mechanical means of shattering. Boulders one (1) cubic yard and over in volume required to be removed are classified as rock excavation. Loam, sand, gravel, clay or other material will not be classified as rock excavation even though portions of it may be stratified or laminated, or may be as hard as portions of sandstone or limestone.

### **Construction Requirements**

- A. Pavements: Rock excavation necessary for the construction of pavements shall be in accordance with Item 203 of the Construction and Material Specifications of the State of Ohio.
- B. Trenches: Rock excavation shall be to the depth required to provide a minimum of four (4) inches of clearance below all parts of the pipe, valves, fittings and other appurtenances and structures. Trench widths shall be a minimum of eight (8) inches wider than the outside diameter of the widest part of the pipe, valves, fittings and other appurtenances and structures.
- C. Rock Blasting: The Contractor shall excavate by blasting in accordance with the requirements of Item 208 of the Construction and Material Specifications of the State of Ohio.

### **Measurement**

The quantity of rock excavation shall be the number of cubic yards of material as measured in place, required to be removed to meet the specified depth and width limitations. Any excavation and backfill beyond the specified limits will be the expense of the Contractor.

### **Payment**

Payment shall include the removal and disposal of the rock; the required material for embankment, bedding and trench backfill not stipulated for payment as part of another item of these specifications. Rock excavation shall be paid as an additional item and not included in the quantities calculated for payment as part of another item of these specifications. Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-204 SUBGRADE COMPACTION**

### **Description**

This item shall consist of preparing subgrade according to Item 204 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Materials**

Suitable material shall meet the requirements of Section 204.02 of the Construction and Material Specifications of ODOT except that slag may not be used. When specified, geotextile fabric, geogrid, or other approved methods of subgrade stabilization shall be used as shown on the plans or as directed by the Engineer.

### **Soft Subgrade**

Soft subgrade shall be removed and replaced as directed by the Engineer. However, if the soft subgrade results from the contractor's failure to provide adequate drainage and maintenance of the subgrade, the contractor will be responsible for replacing the soft subgrade and disposing of the removed material.

### **Payment**

The basis for payment shall be as set forth in Section 204.09 of the Construction and Material Specifications of ODOT and shall include those items specified in the General Notes for payment as part of this item.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-253 PAVEMENT REPAIR**

### **Description**

This item shall consist of removing the existing asphalt and making repairs to flexible pavement sections according to Item 253 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Materials**

Asphalt concrete shall meet the requirements of Section 301 and Section 401 of ODOT Construction and Material Specifications. Aggregate base shall meet the requirements of Section 304.

### **Construction**

Unless otherwise specified or directed by the Engineer, the typical section for flexible base pavement repairs shall match the Typical Roadway Sections specified in the City of Kettering Standard Construction Drawings. Typical pavement sections for repairs shall correspond to the roadway classification of the roadway being repaired, as determined by the Engineer. Aggregate and asphalt shall be placed in lift thicknesses that allow for proper compaction of the repair area.

If the project under which full-depth flexible pavement repairs are being made includes resurfacing of the larger roadway surface, 301 asphalt concrete base material shall be brought up to match the existing roadway surface grade, and 401 asphalt shall not be used. The top of the repair area, thickness as specified by the resurfacing total lift thickness, shall then be milled off as part of the pavement planing work item.

### **Measurement**

The quantity of pavement repair shall be measured by the number of square feet or square yards, as specified by the project bid quantities, of pavement repaired complete and accepted, as established by the Engineer.

### **Payment**

The basis for payment shall be as set forth in Section 253.05 of the ODOT Construction and Material Specifications, inclusive of the above specifications.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.



## **ITEM K-254 PAVEMENT PLANING**

### **Description**

This item shall consist of planing the existing asphalt and disposing of cuttings according to Item 254 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Construction**

Unless otherwise specified or directed by the Engineer, the thickness for the pavement to be removed shall be specified in construction drawings and supplemental specifications.

Dispose of the cuttings according to ODOT 202. When the fabric is encountered, the contractor shall immediately notify the Engineer. If during the pavement planing fabric is encountered as an interlayer, the loose fabric material shall be removed completely. The cost to remove the fabric materials and dispose of shall be included in the cost of Pavement Planing. No additional compensation shall be made and this work will be incidental to the project.

When aggregate base material or natural soil is exposed during planing operations, the contractor shall further plane sufficient depth to achieve a minimum final asphalt thickness of no less than four inches, as directed by the Engineer.

Unless otherwise directed, the planing shall result in a roadway cross-section with a center crown elevated at a minimum of 1.6% from the edge of pavement.

The contractor shall be responsible to achieve proper drainage, curb exposure, and lift thickness; coordinating with city staff as necessary.

### **Measurement**

The quantity of pavement planing shall be measured by the number of square yards, as specified by the project bid quantities, and measured in the field once the pavement planing is complete and accepted, as established by the Engineer.

### **Payment**

The basis for payment shall be as set forth in Section 254.07 of the ODOT Construction and Material Specifications, inclusive of the above specifications.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

Areas of additional pavement planing depth will be paid at the unit bid price per square yard, and in addition to the existing planing area.

## **ITEM K-255 FULL-DEPTH PAVEMENT REMOVAL & RIGID REPLACEMENT**

### **Description**

This item shall consist of removal of the full-depth concrete and rigid replacement of concrete pavement according to Item 255 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT) and the City of Kettering Standard Construction Drawings.

### **Material and Construction**

Concrete shall meet the requirements of Item K-499 of these specifications.

High-early-strength / fast-set concrete shall be used for concrete replacement on all thoroughfare streets. The requirements of ODOT CMS 499 for Class "QC FS" concrete and Class "QC MS" concrete shall apply.

For concrete pavements 9" thick or greater, one-inch (1") epoxy-coated smooth dowel bars shall be spaced at 18" – 24" centers (not to exceed 24") beginning 6" from the edge of pavement, unless otherwise specified. Dowels shall be secured into existing pavement with non-shrink grout or epoxy cement.

### **Measurement**

The quantity of pavement repair shall be measured by the number of square feet or square yards, as specified by the project bid quantities, of pavement repaired complete and accepted, as established by the Engineer.

For joint repair the lineal foot quantity to be paid for shall be based on a five-foot (5') wide joint repair. Any additional width needed out of convenience of equipment used by the contractor shall be included in the contract bid price.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction of the concrete pavement joint removal and replacement. Payment shall include saw-cutting; removal of existing pavement; subgrade preparation; dowels, hook bolts, tie rods and load transfer devices as required; constructing thickened end sections as directed by the Engineer; high-early / fast-set concrete for repairs on thoroughfares; construction of integral curbs as specified; depressing curbs for driveways; providing curb openings for drain tile where directed; expansion material as specified; curing material; and temporary surface patching of the repair with asphalt.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## ITEM K-255A POLYMERIZED EMULSION CONCRETE PAVEMENT JOINT REPAIR

### Description

This item shall consist of furnishing, preparing and systematically applying a polymerized bituminous emulsion, aggregates and asphalt concrete to concrete pavement fractures, joints and imperfections as specified in the proposal. The applied materials shall completely fill the entire cavity and provide an aggregate wearing surface.

### Materials

The asphalt emulsion employed in this specification consist of a highly polymer modified bituminous binder which has been prepared using sufficient quantities of polymers and additive to impart a finished product having superior elastic and adhesive/bonding properties.

### EMULSION:

<u>EMULSION PROPERTY</u>	<u>MIN</u>	<u>MAX</u>	<u>TEST METHOD</u>
VISCOSITY, 122°F (S.F. sec)	50	400	ASTM D 244
DEMULSIBILITY (%)	40	-	ASTM D 244
PERCENT SOLIDS (%)	68	-	ASTM D 244
PARTICLE CHARGE	POSITIVE		ASTM D 244
STORAGE STABILITY, 24 hrs (%)	-	1	ASTM D 244
SIEVE, #20 mesh (%)	-	0.1	ASTM D 244

<u>RESIDUE PROPERTY *</u>	<u>MIN</u>	<u>MAX</u>	<u>TEST METHOD</u>
PENETRATION, 100g, 5 sec, 25°C (dmm)	80	120	ASTM D 5
SOFTENING POINT (°C)	65	90	ASTM D 36
DUCTILITY, 4°C (cm)	45	-	ASTM D 113
ELASTIC RECOVERY, 4°C, 10 cm (%) **	70	-	ASTM D 6084-04
FORCE DUCTILITY @ 4°C, 30 cm (lb/cm <sup>2</sup> ) ***-		6	ASTM D-113 <sup>1</sup>
ELONGATION, 4°C (%)	1000	-	ASTM D 113

\* By distillation.

\*\* The specimen is extended 10 cm. The extended area is severed in the middle using a pair of shears. After 1 hour, at the test temperature the severed ends are returned to contact and the ductilometer reading is made again. The sample must recover at least 75 percent of the original 10 cm distance or to a length of 2.5 cm or less.

\*\*\*1 A standard ductility apparatus is modified by the addition of a load cell. The load cell is calibrated in pounds per square centimeter. The sample is extended to a length of 30 cm and the force required is recorded at 1 cm intervals. It should not exceed the stated limit of 6 lb/cm<sup>2</sup> over this range.

### AGGREGATE :

The aggregates employed in this process shall provide a durable wearing surface while providing for the proper blend of aggregate and emulsion mixtures for filling pavement joints and

potholes. Selection shall be made to achieve the proper design for the intended pavement.

All aggregates used shall be 100% crushed and meet the gradation parameters as outlined below and the quality requirements of the department's material specifications.

	<u>Sieve Size</u>	<u>% Passing</u>
(Type A Gradation)	3/8	100
	4	90-100
	8	0-20
	16	0-10

#### ASPHALT CONCRETE:

Item 448 asphalt concrete shall be used in combination with polymerized emulsion for the repairing of larger joints and potholes as stated in the pavement repair method.

#### Construction Requirements

#### WEATHER LIMITATIONS

The pavement repair shall not be performed when the atmospheric temperature is less than 40 degrees F. Minimum pavement surface temperature shall be 40 degrees F during material application. Materials shall not be placed if impending weather conditions are such that proper curing may not be obtained.

#### EQUIPMENT

All equipment required for performance of the work shall be subject to approval of the engineer and shall be maintained in a satisfactory operating condition. In addition to equipment described herein, the contractor shall furnish squeegees, lutes, compactors and other small tools which may be essential to the satisfactory completion of the work.

#### AGGREGATE APPLICATION

The initial aggregate layers shall consist of #8 limestone and layered in by hand in each lift correlating with the appropriate amount of polymer modified emulsion. Each of these stone particles is to be completely covered with the liquid emulsion. Methods of injecting emulsion into the stream of aggregate, prior to placement in the cavity are not an acceptable method of placing the material. Material shall be layered into the cavity as specified. The emulsion shall show no signs of pre-breaking prior to the placement and attachment of aggregate particles. The aggregate shall make contact to the emulsion in a vertical position and will show no signs of asphalt displacement. These consecutive aggregate layers are to be brought within ½ to ¼ inch of level with the surrounding concrete surface after compaction. The finish layer shall be capped with #9 limestone and compacted once again to be completely level with the surrounding pavement surface. The finished layer of aggregate shall be contained within the area in which the repair has been made.

### POLYMERIZED BITUMINOUS EMULSION APPLICATION

The polymerized bituminous emulsion shall be pumped so as not to cause excessive agitation prior to contact of pavement surface. Application of emulsion shall be applied at a temperature range of 120° F - 170° F and shall never exceed 212° F, nor shall any load be continuously reheated. The application shall be performed by placing a uniform ribbon, 4" in width ±, and a surface thickness of 1/8" to 3/16". Repeated applications may be required to allow complete filling of pavement voids. The repeated application shall be accomplished without increasing ribbon width or thickness. It is necessary to allow adequate time for settlement pending size and depth of cavity. The completed polymerized emulsion ribbon will show no signs of settlement into the pavement structure, visually indicating that the cavity is filled. The final application of emulsion shall show no signs of vertical drainage prior to the application of cover aggregate.

### SURFACE PREPARATION

Areas to be treated shall be free of all vegetation and loose or un-bound material. Immediately prior to material placement all concrete pavement joints showing deterioration shall be surface milled to a width of 18" – 24" and a depth of 2 inches. These areas shall be cleaned to maximum width and depth by use of compressed, oil-free air, at a minimum 125 CFM, and 100 P.S.I. After air cleaning there shall be no visible signs of standing moisture.

### PAVEMENT REPAIR METHOD (CONCRETE JOINT FILLING)

This method shall be used when filling concrete pavement joints, depressions, cold seam ravels and fractures up to 4" in depth.

1. Surface preparation as required to remove loose materials.
2. Prime existing areas with the polymerized bituminous emulsion at an application rate of .10 to .25 gallons per square yard.
3. Place the polymerized emulsion and the specified gradation of aggregate into primed area. Placement of materials shall be accomplished by injecting the emulsion and aggregate (layering) into the pavement area/cavity to be repaired. At least 90% of the aggregate shall be coated. No additional hand mixing shall be required.
4. Strike off the placed repair mixture level with adjacent pavement surface.
5. Apply emulsion to repaired area at an application rate of .20 to .30 gallons per square yard. Cover aggregate shall be applied to emulsion by the preceding cover aggregate specification.

### SPECIAL NOTES

The pavement repair method utilized will vary on the conditions of each joint. The necessary milling depth will determine the appropriate method of repair. Methods of injecting emulsion into the stream of aggregate, prior to placement in the cavity are not an acceptable method. Materials shall be layered into the cavity as specified.

### FINAL CLEAN-UP

Vacuum sweeping shall be completed within three hours of material application. Initial sweeping shall remove all loose or unbound materials. All debris shall be removed from job site.

**Contractor Submittal Requirements**

Certification signed by the contractor stating that all equipment used in the performance of the item of work is owned and maintained by the contractor and meets specifications. Included shall be a listing of all equipment proposed for the specified work.

Contractor shall provide a list of all key personnel employed by the contractor that will have management authority, duties or responsibilities for this item of work. Contractor shall provide a list of all proposed material sources and corresponding test reports that demonstrate compliance with the specifications.

Contractor shall provide a Safety Plan acceptable to the engineer. Contractor shall provide a Quality Control Plan acceptable to the engineer.

**Traffic Control**

During construction, the contractor shall be responsible for all traffic control and must maintain one-lane access to all driveways and entrances utilizing proper traffic control devices, signage, and traffic flaggers. The contractor shall adequately mark, through the use of barrels, flashing lights, portable gates, and/or other devices approved by the Engineer, the limits of the project area and those areas of the site which are temporarily closed to traffic.

**Measurement and Payment**

<b>ITEM OF WORK</b>	<b>PAY ITEM</b>
POLYMERIZED EMULSION CONCRETE JOINT MILLING / JOINT FILLING	LINEAL FOOT

Each Lineal foot payment includes 18 inch width grinding. In the circumstance that the appropriate 18 inch grinding head cannot be obtained for the project a 24 inch grinding head shall be utilized and the contractor shall **not** be compensated for the additional footage due to the extra width.

These pay items shall include all labor, materials and equipment to facilitate cleaning the existing pavement, traffic control, mix designs, construction of the specified product and any corrective work to meet acceptance.

## **ITEM K-301 ASPHALT CONCRETE BASE (449)**

### **Description**

This item shall consist of the construction of an Asphalt Concrete Base according to the requirements of Item 301 of the Construction and Materials Specifications of the Ohio Department of Transportation (ODOT).

### **Material**

Materials shall meet the requirements of Section 301.02 and 401.03 of the Construction and Material Specifications of ODOT, except that slag may not be used and the maximum reclaimed material shall not exceed 30%.

### **Measurement**

The quantity measured shall be the actual number of tons, compacted in place, as determined by plant delivery tickets.

### **Payment**

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items

## **ITEM K-304 AGGREGATE BASE**

### **Description**

This item shall consist of the construction of an aggregate base according to the requirements of Item 304 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Aggregate**

Aggregate shall meet the requirements of section 304.02 of the Construction and Material Specifications of ODOT except that slag may not be used.

### **Measurement**

Aggregate Base shall be measured as specified in the Construction and Material Specifications of ODOT section 304.07 except that the quantity to be paid for will be based on the actual number of tons placed, as determined by plant delivery tickets.

### **Payment**

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items



## **ITEM K-401 ASPHALT CONCRETE PAVEMENTS - GENERAL**

### **Description**

This item shall consist of the construction of an asphalt concrete surface course or intermediate course according to the requirements of Item 449 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

Unless otherwise specified, ODOT Specification 401.20 (Asphalt Binder Price Adjustment) shall be exempted from all non-federally funded City of Kettering projects.

After completion of milling the existing asphalt surface, the new asphalt surface course shall be paved within five calendar days.

ODOT Specification 401.17 shall apply for new asphalt concrete surfaces and new asphalt surface joints shall be six inches from the proposed striping and overlap with the intermediate asphalt course.

On all the secondary and primary arterial streets, and secondary and primary thoroughfare streets, mainline asphalt shall be placed first and then side street pavement placed to meet mainline grades unless otherwise directed by the engineer. Reference the City of Kettering Thoroughfare Plan for the classification of the streets. The Official Thoroughfare Plan is located on the City of Kettering Engineering Web Page. Where proposed pavement is to butt the existing pavement, the existing pavement is to be sawcut and the joint is to be sealed with an approved bituminous material.

After completion of the surface course, seal gutters with asphalt binder material conforming to ODOT Specification 702.01 as directed by the Engineer. Apply the material at a uniform width of approximately 4 inches, and at a rate just sufficient to fill surface voids. New or existing barrier curb, and existing chair curb, shall be sealed along the surface where the curb meets pavement. New chair curb shall be fully sealed along the face of the gutter beneath the pavement surface. This work shall be complete within 30 working days from the completion of the final surface course or liquidated damages will incur per the bid documents based on days late.

**The contractor is expected to maintain line and grade to properly drain water, and meet specifications for curb reveal on existing curb as possible. Kettering Engineering staff will identify areas in need of improvement, stake the proposed grade, and assist the contractor as necessary.**

### **Measurement**

The quantity of material measured for payment shall be the actual number of tons compacted in place as determined by plant delivery tickets. Payment shall be made at the contract unit price bid per ton.

### **Payment**

The price bid for this item shall include all labor, equipment and material necessary to the construction of an asphalt concrete surface course or intermediate course.

Payment shall be made at the contract price bid for the specified items.

## **ITEM 404LVT (Low Volume Traffic) ASPHALT CONCRETE**

- 404LVT.01 Description**
- 404LVT.02 Composition**
- 404LVT.021 Quality Control**
- 404LVT.03 Materials**
- 404LVT.04 Use of Reclaimed Pavement**
- 404LVT.05 Mixing Plants**
- 404LVT.06 Weather Limitations**
- 404LVT.07 Notification**
- 404LVT.08 Asphalt Binder Preparation**
- 404LVT.09 Aggregate Preparation**
- 404LVT.10 Mixing**
- 404LVT.11 Hauling**
- 404LVT.12 Spreading Equipment**
- 404LVT.13 Rollers**
- 404LVT.14 Conditioning Existing Surface**
- 404LVT.15 Spreading and Finishing**
- 404LVT.16 Compaction**
- 404LVT.17 Joints**
- 404LVT.18 Asphalt Binder Compatibility**
- 404LVT.19 Spreading and Surface Tolerances**
- 404LVT.20 Asphalt Binder Price Adjustment**
- 404LVT.21 Method of Measurement**
- 404LVT.22 Acceptance and Basis of Payment**

### **404LVT.01 Description.**

This work consists of constructing a 1- 2 inch thick surface course or variable depth intermediate course of aggregate and asphalt binder for use in low volume traffic applications.

Mix aggregate and asphalt binder in a central plant and spread and compact on a prepared surface according to these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

All specification references herein are to the Ohio Department of Transportation, 2013 Construction & Materials Specifications.

The requirements of specification 401 do not apply except where noted.

Asphalt concrete mix pavement thickness shown on the plans or stated in the proposal is for exclusive use in calculating the weight required to be placed per unit of surface area.

Section .22 includes a pay adjustment mechanism for mix that deviates from the job mix formula. Mix having binder content below the job mix formula, but within specification tolerances, will receive an adjustment commensurate to the amount of lacking binder. No payment is made for binder content in excess of the job mix formula.

### **404LVT.02 Composition.**

Establish a Job Mix Formula (JMF) by combining coarse aggregate, fine aggregate, reclaimed asphalt pavement (RAP) and asphalt binder in proportions that result in an asphalt mixture meeting the blend limits in Table 1. Note: a minimum of 50% of the virgin fine aggregate must be natural sand, 703.05

**Table 1**

<b>Mixture Proportions</b>		
Sieve	Total Percent Passing	
1/2 inch	100	
3/8 inch	90 to 100	
No. 4	72	
No. 8	42 to 60	
No. 16	27 to 45	
No. 50	10 to 22	
No. 200	0 to 8	
Total binder content (% by weight of mix):	Gravel coarse aggregate: 6.6 <sup>1,2</sup> Limestone coarse aggregate: 6.8 <sup>1,2</sup> Gravel/Limestone coarse aggregate blends: 6.7 <sup>1,2</sup> Slag aggregate blends: as determined by Marshall mix design process; medium traffic; binder content selection at 2.5% air voids. <b>Note 1:</b> Increase binder content 0.2% for coarse aggregate having absorption $\geq 4.0$ <b>Note 2:</b> The engineer may adjust binder content. Compensation will be made according to 404LVT.22	
Virgin binder min. (% by weight of mix):	Gravel coarse aggregate: 5.6 Limestone coarse aggregate: 5.8	
Traffic volume (ADT):	2500 max.	
Binder Grades:	PG58-28	PG64-22
Limits for Reclaimed Asphalt Pavement (% by weight of mix):	20 max.	10 max.

**404LVT.021 Quality Control**

Ensure quality control personnel, testing devices, and facilities meet the requirements of Supplement 1041. Meet the requirements of Item 403 except 403.04 and 403.05.

Calibrate asphalt content nuclear gauges according to Supplement 1043.

Perform quality control testing according to the frequency provided in Table 2. Obtain mix samples at the mixing plant.

**Table 2**

<b>Quality Control Testing Schedule</b>		
Daily Frequency	Tests	Sample Type
Within first 100 tons	binder content, gradation	completed mix
Each 400 tons thereafter	binder content, gradation	completed mix

During production investigate and correct variation from the JMF, as shown by the quality control analysis, of plus or minus 4 percent passing the No. 4 sieve or plus or minus 0.3 percent binder.

If variation exceeds the limits in Table 3 immediately cease production until the cause for variation is determined and corrections made. Notify the Engineer.

**Table 3**

<b>Deviation from the Design</b>		
<b>Mix Characteristic</b>	<b>From the Design</b>	<b>Range</b>
Binder Content	± 0.5 percent	1.0
No. 4 Sieve	± 6 percent	12

**404LVT.03 Materials.** Furnish materials conforming to Table 4.

**Table 4**

<b>Material</b>	<b>Specification</b>
Asphalt binder	702.01
Aggregate	703.05 <sup>3</sup>
Mineral filler	703.07
Polymer	702.14

**Note 3:** Do not apply the gradation requirements for fine aggregate.

**404LVT.04 Use of Reclaimed Asphalt Pavement**

Process recycled asphalt pavement such that it passes a 9/16-inch sieve and when incorporated ensures a one-half inch maximum aggregate size.

**404LVT.05 Mixing Plants.** Apply the requirements of 401.05

**404LVT.06 Weather Limitations.** Apply the requirements of 401.06

**404LVT.07 Notification.** Apply the requirements of 401.07

**404LVT.08 Asphalt Binder Preparation.** Apply the requirements of 401.08

**404LVT.09 Aggregate Preparation.** Apply the requirements of 401.09

**404LVT.10 Mixing.** Apply the requirements of 401.10 Asphalt mixtures may be produced using the warm mix asphalt method according to 402.09

**404LVT.11 Hauling.** Apply the requirements of 401.11

**404LVT.12 Spreading Equipment.** Apply the requirements of 401.12

**404LVT.13 Rollers.** Apply the requirements of 401.13

**404LVT.14 Conditioning Existing Surface.** Apply the requirements of 401.14

**404LVT.15 Spreading and Finishing.**

Ensure spreading operations result in a mat texture that is uniform and free of deficiencies such as tears, drags or other blemishes. Remove and replace areas of deficient mat texture.

Apply the requirements of 401.15

**404LVT.16 Compaction.** Apply the requirements of 401.16

**404LVT.17 Joints.** Apply the requirements of 401.17

**404LVT.18 Asphalt Binder Compatibility.** Apply the requirements of 401.18

**404LVT.19 Spreading and Surface Tolerances.** Apply the requirements of 401.19

**404LVT.20 Asphalt Binder Price Adjustment.** Apply the requirements of ODOT proposal note 534

**404LVT.21 Method of Measurement.** Apply the requirements of 401.21

**404LVT.22 Acceptance and Basis of Payment.** Apply the requirements of 401.22

Acceptance for gradation and binder content will be based upon the mean of the results of all required quality control tests performed during a day's production.

The pavement owner is responsible for verification testing according to 403.06.

Production will be considered acceptable if the tolerances shown in Table 3 are not exceeded and the remaining sieves do not exceed the limits of the applicable specifications.

In the event material does not meet these requirements but that reasonably acceptable material has been produced, the Engineer will make a determination if the deficient work will be accepted and remain in place. If accepted, payment will equal 90 percent of the bid item cost for deviations related to aggregate gradation; 70 percent for binder deviations.

Payment for accepted quantities, complete in place, will be based on the following formula:  $CY \times [Unit\ Price + 2BI(B_{ADJUST} - BC)]$

Where CY = cubic yards of asphalt concrete

Unit Price = unit price bid for the item

BC = Binder Correction factor.

$$BC = B_{JMF} - B_{ACTUAL} \text{ if } B_{JMF} > B_{ACTUAL}$$

$$BC = 0 \text{ if } B_{JMF} < B_{ACTUAL}$$

$B_{ACTUAL}$  = Mean binder content of material placed, excluding deficient material removed or accepted at reduced pay

$B_{ADJUST}$  = (%) binder adjustment (Table 1, Note 2)

$B_{BID}$  = specified binder content (%) + (%) binder added for absorptive aggregate (Table 1, Note 1)

$$B_{JMF} = B_{BID} + B_{ADJUST}$$

BI = Bidding Index

Pay Items	Unit	Description
404LVT	Ton	404LVT, Asphalt Concrete, PG 58-28
404LVT	Ton	404LVT, Asphalt Concrete, PG 64-22

## ITEM K-422 STRESS ABSORBING MEMBRANE INTERLAYER (SAMI)

### Description

The work covered under this provision consists of furnishing all materials, equipment, labor and preparation necessary for the application of a Stress Absorbing Membrane Interlayer. The applied materials shall completely seal the entire pavement surface and provide a uniform textured surface, suitable for the placement of hot mixed asphalt overlays, micro-surfacing or slurry surfacing overlays, or left intact as a finished pavement surface.

### Materials

#### 1. POLYMER MODIFIED BITUMINOUS EMULSION BINDER

<u>EMULSION PROPERTY METHOD</u>	<u>MIN</u>	<u>MAX</u>	<u>TEST</u>
S.F. VISCOSITY, 50 C (sec)	50	400	ASTM D 244
PERCENT SOLIDS (%) *	68	-	ASTM D 244
STORAGE STABILITY, 24 hrs (%)	-	1.0	ASTM D 244
SIEVE TEST, #20 mesh (%)		0.1	ASTM D 244
<u>RESIDUE PROPERTY METHOD</u>	<u>MIN</u>	<u>MAX</u>	<u>TEST</u>
PENETRATION, 100g, 5 sec, 25 C (dmm)	70	100	ASTM D 5
SOFTENING POINT, RING & BALL (C)	48.9	-	ASTM D 36
ELASTIC RECOVERY, 4C, 10cm (%) **	60	-	ASTM D 6084
FORCE DUCTILITY, 4C, 40cm ***	20 lbs./sq.in.		ASTM D 113 <sup>1</sup>

<sup>1</sup>Modified

\*By distillation or evaporation.

\*\* The specimen is extended 10 cm. The extended area is severed immediately in the middle using a pair of shears. After 1 hour at the test temperature, the severed ends are returned to contact and the ductilometer reading is made again. The sample must recover at least 70 percent of the original 10-cm distance.

\*\*\* ASTM D 113 as modified by the addition of a load cell to the standard ductility test apparatus. The load cell is calibrated in pounds per square centimeter. Reading is measured at 40 cm. Reading is multiplied by 6.45 to yield pounds per square inch force required to extend the test specimen.

The asphalt modifier shall be of a SBS type polymer. Styrene-Butadiene-Styrene. The modifier shall be added to the asphalt cement prior to the emulsification process. The asphalt modifier shall be an SBS type polymer, Styrene – Butadiene – Styrene. The modifier shall be added to the asphalt cement and pre-dispersed prior to the emulsification process.

#### 2. AGGREGATE

The surface cover aggregate shall be 100% crushed material from quarried stone, natural gravel or other high quality aggregate and meet the following requirements.

## PHYSICAL REQUIREMENTS

<u>TEST</u>	<u>DESCRIPTION SPECIFICATION</u>	
AASHTO T96	L.A. Abrasion Test	40% max.
S1029*	Deleterious Materials	1.0 max.
S1021*	Crushed pieces	100%
AASHTO T104	Sodium sulfate soundness test, 5 cycle	15

## GRADING REQUIREMENTS

ASTM C-117

<u>SIEVE SIZE</u>	<u>TYPE I</u>	<u>TYPE II</u>
1 inch (25mm)	100	100
¾ inch (19mm)	100	90-100
½ inch (12.5mm)	95-100	20-50

  

<u>SIEVE SIZE</u>	<u>TYPE I</u>	<u>TYPE II</u>
No. 4 (4.75mm)	5-25	0-10
No. 8 (2.36mm)	0-10	0-5
No. 200 (75um)	2	2

**STORAGE OF MATERIALS** – Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work.

**STOCKPILES** – Stockpiling and loading methods shall be such as to permit ready identification of the aggregate materials and to minimize segregation. Sites for stockpiles shall be clean prior to storing materials. Material shall not be removed from stockpiles within one foot of the ground until final clean-up of the worksite. Materials shall be handled in a manner such that moisture content shall be reasonably minimized and uniform for each days run.

### **Equipment**

Equipment shall be safe, environmentally acceptable, and capable of producing a consistent quality product.

**PRESSURIZED DISTRIBUTOR APPLICATOR** – The pressurized distributor shall have a computerized rate control that automatically adjusts the distributor’s pump to the ground speed. The distributor shall be capable of heating and re-circulating the bituminous binder to the specified temperature. A number of nozzles shall be spaced longitudinally along the variable width spray bar for uniformly applying the bituminous material and shall include a means of controlling the operation of the nozzles. Interchangeable nozzles and sizes shall be used for the material and rate specified and shall be properly positioned and bar height adjusted so as to provide an overlapping pattern and a uniform rate of application across the desired pavement coverage width without ridges or streaking.

The unit shall include:

- A speed control used by the operator to control the travel speed and rate of product application.
- A method for the driver to control the product placement edge from either side of the unit.

A digital speed/application readout that operates continuously and is located in the operators view.

- The bitumen application system capable of maintaining the specified application rate within +/- 0.02 gal/sq.yd.

**AGGREGATE SPREADER** – The aggregate material spreader shall be a variable width, self-propelled unit equipped so as to deliver a uniform distribution of aggregate particles across the desired pavement surface without ridges or laps at the specified rate. The aggregate spreader unit shall include:

- A ground speed control device interconnected with the aggregate applicator so as to provide a computerized application rate control of the aggregate that adjusts to the travel speed.
- A variable wide application box which is adjustable to maintain a uniform application rate of aggregate to cover exposed emulsion without ridges or laps.
- Capability to apply aggregate at an application rate range of 5 to 70 lbs/ sq.yd.
- Spreading of aggregate in a manner such that the tires of the truck or spreader at no time contact the uncovered and newly applied bituminous material.

**COMPACTING EQUIPMENT** – Self-propelled pneumatic-tired roller(s), weighing not less than 8 tons shall be used.

**MISCELLANEOUS** - All equipment including hand tools, thermometers, etc., shall be provided. All equipment used on the roadway shall be equipped with at least one approved flashing, rotating or oscillating amber light visible from all sides. All material storage tanks and material handling units shall be capable of heating and storing materials such as to not cause damage to the emulsion. The Contractor may use conventional chip seal equipment on project segments of less than 24,000 square yards or on spot repairs. Equipment shall conform to 407.03.

### **Pre-Paving On-Site Meeting**

A meeting between the contractor and engineer will be held at the project site prior to beginning work. The agenda for this meeting will include:

- Review of contractors detailed work schedule
- Review of the traffic control plan
- Inspection of equipment
- Calibration and adjustments to equipment

### **Weather Limitations**

The stress absorbing membrane shall be placed when the pavement and atmosphere temperature is 10 C (50 F) or above. Placement is not permitted if it is raining, the chance of rain is imminent or when the pavement surface condition is wet or when impending weather conditions are such that proper curing may not be obtained.

### **Construction**

The contractor shall follow the construction methods as described.

1. The contractor shall establish stations, at 1000 feet intervals on the entire project, prior to placing the stress absorbing membrane. The stations shall be maintained until project completion.



Reparation of the surface shall be in accordance with 407.05. The surface shall be thoroughly cleaned by the contractor and shall be dry when the bituminous binder is applied. Material cleaned from the surface shall be removed and disposed of as directed

by the engineer. Removal of mud, clay, and other fine silts shall be accomplished by high pressure spray water, min 6000 psi.

2. Bituminous SAM-CE emulsion shall be heated to a temperature within the specified range and applied using an approved pressurized distributor and at a uniform and consistent rate as approved for the design of the project surface to be treated.
3. The specified aggregate shall be spread uniformly onto the bituminous binder within 120 seconds of the bituminous spray and be in accordance with 422.08, except that three wheel rollers are not required.
4. Projects greater than 14,352 yards require a minimum of two rollers to be used. Rollers shall proceed at a maximum speed of 5 mph. The entire surface shall receive a minimum of two roller passes. The first roller pass shall be performed within one minute of aggregate spread.
5. Brooming of the completed surface shall be accomplished prior to full opening to unrestricted use by traffic. The entire surface shall be clean of all loose material within 24 hours prior to the resurfacing with an asphalt mixture.
6. Before opening to traffic the contractor shall post loose stone signs and 25 mph speed plaque mounted below the sign. These signs shall be placed at the beginning of the work area and at one-mile intervals throughout the project. The loose stone signs shall be maintained until the completed surface is free of loose material.
7. The contractor shall protect all utility casting using tarpaper or other approved material. All covers shall be properly fitted to the casting and removed prior to sweeping.

#### **Application of Bituminous Binder**

The bituminous binder shall be heated to the specified temperature and uniformly placed to prevent ridges or streaks in the surface and shall be in accordance with 409.07 and item 3 under Construction above.

#### **1. BITUMINOUS BINDER**

The bituminous binder shall be applied at a temperature of 150 F – 190 F., and at the rate specified +/- 0.02 gallons/sq.yd.. The supplier of (SAM-CE) binder is to design the application rate of the cover material and binder in relation to the surface condition to be treated. This rate shall be approved by the engineer prior to use.

#### **2. APPLICATION OF SURFACE COVER AGGREGATE**

- Stockpiling and loading methods shall permit ready identification of material and to minimize segregation and contamination.
- The moisture content of the course aggregate shall be below 4% and maintained throughout the project.
- Course aggregate shall be spread uniformly with ridges or gaps at the specified rates.
- Spreading shall be adjusted to produce a minimum of excess loose particles and shall provide complete coverage after rolling.
- Spreading shall be accomplished such that the tires of trucks or spreader at no time come into contact with the newly applied bituminous material.

### 3. MATERIAL APPLICATION RATES

#### BINDER APPLICATION RATE (Gallon Per Square Yard)

<u>APPLICATION TYPE</u>	<u>TYPE I</u>	<u>TYPE II</u>	<u>TOLERANCE</u>
Finished Surface	0.40 – 0.45	NA	+/- 0.2
Prior to Micro-Surfacing	0.45 – 0.50	NA	+/- 0.2
Prior to 1 inch min. Overlay	0.50 – 0.55	0.65 – 0.70	+/- 0.2

AGGREGATE APPLICATION RATE- shall be as determined by the supplier of SAMI binder and project design and shall produce a completed surface with no exposed binder. The supplier of SAMI emulsion shall determine the application rate for emulsion and aggregate, based on the pavement condition, aggregate type, and aggregate size. This information shall be reported to the Engineer prior to beginning work and shall include an aggregate gradation on the job specific materials.

#### **Quality Control**

To measure compliance the contractor shall use the methods described in this section.

- Aggregate Gradation
- Aggregate Moisture Content
- Yield Check on Bituminous Binder
- Temperature Check on Bituminous Binder

If the Contractor's test results exceed any of the identified quality control tolerances, the Engineer shall be immediately notified. The Engineer will review explanation and the corrective action taken by the Contractor. Another test will be taken and if the test results still exceed the quality control tolerance, placement shall STOP. The Contractor shall immediately notify the Engineer, and identify the cause of the excessive deviation and detail corrective action necessary to bring the deficiency into compliance. The Engineer will give approval prior to resumption of work.

#### 1. BITUMINOUS BINDER

The application rate shall not exceed a tolerance of 0.02 gallons per square yard from the specified rate, and within the temperature range as specified in Sub-Section 7.1.

#### 2. SURFACE COVER AGGREGATE

The aggregate shall be clean and uniform, and shall be within the gradation range as specified in Sub-Section 2.3. Moisture content shall not exceed the tolerance as specified in Sub-Section 7.2

#### **Documentation**

The Contractor shall provide the Engineer a daily report with the following information:

- Control Section/Project Number/County/Route
- Date/Air Temperature/Pavement Temperature

- Bituminous Binder Temp. (3 per day)
  - Station Location Per Test
  - Beginning and Ending Stations
  - Yield Check on Bituminous Binder (3 per day)
  - Aggregate Gradation & Moisture (1per day)
- Length/Width/Total Area

Other required documentation shall include:

- To be provided as requested or at project completion.
- Bill of Lading on aggregate and bituminous binder.

**Acceptance**

The Contractor shall inspect the completed Stress Absorbing Membrane during the application process for any deficiencies. The deficiencies will be limited to surface flushing, surface patterns, and loss of stone retention. Workmanship shall be inspected for the following:

1. Untreated areas (missed)
2. No overlap on longitudinal joints
3. No overlap on construction joints

All corrective work shall be accomplished prior to resurfacing with bituminous materials, or within 24 hours. The Contractor shall furnish materials, equipment, and labor to make corrections at no additional cost to the contract. The Engineer shall give final approval on inspection and corrective work.

**Measurement and Payment**

The completed work as measured will be paid for at the Contract unit price for the following contract items. Payment for Stress Absorbing Membrane includes all materials, equipment, labor, and preparation, final clean up and related incidentals.

<b><u>Item</u></b>	<b><u>Description</u></b>	<b><u>Unit</u></b>
K-422	Stress Absorbing Membrane Interlayer, Type I	Square Yard
K-422	Stress Absorbing Membrane Interlayer, Type II	Square Yard

**Description**

This item shall consist of the construction of a Portland Cement Concrete Pavement, with integral curbs where specified, on a prepared subgrade or subbase course in accordance with these specifications and in conformity with the lines, grades, thickness and typical cross sections shown on the plans or established by the Engineer.

**Material and Construction**

Concrete shall meet the requirements of Item K-499 of these specifications.

High-early-strength / fast-set concrete shall be used for concrete replacement on all thoroughfare streets. The requirements of ODOT CMS 499 for Class “QC FS” concrete and Class “QC MS” concrete shall apply.

For concrete pavements 9” thick or greater, one-inch (1”) epoxy-coated smooth dowel bars shall be spaced at 18” – 24” centers (not to exceed 24”) beginning 6” from the edge of pavement,

unless otherwise specified. Dowels shall be secured into existing pavement with non-shrink grout or epoxy cement.

**Measurement**

The quantity to be paid for shall be the actual number of square feet or square yards of concrete pavement, of the thicknesses specified, completed and accepted in place. All measurements will be made horizontally along and perpendicular to the centerline of the concrete pavement.

**Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction of the concrete pavement and shall include the construction of integral curbs as specified, sawing of joints, expansion material; dowels, hook bolts, tie rods and load transfer devices as required; curing materials, sealing of joints with approved joint sealer, pre-mold joint material as specified; depressing curbs for driveways, providing curb openings for drain tile where directed, and constructing thickened end sections or construction joints with dowel bars as directed by the Engineer.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-452 NON-REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT**

### **Description**

This item shall consist of the construction of a Portland Cement Concrete Pavement, with integral curbs where specified, on a prepared subgrade or subbase course in accordance with these specifications and in conformity with the lines, grades, thickness and typical cross sections shown on the plans or established by the Engineer.

### **Material and Construction**

Concrete shall meet the requirements of Item K-499 of these specifications.

High-early-strength / fast-set concrete shall be used for concrete replacement on all thoroughfare streets. The requirements of ODOT CMS 499 for Class "QC FS" concrete and Class "QC MS" concrete shall apply.

For concrete pavements 9" thick or greater, one-inch (1") epoxy-coated smooth dowel bars shall be spaced at 18" – 24" centers (not to exceed 24") beginning 6" from the edge of pavement, unless otherwise specified. Dowels shall be secured into existing pavement with non-shrink grout or epoxy cement.

### **Measurement**

The quantity to be paid for shall be the actual number of square feet or square yards of concrete pavement, of the thicknesses specified, completed and accepted in place. All measurements will be made horizontally along and perpendicular to the centerline of the concrete pavement.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction of the concrete pavement and shall include the construction of integral curbs as specified, sawing of joints, expansion material; dowels, hook bolts, tie rods and load transfer devices as required; curing materials, sealing of joints with approved joint sealer, pre-mold joint material as specified; depressing curbs for driveways, providing curb openings for drain tile where directed, and constructing thickened end sections or construction joints with dowel bars as directed by the Engineer.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

**ITEM K-499 CONCRETE – GENERAL**

**Description**

This item consists of the proportioning, material, and construction requirements for Portland Cement concrete.

**Proportioning**

Concrete shall be proportioned in accordance with Item 499 of the Construction and Materials Specifications of the Ohio Department of Transportation (ODOT) for Type QC1 or QC Misc. concrete and will also meet the following sections:

- A. Concrete shall develop seven (7) and twenty-eight (28) days, the average compressive strength indicated in the following table:

	<u>Average Strength</u>	<u>Minimum Strength</u>
7-Day Test	2900 psi	2400 psi
28-Day Test	4000 psi	3500 psi

- B. The contractor and supplier shall permit access to the work and materials for all required tests and inspections. Yield tests will be made by the Engineer for the purpose of determining the cement content per cubic yard of concrete, if determined necessary. Twenty-four hours advance notice is required for this testing. If at any time such cement content is found to be less than that specified above, the batch weights of fine and coarse aggregate shall be reduced proportionally until the cement per cubic yard of concrete is not less than specified.

Test cylinders or beams will be made from concrete incorporated in the work; test cores will be cut from the completed work when required by the Engineer. Cylinders falling below the "Average" Compressive Strengths shown in the strength table above will be sufficient reason for increasing the cement without additional cost to the City. Cylinders falling below the "Minimum" Compressive Strength shown in the strength table above will be sufficient reason for rejection of the work involved.

The measurement of the volume of entrained air in the freshly mixed Portland Cement Concrete will be determined by the Engineer. Failure of the percentage of entrained air to fall within the specified limits (6% ± 2%) will be sufficient reason for rejecting the materials.

**Construction**

- A. Job mixed concrete shall not be used unless permission is obtained from the Engineer. Ready mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the "Standard Specifications for Ready Mixed Concrete: (ASTM C-94)", except that concrete shall be delivered to the work and discharged from the mixer or agitator within a period of 1.5 hours after all ingredients are in the mixer or agitator. Delivery tickets shall be time-stamped when all ingredients are in the mixer or agitator.
- B. Forms shall conform to the shape, lines and dimensions of the members as called for on the plans and shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain position and shape. The use of

bent or damaged side forms varying more than 1/8" in ten (10) foot of length from the true plane of the top and 1/4" in ten (10) foot on the vertical face shall not be permitted.

- C. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not fall free more than five (5) feet. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily. No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the work, nor shall retempered concrete be used. When concreting is once started, it shall be carried on as a continuous operation until the placing of a section is completed. The top surface shall conform to the specified cross-section and profile as shown on the plans. No water or cement shall be added to the surface of the pavement at any time during construction.
- D. Joints shall be constructed where shown on the construction drawings or where required by the Engineer and shall conform to the details set forth on the detail drawing. One-half-inch (1/2") recycled rubber material, or approved equal shall be placed according to the City of Kettering Standard Construction Drawings. Vinyl expansion material is no longer permitted for use in the City Right of Way.
- E. Following compaction, the concrete shall be finished and floated in a manner approved by the Engineer. After floating has been completed and while the concrete is still plastic, it shall be tested for trueness with ten (10) foot straightedges. After final curing, the concrete pavement will be tested for smoothness with an approved surface testing machine and all such surface variations of more than 3/16" in ten (10) foot length of pavement shall be ground off to within the specified tolerances. Sections containing depressions which cannot be corrected by grinding shall be replaced by the contractor to the satisfaction of the Engineer. Before the concrete has taken its initial set, the edges of the pavement where designated on the plans or by the Engineer shall be worked with an approved tool and rounded to a radius of one-eighth (1/8) inch. Any tool marks left by the edging shall be eliminated by texturing the surface. The final surface shall be a broom finish. Retooled joints shall not be constructed unless approved by the Engineer.

The following provision shall be made for the proper curing and sealing of all concrete. Immediately after the final finishing and after the free water has disappeared, all exposed surfaces of the concrete shall be sealed by spraying thereon, as a fine mist, a uniform application of the cure and seal material in such a manner as to provide a continuous uniform, water-impermeable film without marring the surface of the concrete. A minimum of one (1) gallon of material shall be used for each two hundred (200) square feet of surface treated. A solvent based cure and seal material such as Diamond Clear 350 or an approved equal shall be applied to the concrete surface.

- F. Concrete to be placed from October 31 to March 30, which will be opened to traffic during this time period, shall be cured by use of polyethylene sheeting placed as soon after the finishing operations as possible without marring the surface of the concrete. The entire surface of the top and sides of the newly placed concrete shall be covered and maintained covered for seven (7) days. Any concrete surfaces exposed by the removal of forms within seven (7) days after it has been placed shall be cured as specified above.

- G. Adequate equipment shall be provided for heating the concrete material and protecting the concrete during the freezing or near freezing weather. No concrete shall be placed when the temperature of the surrounding air is below thirty-two (32°)

Degrees F, unless permission is obtained from the Engineer. All concrete materials and all reinforcement forms, fillers and ground with which the concrete is to come in

contact shall be completely free from frost. Whenever the temperature of the surrounding air is below forty (40) degrees F., all concrete placed in forms shall have a temperature of between fifty (50) and seventy (70) degrees F. and adequate means shall be provided for maintaining a temperature of not less than fifty (50) degrees F., for a minimum of three (3) days, except when high early strength is used, the temperature shall be maintained at not less than fifty (50) degrees F. for two (2) days or for as much more time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with curing shall remain in place and intact at least twenty-four (24) hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

- H. Unless otherwise directed by the Engineer, concrete traversed by vehicles (roadway, curb, drive approach, 6" sidewalk, and driveway) shall be open within ten calendar days of removal; and the sidewalk, curb ramps, corresponding asphalt and curbs, and steps shall be open within five calendar days of removal.



## **ITEM K-601 SLOPE AND CHANNEL PROTECTION**

### **Description**

This item shall consist of the construction of slope and channel protection, on a prepared subgrade or subbase course in accordance with the Construction and Material Specifications of the Ohio Department of Transportation (ODOT) Item 601 and in conformity with the lines, grades, thickness and typical cross sections shown on the plans or established by the Engineer.

### **Material**

Material shall meet the requirements of ODOT Item 601.02 except that concrete shall meet the requirements of Item K-499.

### **Construction**

Concrete slope and channel protection shall be of the dimensions shown on the plans and as specified by the Engineer.

### **Measurement**

Measurement shall be as specified in ODOT Item 601 except that placed concrete protection will be measured by the square yard of finished surface, of the thickness specified, completed in place, on the side slope and bottom of the channel.

### **Payment**

Payment shall be as specified in ODOT Item 601 and shall include constructing cut-off walls and maintaining existing flow in the channel.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-602 MASONRY**

### **Description**

This item consists of the construction of concrete headwalls and other masonry structures in accordance with Item 602 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Material**

Material shall meet the requirements of Section 602.02 of the Construction and Material Specifications of ODOT.

### **Measurement**

The method of measurement as specified in Section 602.04 of the Construction and Material Specifications of ODOT shall include a measurement for each structure specified as shown on the plans.

### **Payment**

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-605A UNDERDRAINS**

### **Description**

This item shall consist of constructing, pipe, edge, or fabric underdrains in accordance with Item 605 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT). Other materials and applications are to be used as per plan or as directed by the Engineer.

### **Material**

Pipe material shall meet the requirements of ODOT Section 605.02 and be either Corrugated polyethylene drainage tubing (perforated) ODOT 707.31; Polyvinyl chloride plastic pipe, ODOT 707.41; or Polyvinyl chloride corrugated smooth interior pipe, (perforated per ODOT 707.31) ODOT 707.42.

Perforated pipe underdrain is to be wrapped with filter fabric material as per ODOT 712.09 Type A.

Prefabricated edge drain shall conform to ODOT 712.10.

Aggregate underdrain is to be wrapped with filter fabric material as per ODOT 712.09 Type A.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to installing and constructing the underdrains; including: bends, tees, wyes, etc.; excavation and backfill; protecting joints; and connecting the drains to designated outlets as directed by the Engineer.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-605B DRAIN TILE**

### **Description**

This item shall consist of laying, extending, adjusting, relaying or relocating existing house drains, which include yard, roof or other similar drains now in use which are disturbed because of construction. The location, type and size of new tile shall be determined by the Engineer and shall be placed as directed. This item shall also include the placing of drain tile through the new curb where and when required and as directed by the Engineer.

### **Material**

Pipe shall meet the requirements of Section 605.02 of the Construction and Material Specifications of ODOT and the following requirements:

- For 3", 4" and 6" Drain Tile use ODOT 707.31, 707.33, 707.42 or 707.45
- For 8" and 10" Pipe use ODOT 707.32, 707.33, 707.42 or 707.45
- Drain tile through curb shall be Schedule 40 PVC, 3" diameter.
- Other materials and applications to be used as per plan or as directed by the Engineer.

Mechanical couplers shall be used to connect new drain tile to existing drain tile. The type of mechanical coupler to be used shall depend upon the type of existing drain tile that is being connected to with new drain tile, subject to approval by the Engineer.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to replacing, extending, adjusting, relaying and relocating drain pipe or tile; placing of tile through curbs; necessary bends, tees, clean-outs, special fittings, etc.; excavation of all materials encountered; backfilling of trenches with compacted excavated or granular material as directed, and the protecting and sealing of joints to prevent infiltration of backfill material.

Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment shall be made at the contract price bid for the specified items.

## ITEM K-608A WALKS, CURB RAMPS, AND STEPS

### Description

This item shall consist of the construction of walks, curb ramps, and steps in accordance with these specifications and in conformance with the lines, grades, dimensions and details shown on the plans or attached drawings.

### Material and Construction

The concrete shall meet the proportioning, material and construction requirements of Item K-499. Concrete walks and curb ramps shall have a transverse broom finish.

Unless otherwise approved by the Engineer, concrete curb ramps shall conform to ODOT Item 608.07 and shall have ODOT approved detectable warnings installed, except not clay or concrete pavers. Detectable warnings shall be brick red in color and shall be installed per manufacturer's written instructions. Detectable warning mats may only be cut with prior approval of the engineer. **Detectable warning mats shall also meet the following minimum specifications:**

**Compressive Strength: 26,000 PSI**

**Flexural Strength: 23,000 PSI**

**Tensile Strength: 11,000 PSI**

**Form board depth shall match the thickness of the concrete.** Walk thickness through driveways shall be as specified on the plans, but shall not be less than six inches (6"). Concrete walks shall be constructed in conformance with ODOT CMS 608.03. If slip formed, the provisions of ODOT 609.04 (C) shall apply.

Concrete steps shall conform to ODOT Item 608.06. The number and height of risers for each set of steps shall be as shown on the plans or determined in the field by the Engineer.

Half-inch (1/2") recycled rubber material, or approved equal shall be used at 50-foot intervals, adjacent to driveways, and between the walk and any fixed structure (including curb—if walk is adjacent to curb). Contraction joints shall be located at five-foot intervals and be one inch (1") deep with a 3/8-inch radius. Construction joints are to be located as directed by the Engineer.

### Excavation

The excavation and embankment for **these items are** included for payment under this item and shall be compacted according to the requirements of ODOT specifications 203.06 and 203.07. Unsuitable subgrade material shall be removed, and replaced with 304 or approved equal.

Where existing walks, walk ramps, and steps are to be removed and replaced, removal shall be performed according to the requirements of Item K-202 of these specifications.

### Retrofit Detectable Warning

Retrofit detectable warnings shall be installed at locations specified in the plans or as directed by the Engineer. They shall be firmly attached to the existing concrete, per the manufacturer's specifications. The mats shall be *Access Tile Surface Applied mat, Brick Red in color, manufactured by Access Products*. The contractor shall obtain "factory-installed training" All materials shall be submitted to the Engineer for approval prior to installation.

### Measurements

The measurement of walk, curb ramps and steps shall be as specified by Section 608.08 of ODOT Construction and Material Specifications. Retrofit detectable warnings shall be measured as square feet installed fully in place, unless otherwise specified.

**Payment**

The price bid for items under this specification shall include all labor, equipment and material incidental to the construction of the walks, ramps and steps and shall include sawing, excavation and embankment from grade changes, subgrade preparation, base course material, expansion material, approved detectable warnings, finishing of surfaces as specified, backfill, and any other incidentals required to complete the installation as specified. Payment for curb ramps and walks shall also include the placement of topsoil, seed, and mulch. Payment for the curb is a separate item when it is removed and replaced with a curb ramp.

Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment shall be made at the contract price bid for the specified items.

**ITEM K-608A, K-608B****DRIVE APPROACHES AND DRIVEWAYS****Description**

This item shall consist of the construction of driveways and drive approaches of concrete, asphalt concrete and/or aggregate, in accordance with these specifications and to the lines, grades, thickness, and details shown on the plan, or as directed by the Engineer.

**Material and Construction**

The concrete shall meet the requirements of Item K-499 of these specifications.

The material for asphalt concrete and/or aggregate driveways shall be as specified on the plans.

Concrete drive approaches shall be constructed according the City of Kettering Standard Construction Drawings.

Driveways shall be of the thickness indicated on the plans and/or proposal. If a thickness is not specified, the minimum thickness shall be:

- Concrete driveways – four inches (4”).
- Asphalt Concrete driveways – two inches (2”) of compacted asphalt concrete and six inches (6”) of compacted aggregate.
- Compacted Aggregate driveways – six inches (6”).

All butt joints on an asphalt concrete drive approach and/or driveway shall be sealed and the cost shall be included in the asphalt repair.

**Excavation**

The excavation and embankment for these items are included for payment under this item and shall be compacted according to the requirements of ODOT specifications 203.06 and 203.07. Unsuitable subgrade material shall be removed, and replaced with 304 or approved equal.

Where existing concrete driveways and approaches are to be removed and replaced, removal shall be performed and paid for according to the requirements of Item K-202 of these specifications, unless otherwise specified by plan note.

**Measurement**

Concrete driveways and approaches to be paid for shall be the actual square yards or square feet in place complete, of the thickness specified. Asphalt and/or aggregate driveways and approaches shall be paid for based on the actual number of tons placed, as determined by plant delivery tickets, unless otherwise specified by plan note.

**Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction of driveways and drive approaches, including subgrade preparation, base course material, sealing of edges and joints, constructing joints and constructing drive approaches monolithic with curbs where directed, and necessary expansion material. Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment for this item shall include the placement of topsoil, seed and mulch. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-609 CURBING, CONCRETE MEDIANS, AND TRAFFIC ISLANDS**

### **Description**

This item shall consist of constructing curb, combination curb and gutter, medians, and traffic islands according to Item 609 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Material**

Concrete shall meet the requirements of Item K-499 of these specifications. Pea gravel mixes shall not be permitted.

### **Construction**

The construction of cast in place concrete curbs, and curbs and gutters shall be in accordance with ODOT Section 609.04 and shall be of the type specified on the plans or proposal. One-half-inch (½") recycled rubber material, or approved equal shall be placed according to the City of Kettering Standard Construction Drawings. Slip formed concrete curb shall be placed in conformance with ODOT Section 609.04 (C).

Concrete curb (and gutter) spot replacement sections shall be a minimum of three (3) feet in length. The replacement section shall be extended to the nearest existing joint if the end of the replacement section is within two (2) feet of the nearest existing joint. Expansion material shall be placed on one side of a spot replacement section, if the replacement section is 15 feet or less in length. For replacement sections greater than 15 feet in length, expansion material shall be placed on both sides of the replacement section.

The subgrade beneath curb (and gutter) spot replacement sections shall be fully compacted to the maximum extent practicable before new concrete is placed. Approved granular material shall be used if the existing subgrade is determined to be unsuitable by the Engineer.

Curbs placed integral with a concrete pavement shall not be doweled to the pavement.

The construction of concrete medians and traffic islands shall be in accordance with ODOT Section 609.06 and in conformity to the lines, grades, dimensions and cross sections shown on the plans.

### **Measurement**

The measurement of curb, combination curb and gutter, medians, and traffic islands, shall be as specified by Section 609.07 of ODOT Construction and Material Specifications. Integral concrete curbs will not be measured for separate payment, but will be considered as part of the pertinent pavement item. No deductions will be made for depressed curbs.

### **Payment**

The price bid for this item shall include labor, equipment and material incidental to the construction of the curbing and shall include: expansion material, subgrade preparation (including the use of approved granular material at spot replacement sections), constructing openings in the curb for drain tile where required including connecting to existing drain pipe along with a minimal amount of drain pipe; constructing joints, depressing curbs for driveways and ramps; applying a tack coat for asphalt curbs and sealing joints. Unless otherwise directed, payment for this item shall also include the placement of topsoil, seed and mulch, as well as the placement of these correlating work items: Low Strength Mortar 150, temporary asphalt, and finished asphalt.



Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-611 PIPE CULVERTS, SEWERS, DRAINS, AND DRAINAGE STRUCTURES**

### **Description**

This item shall consist of constructing, furnishing and installing pipe of the kind and size called for on the plans, specifications and proposal; and constructing, reconstructing, or adjusting to grade, manholes, catch basins, inlets, monument assemblies or monument boxes in accordance with the requirements of Item 611 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

ODOT CMS Sections 611.04, 611.12, 611.13 and 611.14 shall not be used unless specified by plan note.

### **Material**

Specific material shall meet the requirements of ODOT Section 611.02. Precast concrete plugs shall be used to plug the ends of existing or proposed pipes whenever possible. Precast concrete structures shall be approved by the Engineer prior to construction and installation.

The pipe size and kind shall be as indicated on the plans and in the proposal.

When adjusting rings are used to adjust manholes, catch basins, water valves, lamp holes and monument boxes to grade, they shall be solid cast rings sized specifically to the item being adjusted and shall be approved by the City prior to installation. No mechanical adjusting devices shall be permitted. Con-seal shall be used between the joints to produce a water-tight seal.

An asphalt transition shall be placed around utilities raised to grade prior to the final pavement being placed, as directed by the Engineer. Additional signage for these hazards shall be used as directed by the Engineer and said cost of these signs and labor to install shall be included in Maintaining Traffic, Item K-614.

The grate for an ODOT Type 6 Catch Basin shall be a Neenah R-3408 or equal, vane or sinusoidal as per the direction of the engineer. The frame and lid for an ODOT Type 3 Manhole shall be an East Jordan 1600Z, heavy duty or Neenah R-1767 vented lid, or approved equal.

### **Construction**

Eccentric cone tops shall be used on manholes unless otherwise specified on the plans or in the proposal.

### **EXCAVATION**

Excavation shall be performed as specified in ODOT Section 611.05. The removal of existing storm sewers, manholes, catch basins and inlets within the limits of excavation for the proposed storm sewer shall be paid for as part of this item, unless otherwise specified in the plans. Sheet piling, bracing, shoring, and timbering shall conform to all safety requirements relating to construction as specified by all Federal, State, and Local laws.

## BEDDING

Unless otherwise specified, or otherwise required by manufacturer specifications, six-inches (6") of Type 2 bedding, as specified in ODOT Sections 611.06 and 703.11, shall be used. Concrete encasement shall be placed as shown on the plans or as directed by the Engineer.

## LAYING AND JOINING CONDUIT

Conduit shall be laid in accordance with ODOT Section 611.07. Pipe thirty-six (36") inches in diameter or larger shall be pulled home by use of hoists, pull jacks, winches or other approved means, unless otherwise directed by the Engineer. Concrete pipe joints shall be sealed with bituminous pipe joint filler in accordance with the requirements of ODOT Section 611.08, unless otherwise specified.

## BACKFILL

Only granular material composed of gravel or crushed stone, meeting the requirements of ODOT Section 703.11, may be used for backfill, except that granular slag or foundry sand shall not be used. Backfill shall meet manufacturers' specifications where applicable.

## MANHOLE, CATCH BASIN, & INLET ADJUSTMENTS, REPAIR, AND RECONSTRUCTION

If the elevation between an existing manhole casting, grate or lid and the final pavement or finished grade elevation is greater than ¼-inch, it shall be adjusted to grade as specified in the project construction plans, or as directed by the Engineer. Manhole and catch basin adjustments, repair, or reconstruction shall be constructed according to the following repair categories, as specified in project construction plans or as directed by the Engineer:

### 1. Adjustment to grade – Type 1

Carefully remove the existing cover/lid/grate and install a solid cast iron adjustment ring, approved by the Engineer, within the existing frame to the finished grade. Grade adjustment rings shall be solid cast rings sized to specifically fit the manhole frame being adjusted. No more than one (1) ring shall be used for adjustment to grade. A new cover/lid or grate shall be provided by the Contractor to fit the new adjustment ring, unless the existing cover/lid or grate fits the new adjustment ring, as approved by the Engineer.

### 2. Adjustment to grade – Type 2A

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing frame and cover/lid/grate. Make any necessary repairs to the top of the supporting walls with mortar. Use the EXISTING frame and cover/lid/grate in a bed of concrete mortar or structure concrete to meet finished roadway grade. Masonry block shall only be used at the direction of the Engineer. Place new concrete around the existing frame to within 2.5" of the finished grade.

### 3. Adjustment to grade – Type 2B

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing frame and cover/lid/grate. Make any necessary repairs to

the top of the supporting walls with mortar. Set a NEW frame and cover/lid/grate in a bed of concrete mortar or structure concrete to meet finished roadway grade. Masonry block shall only be used at the direction of the Engineer. Place new concrete around the new frame to within 2.5" of the finished grade.

4. Manhole, catch basin, and inlet repair

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing frame and cover/lid/grate. Make repairs to the existing walls, invert, and/or inlet/outlet pipes with mortar and/or masonry blocks, as directed by the Engineer. Set a new frame and cover/lid/grate to meet finished roadway grade. Cast-in-place concrete walls to be replaced with poured concrete tied into existing walls. Masonry walls to be repaired conforming as nearly as practicable to the existing type of construction. If cast-in-place concrete is used to repair masonry walls, brick or block is to be removed to the base and beyond corners with new concrete sufficient to stabilize supporting walls. Masonry block shall only be used at the direction of the Engineer. Place new concrete around the re-set frame to within 2.5" of the finished grade.

5. Manhole, catch basin, & inlet reconstruction to grade

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing castings, existing walls of manholes down to the spring line or below as necessary, existing walls of catch basins and inlets below the window opening or any points of wall failure, and reconstruct to new, conforming as nearly as practicable to the existing dimension and type of construction, using a new frame and cover/lid/grate approved by the Engineer. Masonry block shall only be used at the direction of the Engineer.

**Measurement**

The method of measurement specified in ODOT Section 611.16 shall be applicable to this item. The number of manholes, catch basins, inlets, monument assemblies or monument boxes, constructed, reconstructed or adjusted to grade will be the actual number of each specified, completed and accepted.

When specified as a separate item, pipe bends, wyes, tees, radius pipe and other pipe specials will be deducted from the linear feet of pipe measured for payment and will be measured and paid for according to the units stipulated on the unit price proposal.

**Payment**

The basis for payment shall be as specified in ODOT Section 611.17.

Payment for conduit shall include plugging proposed of existing conduits; joining to existing and proposed appurtenances as required; excavating for the bedding and preparing the bedding sub-base; backfill material; and constructing concrete collars (DM-1.1) where indicated, in accordance with the details shown on the plans.

Payment for drainage structures shall include: placing of reinforcing steel; setting castings; placing of concrete aprons and curbs for catch basins and inlets; shaping of manhole, catch

basin and inlet inverts as directed; constructing and placing precast structures; and adjusting structures to grade and Maintenance of Traffic. The removal of existing storm sewers, manholes, catch basins and inlets within the limits of excavation for the proposed manholes, catch basins and inlets, shall be paid for as part of this item, unless otherwise specified in the plans.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## ITEM K-614 MAINTAINING TRAFFIC

### Description

This item shall consist of maintaining and protecting vehicular and pedestrian traffic in accordance with the requirements of Item 614 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

In addition to these requirements, the contractor shall obtain the approval of the Engineer before closing a traffic lane, establishing a one-way traffic operation or changing traffic lanes due to stages of construction.

Blocking a lane on a thoroughfare or collector street shall only occur between 9 A.M. to 3 P.M., Monday through Friday. Work outside of these hours may be permitted with approval of the Engineer.

Temporary traffic lanes shall be a minimum of eleven feet in width, unless a plan using reduced width is approved by the Engineer.

All traffic control devices are to be furnished by the contractor unless otherwise specified. If the City provides signs, the cost of signs not returned in good condition will be deducted from any money that may be due or become due the contractor.

The Engineer may require plates to provide driveway access during construction under special circumstances at no additional cost.

### Milling & Paving Operations

In addition to the requirements and ODOT CMS Item 614, the pay item for K-614 Maintenance of Traffic for milling and paving operations shall include the following requirements:

All construction notification signs shall be in place before milling operations begin. Signs may include, but not be limited to, "Road Construction Ahead", "Road Work Ahead", "Left (Right) Lane Closed Ahead", "Bump" (at butt-joint locations), "Rough Road", or "Caution – Raised Manholes." Other signs may be used as deemed necessary by the Contractor or the Engineer. The types of signs and the placement of signs shall meet all the requirements of the Ohio Manual of Uniform Traffic Control Devices, and shall be subject to inspection and modification by the Engineer.

After milling operations in a particular area have been completed, and if the placement of the asphalt scratch course will not commence within one (1) hour of the completion of milling operations, the Contractor shall place temporary pavement markings in the milled area. If milling operations are conducted during inclement weather, temporary pavement markings shall be placed as soon as the weather permits. Pavement markings shall only be painted on the milled surface. No other type of pavement marking shall be used unless approved by the Engineer. The Engineer shall approve the striping layout and dimensions for the temporary pavement markings prior to placement.

After the placement of the asphalt scratch course has been completed in an area, and if the placement of the final asphalt surface course will not commence within one (1) hour of the completion of the scratch course, the Contractor shall place temporary pavement markings in the area. The use of reflective tape or latex paint with reflective beads shall be the only approved means of marking. The Engineer shall approve the striping layout and dimensions for the temporary pavement markings prior to placement. Reflective tape shall be removed as the final asphalt surface course is placed. After the placement of the final asphalt surface course, the Contractor shall place the final pavement markings or temporary pavement markings on the new asphalt surface immediately after the asphalt has been rolled and compacted. The use of reflective tape shall be the only approved means of temporary marking. The Engineer shall approve the striping layout and dimensions for the final and/or temporary pavement markings prior to placement. Reflective tape shall be removed prior to final pavement markings being placed.

The above requirements apply only to roadways that have existing pavement markings that have been removed as a result of milling operations.

The above requirements shall be paid at the lump sum bid price for Item K-614, Maintenance of Traffic. There will not be a separate pay item for placement of signs or for temporary pavement markings, as directed by the Engineer.

#### **Performance**

As specified in ODOT Section 614.14, if, in the opinion of the City, the contractor is not furnishing proper maintenance of traffic facilities and proper provisions for traffic control the City may take the necessary steps to place them in proper condition. The City will deduct the cost of such services from any money that may be due or become due to the contractor.

#### **Payment**

The basis for payment shall be as specified in ODOT Section 614.16.

Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-616 DUST CONTROL**

### **Description**

This item shall consist of furnishing and applying water or dust palliative, or both, when and as directed by the Engineer, according to Item 616 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

The Contractor shall obtain the necessary permits and meet the requirements of the Montgomery County Water Services if water is to be obtained from the local water system. Under no circumstances shall the Contractor use a fire hydrant without a meter and permit from Montgomery County Water Services.

### **Payment**

The basis for payment shall be as set forth in ODOT Section 616.04.

Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment shall be made at the contract price bid for the specified items.



## **ITEM K-653 TOPSOIL FURNISHED AND PLACED**

### **Description**

This item shall consist of furnishing and spreading topsoil and preparing the subgrade, according to Item 653 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT).

### **Material**

The topsoil composition shall meet ODOT specification 653.02. In addition, the source of the topsoil and a sample shall be submitted to the Engineer for approval before acceptance for use.

### **Construction**

The topsoil shall be placed 4", after compacted, unless specified at another depth on plans, in preparation for seeding or sod. The topsoil shall be compacted to a firmness in which a 200-pound person stepping on the topsoil will not cause indents in the topsoil. The surface of the topsoil shall be such that the final grade as shown on the plans is met. Before placing the seed, the topsoil shall be opened up to receive the seed.

### **Payment**

Items included for payment as part of this Specification shall be indicated on the plans and/or listed in the Proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-659 SEEDING AND MULCHING**

### **Description**

This item shall consist of Seeding and Mulching roadway areas according to the requirements of Item 659 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT). The seed mixture and commercial fertilizer shall conform to the specifications listed below. All seeding shall be evenly spread on a prepared seedbed and shall be tacked in place with hydroseeding procedure applied without seed. Any alternate method requires prior approval of the Engineer.

### **Material**

Seeding shall be performed as specified in Section 659.12 except that the seed shall be labeled in accordance with U. S. Department of Agriculture Rules and Regulations under the Federal Seed Act and State Seed Laws. Seed that appears, in the opinion of the Engineer, to have become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The fertilizer, kind of seed, and minimum percentage by weight of pure live seed in each lot of seed, shall be as described below. All seed mixtures shall be approved by the Engineer before placement and may include furnishing seed labels.

#### **Kettering Type 1 Mix**

For areas such as quality lawns, private property and other areas where normal lawn maintenance will occur, use the following seed mixture.

45%	Perennial Ryegrass
30%	Kentucky Bluegrass
10%	Kentucky Bluegrass
15%	Creeping Red Fescue

Ryegrass Choices (choose one): SR 4600, SR 4500, SR 4420, SR 4220, SR 4600, Defender, Majesty, Pentium, and Brightstar.

Bluegrass Choices 30% and 10% (choose two at ratio of 3:1): Arlene, Cynthia, Cannon, Abbey, Nottingham, Goldrush, Kenblue, Merit, Raven, Rampert, Gaelic, and Cashe.

Creeping Red Fescue (choose one): Pennlawn, Wendy Jean, SR 5250, Fenway.

Seeding Rate: 4 pounds per 1000 square foot

#### **Kettering Type 2 Mix**

For areas such as ditch banks and other areas not expected to receive normal lawn maintenance use the following varieties listed below.

85%	Turf Type Tall Fescue
15%	Annual Ryegrass

Fescue Choices (select one or more): SR 8600, SR 8550, SR 8650, Grande II, Dynamic, Coyote II, Dynasty, Greenkeeper WAF, Wolfpack, Fidelity.

Ryegrass Choices (choose one): Citation, Palmer, Derby, Inspire, Manhattan, Pennfine, or Pennent

Seeding Rate: 8 pounds per 1000 square foot

Kettering Type 3 Mix

For medians, parks, high traffic areas, such as athletic fields, and routine maintenance levels use the following seed mixture.

- 30% Turf Type Tall Fescue
- 30% Turf Type Tall Fescue
- 20% Turf Type Tall Fescue
- 10% Kentucky Bluegrass
- 10% Perennial Ryegrass

Fescue Choices (choose three at a ratio of 30/30/20): SR 8600, SR 8550, SR 8650, Grande II, Dynamic, Coyote II, Dynasty, Greenkeeper WAF, Wolfpack, Fidelity.

Bluegrass Choices (choose one): Arlene, Cynthia, Cannon, Abbey, Nottingham, Goldrush, Kenblue, Merit, Raven, Rampert, Gaelic, and Cashe.

Ryegrass Choices (choose one): SR 4600, SR 4500, SR 4420, SR 4220, SR 4600, Defender, Majesty, Pentium, and Brightstar.

Seeding Rate: 7 pounds per 1000 square feet

#### Fertilizer

Commercial fertilizer shall be a blend bearing the manufacturer's guarantee statement of analysis and shall meet the following minimum requirements for the Percent Nutrients, 100 Pound Total Basis:

12% of Nitrogen (N); 12% of Phosphoric Acid ( $P_2O_5$ ); 12% of Potash ( $K_2O$ )

All fertilizer shall be delivered to the site in the original unopened containers that shall bear the manufacturer's guaranteed statement of analysis. Container labels shall be supplied at the request of the Engineer.

#### Construction

The topsoil shall be placed 4", after compacted, in preparation for seeding or sod. The topsoil shall be compacted to a firmness in which a 200-pound person stepping on the topsoil will not cause indents in the topsoil. The surface of the topsoil shall be such that the final grade as shown on the plans is met. Before placing the seed, the topsoil shall be opened up to receive the seed. The Inspector shall review the seedbed before the Contractor places seed and before the Contractor places the hydroseeding mulch.

The contractor is to perform work in compliance with Kettering and Ohio Environmental Protection Agency requirements.

**Mowing**

If mowing is called for in plan scope of work the Contractor shall provide manpower and equipment as required to remove litter and mow lawn in a neat workmanlike manner. The initial mowing shall occur at the direction of the Engineer. When new grass is between 3.5" – 4" tall the Contractor, at the Engineer's direction, shall mow the new grass to a height of 3". Frequency of mowing after initial mowing shall be subject to Engineer's approval. Contractor shall not remove more than 1/3 of grass height on subsequent mowing events. Payment shall be based on unit price of per 1000 SF per mowing event

**Payment**

The basis for payment shall be as set forth in Section 659.25. Unless listed separately, the cost of fertilizer shall be included in the cost of seeding and mulching.

Though payment is permitted upon performance of seeding and mulching, the contractor is responsible to achieve a full stand of grass without additional compensation as soon as possible within the one year maintenance bond.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-660 SODDING**

### **Description**

This item shall consist of sodding areas in accordance with the requirements of Item 660 of the Construction and Material Specifications of the Ohio Department of Transportation (ODOT). Fertilizer shall meet the requirements of Item K-659 and applied at the rate specified or as directed by the Engineer. The sod shall be in a healthy, green, vigorous condition for final acceptance.

### **Payment**

The basis for payment shall be as set forth in Section 660.11 and shall include watering for 30 days as specified in Section 660.09. Unless listed separately, the cost of fertilizer shall be included in the cost of sodding.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-901 WATER MAINS, WATER VALVES, AND SERVICE BRANCHES**

### **Description**

This item shall consist of laying new water main and adjusting or relocating existing water mains, including valves, boxes and fittings; laying new service laterals and adjusting or relocating existing service laterals, including: service stops, meters, boxes and corporation stops; installing new fire hydrants and adjusting or relocating existing fire hydrants, including valves, boxes and fittings; adjusting existing service boxes, meter pits and boxes, and valve boxes to grade. All work under this item shall be performed in accordance with the requirements of Montgomery County Water Services.

### **Material and Construction**

All material and methods of construction shall conform to the requirements of the Montgomery County Water Services, except that only granular material shall be used for backfill and bedding. Valve box adjustments to grade shall conform to Item K-611.

### **Excavation**

Excavation shall include the removal and disposal of all materials encountered of every name and nature.

### **Measurement**

The length of pipe to be paid for will be the actual lineal feet of the size and kind specified, in place complete, measured along the centerline of the pipe. Measurements shall be continuous through valves, bends, tees, special fittings, etc., and lateral branches shall be measured from the intersection of the center axis of the branch pipe with the inside surface of the main pipe.

Payment for water main adjustments necessitated by the installation of new sewers will be based on the actual number of adjustments made, for the size of pipe specified. Payment for new water main, or water main adjustments due to changes in the elevation of the roadway, will be based on the actual lineal feet of pipe installed or adjusted, measured as set forth above, for the sizes specified.

Service lateral adjustment shall include the adjustment of all pipes of a nominal two (2) inch diameter or less. Measurement for payment of Service Lateral adjustments necessitated by the installation of new sewers will be based on the actual number of laterals adjusted. Payment for new laterals or laterals adjusted due to changes in the elevation of the roadway will be based on the actual lineal feet of pipe installed or adjusted measured as set forth above.

Payment for new fire hydrants shall include, unless specified for separate payment, the furnishing and installing of a valve, valve box, tapping sleeves and valves or tees; cutting or tapping into the main line, and adjusting the hydrant to grade. Pipe required to connect the hydrant to the main line will be measured and paid for separately. Payment will be based on the actual number of hydrants installed.

Payment for relocated or adjusted fire hydrants shall include the removal and resetting of the existing hydrants, including furnishing and installing hydrant extensions as required. Pipe required to connect the hydrant to the main line will be measured and paid for separately. Payment will be based on the actual number of fire hydrants relocated.

Payment for new mainline valves and valve boxes, tapping valves and sleeves, service boxes and meter pits, corporation or service stops, curb boxes, bends, tees, etc., or other special pipe fittings shall be based on the actual number of the type, kind and size specified. Unless separately stipulated in the specifications or proposal, any of the above mentioned items or other special pipe fittings, shall be included in the unit price bid for the item of which they are appurtenant.

#### WATER VALVE ADJUSTMENTS

If the elevation between an existing water valve casting, or lid and the final pavement or finished grade elevation is greater than ¼-inch, it shall be adjusted to grade as specified in the project construction plans, or as directed by the Engineer. Water valve adjustments, shall be constructed according to the following repair categories, and as specified in Montgomery County Environmental Service's:

1. Adjustment to grade – Type 1

Carefully remove the existing lid and install a solid cast iron adjustment ring, approved by the Engineer, within the water valve to the finished grade. Grade adjustment rings shall be solid cast rings sized to specifically fit the water valve frame being adjusted. No more than one (1) ring shall be used for adjustment to grade. A new lid shall be provided by the Contractor to fit the new adjustment ring, unless the existing lid fits the new adjustment ring, as approved by the Engineer and as specified by Montgomery County Environmental Services.

2. Adjustment to grade – Type 2A

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing water valve box and lid. Use the EXISTING water valve box and lid in a bed of concrete mortar or structure concrete to meet finished roadway grade. Place new concrete around the existing frame to within 2.5" of the finished grade.

3. Adjustment to grade – Type 2B

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing water valve and lid. Set a NEW water valve box in a bed of concrete mortar or structure concrete to meet finished roadway grade. Place new concrete around the new water valve box to within 2.5" of the finished grade.

4. Water Valve reconstruction to grade

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing water valve box down to the spring line or below as necessary, and reconstruct to new, conforming as nearly as practicable to the existing dimension and type of construction, using a new water valve box approved by the Engineer and as specified by Montgomery County Environmental Services.

#### Payment

The price bid for this item shall include all labor, equipment and material incidental to the construction, installation, relocation and adjustment of water mains, **water valves**, service laterals, fire hydrants and their appurtenances, and shall include all excavation, backfill, required testing, disinfecting, connection to existing lines and concrete for anchorage of waterlines and

appurtenances. Necessary permits, as required by and as specified by Montgomery County Environmental Services, shall be included in the unit price bid for that item.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.



## **ITEM K-902 SANITARY SEWERS**

### **Description**

This item shall consist of constructing, furnishing and installing pipes and manholes for sanitary sewers, of the kind and size called for on the plans, specifications and proposal, and shall also include the raising, lowering, relocation, or encasement of existing sanitary sewers, **manholes**, and service laterals, all in accordance with the requirements of Montgomery County Environmental Services.

### **Material and Construction**

All materials and methods of construction shall conform to the requirements of Montgomery County Environmental Services, except that only granular material shall be used for backfill and bedding.

#### **MCES Standard (Vented) Manhole Frames and Covers**

- A. Provide covers having one (1) one (1) inch diameter hole. The cover shall be solid except for the single vent hole, and the rim of the casting properly prepared to achieve a full contact bearing of the cover. The vent hole shall be placed approximately halfway between the center and edge of the cover, but shall not impinge on the cover's structural ribs. The cover shall have the words "MONTGOMERY COUNTY SANITARY SEWER" cast into it in raised relief.
- B. Frames shall be provided with four (4) holes at quarter points to anchor frame to manholes as specified in MCWS Specifications, Section 02722.
- C. Acceptable Manufacturers and Products:
  - a. East Jordan Iron Works, Model 1600
  - b. Neenah Foundry, Model 1767

#### **Grade Adjustment Rings**

- A. Grade adjustment rings shall be solid cast rings sized to specifically fit the manhole frame being adjusted.
- B. Acceptable Manufacturers and Products
  - a. East Jordan Iron Works, Model 1600H
  - b. or approved equal.

### **Excavation**

Excavation shall include the removal and disposal of all materials encountered of every name and nature.

### **Manhole Adjustments**

If the elevation between an existing manhole casting, grate or lid and the final pavement or finished grade elevation is greater than ¼-inch, it shall be adjusted to grade as specified in the project construction plans, or as directed by the Engineer. Manhole adjustments, repair, or reconstruction shall be constructed according to the following repair categories, as specified in project construction plans or as directed by the Engineer and as specified by Montgomery County Environmental Services:

1. Adjustment to grade – Type 1

Carefully remove the existing lid and install a solid cast iron adjustment ring, approved by the Engineer, within the existing frame to the finished grade. Grade adjustment rings shall be solid cast rings sized to specifically fit the manhole frame being adjusted. No more than one (1) ring shall be used for adjustment to grade. A new lid shall be provided by the Contractor to fit the new adjustment ring, unless the existing lid fits the new adjustment ring, as approved by the Engineer and as specified by Montgomery County Environmental Services.

2. Adjustment to grade – Type 2A

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing frame and lid. Make any necessary repairs to the top of the supporting walls with mortar. Use the EXISTING frame and lid in a bed of concrete mortar or structure concrete to meet finished roadway grade. Masonry block shall only be used at the direction of the Engineer. Place new concrete around the existing frame to within 2.5" of the finished grade.

3. Adjustment to grade – Type 2B

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing frame and lid. Make any necessary repairs to the top of the supporting walls with mortar. Set a NEW frame and lid in a bed of concrete mortar or structure concrete to meet finished roadway grade. Masonry block shall only be used at the direction of the Engineer. Place new concrete around the new frame to within 2.5" of the finished grade.

4. Manhole, catch basin, & inlet reconstruction to grade

Saw-cut and remove existing asphalt or concrete surrounding the structure. Remove the existing castings, existing walls of manholes down to the spring line or below as necessary, existing walls of catch basins and inlets below the window opening or any points of wall failure, and reconstruct to new, conforming as nearly as practicable to the existing dimension and type of construction, using a new frame and cover/lid/grate approved by the Engineer. Masonry block shall only be used at the direction of the Engineer and as specified by Montgomery County Environmental Services.

**Measurement**

The length of pipe to be paid for will be the actual lineal feet of the size and kind specified, in place complete, measured along the centerline of the pipe. Measurements shall be continuous through manholes, bends, tees, special fittings, clean outs, etc., and lateral branches shall be measured from the intersection of the center axis of the branch pipe with the inside surface of the main pipe.

Sanitary lateral adjustment shall include the adjustment of all pipes of a nominal six (6) inch diameter or less, and shall be measured as set forth above.

The number of sanitary manholes measured for payment will be the actual number of the kind and type specified, in place complete. Manhole drop connections, when specified, shall be included in the price bid for manholes.

The quantity of concrete pipe encasement to be paid for shall be the actual number of cubic yards placed, as shown on the plans or as directed by the Engineer. The contractor shall be responsible for maintaining the minimum trench. If the trench is oversized or irregular in shape only the proposed trench width will be accepted and calculated for concrete encasement. The number of lampholes measured for payment will be the actual number installed including special fittings and castings.

Payment for sanitary wyes, cleanouts, tees, lampholes and plugs, adjusted or relocated; and other special fittings, shall be based on the actual number and type, kind and size specified; unless separately stipulated in the specifications or proposal, any of the above mentioned items or other special pipe fittings, shall be included in the unit price bid for the item of which they are appurtenant.

**Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction and installation of sanitary sewers, service laterals, manholes, and concrete encasement, and shall include manhole frames, covers, steps, hydrostatic testing, connections to existing sewers and manholes, and reshaping of manhole bottoms; all excavation and backfill; necessary bends, tees, fittings, etc., setting and removal of forms where required, and necessary permits as required by the Montgomery County Water Services.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items

## **ITEM K-903 GAS SERVICE**

### **Description**

This item shall consist of laying new Gas Services, including valves, boxes and fittings, raising, lowering or relocating existing services between the service valve and the house; adjusting existing service boxes, meter pits and boxes, and valve boxes to grade. Prior to construction the Contractor shall have the utility company test and repair service lines that are not to minimum standards.

### **Material and Construction**

All materials and methods of construction shall conform to the requirements of the gas utility.

### **Excavation**

Excavation shall include the removal and disposal of all materials encountered of every name and nature.

### **Measurement**

Payment for new or relocated services will be based on the lineal feet of service installed or adjusted in place complete, measured along the centerline of the pipe. Measurements will be continuous through valves, bends, tees and other fittings.

Payment for relocated or adjusted valves, service boxes, valve boxes and meter pits and boxes, shall be based on the actual number of adjustments made.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to installing, relocating and adjusting gas services, valves and boxes, including excavation, gravel backfill and required testing and permits.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## ITEM K-905 BASE STABILIZATION

### Description

This item shall consist of removing and replacing unsuitable material encountered in the preparation of subgrades, and foundation for pipes, drainage appurtenances, and structures, as directed by the Engineer. The type of replacement material shall be designated by the Engineer. The contractor shall be responsible for removing and replacing material which becomes unsuitable through his own fault or negligence.

### Material

Unsuitable material shall be replaced with the following material, as directed by the Engineer:

- A. Gravel: This material shall be sound, durable gravel containing negligible amounts of vegetable matter with 100% of the material passing a 3" sieve and at least 80% by weight of the grains or by particles being retained on a No. 200 sieve.
- B. No. 2 Aggregate: This material shall be crushed limestone or gravel meeting the requirements of Item 703 of the Material and Construction Specifications of ODOT for No. 2 size aggregate.
- C. No. 304 Aggregate: This material shall be crushed limestone or gravel meeting the requirements of Item K-304.
- D. Geogrid: This material shall be Tensar BX1200 geogrid, or approved equal. Approved equal products shall meet or exceed the following specifications:

<u>Index Properties</u>	<u>Units</u>	<u>Values</u>
Aperture Dimensions	mm (in)	25 (1.0)
Minimum Rib Thickness	mm (in)	1.27 (0.05)
Tensile Strength @ 2% strain	kN/m (lb/ft)	6.0 (410)
Tensile Strength @ 5% strain	kN/m (lb/ft)	11.8 (810)
Ultimate Tensile Strength	kN/m (lb/ft)	19.2 (1,310)
<u>Structural Integrity</u>	<u>Units</u>	<u>Values</u>
Junction Efficiency	%	93
Flexural Stiffness	mg-cm	750,000
Aperture Stability	m-N/deg	0.65

Proof that these materials meet the specifications shall be submitted to the Engineer when required.

### Construction

The unsuitable material shall be removed to the depth and limit specified by the Engineer. Replacement material shall be placed and compacted as follows:

GRAVEL shall be placed in maximum 8" lifts and compacted equal to the same requirements specified for the material removed or as directed by the Engineer.

#2 AGGREGATE shall be placed in maximum 6" lifts and rolled until properly keyed as specified by the Engineer.

#304 AGGREGATE shall be placed and compacted in accordance with the requirements of Item K-304

GEOGRID shall be installed per the manufacturer's specifications on a smooth, graded, compacted subgrade surface that meets lines and grades specified by the plans or by the Engineer. Place #304 Aggregate in lifts and compact in accordance with the requirements of Item K-304. #304 Aggregate shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in the geogrid and/or movement of the geogrid. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

Compaction shall be accomplished by using steel wheel or pneumatic tire rollers, and/or vibratory compactors, of sufficient capacity to properly compact the material. Where small areas are to be compacted, hand vibrators or tampers may be used.

#### **Measurement**

GRAVEL, #2 AGGREGATE, #304 AGGREGATE:

The quantity of Base Stabilization to be paid for will be based on the actual number of tons of the specified material placed, as determined by Plant Delivery Tickets. The excavation and disposal of unsuitable material shall be considered as part of this item.

#### **GEOGRID**

The quantity of geogrid to be paid for will be based on the actual number of square yards of the geogrid placed, as determined by field measurement. The excavation and disposal of unsuitable material shall be considered as part of this item. The quantity of #304 Aggregate to be measured will be based on the actual number of tons of the specified material placed, as determined by Plant Delivery Tickets, and shall be paid for under Item K-304, Aggregate Base.

#### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to removing and replacing the unsuitable material, including excavation and disposal of the material replaced, compacting the gravel and aggregate as specified for base stabilization, the use of water necessary for compaction, and/or the installation of geogrid as specified. If geogrid is specified, the #304 Aggregate provided, placed, and compacted for the installation of geogrid shall be paid for under Item K-304, Aggregate Base. If #304 Aggregate is specified for Base Stabilization without the use of geogrid, then the #304 Aggregate shall be paid for as a part of K-905, Base Stabilization.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## ITEM K-906 FABRIC STABILIZATION

### Description

The engineering fabric shall be used on soil subgrades and granular bases to perform drainage, soil separation and reinforcement functions. These basic functions are performed either separately or simultaneously. The fabric shall be placed under concrete, hot asphalt, gravel and any other material requiring any of the above mentioned basic functions.

### Material

The engineering fabric shall be a non-woven fabric consisting of either polyester or polypropylene polymeric fibers. Only one side of the fabric can be of thermal bonded construction. The fabric shall comply with the physical property requirements listed in Table I.

**TABLE I**

PHYSICAL PROPERTY	TEST METHOD	ACCEPTABLE TEST RESULT
Weight (oz. /sq. yd.)	ASTM D-3776	6
Grab Strength (lbs.)	ASTM D-4632-91	160
Grab Elongation (%)	ASTM D-4632-91	50
Mullen Burst Strength (PSI)	ASTM D-3786-88	280
Puncture Resistance (lbs.)	ASTM D-4833-88	85

The Contractor shall send the Engineer a sample and/or literature of the fabric containing name of manufacturer, chemical composition, product description and physical property requirements. The Engineer shall approve any and all fabrics prior to their use.

### Construction

1. The subgrade shall be constructed to the required elevation, leveled and compacted.
2. Unroll fabric in the direction vehicles will travel, over areas requiring stabilization as directed by the Engineer. Do not unroll more than the required length of fabric (approximately 50 feet) in front of the ongoing operation. This will minimize any distortion, breakage and pulling of the fabric by the construction equipment. Trucks, pavers or other equipment should not make turns or sudden wheel movements on the fabric.
3. Soils with a California Bearing Ratio (CBR) less or equal to 1.5 shall have two (2) layers of engineering fabric with proper overlap. Minimum overlap in stiff and well compacted material in both longitudinal and transversal directions shall be 12". For more information on CBR and overlap see Table II.

**TABLE II**

APPROXIMATE CBR	IDENTIFICATION PROCEDURE	SOIL CONSISTENCY	OVERLAP*
Less Than 1	Easily Indented with Fist	Very Soft	36"
2	Easily Penetrated with Thumb	Soft	24"
3	Moderate Effort to penetrate with Thumb	Medium	18"
4-6	Indented by Thumb	Stiff	12"
6-16	Indented by Thumbnail	Very Stiff	12"

\* Note - Increase overlap by 4" if fabric is made of polypropylene fibers, and if it is to be placed in direct contact with hot asphalt. Asphalt temperature should not exceed 290°F.

4. When a new roll is to be added in the direction of travel, tuck the beginning of this new fabric under the previous end section of fabric with proper overlap. Allow for excess of at least one foot next to curbs and edge of pavements.

5. Avoid traffic directly on the fabric when soft or very soft soils are present, unless dry conditions have produced a crusted surface. Whenever poor subgrade is encountered, the material (aggregate, asphalt) shall be back dumped and spread in a uniform lift maintaining minimum recommended thickness (3" - aggregate, 2" - asphalt) at all times. Use graders or light dozers to spread the material.
6. Compact the material (aggregate, asphalt) by using a steel roller, initial roll to be a seal roll, increase rolling and or vibration with added depth. Avoid overstressing the soil with equipment used for dumping, spreading and rolling. Severe rutting at the time of placement is an indication of overstressing the soil. Two methods of reducing pressures on the soil are increasing material depth and reducing loads. Any ruts which develop during spreading and compacting should be filled with additional materials rather than bladed from surrounding areas. Any tears shall be repaired by placing a second layer of fabric with proper overlap.

### **Measurement**

The engineering fabric shall be measured for payment by the square yard in place. Measurement will be to the nearest yard. No allowances will be made for overlaps, seams, and repair of tears and to either contamination or damage due to the fault or negligence of the contractor. A second layer of fabric placed over poor subgrade, as directed by the Engineer will be measured for additional payment.

### **Payment**

The price bid for this item shall constitute full compensation for furnishing all labor, material and equipment, and performance of all operations in connection with placing the engineering fabric. Payment will be based on the unit price bid.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.



## **ITEM K-910 GABIONS**

### **Description**

This item shall consist of the installation of gabions on a prepared base in accordance with the plans or as directed by the Engineer.

### **Construction and Material**

The gabions shall be rectangular baskets of the size and type shown on the construction plans. They shall be unfolded and assembled on the job site according to the manufacturer's instructions. The gabions shall be manufactured with a hexagonal triple twist steel wire mesh 3" x 4" approximately, running at right angles to the long axis of the gabion. The mesh shall be reinforced at all edges with a thicker salvage rod. Each gabion shall be divided into cells of equal size by diaphragms. All wire to be used in the mesh is heavily galvanized steel wire with a zinc coating exceeding Federal specification requirements (QQ-W 461 F). The wire of the mesh shall have a diameter of not less than 0.114" (U.S. Gage II 1/4); the salvage rod shall have a diameter of not less than 0.150" (U.S. gage 9). The zinc coating shall exceed Federal specifications Finish 5, Class 3. Material to be placed in the gabion baskets shall be clean stone approved for gabion use, unless otherwise noted in the plans.

### **Measurement**

The measurement shall be the actual number of gabions in place of each particular size.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction and installation of the various gabions as indicated on the plans, and shall include the furnishing, placing and preparation of all materials required to complete the gabions.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-911 GRAVITY RETAINING WALL**

### **Description**

This item shall include all materials, manpower, equipment, incidentals, and appurtenances necessary to install a "semi-dry" masonry block and stone gravity retaining wall in accordance with the City of Kettering Standard Construction Drawings and any project-specific plan drawings and details. Work included and to be paid for under this item includes layout, excavation, base construction, placement of masonry block, mortar, wall stone, drainage pipe, backfill, topsoil, seeding/mulching, and other such work and materials required to yield a complete gravity retaining wall in a workman-like manner, in conformity with the lines, grades, and dimensions shown on the plans or as directed by the Engineer.

### **Materials**

**Stone:** Unless specified otherwise, the stone shall be limestone and shall be of approved quality, sound and durable, free from segregations, seams, cracks, and other structural defects or imperfections tending to destroy its resistance to the weather. Unless specified otherwise on the plans it shall be free from rounded, worn or weathered surfaces. Individual stones shall not have a thickness or width less than that specified on the plans. The stones shall be roughly squared on joints, beds, and faces. Selected stone, roughly squared and pitched to line, shall be used at all angles and ends of walls. All shaping or dressing of stone shall be done before the stone is laid in the wall and no dressing or hammering which will loosen the stone will be permitted after it is in place. The Engineer shall specify the color of the stone.

**Mortar:** Use Type S or stronger.

Other materials shall be as described and indicated on the plans or as approved by the Engineer.

### **Construction**

**Foundation:** Shall be constructed as specified on the plans or as directed by the Engineer.

**Drainage:** Unless a reason for exemption is granted, install a 4" perforated, fabric-wrapped flexible drain tile at base of wall. Extend drain tile around the low end of the wall. Cut the exposed end flush with the existing grade. Form a mortar collar around the end of the drain outlet. All costs associated with the drain tile installation shall be included in the bid price for K-911 Gravity Retaining Wall.

**Wall:** Masonry blocks shall be laid to line and in courses roughly leveled up. Use freshly made mortar in and around the blocks to ensure a sufficient bond between individual blocks. The mortar joints shall be full and the blocks carefully settled in place before the mortar has set. Joints and beds shall have an average thickness of not more than 1 inch.

Face stones are to be selected, trimmed as necessary, and fit together in a workman-like manner to construct a sturdy wall. Mortar shall be used in such a manner to lock stones together to augment wall strength and aesthetic appearance. The use of mortar shall be limited to 60% of the voids between the stones to allow for adequate movement of moisture through the wall. Mortar shall be placed no closer than 3" to the face of the wall, except for the top of the wall where mortar shall be flush

Each stone shall be cleaned and thoroughly saturated with water before being set and the bed that is to receive it shall be clean and well moistened. All stones shall be well bedded in freshly

made mortar. The mortar joints shall be full and the stones carefully settled in place before the mortar has set. No spalls will be permitted in the beds. Joints and beds shall have an average thickness of not more than 1 inch.

Face stones shall be rectangular with the long axis oriented horizontal. The top and bottom shall be essentially parallel. Minimum height of face stones shall be 1-1/2" to a maximum of 6", except that square face stones shall have a maximum size of 10"x10". The height of a face stone shall not exceed 3/4 of the depth of the stone.

The individual face stones shall be placed so that they break joints with the stone in the course below. Exception is where shorter stones butt a taller stone. Horizontal joints along the face of the wall shall not exceed 3' before butting into a vertical joint.

Top of wall shall have a slight slope (approximately 1/8" per 1') to shed water toward the face.

Whenever possible the face joints shall be properly pointed before the mortar becomes set. Joints that cannot be so pointed shall be prepared for pointing by raking them out to a depth of 2 inches before the mortar has set. The face surfaces of stones shall not be smeared with the mortar forced out of the joints or that used in pointing. Pointing shall not be done in freezing weather or when the stone contains frost.

Joints not pointed at the time the stone is laid shall be thoroughly wet with clean water and filled with mortar. The mortar shall be well driven into the joints and finished with an approved pointing tool. The wall shall be kept wet while pointing is being done and in hot or dry weather the pointed masonry shall be protected from the sun and kept wet for a period of at least three days after completion.

After the pointing is completed and the mortar set, the wall shall be thoroughly cleaned and left in a neat and workmanlike condition.

Stone masonry shall not be constructed in freezing weather or when stone contains frost, except by written permission of the Engineer and subject to such conditions the Engineer may require.

In case any stone is moved or the joint broken, the stone shall be taken up, the mortar thoroughly cleaned from bed and joints, and the stone reset in fresh mortar.

**Backfill:** Place granular backfill behind the wall, a minimum of 8" thick measured from the backside of the wall. Stop the granular backfill approximately 10"-12" from the top of the wall.

Backfill shall be 1/4" to 1" diameter stone, free of fines and dust. Use of any other aggregate that will provide equivalent drainage may be used subject to approval of the engineer

**Restoration:** Contractor shall restore any damaged turf areas with a minimum of 4" of topsoil. Smooth and blend the topsoil into the existing topography to provide positive drainage. Place grass seed and mulch per the requirements of K-659 Seeding and Mulching. Unless otherwise specified or itemized in the construction plans, all costs associated with restoration shall be included in the unit bid price for item K-911, Gravity Retaining Wall.

**Measurement**

Unless otherwise specified, the quantity of gravity retaining wall measured for payment shall be the measured square footage of the front face of the wall, as measured from the top of the wall to 6" below the finished grade and along the front face of the wall. The top, ends and rear faces of the wall shall not be included in the square footage measured for payment, but shall be constructed to the same quality standards as the front face of the wall.

**Payment**

The price bid for this item shall include all labor, equipment and material incidental to the construction and installation of the various structures as indicated on the plan and shall include the furnishing, placing and preparation of all material required to complete the structures. The cost to finish the top ends and rear faces of the wall shall be included in the price bid for this item.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## **ITEM K-915 EXCESS COST OF HIGH-EARLY-STRENGTH CEMENT**

### **Description**

This item shall consist of furnishing high-early-strength cement instead of the cement required for the specified concrete in the item involved. It shall be used only when specified on the plans or where directed by the Engineer

### **Material**

The Ohio Department of Transportation (ODOT) Construction and Material Specifications Item 499 for Class "QC MS" and "QC FS" shall apply. The excess cost shall be the difference between the price for the concrete item using K-499 concrete and the price for the same concrete item using cement per ODOT specification 701.05.

### **Measurement**

The quantity of high-early-strength concrete to be paid for shall be based on the actual quantity of the concrete item, completed and accepted, in place.

### **Payment**

Payment for this item will be made at the price bid per square yard and shall cover only the cost of the high-early-strength cement over and above the cost of the cement required for the specified concrete in the item involved.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.

## ITEM K-921 ASPHALT PAVEMENT REJUVENATING

### Description

This work shall consist of furnishing all labor, material, and equipment necessary to perform all operations for the application of an asphalt rejuvenating agent to asphaltic concrete surface courses. The rejuvenation of surface courses shall be by spray application of a cationic rejuvenating agent composed of petroleum oils and resins emulsified with water. All work shall be in accordance with the specifications, the applicable drawings, and subject to the terms and conditions of this contract.

### Materials

The asphalt rejuvenating agent shall be an emulsion composed of a petroleum resin oil base uniformly emulsified with water. Each bidder must submit with his bid a certified statement from the asphalt rejuvenator manufacturer showing that the asphalt rejuvenating emulsion conforms to the required physical and chemical requirements shown below.

<u>Tests</u>	<u>ASTM</u>	<u>AASHTO</u>	<u>Requirements</u>	
			<u>Minimum</u>	<u>Maximum</u>
Tests on Emulsion:				
Viscosity @ 25°C, SFS	D-244	T-59	15	40
Residue, % W <sup>1</sup>	D-244 (Mod.)	T-59 (Mod.)	60	65
Miscibility Test <sup>2</sup>	D-244 (Mod.)	T-59 (Mod.)	No Coagulation	-
Sieve Test, %W <sup>3</sup>	D-244 (Mod.)	T-59 (Mod.)	-	0.1
Particle Charge Test	D-244	T-59	Positive	-
Percent Light Transmittance <sup>4</sup>	GB	GB	-	30
Tests on Residue from Distillation:				
Flash Point, COC, °C	D-92	T-48	196	-
Viscosity @ 60°C, cSt	D-445		100	200
Asphaltenes, %w	D-2006-70	-	-	1.00
Maltene Dist. Ratio	D-2006-70	-	0.3	0.6
<u>PC + A<sub>1</sub></u> <sup>5</sup>				
S + A <sub>2</sub>				
PC/S Ratio <sup>5</sup>	D-2006-70		0.5	-
Saturated Hydrocarbons, S <sup>5</sup>	D-2006-70		21	28

<sup>1</sup> ASTM D-244 Modified Evaporation Test for percent of residue is made by heating 50 gram sample to 149 C (300° F) until foaming ceases, then cool immediately and calculate results.

<sup>2</sup> Test procedure identical with ASTM D-244-60 except that .02 Normal Calcium Chloride solution shall be used in place of distilled water.

<sup>3</sup> Test procedure identical with ASTM D-244 except that distilled water shall be used in place of two percent sodium oleate solution.

<sup>4</sup> Test procedure is attached.

<sup>5</sup> Chemical composition by ASTM Method D-2006-70:  
PC = Polar Compounds, A<sub>1</sub> = First Acidaffins, A<sub>2</sub> = Second Acidaffins, S = Saturated Hydrocarbons

### **Performance**

The rejuvenating agent shall have a record of at least five years of satisfactory service as an asphalt rejuvenating agent and in-depth sealer. Satisfactory service shall be based on the capability of the material to decrease the viscosity and increase the penetration value of the asphalt binder as follows. The viscosity shall be reduced by a minimum of 45 percent and the penetration value shall be increased by a minimum of 25 percent. Testing shall be performed on extracted asphalt cement from a pavement to a depth of three eighths inch (3/8"). In addition, the pavement shall be in-depth sealed to the intrusion of air and water.

The bidder must submit with his bid the manufacturer's certification that the material proposed for use is in compliance with the specified requirements. The bidder must submit with his bid previous use documentation and test data conclusively demonstrating that; the rejuvenating agent has been used successfully for a period of five years by government agencies such as cities, counties, etc.; and that the asphalt rejuvenating agent has been proven to perform, as heretofore required, through field testing by government agencies as to the required change in the asphalt binder viscosity and penetration number. Testing data shall be submitted indicating such product performance on a sufficient number of projects, each being tested for a minimum period of three years to insure reasonable longevity of the treatment, as well as produce consistency. RECLAMITE®, manufactured by Golden Bear Oil Corporation, is a product of known quality and accepted performance.

### **Product Standards and Alternates**

The product "Reclamite"® for the asphalt rejuvenating agent as manufactured by Witco Corporation is the standard for these specifications and the prices quoted on the bid sheet base bid shall be for this standard. Should a bidder wish to submit a bid for alternates to the standard, said prices shall be entered on the bid sheet as the "alternate bid" for each item. In the event that the bidder submits no bid for the standard, only the "alternate bids" should be completed.

Bidders may offer an alternate for the standard specified in the specifications provided the bidder adheres to the following and submits same with the bid.

- a. List the proposed alternate on the bid sheet form giving the product name and price.
- b. Furnish complete specifications and descriptive literature for the alternate as well as a one-gallon sample of the material proposed for use. Such descriptive and detailed information shall be complete and at least equal in detail to the City's requirements for the standard item for which the alternate is offered.
- c. Submit a current Material Safety Data Sheet for the alternate materials.

The alternate will be given consideration by the City. The contractor may furnish only those alternate items included in his proposal and approved by the City prior to award of a contract.

If no alternate is indicated on the bid sheet, the contractor shall furnish the standard (brand) specified in the attached specifications.

Should the alternate offered be found unacceptable by the City based on the data submitted with the bid and no bid is entered on the bid sheet for the standard, then said bid will be considered non-responsive.

### **Application of Rejuvenating Agent**

The asphalt rejuvenating agent shall be applied by a distributor truck at the temperature recommended by the manufacturer and at the pressure required for the proper distribution. The emulsion shall be so applied that uniform distribution is obtained at all points of the areas to be treated. Distribution shall be commenced with a running start to insure full rate of spread over the entire area to be treated. Areas inadvertently missed shall receive additional treatment as may be required by hand sprayer application.

Application of asphalt rejuvenating agent shall be on one-half width of the pavement at a time. When the second half of the surface is treated, the distributor nozzle nearest the center of the road shall overlap the previous application by at least one-half the width of the nozzle spray. In any event the centerline construction joint of the pavement shall be treated in both application passes of the distributor truck.

Before spreading, the asphalt rejuvenating agent shall be blended with water at the rate of two (2) parts rejuvenating agent to one (1) part water, by volume or as specified by the manufacturer. The combined mixture of asphalt rejuvenating agent and water shall be spread at the rate of 0.05 to 0.10 gallons per square yard, or as approved by the Engineer following field testing.

Where more than one application is to be made, succeeding applications shall be made as soon as penetration of the preceding application has been completed and approval is granted for additional applications by the Engineer.

Grades or super elevations of surfaces that may cause excessive runoff, in the opinion of the Engineer, shall have the required amounts applied in two or more applications as directed. After the street has been treated, the area within one foot of the curb line on both sides of the road shall receive an additional treatment of the asphalt rejuvenating emulsion. Said treatment shall be uniformly applied by a method acceptable to the Engineer.

After the rejuvenating emulsion has penetrated, a coating of dry sand shall be applied to the surface in sufficient amount to protect the traveling public as required by the Engineer.

The contractor shall furnish a quality inspection report showing the source, manufacturer, and the date shipped, for each load of asphalt rejuvenating agent. When directed by the Engineer, the contractor shall take representative samples of material for testing.

### **Street Sweeping**

The contractor shall be responsible for sweeping and cleaning of the streets prior to, and after treatment.

Prior to treatment, the street will be cleaned of all standing water, dirt, leaves, foreign materials, etc. This work shall be accomplished by hand brooming, power blowing or other approved methods. If in the opinion of the Engineer the hand cleaning is not sufficient then a self-propelled street sweeper shall be used.

All sand used during the treatment must be removed not later than forty-eight (48) hours after treatment of the street. This shall be accomplished by a combination of hand and mechanical sweeping. All turnouts, cul-de-sacs, etc. must be cleaned of any material to the satisfaction of



the Engineer. Street sweeping will be included in the price bid per square yard for asphalt rejuvenating agent.

If, after sand is swept and in the opinion of the Engineer a hazardous condition exists on the roadway, the contractor must apply additional sand and sand same no later than twenty-four (24) hours following reapplication.

No additional compensation will be allowed for reapplications and removal of sand.

### **Resident Notification**

The contractor shall distribute by hand, a typed notice to all residences and businesses on the street to be treated. The notice will be delivered no more than twenty-four (24) hours prior to the treatment of the road. The notice will have a local phone number that residents may call to ask questions. The notice shall be of the door hanger type which secures to the door handle of each dwelling. Unsecured notices will not be allowed. The contractor shall also place the notice on the windshield of any parked cars on the street. Hand distribution of this notice will be considered incidental to the contract.

### **Traffic Control**

The contractor shall schedule his operations and carry out the work in a manner to cause the least disturbance and/or interference with the normal flow of traffic over the areas to be treated. Treated portions of the pavement surfaces shall be kept closed and free from traffic until penetration, in the opinion of the Engineer, has become complete and the area is suitable for traffic.

When, in the opinion of the Engineer, traffic must be maintained at all times on a particular street, then the contractor shall apply an asphalt rejuvenating agent to one lane at a time. Traffic shall be maintained in the untreated lane until the traffic may be switched to the completed lane.

The contractor shall be responsible for all traffic control and signing required to permit safe travel. The contractor shall notify the Police and Fire departments as to the streets that are to be treated each day through the Engineering Department.

If, in the opinion of the Engineer, proper signing is not being used, the contractor shall stop all operations until safe signing and barricading is achieved.

### **Method of Measurement**

Asphalt rejuvenating agent will be measured by the square yard as provided for in the contract documents.

### **Basis for Payment**

The accepted quantities, measured as provided for above, will be paid for at the contract unit price for asphalt rejuvenating agent. Asphalt rejuvenating agent shall be paid for per square yard which shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work as specified and required.

## ITEM K-925 LANDSCAPE PLANTING

### Description

This item shall consist of furnishing and properly installing all landscape plant materials (except sod) in accordance with the Ohio Department of Transportation (ODOT) Construction and Material Specifications Item 661. This work shall include providing plant material, the digging of pocket holes, and the placing of topsoil, soil-mix, peat, mulch, bracing, and commercial fertilizer. Work under this item shall also include watering in accordance with ODOT Item 662, and any other incidentals necessary to complete this item in accordance with these Specifications, the plan drawings, and as directed by the Engineer.

### General

Schedule - All planting is to be completed in accordance with the following schedule:

- Deciduous Trees & Shrubs  
**March 15 - June 1**  
**September 15 - December 15**
  
- Evergreen Shrubs & Groundcovers  
**May 1 - June 1**  
**September 15 - October 15**

Plants will not be installed when soil is frozen, or excessively wet (muddy), as determined by the Engineer.

Disposal of Surplus and Waste Materials - All rocks, debris, rubbish and other unsuitable materials shall be separated from the existing topsoil if such topsoil is to be stored for reuse. All unsuitable and surplus materials shall be removed from the site and disposed of by the Contractor. This shall be considered incidental to the planting work.

Maintenance - The Contractor shall properly care for all plants, doing such watering, fertilizing, cultivating, adjusting of bracings, or other maintenance work which is necessary to keep the plants in a healthy condition and in a plumb position. All plants shall be watered as seasonal conditions require and as directed by the Engineer until final acceptance. At any time during the life of the Contract the Engineer may require the Contractor to remove any dead, unhealthy or unsightly plants.

Guarantee and Acceptance - The Contractor shall guarantee that all trees and shrubs shall be in a healthy and vigorous condition one full growing season after plant installation. At this time the Engineer shall inspect the tree, shrub and ground cover planting work and individual plants will be either accepted or rejected. Plants that are dead, or in the opinion of the Engineer have become diseased, or have been injured, or have lost their natural shape due to dead branches or stems, excessive pruning, or other causes will be rejected. If plants are rejected, the Owner shall deduct from the final payment due to the Contractor, a sum sufficient to cover the cost of replacement, including material and labor, until such time that the Contractor performs replacement work in accordance with the plans and these technical Specifications. Rejected plants shall be replaced once by the Contractor in accordance with the plans and technical Specifications not later than one year after final inspection.

### Materials

Topsoil - All topsoil used in this work shall be fertile, friable, natural topsoil typical for this locality. It shall not contain a mixture of subsoil or slag and shall be free of lumps, stones, plants or their

roots, stalks and other extraneous matter and shall not be used while in a frozen or muddy condition.

Topsoil shall have a pH from 5.5 to 7.5 and shall contain not less than 12% or more than 20% organic matter as determined by loss on ignition of moisture free samples dried at 100° C

Analysis for organic matter and pH shall be made in accordance with current methods of the Association of Officials of the Agricultural Chemists and shall be paid for by this Contractor and furnished to the Engineer in triplicate for approval.

Soil Mix - Soil mix shall be a thoroughly uniform mixture of topsoil and sphagnum peat moss. The ratio by volume is 3 parts top soil to 1 part sphagnum peat moss.

Plant Materials - Plant materials shall conform to the types shown on the plans and as specified herein, and all plant materials shall conform to the American Association of Nurseryman (AAN) Standards.

- i. Name - All plant materials furnished under this item shall be true to name and shall follow standard names of vines, shrubs, and trees in accordance with Horticulture Standards as accepted by the AAN.
- ii. Condition - Plants shall be sound, healthy, and vigorous, free from plant diseases, mechanical defects, abrasions, insect pests, or their eggs, and shall have healthy, normal root systems. Plants shall be freshly dug and shall not be heeled-in stock or from cold storage. No plant shall be so bound with rope or wire at any time as to damage the bark, break branches, or destroy its natural shape.
- iii. Origin - All plants shall be nursery-grown under climatic conditions similar to those which exist in the locality of the project site, or shall have been acclimated to these conditions for at least one year. The Engineer will approve exceptions to this clause provided that the Contractor can cite successful, completed local experience using the same types of plants from his proposed point of origin. Exception to this is when plans may identify specific plants to be collected or salvaged subject to proper transplanting.
- iv. Pruning - Plants shall not be pruned prior to delivery except as authorized by the Engineer.
- v. Symmetry - Plant material shall be symmetrical, typical for the variety and species, and shall conform to the minimum measurements shown on the plans. Plants for groups or where symmetry is required, shall be matched as nearly as possible, and shall meet the approval of the Engineer.
- vi. Height and Spread - The height and spread of plants shall be measured with the branches in their normal position. The caliper of all deciduous trees shall be measured one foot above the surface of the ground.
- vii. Inspection - The Contractor shall be responsible for all inspection of plant material that may be required by the State and Federal authorities, and he shall secure and have executed any permits and certificates that may be necessary.

The Engineer, in the presence of the Contractor, shall seal all shade trees and intermediate trees in the nursery. At the Contractor's option, the Engineer in the presence of the Contractor, may approve, all or a representative quantity of deciduous shrubs and evergreen shrubs at the nursery. Plants shall be inspected for size and quality only; variety, color and all other requirements shall be the responsibility of the Contractor. Any plant material delivered to the site which does not satisfy all of the requirements of these Specifications shall be removed from the site by this Contractor and shall be replaced by materials meeting these requirements. No inspection or sealing of plant materials as herein specified shall be taken to change or modify these requirements in any way.

- viii. Digging and Moving - All plant material shall be selected and prepared to conform to at least minimum specifications established by the American Association of Nurserymen Standards.
- ix. Balled and Burlapped Plants - Plants marked "BB" on the itemized schedule of prices shall be adequately balled and burlapped. No plant shall be accepted when the ball of earth surrounding its roots has been cracked or broken preparatory to or during the process of planting, or when the burlap, staves, ropes, or platforms required in connection with its use have been removed.

All balled and burlapped plants that cannot be planted immediately on delivery, shall be set on the ground and the balls well covered with soil, straw, or other acceptable material, and such material shall be moistened periodically to prevent drying.

Identification - All plants shall be properly marked for identification and for checking with legible, weatherproof labels securely attached before delivery to the site.

Peat Moss - This item shall be a granulated sphagnum peat moss furnished in air-dry condition. It shall be finely shredded material, suitable for horticultural purposes. Shredded particles shall not exceed one-quarter (1/4) inch in size. The pH value shall not be less than 3.5 and not more than 5.5.

Mulch Material - The mulch material shall be shredded wood bark having a uniform soft stringy texture, a dark brown color, and freedom from cakes and lumps. Any substitution shall be subject to approval of the Engineer.

Commercial Fertilizer - Commercial fertilizer shall be a blend bearing the manufacturer's guarantee statement of analysis and shall meet the following minimum requirements:

Percent Nutrients, 100 Pound Total Basis: 12% of Nitrogen (N); 12% of Phosphoric Acid (P<sub>2</sub>O<sub>5</sub>); 12% of Potash (K<sub>2</sub>O).

Commercial fertilizer for shade trees, in tree wells, shall be Planting Tablets. Planting tablets shall be tightly compressed, long-lasting, slow release fertilizer tablet weighing between 5 and 25 grams with a potential acidity of not more than 5% by weight and having an analysis of 20-10-5 OR 12-12-12. Any other analysis shall be subject to approval by the engineer. Use of fertilizer tablets for shade trees, intermediate trees and shrubs is at the contractor's option. Tablets shall be installed according to the manufacturer's recommendations.

All fertilizer shall be delivered to the site in the original unopened containers, which shall bear the manufacturer's guaranteed statement of analysis.

Stone - Stone placed in and around base of irrigation heads shall consist of nominal 3/4" to 1 1/2" diameter washed gravel.

Tree Wound Dressing - The Engineer shall approve tree wound dressing.

**Bracing Stakes - Bracing stakes for plants shall be 2 x 2 inches of hardwood lumber, free of unsound or loose knots and rot, and from cross grain and sapwood or other defects that may impair strength**

Tree Wrapping Material - Wrapping material for trees shall be waterproof crepe tree wrapping paper 30-30-30 in 4" or 6" strips, or burlap in 6" strips. The tying material in wrapping trees shall be jute twine not less than 2-ply for trees 3" or less in diameter.

Wire - Wire used in bracing trees shall be regular, galvanized soft wire of common quality. All wire shall be new and free from bends and kinks. Wire shall not be placed in direct contact with a tree. Wire against a tree shall be placed within a length of garden hose.

## **Construction**

### **Planting** -

Staking and Excavation - Plant pits shall not be excavated or prepared until they have been staked on the ground with location approved by the Engineer. All plant pits shall be excavated to the depth and size as shown on the plans and/or as called for in these Specifications.

Plant Grade – Set plants in the planting holes at a level such that the top of the root structure is 1 inch (25 mm) above the surrounding soil. Set each plant in the center of the planting hole, plumb, and straight. If the Engineer determines that existing soils are compacted or poorly drained, set the trees and shrubs with half of the root structure above the existing soil level. Add backfill mix around the root structure so that the edges of the root structure are covered by a minimum of 12 inches (300 mm).

Pits - Trees (not in tree wells) shall be planted in individual pits two feet greater in diameter than the plant ball.

Pits - Shrubs shall be planted in individual pits or in trenches. The width of trenches shall be no less than twelve inches greater than the diameter of the ball, and shall have vertical sides. Pits for shrubs shall be no less than twelve inches greater in diameter than the diameter of the ball, and they shall have vertical sides. The depth of such pits and trenches shall not be less than twelve inches more than the depth of the ball when the shrub has been set at the proper plant grade.

Balled and Burlapped Plants - After the trees have been properly set in tree pits, and partially backfilled, the cord and burlap shall be loosened from the top of the ball, but the burlap shall not be pulled out from under the ball. Remove the top one-third of the wire from root balls having wire baskets. **ROT-PROOF BURLAP SHALL NOT BE USED.**

Backfill Mix – For all plantings, use backfill mix consisting of the following:

- a. 1 part excavated soil.
- b. 1 part sand

- c. 1 part sphagnum peat moss or approved compost.
  - d. A slow release fertilizer (0-20-20 or equal) added at a rate of 5 pounds per cubic yard to backfill mix. Or apply a surface fertilizer as prescribed in Fertilizer paragraph.
- Mix backfill at project site.

After setting the tree in the center of the pit, the pit shall be filled to the required grade with the topsoil mixture that shall be thoroughly settled by frequent tamping and watering. There shall be no air space between soil mixture and root ball.

Staking and Guying - The Contractor shall be wholly responsible for assuring that all trees are planted in a vertical and plumb position, and remain so throughout the life of this Contract and maintenance bond. Trees may be staked and guyed depending upon the individual preference of the Contractor, however, prior to their installation the Engineer must approve any bracing procedures.

Trees that sway excessively, move out of plumb, blow down, or are otherwise injured due to settling or failure of bracing techniques, during the life of this Contract and maintenance bond period, will be rejected by the Engineer and shall be replaced or corrected by the Contractor at the contractor's own expense and at the discretion of the Engineer.

Pruning - Plants shall not be pruned prior to delivery, except as authorized by the Engineer. All pruning on the planting site shall be as follows:

- A. The ends of all broken and damaged branches and roots of one-quarter inch (1/4") or larger diameter shall be pruned with a clean cut, removing only the injured portion. All broken branches and stubs shall be removed.
- B. All wounded or pruned surfaces of one inch or more in diameter shall be painted with approved tree wound dressing.

Wrapping - Wrapping shall be in accord with section 661.15. The Contractor shall be responsible for the condition of this wrapping throughout the life of this Contract. Any damage resulting from the improper installation or maintenance of this wrapping shall be the responsibility of the Contractor and immediately prior to final inspection the Contractor shall replace such damaged trees, unless otherwise directed by the Engineer.

Mulching - All trees not planted in sodded areas shall receive a three inch deep layer of mulch. Mulch shall be pulled away from making direct contact with the tree bark. Bark shall have direct exposure to air.

Edging and Surface Treatment - Where individual plants are arranged in a group, the area between the pits or trenches shall be filled to the finished grade with clean soil from the excavation of plant areas, or with other acceptable soil. After filling has been completed and prior to any required mulching, the entire area between and around the shrubs shall be spaded and pulverized to a depth of three inches and then neatly edged in a line and in a manner acceptable to the Engineer. Arrangement of pits and shrubs must meet with the approval of the Engineer. For individual trees place mulch in a circular bed centered on the

tree trunk. Unless otherwise specified the bed diameter shall be three feet. The outer perimeter of the bed shall be neatly shovel cut.

Fertilizer – For trees place fertilizer tablets according to manufacturer's instructions or a surface applied commercial fertilizer (12-12-12) shall be evenly applied over the backfilled area at the rate of 1/2 pound per inch of caliper. For shrubs place fertilizer tablets according to manufacturer's instructions or a surface applied commercial fertilizer (12-12-12) shall be evenly applied to the backfilled area at the rate of 1/4 pound per shrub or over the top of the planting bed at the rate of 5 pounds per 100 square feet. Care shall be taken so that the fertilizer does not contact the stem, trunk, branches or leaves of the plant. For mixing fertilizer into backfill mix see Backfill Mix.

### **Groundcover and Vine Planting -**

Staking and Excavation - Planting areas shall not be excavated or prepared until they have been staked, or otherwise indicated, on the ground with the location and outline approved by Engineer. All plant areas shall be excavated to depth and size as shown on the plans and/or as specified herein.

Pits - Groundcovers or vines shall be planted in individual pits or trenches. Pits shall have a diameter or width not less than 8 inches for 2 1/4" pot size plants or 12 inches for 4 inch pot size plants, and have a depth less than 12 inches. For plant spacing less than one foot apart as per plan drawings the entire bed area shall be tilled to 12" depth.

Plant Grade - Groundcovers and vines shall be set to the finished grade so that they have the same relationship to the surrounding grade as they had before transplanting or before being taken out of a pot.

Peat Moss - Peat moss shall be roto-tilled into groundcover bed at the rate of 3 inch depth of peat moss to 12 inch depth of tillage.

Planting - Planting shall be in accord with paragraph 661.12 of ODOT Construction & Material Specifications.

Mulching and Fertilizing – Mulching and fertilizing shall be in accord with paragraph 661.13 of ODOT Construction & Material Specifications.

### **Payment**

The price bid for this item shall include all labor, equipment and material incidental to installing the landscape planting materials. The laying of sod is covered under a separate item.

Items included for payment as part of this specification shall be indicated on the plans and/or listed in the proposal. Payment shall be made at the contract price bid for the specified items.