

**STANDARD SPECIFICATIONS  
FOR  
STREET AND DRAINAGE CONSTRUCTION**





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## **DIVISION 100. GENERAL PROVISIONS**

### **Section 101. Definitions and Terms**

**101.01 Abbreviations and Definitions.** Whenever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as the respective expressions represented:

#### **(a) Industry Abbreviations.**

ACI	American Concrete Institute
AASHTO	American Association of State Highway and Transportation Officials
ADEQ	Arkansas Department of Environmental Quality
AGC	Associated General Contractors of America
AHTD	Arkansas State Highway and Transportation Department
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ARA	American Railway Association
AREA	American Railway Engineering Association
ARTBA	American Road and Transportation Builders Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
ATSSA	American Traffic Safety Service Association
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CoE	U.S. Army Corps of Engineers
CRSI	Concrete Reinforcing Steel Institute
FHWA	Federal Highway Administration
FSS	Federal Specifications and Standards, General
ITE	Institute of Traffic Engineers
MIL	Military Specifications
MUTCD	Manual on Uniform Traffic Control Devices for Streets and Highways
NEMA	National Electrical Manufacturers Association
OSHA	Occupational Safety and Health Administration
SAE	Society of Automotive Engineers
SSPC	Steel Structures Painting Council
UL	Underwriter's Laboratory
USC	United States Code

**(b) Contract Abbreviations for Construction Work**

AC	Asphalt Cement	ACHM	Asphalt Concrete Hot Mix
ACTD	Actuated	ADJ	Adjusted
AGG	Aggregate(s)	ALUM	Aluminum
APPL	Application	APPR	Approach
ASPH	Asphalt	ASSY	Assembly
AST	Asphalt Surface Treatment	AUTO	Automatic
BIND	Binder	BIT	Bituminous
BLDG	Building(s)	BLDG	Building(s)
BLKT	Blanket	BNG(S)	Bearing(s)
BR	Bridge(s)	BST	Bituminous Surface Treatment
C & G	Curb and Gutter	CA	Corrugated Aluminum
cc	cubic centimeter(s)	CD	Compacted Depth
CEM	Cement	CL	Class
CLVT(S)	Culvert(s)	CM	Corrugated Metal
CMBN	Combination	CNTL	Control, Controller
COMP	Compaction, Controller	CONC	Concrete
CONT	Continuous, Continuously	CONST	Construction
CRS	Course(s)	CORR	Corrugated
CTD	Coated	CR	Crushed
DBL	Double	CS	Corrugated Steel
DWY(S)	Driveway(s)	CU,cu	Cubic
EMUL	Emulsified	DI	Drop Inlet(s)
EXC	Excavation	EWK	Earthwork
F & I	Furnish and Install	EXP	Expansion
FES	Flared End Section(s)	FDN	Foundation
FURN	Furnish, Furnishing	FNC	Fence(s)
GA	Gage, Gauge	GALV	Galvanized
GR	Grade, Graded	GRVL	Gravel
ha	hectare(s)	HI	High Intensity
HM	Hot Mix	HMA	Hot Mix Asphalt
HMAS	Hot Mix Asphalt Stabilized		
INST	Install, Installing, Installation		
j	joule(s)		
kg	kilogram(s)	kL	kilometer(s)
km/h	kilometers per hour	KPa	kilopascal(s)
L	liter(s)	LAB	Laboratory
m	meter(s)	mm	millimeter(s)
MA	Mineral Aggregate	MAINT	Maintenance
MATL	Material(s)	MES	Mitered End Section(s)
MET	Metal	MG	1000 Gallons
MIN	Mineral	MOB	Mobilization
MOD	Modified	MPa	MegaPascal(s)

MRK	Marking(s)	msta	metric station
mton	1000 kilograms		
NO	Number(s)	NON MET	Non-Metallic
NON REINF	Non-Reinforced	NPDES	National Pollutant Discharge Elimination System
OCT	Octagonal	OFF	Office
Pa	Pascal(s)	PC	Portland Cement
PIL	Piles, Piling	PM	Plant Mixed
ppm	parts per million	PRCST	Precast
PRFMD	Preformed	PROC	Process, Processing
PVC	Polyvinylchloride	PVMT	Pavements(s)
PVNG	Paving		
QPL	Qualified Products List	QUAD	Quadruple
QUINT	Quintuple		
R & D	Removal and Disposal	RC	Reinforced Concrete
RDWY	Roadway(s)	RECOMP	Recompact(ed), Recompaction
RECON	Reconstruct(ed)		
REFL	Reflectorized	REHAB	Rehabilitate, Rehabilitation
RELOC	Relocate, Relocation	REMOV	Removal, Removing, Removed
RELP	Replace, Replacing		
RESTOR	Restoration	RESTEEL	Reinforcing Steel
RMC	Rigid Metallic Conduit	RNMC	Rigid Non-Metallic Conduit
SCAR	Scarify, Scarifying	SGNL(S)	Signal(s)
SHLD(S)	Shoulder(s)	SPEC	Special
sq	Square	Sta	Station (100 feet)
STAB	Stabilized, Stabilization	STKPL	Stockpile, Stockpiling
STL	Steel	STN	Stone
STR(S)	Structure(s)	STRL	Structural
SURF	Surface, Surfacing	SWPPP	Storm Water Pollution Prevention Plan
SYS	System, Systems		
TEMP	Temporary	TERM	Terminal
THERMPL	Thermoplastic	TMBR	Timber
TRAF	Traffic	TRPL	Triple
TRMT	Treatment	TRTD	Treated
TY	Type		
UNCL	Unclassified	UNTRTD	Untreated
UT	Uniform Thickness	VAR	Variable
VEH	Vehicle(s)		
µm	micrometer ( 1 x 10 <sup>-6</sup> m )		

## **Section 102. Control of Material**

**102.01 Quality Requirements.** The materials used in the work shall meet all quality requirements of the Contract. Quality control, to insure that materials and workmanship, prior to and after, being incorporated into the work meets the requirements of the Contract, is the sole responsibility of the Contractor. Testing required for Contractor's quality control, certificates of compliance, mix designs and manufacturing of materials, and as needed for Contractor's operations shall be provided by the Contractor and the costs therefore will not be paid separately but full compensation will be considered included in the contract unit prices bid for associated items.

All Quality Assurance testing, to insure that the materials and workmanship as a final product meets the requirements of the Contract, will be accomplished and paid for by the Owner. The costs for any retesting required in areas failing to meet the specified requirements shall be paid for by the Contractor.

The materials furnished and used shall be new, except as may be provided elsewhere in these specifications, on the plans or in the Special Conditions. The materials shall be manufactured, handled, and used in a workmanlike manner to ensure completed work in accordance with the plans and specifications.

Also, refer to Section 103 "Quality Control Requirements".

**102.02 Sources of Supply.** To expedite the inspection and testing of materials, the Contractor shall notify the Engineer of proposed sources of materials before delivery. The Contractor shall furnish without charge such samples as may be required. Inspection and tests may be performed by the Engineer or Owner's designated testing firm, but it is understood that such inspections and tests, if made at any point other than the point of incorporation in the work, in no way shall be considered as a guarantee of acceptance of such materials nor of continued acceptance of material presumed to be similar to that upon which inspections and tests have been made.

The Contractor shall assume full responsibility for ordering materials of the quality and quantity required and for the delivered costs of such materials. Materials needed in the work shall be furnished by the Contractor unless otherwise stated in the Contract.

**102.03 Samples, Tests, and Cited Specifications.** All materials will be inspected and tested by the supplier or Contractor as required by these specifications before incorporation in the Work. Work in which untested materials are used without the approval or written permission of the Engineer shall be treated as provided in the Standard General Conditions Section 13.08 "Acceptance of Defective Work."

Whenever a reference is made in the specifications to a Federal Specification, or to a specification or test designation of the American Association of State Highway and Transportation Officials, the American Society for Testing and Materials, American Water Works Association, or any other recognized national organization, it shall mean the year of adoption or latest revision of the specification or test designation in effect on the day the

advertisement for bids is dated. When a specific reference is made to a dated specification or test designation, the revision in effect on that date shall apply.

When requested, the Contractor shall furnish a complete certified statement of the origin, composition, and/or manufacture of materials that are to be used in the Work.

**102.04 Certification of Compliance.** The Engineer/City Engineer may permit use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance stating that such materials or assemblies fully comply with the requirements of the Contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the Project must be accompanied by a Certificate of Compliance and clearly identified.

Materials or assemblies used on the basis of Certificates of Compliance may be sampled and tested and if found not in conformity with Contract requirement will be subject to rejection whether in place or not.

The form and distribution of Certificates of Compliance shall be as approved by the Engineer/City Engineer.

**102.05 Plant Inspection.** The Engineer may undertake the inspection of materials at the source. In the event plant inspection is undertaken the following conditions shall be met:

- The Engineer/City Engineer shall have the cooperation and assistance of the Contractor and of the producers of materials for the Work.
- The Engineer/City Engineer shall have full entry at all times to such parts of the plant as may concern the manufacture or production of the materials being furnished.

Adequate safety measures shall be provided and maintained.

It is understood that the Engineer/City Engineer reserves the right to retest all materials prior to incorporation into the Work which have been tested and accepted at the source of supply after the sample have been delivered and to reject all materials which, when retested, do not meet the requirements of these specifications or contract documents.

**102.06 Storage of Materials.** Materials shall be so stored as to assure the preservation of their quality and fitness for the work and in accordance with requirements of the Specifications; or if not covered in the Specifications, in accordance with the manufacturer's recommendations. Stored materials, even though approved before storage, may again be inspected before their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Portions of the right-of-way not required for public travel may be used for storage purposes and for the placing of the Contractor's plant and equipment, if approved by the Engineer, but any additional space required therefor must be provided by the Contractor, and at no cost to the Owner. Private property shall not be used for storage purposes without written permission of the owner or lessee, and if requested by the Engineer, copies of such written permission shall be furnished. All storage sites shall be restored to their original condition by Contractor at his expense. Construction materials may not be stored in the roadway for more than five (5) days after unloading.

**102.07 Handling Materials.** All materials shall be handled in such manner as to preserve their quality and fitness for the work. Aggregates shall be transported from the storage site to the Work in tightly covered vehicles so constructed as to prevent loss or segregation of materials after loading and measuring so that there may be no inconsistencies in the quantities of materials intended for incorporation in the Work as loaded and the quantities as actually received at the place of operations.

**102.08 Unacceptable Material.** All materials not conforming to the requirements of the specifications at the time they are used shall be considered as unacceptable and all such materials will be rejected and shall be removed immediately from the site of the work unless otherwise instructed by the Engineer/City Engineer. No rejected material, the defects of which have been corrected, shall be used until approval has been given.

**102.09 Owner-Furnished Material.** The Contractor shall furnish all materials required to complete the Work, except those specified to be furnished by the Owner. Material furnished by the Owner will be delivered or made available to the Contractor at the points specified in the Special Provisions.

The cost of handling and placing all materials after they are delivered to the Contractor will not be paid for separately, but full compensation therefor will be considered included in the contract unit price(s) bid for the item(s) with which they are used.

The Contractor will be held responsible for all material delivered by the Owner through this arrangement. Deductions will be made from any moneys due the Contractor to make good any shortages and deficiencies, from any cause whatsoever; for any damage that may occur after such delivery; and for any demurrage charges.

**102.10 Salvaged Materials.** All salvaged materials in reusable condition, including pavement millings, signal poles and appurtenances, signs, water and drainage pipe, valves, fittings and other items, remain the property of the City of Rogers. Contractor shall deliver items to location directed by Engineer/City Engineer or designated in specifications. Items not considered of value shall be disposed of by the Contractor at his expense.

**102.11 Automatically Controlled Equipment.** Whenever a breakdown or malfunction of the automatic controls occurs on scales, scale printers, batch plants, or mixing plants, the equipment may be operated manually or by other methods for a period not to exceed two working days, provided that such alternate methods of operation produce results otherwise meeting the Specifications.

## **Section 103. Quality Control Requirements**

**103.01 Description.** This section shall set forth the requirements for Quality Control, including material testing and submittal requirements.

**103.02 Submittal Requirements.** All submittals required by the contract shall be submitted before associated work is begun. Sufficient copies shall be submitted for the Engineer to

retain two copies, the City to receive two copies and the Contractor to receive a minimum of one approved copy.

The following submittals are required:

- 1) Project Schedule
- 2) Concrete Mix Design(s)
- 3) Asphalt Mix Design(s)
- 4) Concrete Pipe Certifications
- 5) Precast Box Culvert Shop Drawings and Hydraulic Design
- 6) Listings of Project Personnel and Contact Phone Numbers
- 7) Traffic Control Plan
- 8) Striping Material
- 9) Reinforcing Steel Fabrication Drawings
- 10) Signal Equipment
- 11) Other Submittals as requested by the Engineer/City Engineer

The Engineer/City Engineer will review all submittals promptly and notify the contractor of their approval or denial. The contractor shall have approved submittals before beginning any associated work. Any work accomplished before approved submittals are received is subject to rejection and removal from the job at the contractor's expense.

**103.03 Material Submittals.** As a minimum, the following material submittals will be required:

- 1) Samples of on-site soils, if these soils are to be used as fill in the roadway. The Engineer/City Engineer will determine the number of samples to be taken.
- 2) Samples of soils to be used as borrow material.
- 3) Samples of material to be used as aggregate base under the roadway. One sample will be required initially. Additional samples will be taken during placement of aggregate base if deemed necessary by the Engineer/City Engineer.
- 4) Samples of material to be used as topsoil. Alternatively, the Engineer/City Engineer will inspect the site from which the topsoil is to be taken to determine its acceptability. All material samples shall be taken in the presence of a representative from the Quality Control (QC) Laboratory. Other submittals may be required as determined by the Engineer/City Engineer.

### 103.04 Testing and Inspection Requirements

**(a) Field Inspections.** The City's field representative will be on-site during all work, which is to be paid for under the contract. The contractor shall provide one person as its on-site representative to receive instructions from the Engineer/City Engineer. This person shall be qualified and experienced in job superintendence.

The Contractor's representative shall be on-site during all work, which is to be paid for under the contract. If the Contractor's representative is not on-site, the Engineer/City Engineer may order all work be stopped until such time as the contractor's superintendent returns to the job site.

The Contractor shall provide the City's field representative with at least 24 hours of advance notice for any concrete placement.

The City will provide, at its expense, an independent quality control (QC) laboratory to accomplish quality control testing. All testing will be scheduled with the QC lab and the Contractor by the City. The Contractor shall provide or make available samples of all material as required by these specifications as well as any other materials deemed necessary by the Engineer/City Engineer.

**(b) Testing Requirements.** The Contractor shall inform the City's field representative at least 24 hours in advance of any required testing. If conditions occur between the inspection and the placing of concrete or continuation of the work, such as but not limited to rain or freezing temperatures, it shall be up to the City Inspector to allow the work to proceed or to require rework and retesting. The following is the minimum sampling and testing frequency required:

- 1) **Cross Drain Backfill:** minimum of one density test per layer of material placed per pipe or box culvert location.
- 2) **Storm drain backfill:** minimum of one density test per layer per 500 lineal feet of pipe or portion thereof when the storm drain is located in the street or under the curb and gutter.
- 3) **Embankment:** minimum of one density test per layer per 500 lineal feet of roadway or portion thereof.
- 4) **Subgrade:** minimum of one density test per 500 feet of roadway with a minimum of three density tests per project, and one sieve analysis and plasticity index test per project per material type for subgrade soil classification.
- 5) **Aggregate base course:** minimum of one density test and one depth measurement (depth sounding) per 500 lineal feet of roadway, with a minimum of three density tests and three depth measurements per project. Also, there will be a minimum of one gradation test per project.

- 6) **Asphalt Concrete Hot Mix.** Testing shall be as specified in Section 403. Core holes shall be filled with non-shrink grout mix by the Contractor. All holes shall be protected from traffic until the grout has cured.
- 7) **Concrete for Drainage Structures.** A minimum of one set of three concrete cylinders per day's concrete placement will be required for drop inlets and junction boxes. Other placements will be sampled at the rate of 1 set of cylinders per 30 cubic yards of concrete placed. Slump and air entrainment tests will be conducted at the time of cylinder preparation. One cylinder will be broken at seven days and the other two will be broken at 28 days.
- 8) **Concrete for Curb and Gutter.** A minimum of one set of three concrete cylinders per 500 lineal feet of curb and gutter or portion thereof. One cylinder will be broken at seven days and the other two will be broken at 28 days.
- 9) **Concrete Pavement.** A minimum of one set of three concrete cylinders per 500 lineal feet of pavement or portion thereof, with a minimum of one set per project. The set shall be broken in seven and 28 days as described above. Also, one core and depth measurement per 500 lineal feet of complete pavement with a minimum of one per project. Core holes shall be filled with non shrink grout mix. All holes shall be protected from traffic until the grout has cured.

(c) **Provisions for Acceptance of Nonspecification Materials.** This section provides for corrective actions to be taken when test results indicate nonspecification materials or workmanship have been incorporated into the project. Any penalties, which are assessed, will be deducted from the contract price.

- 1) **Density for Embankment, Subgrade, Pipe Backfill, and Crushed Stone Base Course:** Recompact until the minimum density is obtained.
- 2) **Depth of Crushed Stone Base Course:** The depth of the crushed stone base shall be within plus or minus one-half inch ( $\pm \frac{1}{2}$ "") of the required depth. If the deficient depth is greater than one-half inch ( $\frac{1}{2}$ ""), additional material shall be added to reach the required depth. This material shall be incorporated into the existing material by the use of rippers or other equipment extending a minimum of 3 inches into the existing material.
- 3) **Depth and Density of ACHM Binder and Surface:** Depth and density requirements shall be as specified in Section 403 "Asphalt Concrete Hot Mix" of these specifications.
- 4) **Surface Tolerance of ACHM Surface:** Surface tolerance of ACHM Surface shall be as specified in Section 403 "Asphalt Concrete Hot Mix" of these specifications.
- 5) **Concrete Strength:** The average 28-day compressive strength of the two cylinders of a set shall be at least the required strength of the concrete specified. If the average strength is lower, the following penalties will be assessed:

% of Minimum Strength	% Reduction in Contract Price
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92-100	10
85-92	25
Below 85%	Remove and Replace

- 6) **Concrete Pavement Depth:** The concrete pavement depths shall be within plus or minus three-eighths inch ( $\pm 3/8''$ ) of the required depth plus any additional depth required as a result of a deficient subbase depth. The average of all depth measurements shall not be less than the required depth, and any depth in excess of plus three-eighths inch ( $\pm 3/8''$ ) will not be used in computing the average depth. If the average depth is less than the required depth, the following penalties shall be assessed:

Deficient Depth	% Reduction in Contract Price
Req. depth to 1/8 inch	1
1/8 inch to 1/4 inch	3
1/4 inch to 3/8 inch	7
3/8 inch to 1/2 inch	15
1/2 inch to 5/8 inch	25
5/8 inch to 3/4 inch	40
More than 3/4 inch	Remove and Replace

- 7) **Concrete Pavement Surface:** The finished pavement surface shall have a maximum deviation of 1/4" when tested with a 10' straight edge parallel to the flow of traffic. Pavement cross slope shall vary by no more than 1/8" in 10' when tested with a straightedge.

Grinding shall be performed, if necessary, to remove any deviations in excess of 1/4". The grinding equipment shall be power driven and specifically designed to smooth and texture portland cement concrete by means of diamond blades. Areas that have been ground shall be re-grooved by grooving in accordance with subsection 601.16 for Class 7 surface finish, to provide a uniform texture equal in roughness to the surrounding pavement.

In addition to these requirements, if any individual test falls below the minimum requirements, the area represented by this test shall be assessed the appropriate penalty under the applicable section above.

**103.05 Testing and Material Specification.** These Specifications reference AASHTO Standards for testing and material. Unless specifically stated otherwise, the corresponding ASTM Standard will be allowed in lieu of the AASHTO Standard.

## Section 104. Measurement and Payment

**104.01 Measurement of Quantities.** Work acceptably completed under the Contract will be measured by the Engineer/City Engineer according to United States Standard measures. Only

actual quantities will be paid for unless otherwise specified. Unless otherwise specified, the following listed methods will be used:

- 1) For computing volumes of excavated materials specified for measurement by the cubic yard, the average end area method will be used.
- 2) Structures will be measured to the neat lines as shown on the plans or as finally constructed at the direction of the Engineer/City Engineer.
- 3) Items that are measured by the linear foot, such as pipe culverts, guardrail, underdrains, etc., will be measured parallel to the base or foundation upon which such structures are placed.
- 4) In determining the area for items bid on a square yard or acre basis, except as noted below, the longitudinal measurement will be made along the actual surface of the item and not horizontally, and transverse measurements shall conform to the dimensions shown on the plans or as directed by the Engineer/City Engineer.
- 5) In determining the area for all seeding and mulch cover items bid on an acre basis, when the area is a strip of varying width running approximately parallel to the centerline of the roadway, the longitudinal dimension will be measured horizontally and the transverse dimension will be measured parallel to the surface of the area seeded and/or mulched. For other areas of seeding and mulch cover items, all measurements will be made parallel to the surface of the area seeded and/or mulched. The area will be computed to the nearest 0.01 acre.
- 6) Materials that are specified for measurement by the ton shall be hauled in approved vehicles bearing a plainly legible identification number and weighed on accurate, approved scales furnished by the Contractor and inspected by a registered scale mechanic at least once a year and before their use after each move. Scales shall be located at the loading point or other approved location.
- 7) The scales shall be an automatic weighing system, with digital or springless dials, and equipped with an automatic ticket printer. An automatic ticket printer is defined as a device connected to the weighing system in such manner that it automatically detects the weight determined by the system. It shall store and recall the TARE weight when the operator enters the truck identification. It shall print the following information on the ticket:
  - Gross, Tare, and Net weights.
  - Identification of the truck.
  - Current date.
  - For asphalt mixtures, the time of loading or weighing.
  - A unique ticket number (may be preprinted on the tickets).

The NET weight should be computed by the weighing system; however, it may be computed manually and keyed in for printing. When the net weight of the material is determined by batch weights, the scales used shall meet all applicable requirements

specified for truck scales, including automatic ticket printing, except that the GROSS and TARE weights will not be required. The ticket shall accompany each load delivered to the project. In addition to the items shown above that must be printed by the ticket printer, the following information shall also be shown on each ticket:

- Identification of the project.
  - Identification of the material being delivered, including mix design numbers for asphalt mixtures. The ton shall be the short ton of 2000 pounds. Vehicles used to haul materials measured by weight shall be weighed empty for each load, or shall be weighed daily or from time to time during the day as the Engineer may direct, to establish the tare weight of each load. The scales furnished shall be capable of weighing the entire loaded vehicle at one time. Deduction will be made for the weight of moisture in aggregates in excess of 5% of the oven-dry weight of the material.
- 8) A station when used as a definition or term of measurement will be 100 linear feet measured horizontally.
- 9) The term "lump sum" when used as an item of payment will mean complete payment for the work described in the Contract.
- 10) When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.
- 11) When mutually agreed, the plan quantity of any item may be taken as the Final Contract Quantity. Items to be paid at plan quantity shall be agreed upon in writing before work begins.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

**104.02 Scope of Payment.** Payments to the Contractor will be made for the actual quantities of contract items completed and accepted according to the plans and specifications and if, upon completion of the construction, these actual quantities show either an increase or decrease from the quantities given in the proposal schedule, the contract unit prices will still prevail, except as provided in Subsection 104.03, below.

The Contractor will receive and accept the compensation herein provided as full payment for furnishing all materials, labor, equipment, tools, and incidentals necessary to the completed work; for performing all work contemplated and embraced under the Contract; for all loss or damage arising out of the nature of the work, or from the action of the elements, or from any unforeseen difficulties or obstructions that may arise or be encountered during the prosecution of the work until its final acceptance by the Commission; for all risks of every description connected with the prosecution of the work; for all expenses incurred by, or in consequence

of, the temporary suspension or discontinuance of the work as herein specified; for any infringement of patent, trade mark, or copyright; for all costs of permits, licenses, fees, and taxes; and for completing the work in an acceptable manner according to the plans and specifications. The payment of current or final estimate, or of retained percentage, shall in no degree prejudice or affect the obligation of the Contractor, at no cost to the City, to repair, correct, renew, or replace any defects or imperfections in the construction of the roadway and its appurtenances, or in the strength of or quality of materials used therein or thereabouts, or relieve the Contractor from the payment of all damages due to such defects; provided such defects, imperfections, or damages shall be discovered on or before the final inspection or acceptance of the entire work. No retained percentage payable under the Contract, or any part thereof, shall become due and payable, if the City so elects, until the City is satisfied that the Contractor has fully settled or paid for all materials and equipment used in or upon the work, and for all labor done in connection therewith, and the City, if it so elects, may pay any or all such accounts wholly or in part and deduct the amount or amounts so paid from the final estimate.

Any overpayments made to the Contractor or Surety, from whatever cause, are due and payable to the City upon receipt by the Contractor or Surety of a request setting forth the particulars, regardless of pending claims or intention of the Contractor or Surety to file a claim.

**104.03 Payment and Compensation for Altered Quantities.** When alterations in plans or quantities of work not requiring a change order are ordered and performed and when such alterations result in an increase or a decrease of the quantity of work to be performed, the Contractor shall accept payment in full at the contract unit prices for the actual quantities of work accomplished, and no allowance will be made for anticipated profits, organization or overhead expense, or interest.

Increased or decreased work involving change orders will be paid for as stipulated in such change orders.

## **Section 105. Roadway Construction Control**

**105.01 Description.** When this item is included in the proposal, it shall consist of furnishing and maintaining all lines, grades, and measurements necessary for the proper execution of the roadway work under the Contract, all according to the plans and specifications.

**105.02 Materials.** The Contractor shall furnish all stakes, templates, straightedges, surveying equipment, and other devices necessary for establishing, setting, checking, marking, and maintaining points, lines, grades, and layout of the work called for on the plans and in the specifications.

### **105.03 Construction Requirements.**

**(a) City Responsibilities.** The Engineer/City Engineer will establish the benchmarks and horizontal control points referenced on the plans, certified correct by the Engineer, and furnish the data to the Contractor at the beginning of work.

Any additional information provided by the Engineer shall be verified by the Contractor before use and the Contractor shall accept full responsibility for any costs incurred as the result of the use of such additional information. Any checking performed by the Engineer/City Engineer will not relieve the Contractor of the responsibility for the final results.

The City will be responsible for taking all measurements to establish both current estimate and final estimate pay quantities, including any horizontal and vertical control points necessary to complete such measurements. When making these measurements, the Engineer/City Engineer may use any points, stakes, lines, or elevations that have been set by the Contractor.

**(b) Contractor Requirements.** Roadway Construction Control shall include use by the Contractor of the plans and the vertical and horizontal control points established by the City as described above to perform all required construction surveying and layout. The Contractor shall make all necessary calculations and set all stakes including, but not limited to: centerline stakes; offset stakes; reference point stakes; additional bench marks as needed; slope stakes; pavement lines; curb lines; grade stakes; roadway drainage; pipe culverts; box culverts; underdrains; clearing and grubbing limits; guardrail; fence; blue tops for subgrade, subbase, and base courses; and any other points, lines, or elevations deemed necessary for proper control of the work.

On projects that include an ACHM overlay and/or Asphalt Surface Treatment, the Contractor shall mark the stationing by setting a stake at least every 200 feet along the roadway. These stakes shall be placed on the shoulder or slope so that they will not interfere with the construction operations, but will be usable for determining locations along the roadway. On projects with widening sections where a grade line is not shown on the plans, the Contractor shall profile the existing pavement at the centerline and edges of pavement. This profile data shall be furnished to the Engineer/City Engineer for use in the establishment of the finished grade line. This finished grade line will be furnished to the Contractor for use in computing and setting all grades required to construct the finished roadway section. The Contractor shall be responsible for joining the work to contiguous roadways and/or bridges in an acceptable manner. This shall include making minor adjustments to the plan grade and/or typical section as necessary to construct a smooth transition from the new work to match the existing roadway.

The Contractor shall provide sufficient qualified personnel to complete the work accurately. The supervision of the Contractor's surveying and personnel shall be the responsibility of the Contractor, and any errors resulting from the operations of such personnel shall be adjusted or corrected by the Contractor at no cost to the City.

The Contractor shall maintain adequate survey notes as the work progresses and make them available to the Engineer/City Engineer on request. Copies of survey notes designated by the Engineer/City Engineer shall be provided for the City's permanent project records. The Contractor shall be responsible for the accuracy and uniformity of the construction stakes, lines, grades, and layouts. Any errors in the work constructed due to errors in the Contractor's Roadway Construction Control shall be adjusted or corrected by the Contractor at no cost to the City.

**105.04 Method of Measurement.** Roadway Construction Control will be measured as a complete unit.

**105.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract lump sum price bid for Roadway Construction Control, which price shall be full compensation for furnishing and maintaining all necessary lines, grades, and measurements; and for furnishing all engineering personnel, equipment, materials, tools, and incidentals necessary to complete the work.

No adjustments in the lump sum price bid will be made for Roadway Construction Control required due to normal increases or decreases in Contract quantities. However, if the amount of Roadway Construction Control required is increased or decreased in connection with a Change Order, compensation will be adjusted accordingly.

Partial payments for Roadway Construction Control will be made in proportion to the amount of work accomplished on this item. No additional payment will be made for re-staking needed to maintain the control.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Roadway Construction Control	LS

## **Section 106. Trench and Excavation Safety Systems**

**106.01 Description.** This item covers trench and excavation safety systems required for constructing improvements that necessitate open excavations on the project. All work under this item shall be in accordance with the current edition of the “Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P”, a copy of which may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

**106.02 Notifications Required.** The Contractor, prior to beginning any excavation, shall notify the State Department of Labor (Safety Division) that work is commencing on a project with excavations greater than five feet.

The contractor shall notify all Utility Companies and Owners in accordance with OSHA Administration 29 CFR 1926.651(b)(2) for the purpose of locating utilities and underground installations.

**106.03 Existing Structures and Utilities.** Where the trench or excavation endangers the stability of a building, wall, street, highway, utilities or other installation, the Contractor shall provide support systems such as shoring, bracing, or underpinning to ensure the stability of such structure or utility.

The Contractor may elect to remove and replace or relocate such structures or utilities with the written approval of the owner of the structure or utility and the Engineer/City Engineer.

**106.04 Method of Measurement.** After award of the contract, the Contractor shall submit to the Engineer/City Engineer a breakdown of costs for work involved in the lump sum price bid for “Trench and Excavation Safety Systems” and shall, with each periodic payment request, submit a certification by the Contractor’s “competent person” as defined in Subpart P 1926.650(b) that the Contractor has complied with the provisions of “Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System”, 29 CFR 1926 Subpart P for work which payment is requested.

**106.05 Basis of Payment.** The work required by this item will be paid for at the lump sum price for “Trench and Excavation Safety Systems”.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Trench and Excavation Safety Systems	LS

## **DIVISION 200. EARTHWORK**

### **Section 201. Clearing and Grubbing**

**201.01 Description.** This work consists of clearing, grubbing, removing, and disposing of all vegetation, obstructions and debris within designated limits of the Right-of-Way and easement areas. Vegetation and objects designated to remain shall be preserved free from injury or damage.

**201.02 Definitions.** Clearing and Grubbing shall be defined as follows:

Clearing shall consist of: cutting, removing, and disposing of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth; removal and disposal of existing fences, drainage structures, abandoned pipelines or utilities, paving, curbs and gutters, rubbish and trash, and other objectionable material(s). Clearing shall also include the preservation of trees, shrubs, and vegetative growth, which are not designated for removal.

Grubbing shall consist of the removal and disposal of wood or root matter below the ground surface remaining after clearing and shall include stumps, trunks, roots, or root systems greater than 2 inches in diameter to a depth of two feet below the natural ground surface.

**201.03 Construction Requirements.** All surface objects, trees, stumps, roots, and other protruding obstructions designated for removal shall be cleared and grubbed, including required mowing. Undisturbed and sound stumps and nonperishable solid objects located more than two feet below subgrade and slope of embankments may remain in place. When authorized, stumps and nonperishable solid objects that are located more than 1 foot below the ground line may remain if they are located outside the construction limits of excavation and embankment areas.

Existing pipes, culverts, bridges, and other drainage structures shall be removed to the natural stream bottom and those parts outside the stream shall be removed to 1 foot below natural

ground surface. Materials designated as City salvaged material shall be dismantled without damage and stored at designated locations. All other structures shall be removed from the Right-of-Way.

All concrete pavement, base course, sidewalks, curbs, gutters, buildings, foundations, slabs, ballast, gravel, bituminous material, and pavement materials shall be disposed of unless specifically stated otherwise in the Plans or by the Engineer/City Engineer.

Concrete designated for use as rip rap shall be broken into pieces not to exceed 150 pounds and stockpiled at designated locations or promptly placed where specified on the project.

Ballast, gravel, bituminous material, or other surfacing or pavement materials designated for salvage shall be stockpiled at designated locations without contaminating the material with dirt or foreign materials. Old concrete pavement, sidewalks, curbs, gutters, and similar structures to be left in place shall be sawed to a straight and true vertical line or removed to an existing joint as shown on the plans or as directed by the Engineer/City Engineer.

In embankment areas, cavities resulting from removal of obstructions shall be backfilled and compacted with suitable material under Subsection 202.03.

Disposal of material and debris shall be done under applicable Federal, State, County, and City laws, ordinances, and regulations. Perishable material if burned shall be under constant care of a watchman so the surrounding vegetation, adjacent property, and anything designated to remain is not jeopardized.

Materials and debris may be disposed of by burial at locations acceptable to the City within the project limits, if at least 12 inches of cover material is provided and the area is graded, shaped, and seeded according to these specifications or otherwise restored to present a pleasing appearance. Said burial and restoration shall be at the Contractor's expense.

**201.04 Measurement and Payment.** No measurement of this item will be made. Payment will be made on a lump sum basis.

<u>Pay Item</u>	<u>Pay Unit</u>
Clearing and Grubbing	LS

## **Section 202. Excavation and Embankment**

**202.01 Description.** This work consists of excavation, hauling, disposal, placement and compaction of all materials encountered within the limits of the work that is not covered under another item. Excavation will be classified as one of the following:

(a) **Unclassified Excavation.** Unclassified Excavation consists of the removal and disposal of all material of whatever character encountered in the work not covered under other items. This shall include removal of material in existing ditch lines along roadways to a depth of 1 foot below existing grade in the ditches. This shall also include stripping of vegetation and topsoil as required to a depth of one (1) foot below existing grade in embankment areas.

**(b) Rock Excavation.** Rock Excavation includes removal and disposal of rock material that by actual demonstration cannot be excavated with a Caterpillar Model No. 215D LC track-mounted hydraulic excavator equipped with two rippers or similarly approved equipment. Rock excavation also includes boulders one-half cubic yard or more in volume.

**(c) Undercut Excavation.** Undercut excavation includes removal and disposal of material not suitable for use as embankment material that is below the proposed subgrade elevation and that is more than 1' below existing ground within the roadway.

Embankment shall be defined as all material placed within the limits of the proposed roadway to achieve subgrade elevation. Embankment material may include approved on-site or approved off-site material.

**202.02 Materials.** Samples of material to be used as embankment material shall be submitted for approval per the requirements of these specifications. All material shall meet the requirements of Chapters 110 and 111 of The City of Rogers Code of Ordinances.

### **202.03 Construction Requirements.**

**(a) General.** Excavations and embankments shall be finished to smooth and uniform surfaces. No excavation material shall be wasted without permission of the Engineer/City Engineer. Excavation and embankment operations shall be conducted without disturbing material outside the staked construction limits. Before beginning excavation, grading, and embankment operations, all necessary clearing, grubbing and top soil removal in that area shall be completed.

Excess or unsuitable excavated material, including topsoil, rock and boulders, shall be disposed of at locations acceptable to the Engineer/City Engineer. All approved surplus material shall be used to uniformly widen embankments and flatten slopes within the Right-of-Way. Rocks and boulders shall be covered with a minimum of 1 foot of embankment material.

Demolition of old roadways shall include filling of all ditches and grading to restore the original contour of the ground producing a pleasing appearance by forming natural, rounded slopes. Removal and disposal of pavements and base courses shall be performed under Section 201.

**(b) Rock Excavation.** Material classified as rock shall be excavated to a minimum depth of 6 inches and a maximum depth of 12 inches below proposed subgrade within the limits of the roadbed. The excavation shall be backfilled and compacted with material designated in the Contract or approved by the Engineer/City Engineer. Rock excavation removed in excess of 12 inches below subgrade will not be measured and paid for. Rock excavation backfill of the depth in excess of 12 inches below proposed subgrade is at the Contractor's expense.

Undrained pockets shall not be left in the rock surface. Depressions shall be drained. Bore holes shall be drilled along the slope line, maintaining the drill holes at the angle designated on the plans and ensuring that all drill holes are in the same plane. The diameter, spacing, and loading of presplit holes shall result in a neat break. The presplitting holes shall be drilled for the full depth of the ledge. The initial presplitting of a geological formation shall be

accomplished utilizing a 100-foot test section. After drilling, loading, and shooting this test section, the material shall be removed to determine if the diameter, spacing, and loading of the presplit holes are adequate to give an acceptable backslope. If the results are determined to be acceptable, the presplitting may continue throughout the geological formation using those methods and procedures. If the presplitting is determined to be unsatisfactory, adjustments shall be made in the spacing, diameter and loading of the presplit holes utilizing another 100-foot test section.

Presplitting holes shall be loaded with explosives as per the manufacturer's recommendations. The cost of presplitting shall be included in the unit bid price for rock excavation.

**(c) Undercut Excavation.** If and where directed by the Engineer/City Engineer, unsuitable material encountered at the proposed subgrade elevation shall be removed to the depth specified or directed by the Engineer/City Engineer and backfilled and compacted with approved off-site material, and compacted in accordance with this section. Excavation operations shall be conducted so necessary measurements can be taken before replacing unsuitable material with approved backfill.

No payment will be made for this item if:

The contractor does not notify the Engineer/City Engineer of potential areas requiring undercut before excavating these areas.

An area that was previously stable becomes unstable due to actions of the contractor. These causes include, but are not limited to, ponding of water and construction traffic.

The Contractor does not allow the Engineer/City Engineer sufficient time to measure the undercut excavation volume before placing backfill material.

In addition, no payment will be made to remove and replace any embankment material placed on unsuitable soil that subsequently requires removal and replacement.

**(d) Embankment Construction.** Embankment construction includes the preparation of the areas where embankments are placed, placement and compaction of approved embankment material for replacement of unsuitable material, and placement and compaction of embankment material in all cavities and depressions within the roadway area.

Rocks, broken concrete, and other solid materials shall not be placed in embankment areas where piling is to be placed or driven.

Benching shall be required when embankment is placed on hillsides or against existing embankment with slopes that are steeper than 6-to-1 when measured at right angles to the roadway and shall be continuously benched in loose lifts not to exceed 12 inches. Benching shall be wide enough to permit the operations of placement and compaction equipment. All horizontal cuts shall begin at the intersection of the ground line and the vertical side of the previous bench. Existing slopes shall also be stepped to prevent wedging action of the embankment against structures. Excavation from benching shall be compacted with the new embankment material and the cost for benching and recompaction shall be included in the unit bid price for excavation.

When natural ground is within 4 feet of the subgrade, all sod and vegetable matter shall be removed from the surface where embankment is placed. The cleared surface shall be completely broken up by plowing, scarifying, or stepping to a minimum depth of 6 inches and shall then be compacted to the specified embankment density. Sod not requiring removal shall be thoroughly disked prior to embankment construction. Wherever a compacted road surface containing granular material lies within 3 feet of the subgrade, the old road surface shall be scarified to a minimum depth of 6 inches and compacted to the specified embankment density.

If embankment can only be placed on one side of abutments, wing walls, piers, or culvert headwalls, compaction shall be accomplished without overturning of or placing excessive pressure against the structure. The fill adjacent to the end bent of a bridge shall not be placed higher than the bottom of the backwall until the superstructure is in place. When embankment is placed on both sides of a concrete wall or box-type structure, the embankment shall be brought up equally on both sides of the structure. Embankment that is adjacent to structures or inaccessible to normal compaction equipment shall be placed in 4" loose lifts and compacted with mechanical equipment to 95% of maximum density as determined by AASHTO T99.

Roadway embankment shall be placed in horizontal lifts not to exceed 8 inches (loose measurement) and compacted to the specified density before the next lift is placed. Spreading equipment shall be used to obtain uniform lift thickness prior to compaction. As the compaction progresses, leveling and manipulating shall be continuous to assure uniform density. Moisture content shall be increased or decreased as necessary to obtain the required density and stability. Construction equipment shall be routed uniformly over the entire embankment surface.

When the excavated material consists predominantly of rock too large to be placed in 8-inch lifts, the material may be placed in thicknesses up to the average rock dimension not to exceed 3 feet. Each lift shall be leveled and smoothed by distribution of spalls and finer fragments of earth. Rock shall not be end dumped directly on the previously completed lift of embankment. Rock shall be dumped in the lift of embankment being constructed and pushed into place. The lifts shall not be constructed above an elevation 2 feet below the finished subgrade.

A minimum of 2 feet of compacted embankment shall be placed over structures before rock is placed.

**(e) Moisture and Density Requirements.** All lifts in embankment areas shall be compacted to not less than 95 percent of the maximum density. The moisture content of the material shall be uniformly increased or decreased to within 2% of optimum moisture content before compaction.

Maximum density will be determined using AASHTO T 99 or ASTM D698 (Standard Proctor). In-place field density measurements shall be determined using AASHTO T 191, T 238, or T 205.

Density requirements do not apply to portions of embankments constructed of materials such as rock that cannot be tested by approved testing methods.

**202.04 Method of Measurement.**

(a) Undercut and Backfill will be measured by the cubic yard of material placed and compacted according to the specifications and as directed by the Engineer/City Engineer. Measurements of the excavated area will be taken by the Engineer/City Engineer after excavation and before backfilling. The quantity of Undercut and Backfill will be measured as In Place quantities. Measurement for undercut will begin at subgrade elevation or one (1) foot below existing ground, whichever is lower.

(b) Rock Excavation will be measured by the cubic yard of rock in place actually removed according to the specifications. Measurements taken after the rock is removed and before any associated backfilling will be used to calculate rock excavation quantities.

(c) Excavation and Embankment will not be measured and the plan quantity will be considered the final quantity for purposes of final payment, unless changes to the original design are made. In such case, the revised quantity shall be agreed upon prior to beginning any work associated with the change.

**202.05 Basis of Payment.** Quantities of earthwork completed, accepted and measured as provided above will be paid for at the Contract Price bid as follows:

(a) Undercut Excavation shall be paid for at the Contract Price bid per cubic yard (CY) for Undercut and Backfill. Said price shall be full compensation for excavation, furnishing, hauling, placing, and compacting approved off-site material according to the plans and specifications. This price shall not include final compaction and finish grading to subgrade elevation. Final compaction and finish grading will be paid for under the item “Subgrade Preparation.”

(b) Rock excavation shall be paid for at the Contract Price bid per cubic yard (CY) for Rock Excavation. Said price shall be full compensation for rock removal and disposal to the lines and depths shown on the plans and according to these specifications, and for furnishing, hauling, placing, and compacting approved material in the excavated area as required.

(c) All earthwork not paid for under other items will be paid for under the items Excavation and Embankment. Payment for these items will be on a CY basis, and shall include: (1) excavation, hauling off, and disposal of all materials on the project that are not required for completion of the project. (2) Placement of materials on the jobsite, whether from on-site or off-site sources, to establish the lines and grades shown on the plans. (3) Placement of embankment as backfill for excavated areas to 1 foot below existing ground in roadway areas. (4) Any other excavation, embankment, grading or other miscellaneous earthwork items not included in other items of work. The plan quantity will be considered the final quantity for purposes of final payment, unless changes to the original design are made.

<u>Pay Item</u>	<u>Pay Unit</u>
Undercut and Backfill	CY
Rock Excavation	CY
Excavation	CY (Plan Quantity)
Embankment	CY (Plan Quantity)

### **Section 203. Subgrade Preparation**

**203.01 Description.** This work consists of preparing the subgrade for placement of the base course, curb and gutter, and asphalt courses. The intent of this specification is to provide a stable subgrade consisting of approved material compacted as specified.

**203.02 Materials.** Materials not specified.

**203.03 Construction Requirements.** Material at subgrade will receive one or a combination of the following treatments as directed by the Engineer/City Engineer:

- (a) Unsuitable material will be excavated to a depth as directed by the Engineer/City Engineer, disposed of, and replaced with off-site material approved by the Engineer/City Engineer. This material shall be placed and compacted to conform to Subsection 202.03.
- (b) If the material is acceptable for use as subgrade material, the subgrade will be scarified to a depth of 8 inches and recompactd to conform to Subsection 202.03 of these Specifications.
- (c) In areas requiring fill to achieve subgrade elevation, the subgrade shall consist of approved on-site or off-site material compacted in accordance with Subsection 202.03 of these Specifications.

The subgrade shall be shaped for its full width to the required grade and cross section. The finished subgrade shall not vary at any point by more than .02 foot from the prescribed elevation.

Finished sections damaged by construction operations shall be corrected by the contractor at no cost to the City.

**203.04 Method of Measurement.** Measurement for this item will be as follows:

- (a) Excavation and backfill of any areas of subgrade requiring undercut will be measured as specified in Section 202.04.
- (b) Subgrade Preparation will be measured by the square yard. Measurement will include all subgrade area including areas up to 1' behind proposed back of curbs. Measurement will include areas of undercut, areas that receive scarification and recompaction of existing acceptable material, and areas where fill material is required to achieve subgrade elevation. The plan quantity will be considered the final quantity for purposes of final payment, unless

changes to the original design are made. In such case, the revised quantity shall be agreed upon prior to beginning any work associated with the change.

(c) Fill material required to achieve subgrade elevation will be measured as specified in Section 202.4.

**203.05 Basis of Payment.** Quantities of earthwork completed, accepted and measured as provided above will be paid for at the Contract Price bid as follows:

(a) Undercut Excavation shall be paid for as stated in Section 202.5a. This price shall not include final compaction and finish grading to subgrade elevation. Final compaction and finish grading will be paid for under the item “Subgrade Preparation.”

(b) Subgrade preparation will be paid for at the Contract Price per square yard (SY) for Subgrade Preparation. Said price shall be full compensation for scarification (if required), compaction, and finish grading of subgrade areas.

**Pay Item**

**Pay Unit**

Subgrade Preparation

SY (Plan Quantity)

**Section 204. Select Grading**

**204.01 Description.** This work consists of excavating, placing, and compacting material between the back of the roadway curb and the limits of the work. It also includes grading and placing topsoil in this area or other disturbed areas.

**204.02 Materials.**

(a) **General.** Material used for backfilling curbs and grading for sidewalk shall be free of trash, organics, and other deleterious materials.

(b) **Topsoil.** Topsoil may be obtained from sources outside the right-of-way limits or from areas within the project limits that will be occupied by cuts and/or embankments. When topsoil is furnished from sources outside the right-of-way, the Contractor shall be responsible for locating and obtaining the material and for performing all work, including erosion control, prevention of water pollution, and restoration, according to the specifications. The cost of such work will be considered included in the contract unit price bid for Topsoil Furnished and Placed. At the request of the City, the Contractor shall furnish copies of agreements with the property owners.

Topsoil shall be good quality, fertile, friable, surface soil and consist of loamy sand, sandy loam, clay loam, or sandy clay loam and shall be clean, rich, dark soil that contains adequate organic material. River sand will not be accepted as topsoil. Topsoil shall be reasonably free from subsoil, slag, weeds, grasses, roots, or stones greater than:

- 1/4 inch for residential/commercial lawn areas, or

- 1 inch for all other areas.

Topsoil shall have a pH suitable for intended use areas. Obtain soil only from naturally well-drained sites where topsoil occurs in depths greater than 4". Do not obtain from bogs, marshes or steep clayey slopes. Do not strip, collect, or deposit topsoil while soil is wet.

In no case shall topsoil be excavated more than 12" from the original ground level. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sods and herbaceous growth, such as grass and weeds, shall not be removed but shall be thoroughly broken up and intermixed with the soil during handling operations.

### **204.03 Construction Requirements.**

**(a) Curb Backfill and Grading.** After curbs have set sufficiently, they shall be backfilled with approved material and graded so that no ponding will occur. Areas on which sidewalk or driveways are to be constructed shall be compacted to 95% of maximum density as measured by AASHTO T99 or ASTM D698 (Standard Proctor).

Upon completion of the construction of sidewalks, driveways, and other items of construction within the construction limits, all areas to receive topsoil shall be excavated, graded, backfilled and compacted as necessary to remove all depressions, ridges, soft areas, waste concrete, and other items that will interfere with placement of the topsoil layer. All slopes shall be excavated to a maximum slope of 1 vertical foot in 3 horizontal feet unless otherwise noted in the plans or directed by the Engineer.

**(b) Topsoil Placement.** After the areas to receive topsoil have been prepared to the satisfaction of the Engineer/City Engineer, topsoil placement may begin.

Topsoil shall be placed on all earth areas to a minimum depth of 4 inches unless shown otherwise on the plans or directed by the Engineer/City Engineer. Topsoil shall be graded to within 1 inch of finished elevation, and lightly compacted. Before placing seed all topsoiled areas shall be lightly scarified and raked to remove rocks, sticks, roots, and other undesirable materials as outlined in Section 204.02b.

### **204.04 Method of Measurement.**

**(a) Curb Backfill and Grading.** Backfilling of curbs and grading of areas between the back of curb and the construction limits will be measured by the Station. A Station for the purposes of this Section is defined as 100' in length for both sides of the roadway, with a width reaching to the outer construction limits on both sides of the road.

**(b) Topsoil.** Topsoil furnished and placed will be measured by the square yard based on the location. Measurement will be made to the permanent street right-of-way or permanent easement or to the toe or top of slopes as shown on the plans. Areas outside these limits disturbed by the Contractor shall be topsoiled and restored at no cost to the City.

**204.05 Basis of Payment.** Quantities completed, accepted, and measured as provided above will be paid for at the Contract Price bid as follows:

(a) Curb backfill and grading will be paid for at the unit price per station (Sta). Said price shall be full compensation for excavation, hauling, placing, and compacting approved material to the lines and grades shown on the plans.

(b) Topsoil will be paid for at the unit price bid per square yard (SY). Said price shall be full compensation for excavating, stockpiling, hauling, placing, grading, and all other labor, tools, and equipment to provide a layer of topsoil in accordance with the specifications.

<u>Pay Item</u>	<u>Pay Unit</u>
Curb Backfill and Grading	Sta
4" Topsoil Placement (Yard Areas)	SY
4" Topsoil Placement (Other Areas)	SY

## **DIVISION 300. STORM DRAINAGE**

### **Section 301. Storm Drainage Pipe**

**301.01 Description.** This work consists of the construction or reconstruction of pipe culverts, including excavation and backfill of storm sewer trenches.

**301.02 Materials.** All materials supplied under the requirements of this section shall meet the requirements of Section 606 of AHTD Specifications. All reinforced concrete pipe shall be Class III unless otherwise shown on the Plans or directed in the Specifications. Sizes and gauges of corrugated metal pipe shall be as shown on the plans.

#### **301.03 Construction Requirements.**

(a) **General.** Unsuitable material excavated for storm sewer placement shall be disposed of under Subsection 202.03(a). Suitable surplus excavated material shall be used in the construction of embankments. Unsuitable excavated material below the designed bottom of pipe elevation shall be replaced and compacted using approved material. Rock, hardpan, and other unyielding material shall be excavated below the designed grade for a depth of 6 inches minimum and 8 inches maximum. This extra depth excavation shall be backfilled with approved bedding material. Trenches shall be excavated to a minimum width that allows for proper jointing of the pipe and compaction of backfill material under and around the pipe. The completed trench bottom shall be firm for its full length and width.

(b) **Bedding.** All storm sewer pipe shall be bedded with a minimum of 4 inches of approved granular material. Bedding shall be placed to the required depth and shaped to conform to the bottom configuration of the pipe.

(c) **Laying Pipe.** Pipe placement shall begin at the downstream end. Pipe shall be in contact with the shaped bedding throughout its full length. Bell or groove ends of concrete pipe and outside circumferential laps of flexible pipe shall be placed facing upstream. Flexible pipe shall be placed with longitudinal laps or seams at the sides.

Paved or partially lined pipe shall be laid so the longitudinal centerline of the paved segment coincides with the flow line. Elliptical pipe shall be installed so the orientation of a vertical plane through the longitudinal axis of the conduit does not vary more than 5 degrees from the design orientation.

Pipe that is not in true alignment or that shows settlement after placement shall be removed and re-laid at no cost to the City.

**(d) Joining Pipe.** The method of joining pipe sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even.

Pipe protruding through structure walls shall be cut off flush with the inside face of wall and grouted.

All surfaces of the joint upon or against which joint seal gaskets may bear shall be smooth, free of spalls, cracks, fractures, and imperfections that would adversely affect the performance of the joint. A primer shall be applied if recommended by the manufacturer.

When preformed rubber gasket is selected by the Contractor, the gasket shall be the sole element depended upon to make the joint flexible and watertight. The gasket shall be a continuous ring that fits snugly into the annular space between the overlapping surfaces of the assembled pipe joint to form a flexible watertight seal.

The gasket shall not be stretched more than 30% of its original circumference when seated on the spigot or tongue end of the pipe.

When bitumen/butyl plastic gasket is selected by the Contractor, the following procedure shall be used. The protective wrapping shall be removed from one side of the gasket. The gasket shall be pressed firmly to the vertical shoulder of the pipe joint, end to end continuing around the entire circumference of the joint. The remaining protective wrapping shall be removed and the pipe forced into connection until material fills the joint space.

For either type of gasket used and to ensure an even and well filled joint, the final joining of the pipe shall be accomplished by either pushing or pulling, by approved mechanical means, each joint of the pipe as it is laid. In cold weather, when directed, the joint material shall be warmed in a hot water bath, or by other approved methods, to the extent required to keep the material pliable for placement without breaking or cracking.

**(e) Backfilling.** The pipe shall be backfilled with bedding material in 4 inch compacted lifts to the springline. Pipe placed under roadways or driveways will then be backfilled with aggregate base material meeting the requirements of Section 401 placed in 4 inch lifts compacted to 95% of maximum density near optimum moisture as determined by AASHTO T180 or ASTM D1557. Flowable fill in accordance with these specifications may be used as an alternate to the aggregate base material. For the purpose of this section, roadway shall be defined as back of curb to back of curb.

All other areas shall be backfilled with material free from lumps or clods placed in layers not to exceed 6" at or near optimum moisture content and compacted with mechanical equipment to 90% of the maximum density, as determined by AASHTO T 99 or ASTM D698, to the

limits shown on the plans. Pipe damaged during construction operations shall be replaced at no cost to the City.

When the existing material excavated for the pipe trench is declared by the Engineer/City Engineer as unsuitable for pipe backfill, this material shall be placed at other locations on the job and used to backfill behind curbs and/or placed on the fill slopes. If the Engineer/City Engineer determines that no suitable location exists on the job to utilize this material, the Engineer/City Engineer may approve the material to be wasted at an appropriate location outside the job limits. Material declared unsuitable for backfill shall be replaced with suitable material from roadway excavation and/or off-site sources.

**301.04 Method of Measurement.** Storm drainage pipe of the type and size specified will be measured by the linear foot (LF) measured parallel to the flowline of the pipe. Where inlets, junction boxes, or other structures are included in lines of pipe, that length of pipe extending to and flush with the inside of the structure wall will be included for measurement but no other portion of the structure length or width will be so included. Whenever possible, the lengths shown on the plans may be adjusted by the Engineer/City Engineer to accommodate the pipe lengths available from the supplier that most nearly match the plan lengths. Flared end sections for pipe culverts will be measured by the unit.

**301.05 Basis of Payment.** Work completed, accepted, and measured as provided above will be paid for at the Contract Price bid as follows:

(a) Pipe will be paid for at the unit price per linear foot (LF) for each type and size of pipe and type of backfill specified; which price shall be full compensation for furnishing, hauling, and installing the pipe; for material including joint filler for concrete pipe and connection bands for metal pipe; for excavation and backfilling, including class 7 base as required, and for all other labor, tools, and equipment necessary to complete the work.

(b) Flared End Sections will be paid for at the unit price per each (EA) for the type and size of the flared end section specified; which price shall be full compensation for furnishing, hauling, and installing the flared end sections; for material including joint filler for concrete pipe and connection bands for metal flared end sections; for excavation and backfilling, including compacted backfill, and for all other labor, tools, and equipment necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
__" (Pipe Type and Material) Within Roadway	LF
__" (Pipe Type and Material) Outside Roadway	LF
__" (FES Type and Material)	EA

## **Section 302. Drop Inlets and Junction Boxes**

**302.01 Description.** This item shall consist of the construction of drop inlets, junction boxes, and drop inlet extensions with rings and covers or grates and frames.

### **302.02 Materials.**

(a) All concrete for this section shall conform to the requirements for Class B Concrete as provided in Section 601.

(b) Reinforcing steel shall conform to the requirements of Section 602.

(c) Steel for welded steel grates and frames shall conform to the requirements of ASTM A 36.

(d) Iron castings for rings and covers, grates and frames, and other appurtenances shall conform to the requirements of ASTM A 48, Class 30A. Bearing surfaces between rings and covers or grates and frames shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact. Castings shall be of the weight shown on the plans. Minimum weight of ring and lid shall be 275 pounds. The lid shall include the standard City of Rogers logo according to the Standard Details.

(e) Precast concrete units of the type, size, and designation shown on the plans may not be used unless written permission is given by the City. Precast units shall be subject to the requirements of AASHTO M 199. Units so manufactured must be certified by a professional engineer registered in the State of Arkansas that they have been designed and manufactured according to AASHTO M199 and that they meet the requirements for HS20 loading. Joint materials shall conform to Subsection 301.02.

(f) Curing Materials. Curing materials shall meet the requirements of Subsection 601.15.

**302.03 Construction Requirements.** Drop inlets, junction boxes, and drop inlet extensions shall be constructed with either reinforced or non-reinforced concrete, as shown on the plans.

Concrete shall not be placed until the Engineer/City Engineer has inspected the forms and the placement of reinforcing steel and rings or frames.

Round monolithic drop inlets may have the floors cast monolithically with the walls. All other concrete floors shall be placed at least 24 hours before beginning construction of the walls. A longer period of time may be required if weather conditions make it necessary.

When completed, the concrete shall be cured as specified in Subsection 601.15.

Walls shall be constructed to form a tight joint with the floor and around the inlet and outlet pipes. Pipes shall be cut flush with the inside surfaces of the wall.

Utility lines that are carried through the walls shall be protected in an approved manner to avoid damage.

Faces of drop inlets and drop inlet extensions shall be placed as a part of the curb in order to preserve the proper alignment.

Precast concrete drop inlets or junction boxes may be used only by special permission of the City. Inlet and extension tops and throats will be cast-in-place with no exceptions.

Precast reinforced concrete drop inlet or junction box sections shall be carefully set with joints conforming to the requirements of Subsection 301.03(d).

Metal rings or frames shall be set accurately to the finished elevations so that no subsequent adjustments will be necessary. They shall be set in a full mortar bed with firm bearing on the walls or securely fastened to the forms so that no movement will occur when concrete is placed around them.

Welded steel grates and frames shall be welded with ¼” fillet welds, and painted in accordance with the plans.

**302.04 Backfilling.** Backfill around inlets and junction boxes shall be with approved material as defined in the following paragraphs. Backfilling of inlets and junction boxes shall not begin until results of concrete cylinder tests demonstrate that concrete has reached 75% of specified strength. Backfill material shall be placed in layers not to exceed 4” in depth and shall be compacted to 95% of maximum density as measured by AASHTO T 99 for soil materials or by AASHTO T 180 for aggregate base materials.

All structures or parts of structures that fall within the limits of the roadway (defined as centerline to 1’ behind the backs of curbs) shall be backfilled with aggregate base material unless otherwise allowed in writing by the Engineer/City Engineer.

Structures in other areas shall be backfilled with approved material provided from on-site or off-site areas.

Structures shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be reasonably free of such accumulations at the time of final inspection.

**302.05 Method of Measurement.** Drop inlets, junction boxes, and drop inlet extensions will be measured by the unit. One drop inlet extension unit is measured at a 4’ length. Each unit shall consist of the concrete frame, the ring and grate, and any pipe required to form the vertical portion of the drain including a standard elbow or tee.

**302.06 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid each for Drop Inlets, Drop Inlet Extensions, or Junction Boxes, of the size and type specified, which price shall be full compensation for constructing drop inlets, drop inlet extensions, or junction boxes; for furnishing, installing, and painting (if required), of rings and covers or grates and frames; for excavation and backfill; and for all materials, labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
(Size) Drop Inlets (Type)	EA
(Size) Curb Inlets (Type)	EA
(Size) Junction Boxes (Type)	EA
(Size) Drop Inlet Extension	EA
(Size) Curb Inlet Extension	EA

### **Section 303. Concrete Box Culverts**

**303.01 Description.** This work consists of constructing reinforced concrete box culverts, in accordance with the details shown on the plans, and to the lines, grades, and dimensions shown on the plans. This work also includes associated wingwalls and aprons at the ends of the box culvert.

**303.02 Materials.** Concrete for reinforced concrete box culverts shall be class B in accordance with Section 601 unless specified otherwise. Reinforcing steel shall be in accordance with Section 602. Precast concrete box culverts shall be subject to the requirements of AASHTO M 199. Units so manufactured must be certified by a professional engineer registered in the State of Arkansas that they have been designed and manufactured according to AASHTO M199 and that they meet the requirements for HS20 loading.

**303.03 Construction Requirements.** Concrete box culverts shall be constructed on firm, unyielding material. Unsuitable material found at the planned elevation of the box bottom shall be removed and replaced with material acceptable to the Engineer/City Engineer to provide an adequate foundation for construction of the box culvert. No concrete shall be placed before approval of the subgrade by the Engineer/City Engineer.

Reinforcing steel and concrete for box culverts shall be provided and placed in accordance with Sections 601 and 602 and as detailed on the plans. All concrete shall be placed in the dry unless otherwise directed by the Engineer/City Engineer.

Precast box culverts shall be placed in accordance with Section 301.03.

Backfill material placed within the roadway limits (defined as centerline of roadway to 1' behind the back of curb) or under driveways and parking lots shall be AHTD Class 7 aggregate base material or gravelly clay material, generally known as "hillside". Aggregate base shall be placed in layers not to exceed 4" loose depth and shall be compacted to 95% of maximum density as determined by AASHTO T 180 or ASTM D1557. "Hillside" material shall be placed in layers not to exceed 8" loose depth and shall be compacted to 95% of maximum density as determined by AASHTO T 99 or ASTM D698.

Backfill material placed in other areas shall be "hillside" material or other material that may be approved by the Engineer/City Engineer. Backfill in these areas shall be placed in layers not to exceed 8" loose depth and shall be compacted to 90% of maximum density as determined by AASHTO T 99 or ASTM D698.

No backfill shall be placed against box culvert walls or on box culvert tops until the concrete has cured for 14 days and until test cylinders show that the minimum specified strength has been obtained.

Backfill shall be placed and compacted on both sides of the box culvert simultaneously.

**303.04 Method of Measurement.** Measurement will be by one of the following methods as detailed below. The method to be used will be stated in the bid form.

**(a) Lump Sum Method.** No measurement will be made for this item. Payment will be on a lump sum basis.

**(b) Unit Price Method.** Concrete box culverts will be measured by the linear foot (LF) of box culvert constructed. Measurement will be taken at the centerline of the box culvert. Wingwalls, headwalls, and other appurtenances will not be measured under this item but will be considered as a separate lump sum item.

**303.05 Basis of Payment.**

**(a) Lump Sum Method.** Payment using this method will be on a lump sum basis. The lump sum price shall include all labor, materials, equipment, and incidentals necessary to completely construct each box culvert. Payment shall also include construction of all wingwalls, headwalls, and other appurtenances, as shown on the plans, excavation, backfill, and over excavation as necessary to provide a stable subgrade for box culvert construction.

**(b) Unit Price Method.** Payment using this method will be made at the per linear foot price (LF) for box culvert completed, accepted and measured as provided above. The per lineal foot price shall include all labor, materials, equipment, and incidentals necessary to completely construct each box culvert. Payment shall also include excavation, backfill, and over excavation as necessary to provide a stable subgrade for box culvert construction. This per linear foot price shall not include construction of headwalls, wingwalls, and other appurtenances. They will be paid on a lump sum basis for each box culvert.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
(Size) Cast-in-Place Concrete Box Culvert	LS or LF
(Size) Precast Concrete Box Culvert	LS of LF
Wingwalls & Appurtenances	LS

## **Section 304. Vacant**

## **Section 305. Open Channels**

**305.01 Description.** This work consists of construction of open channels, including earthen and concrete channels.

**305.02 Channel Excavation.** Channels shall be excavated to the lines and grades shown on the plans. All constructed grades and slopes shall be within  $\pm 0.1$  feet of the plan grade. Ponding or standing water in the constructed channel will not be allowed.

**305.03 Earthen Channel Finishes.** Earthen channels shall receive a 4" minimum layer of topsoil meeting the requirements of Section 204. Topsoil shall be firmly compacted, then the surface scarified in preparation for seed or sod. All rocks and clods larger than 1 inch in diameter shall be removed before seeding or sodding operations begin. Seeding or sodding as specified on the plans shall be accomplished according to the requirements of Section 505.

Erosion control fabric, if specified, shall be placed according to manufacturer's specifications. Fabric shall be of the type specified unless an alternate type is approved in writing by the City. The Contractor shall submit a sample of the alternate fabric type along with specifications before such approval is granted.

**305.04 Concrete Ditch Paving.**

**(a) Materials.** Concrete for ditch paving shall be Class A concrete in accordance with section 601.

**(b) Construction Requirements.**

- 1) **Subgrade.** The subgrade shall be excavated or filled to the required grade. Soft and yielding material shall be removed and replaced with suitable material and the entire subgrade shall be thoroughly compacted.
- 2) **Forms.** Forms shall be constructed of metal or wood, free from warp, and of sufficient strength to resist springing during the process of depositing concrete. They shall be securely staked, braced, set, and held firmly to the required line and grade. Forms shall be cleaned and oiled before concrete is placed against them.
- 3) **Placing and Finishing.** The concrete shall be deposited in the forms upon a wetted subgrade to such depth that when it is compacted and finished, the flow line shall be at the required elevation and the sides at required widths, slopes, and thicknesses. The concrete shall be thoroughly compacted and the edges along the forms spaded to prevent honeycomb. The flow lines and sides shall be struck off with a straightedge and tamped sufficiently to flush mortar to the surface, after which it shall be finished with a wood float to a smooth and even surface. Edges shall be rounded with a 1/4" edger.

Transverse joints 1/4" wide shall be tooled or sawed perpendicular to the flow line at intervals not greater than 15' measured longitudinally along the flow line. Joints shall continue across the bottom and up the slope to form a continuous joint. 3" diameter weepholes shall be spaced at 10' intervals along the channel. These weepholes shall be constructed in both channel walls a minimum of 6 inches and a maximum of 1 foot above the channel flowline. Weepholes will not be required if the channel wall is less than 1' tall.

When completed, the concrete shall be cured as specified in Section 601.

- 4) **Backfilling.** Immediately after the forms have been removed, the spaces on each side of the paving shall be backfilled with suitable material and compacted with mechanical equipment. Solid sodding shall be placed in conjunction with backfill when provided on the plans.
- 5) **Expansion Joints.** When a section of ditch paving terminates at a drop inlet or other structure, a space not less than ½” wide shall be left between the end of the paving and the structure. This space shall be filled with joint filler conforming to the requirements of AASHTO M 213. Expansion joints shall also be placed between successive placements or as directed by the Engineer/City Engineer.
- 6) **Placement on Slopes.** Slope paving shall begin at the toe of the slope and be constructed to the lines and dimensions as shown on the plans or as directed.
- 7) **Toewalls.** Concrete toewalls shall be constructed at the ends of all paved channels that do not terminate at a concrete structure. Toewalls shall be a minimum of 8” thick and 3’ deep below the flowline of the channel, and shall be placed monolithically with the concrete channel.

#### **305.05 Method of Measurement.**

(a) Excavation for earthen or concrete channels shall be measured by the cubic yard (CY) of material removed. Quantities will be measured by cross sections taken before and after excavation operations. Payment for plan quantity of channel excavation will be made unless a change in the channel profile or cross section is made.

(b) Concrete channels will be measured by the square yard (SY) of concrete placed.

(c) Erosion control fabric will be measured by the square yard (SY) of area covered by fabric. Overlaps, splices, and other additional fabric required for proper placement of fabric according to manufacturers specifications will not be measured.

**305.06 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price per square yard for concrete channels and per square yard for erosion control fabric. Said price shall be full compensation for placement and finishing of concrete as specified, placement of erosion control fabric per manufacturer’s specifications, and all other labor, equipment, and materials necessary for a complete installation of each item as detailed on the plans.

Excavation will be paid on a CY basis. The plan quantity will be considered the final quantity for purposes of final payment, unless changes to the original design are made. Payment for excavation shall include excavation and removal of material as required, grading to proposed elevations, and all other items of work required to prepare proposed channel areas for concrete or topsoil as required. Topsoil, seeding, and sodding as specified or shown on the plans will be paid for under other items of work.

Payment will be made under:

**Pay Item**

**Pay Unit**

Channel Excavation	CY (Plan Quantity)
Concrete Channel Paving	SY
Erosion Control Fabric	SY

**Section 306. Filter Blanket and Riprap**

**306.01 Description.** This item consists of a protective layer of riprap, including filter blanket.

**306.02 Materials.** Stone for riprap shall be from an approved source and shall consist of a durable material with a percent of wear not greater than 45 by the Los Angeles Abrasion Test (AASHTO T96). Riprap stone shall have angular or fractured faces, and shall not weigh less than 140 pounds per cubic foot.

Riprap stone shall be well graded to produce a minimum of voids. The maximum size of each piece shall be no greater than 18” in any dimension, and approximately 50% of material shall consist of pieces weighing 35 pounds or more.

Filter blanket material shall consist of crushed stone reasonably well graded from coarse to fine as approved by the Engineer/City Engineer, or shall be a synthetic geotextile filter fabric meeting the requirements of AASHTO M288 for Erosion Control Class A.

**306.03 Construction Requirements.**

**(a) General.** Prior to placing filter blanket and riprap, the slopes shall be shaped as shown on the plans. When rock or hard shale is encountered at the toe of the slope, the riprap shall be keyed into this material the depth of the riprap.

Riprap shall be placed immediately following construction of the embankment in order to provide slope protection.

**(b) Filter Blanket.** Granular filter blanket material shall be spread uniformly on the previously prepared and approved surface to the thickness and location shown on the plans. Placement of the material by methods that will cause segregation or cause damage to the surface will not be permitted. Compaction of filter blanket will not be required, but it shall be finished to present a reasonably even surface free from mounds or windrows.

When fabric is used in lieu of granular material, it shall be placed directly on the prepared surface. Fabric sections may be placed vertically or horizontally on the slope. Adjacent fabric sections shall be joined by overlapping a minimum of 2’ at the edges and pinning the overlapped strip with U-shaped wire pins, single shaped steel pins with metal disc heads, or similar fasteners. The fasteners shall be 6” or more in length and shall hold the fabric firmly in place. Fasteners shall be inserted through both strips of overlapped fabric at intervals of approximately 4’ along the overlap. Additional pins shall be installed as necessary to prevent displacement of the fabric.

Fabric shall be overlapped in the direction of water flow. The fabric shall be turned down and buried approximately 12” at the exterior limits.

No construction equipment will be permitted directly on the fabric.

**(c) Dumped Riprap.** Stone or broken concrete for dumped riprap shall be placed in such a manner as to produce a reasonably well graded mass of rock with the minimum practicable percentage of voids and shall be constructed to the lines and grades shown on the plans or as directed by the Engineer/City Engineer. Unless otherwise specified, the minimum rip-rap depth shall be 18 inches. Material shall be placed in such a manner as to avoid displacing the underlying material. The larger pieces shall be well distributed throughout the entire mass and the finished riprap shall be free from objectionable pockets of small or large pieces. Hand placing, to a limited extent, may be required, but only to the extent necessary to secure the results specified above. Placing riprap by dumping into chutes or by similar methods likely to cause segregation of various sizes will not be permitted.

Riprap stone shall not be deposited in a manner that will cause damage to the filter blanket. Any damage to fabric during placement of riprap shall be corrected by the Contractor at no cost to the City prior to proceeding with the work. Damaged fabric shall be repaired by placing a piece of fabric large enough to cover the damaged area, overlapping, and pinning in accordance with this section.

**306.04 Measurement and Payment.** Quantities of 18” thick rip-rap will be measured by the square yard (SY). Filter blanket will not be measured.

Payment for quantities of rip-rap completed and accepted and measured as provided above will be paid for at the unit contract price bid per square yard. Said price shall be full compensation for excavation and grading, placement of filter fabric, and placement of the rip-rap to the lines, grades, and depth specified.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Rip Rap	SY

## **Section 307. Flowable Select Material**

**307.01 Description.** This item shall consist of the furnishing, mixing, and placing a flowable mixture of portland cement, fly ash, sand, and water for backfilling bridge abutments, pipe culverts, box culverts, structural plate pipe and arches, or other uses as approved by the Engineer/City Engineer. The material shall be placed in close conformity with the lines, grades, dimensions, and details shown on the plans or established by the Engineer.

**307.02 Materials.** The materials used in the flowable select material shall conform to the applicable requirements of Section 601. The portland cement, fly ash, and chemical admixtures shall be listed on the QPL.

**(a) Mix Design.** The mix design will be prepared by the Contractor. The mixture will be proportioned to produce a flowable mixture without segregation. Material for one cubic yard, absolute volume, shall be as follows:

Cement 80 - 100 lbs.  
Fly ash 220 - 300 lbs.  
Sand Variable to equal one cubic yard  
Water Approximately 65 gallons

The minimum flow of the mixture shall be 8" as determined by the test method described herein. The unit weight shall be a minimum of 110 lbs./cubic foot. The mix design shall be accompanied by the following documentation:

- A listing of the weights of all components of the proposed mix (water and admixtures may be measured by volume);
- Certified test results for flow and unit weight.

When unsatisfactory results or other conditions make it necessary, a new mix design will be established.

**(b) Sampling and Testing.** Sampling and testing will be performed by the City. The flow test shall consist of filling a 3" diameter x 6" high open-ended cylinder to the top with the flowable material mixture. If necessary, the top of the mixture will be struck off level. The cylinder will then be pulled straight up and the flow will be measured by the approximate diameter of the mixture. There shall be no evidence of segregation in the mixture. The unit weight shall be determined according to AASHTO T 121, except that rodding and tapping shall not be done.

**307.03 Construction Requirements.** The Contractor shall provide sufficient supervision, labor, equipment, tools, and materials to assure proper production, delivery, and placement. When deemed necessary by the Engineer/City Engineer, the flowable select material shall be contained within the designated area by metal or wood forms that are sufficiently tight as to keep the loss of material to a minimum, or by other means as approved by the Engineer/City Engineer. The flowable select material shall be discharged from the mixer and conveyed into the space to be filled according to Section 601. The fill material shall be brought up uniformly to the fill line shown on the plans or as directed by the Engineer/City Engineer. Placing of other material over flowable select material may begin after the flowable select material has taken its initial set, is stable, and does not displace under equipment.

**307.04 Method of Measurement.** Flowable Select Material will be measured by the cubic yard. The quantities shown included in the proposal will be considered the final quantities and no further measurement will be made unless, in the opinion of the Engineer or upon evidence furnished by the Contractor, substantial variations exist between the planned quantities and actual quantities due to changes in alignment or dimensions or to apparent errors.

**307.05 Basis of Payment.** Work completed, accepted, and measured as provided above will be paid for at the contract unit price bid per cubic yard for Flowable Select Material, which

price shall be full compensation for designing the mix; for furnishing, mixing, and placing the material; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Flowable Select Material	CY

## **DIVISION 400. BASE AND PAVING**

### **Section 401. Aggregate Base Course**

**401.01 Description.** This work consists of preparing an aggregate base course on a prepared foundation.

**401.02 Materials.** Materials for aggregate base course shall meet the requirements of the AHTD Standard Specifications (2003) Section 303 for Class 7.

**401.03 Construction Requirements.** The base course material shall be placed on a completed and approved subgrade or existing base that has been bladed to substantially conform to the grade and cross section shown on the plans.

The subgrade shall be prepared as specified in Section 203 and shall be free from an excess or deficiency of moisture at the time of placing base course material. The subgrade shall also comply, where applicable, with the requirements of other items that may be contained in the Contract that provide for the construction, reconstruction, or shaping of the subgrade or the reconstruction of the existing base course. Base course material shall not be placed on a frozen subgrade or subbase.

The aggregate shall be placed on the subgrade or other base course material and spread uniformly to such depth and lines that when compacted it will have the thickness, width, and cross section shown on the plans. Unless otherwise specified or directed, base material shall extend full depth to 1' beyond the planned back of curb line.

If the specified compacted depth of the base course exceeds 8" the base shall be constructed in two or more layers of approximately equal thickness.

The material shall be spread the same day that it is hauled. Spreading shall be performed in such a manner that no segregation of coarse and fine particles nor nests or hard areas caused by dumping the aggregate on the subgrade will exist. Care shall be taken to prevent mixing of subgrade or unspecified material with the base course material in the blading and spreading operation.

When the base course is placed adjacent to an existing or newly constructed asphalt surface course or portland cement concrete pavement, the aggregate shall not be dumped or mixed on the pavement surface. Mechanical spreading equipment shall be used, if necessary, to place the base course on the subgrade.

Each course shall be thoroughly mixed for the full depth of the course and shall be compacted by any satisfactory method that will produce the density specified. The aggregate shall be maintained substantially at optimum moisture during the mixing, spreading, and compacting operations. The specified grade and cross section shall be maintained by blading throughout the compaction operation. The material in each course shall be compacted to a density, not less than 95% of the maximum density determined in the laboratory by AASHTO T 180 or ASTM D1557. The aggregate shall be compacted across the full width of application.

The compacted base course shall be tested for depth and any deficiencies corrected by scarifying, placing additional material, mixing, reshaping, and recompacting to the specified density, as directed. The base course shall be shaped for its full width to the required grade and cross section. The finished base course layer shall not vary at any point by more than .02 foot from the prescribed elevation.

The Contractor shall maintain the base course in a satisfactory condition until accepted.

**401.04 Method of Measurement.** Aggregate base course will be measured in square yards of material in place per the plans. Measurement will include areas up to 1' behind the backs of curbs if required on the plans. Aggregate base course placed beyond 1' behind the back of curbs will not be measured.

**401.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per square yard for Aggregate Base Course, which price shall be full compensation for preparing the subgrade; for furnishing material; for spreading; finishing, watering, manipulating, and compacting; and for all labor, equipment, tools, and incidentals necessary to complete the work.

<u>Pay Item</u>	<u>Pay Unit</u>
(Depth) Aggregate Base Course	SY

## Section 402. Prime and Tack Coats

**402.01 Description.** This work consists of preparing and treating an existing surface with asphalt and, if required, blotter material.

### 402.02 Materials.

(a) **Asphalt.** Asphalt cement shall meet the requirements of AASHTO M 20 or M 226.

(b) **Emulsified Asphalt.** Emulsified asphalt shall meet the requirements of AASHTO M 140 or M 208.

(c) **Blotter Material.** Aggregate for blotter material shall meet the requirements of AASHTO M 43 for size 10.

Asphalt will be conditionally accepted at the source. Blotter material may be accepted in the stockpile, at the source, or at the roadway prior to placement.

### 402.03 Construction Requirements.

(a) **Weather Limitations.** Prime and tack coats shall not be applied on a wet surface, when the surface temperature is below 45 degrees F, or when weather conditions would prevent the proper construction of the prime or tack coat.

(b) **Equipment.** The contractor shall provide equipment for heating the asphalt and uniformly applying the asphalt and blotter material. The distributor shall be capable of uniformly distributing prime and tack coats at even temperatures on variable surface widths at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard. Distributor equipment shall include a tachometer, pressure gages, volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents.

(c) **Preparation of Surface.** Surfaces to be primed shall be shaped to the required grade and section, free from all ruts, corrugations, segregated material, or other irregularities and uniformly compacted and broomed. Surfaces to receive tack coat shall be free of dirt, gravel, and other debris and shall be thoroughly washed and broomed to produce a clean and dry surface.

(d) **Application of Asphalt.** Asphalt shall be applied by a pressure distributor in a uniform, continuous spread. When traffic is maintained, not more than ½ the width of the section shall be treated in one application. Care shall be taken so the application of asphalt at the junctions of spreads is not in excess of the specified amount. Excess asphalt shall be squeegeed from the surface. Skipped areas or deficiencies shall be corrected. Building paper shall be placed over the end of the previous applications, and the joining application shall start on the building paper. Building paper used shall be removed and satisfactorily disposed of.

When traffic is maintained, one-way traffic shall be permitted on the untreated portion of the roadbed. After the asphalt has been absorbed by the surface and will not pick up, traffic shall be transferred to the treated portion and the remaining width of the section shall be primed.

The quantities, rate of application, temperatures, and areas to be treated shall be approved before application of the prime or tack coat.

(e) **Application of Blotter Material.** If the prime coat fails to penetrate within the time specified and the roadway must be used by traffic, blotter material shall be spread in the quantities required to absorb any excess asphalt.

**402.04 Measurement and Payment.** Prime coat, when required, will be measured and paid for per square yard of material placed at the required application rate. Tack coat will not be measured and will be subsidiary to other items. Blotter material will not be measured but will be subsidiary to other items.

**Pay Item**

**Pay Unit**

Prime Coat

SY

## **Section 403. Asphalt Concrete Hot Mix**

**403.01 Description.** This item consists of furnishing and placing asphalt concrete hot mix of the type specified on a prepared foundation.

### **403.02 Materials, Design, and Quality Control of Marshall Mixes**

**(a) Materials** Materials for Asphalt Concrete Binder Course shall meet the requirements of Section 406 of the AHTD Standard Specifications Edition of 1996. Materials for Asphalt Concrete Surface Course shall meet the requirements of Section 407 of the AHTD Standard Specifications Edition of 1996.

**(b) Design and Quality Control Requirements** Design and quality control of Marshall mixes shall be as specified in Section 404 of the AHTD Standard Specifications Edition of 1996.

**(c) Materials and Equipment for Asphalt Concrete Plant Mix Courses** Materials and equipment for asphalt concrete plant mix courses shall meet the requirements of Section 409 of the AHTD Standard Specifications Edition of 2003.

### **403.03 Materials, Design, and Quality Control of Superpave Mixes**

**(a) Materials** Materials for Asphalt Concrete Binder Course shall meet the requirements of Section 406 of the AHTD Standard Specifications Edition of 2003. Materials for Asphalt Concrete Surface Course shall meet the requirements of Section 407 of the AHTD Standard Specifications Edition of 2003.

**(b) Design and Quality Control Requirements** Design and quality control of Superpave mixes shall be as specified in Section 404 of the AHTD Standard Specifications Edition of 2003.

**(c) Materials and Equipment for Asphalt Concrete Plant Mix Courses** Materials and equipment for asphalt concrete plant mix courses shall meet the requirements of Section 409 of the AHTD Standard Specifications Edition of 2003, except for the requirements of Section 409.04(b) is at the contractor's option. If a material transfer device is used, the requirements of Section 409.04(b) shall apply.

### **403.04 Construction Requirements.**

**(a) Description.** The methods employed in performing the work shall be at the Contractor's option. When the production and/or placement of the material does not comply with the specifications, the Contractor shall make the changes necessary to bring the work into compliance.

**(b) Pre-Placement Conference.** Unless waived by the Engineer, prior to the start of paving operations the Contractor shall conduct a Pre-Placement Conference involving the Contractor's personnel and the Engineer and City's personnel. The Contractor's proposed plant, delivery, laydown, compaction, and equipment shall be discussed and, if deemed necessary by the City, all the equipment inspected. The accepted mix designs and materials to

be used shall be discussed. The proposed mixing and compaction temperatures, sampling and testing plan, haul route, rolling pattern, and other pertinent information shall be discussed. The Pre-Placement Conference and all items discussed shall be documented by the Contractor and furnished to the Engineer within ten calendar days after the Pre-Placement Conference.

**(c) Preparation of Mixture.** The aggregates, mineral filler, and asphalt binder shall be measured separately and accurately mixed in the proper proportions according to the mix design. The aggregates shall be thoroughly coated and the mixture shall not show an excess or deficiency of asphalt binder, injury or damage due to burning or overheating, or an improper combination of aggregates. The continuous production of ACHM shall be within plus or minus 25° F (14° C) of the mixing temperature shown on the approved mix design. Momentary temperature spikes shall be kept to a minimum.

**(d) Preparation of Base or Existing Surface.** Newly constructed base courses or subgrade shall be prepared as set forth in the specification item covering such items.

Prior to placing asphalt base, binder, or surface courses, all required corrections of the existing pavement or base, such as filling potholes, sags, and depressions, or alterations of the existing pavement crown, shall be made. Such corrections shall be accomplished by placing asphalt binder or surface course mixtures at the location and in a manner as directed by the Engineer/City Engineer. Asphalt material used for wedging or leveling courses, or for fillings holes, may be placed by hand, blade grader, or mechanical spreader methods. The mixture shall be featheredged to a smooth and even surface around the edges of these areas.

Prior to arrival of the mixture on the work, the prepared surface shall be cleaned of all loose and foreign materials and primed or tack coated as specified. Excessive joint and crack filler shall be removed before application of the prime or tack coat. The mixture shall not be placed on a surface that shows evidence of free moisture.

Contact surfaces of curbing, gutters, manholes, and other structures shall be painted with a thin coating of rapid curing cutback asphalt or emulsified asphalt. No direct compensation will be made for this work.

If the earlier course has been contaminated with dirt or other foreign materials, or when the time lapse between courses is in excess of 72 hours, the earlier course shall be cleaned and given a tack coat prior to placing the succeeding course. If directed by the Engineer/City Engineer, a tack coat shall be used even though the lapsed time has been less than 72 hours.

**(e) Transporting.** The mixture shall be transported from the mixing plant to the work in vehicles with clean tight beds.

When the mixture is being hauled more than 15 miles or when the mixture is being placed between November 1 and April 1, the beds of the vehicles shall be covered with canvas or other suitable material to retard loss of heat. The cover shall extend over the sides and ends of the truck bed and shall be securely fastened. When the mixture is being hauled less than 15 miles the cover shall be stored on the truck at all times to be utilized when overtaken by sudden rains.

No loads shall be sent so late in the day as to interfere with spreading and compacting the mixture during daylight hours unless adequate artificial lighting is provided.

Sufficient haul vehicles and plant production rate shall be maintained to the project to provide a continuous operation on the roadway.

Only non-petroleum release agents approved by the Engineer/City Engineer shall be used in haul trucks.

**(f) Spreading and Finishing.** The mixture shall be placed on an approved surface, spread, and struck off to the line, grade, and elevation established. The mixture shall be placed only on a base that shows no evidence of free moisture, and only when weather conditions are suitable.

The mixture from all types of plants should be delivered to the paver within the recommended compaction temperature range as shown on the approved job mix design. These recommended temperatures should be used in placing and compacting the material. In addition, surface and binder course mixtures shall not be placed on the roadway at a temperature lower than 250° F.

The paver shall uniformly distribute and compact the mixture in front of the screed for the full width being paved. The screed or strike-off assembly shall effectively produce a finished surface of smooth and uniform texture without tearing, shoving, or gouging the mixture. The paver shall be operated at forward speeds consistent with satisfactory laying of the mixture. The speed of the paver shall be matched with the plant production rate and number of hauling units. Stop and go operation of the paver is to be avoided.

The longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6". In general, the joint in the top layer shall be at the centerline of the pavement if the asphalt is placed in 2 passes or less, or at lane lines if the asphalt is placed in more than 2 passes.

**(g) Rolling and Density Requirements and Joints.** The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement.

At the beginning of placement of each mix design, the Contractor shall establish an optimum rolling pattern that will achieve the specified density for the mix being placed. The Contractor may continue with paving operations while the optimum rolling pattern is being established. The established rolling pattern shall be used for compacting all mix placed unless a change in the job mix formula occurs or unacceptable results are obtained. Whenever a change in the job mix formula occurs, or when the compaction method or equipment is changed, or when unacceptable results are obtained, a new optimum rolling pattern shall be established.

The number, weight, and type of rollers, and the optimum rolling pattern shall be such that the specified density and surface requirements are consistently attained while the mixture is in a workable condition. Final approval of the rollers and the rolling pattern will be based upon

satisfactory performance and the ability to compact the mixture to the specified density and surface requirements. Rollers that produce excessive crushing of aggregate particles will not be permitted.

When using vibratory rollers, the Contractor shall exercise due caution to prevent any deterioration of the material caused by excessive rolling or vibration. Vibratory rollers shall be operated in such a manner that overlap of adjacent passes shall be held to a minimum. Vibration shall not be used on courses less than 1 ½ “ thick.

Rolling shall start longitudinally at the low edge and proceed toward the higher portion of the mat. When paving in echelon or abutting the previously placed lane, the longitudinal joint shall be rolled first followed by the regular rolling procedure. Alternate passes of the roller shall be terminated at least 3’ from any preceding stop. Rolling on superelevated curves shall progress from the low side. Rollers shall not be stopped perpendicular to the centerline of the traveled way.

The speed of the roller shall be slow enough to avoid displacement of the hot mixture, and in no case more than 3 mph. The roller shall be operated in such a manner that no displacement of the mat will occur. Rolling shall proceed continuously until the required density is attained and all roller marks are eliminated, leaving the surface smooth and uniform and the required density attained. To prevent adhesion of the asphalt mixture to the rollers, the rollers shall be kept moist for the full width of the rollers, but excess water will not be permitted.

Rollers shall not pass over the unprotected end of a freshly laid mixture. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course. A brush coat of asphalt material shall be used on contact surfaces of transverse joints just before additional mixture is placed against the previously placed material.

**(h) Weather Limitations.** Bituminous mixtures shall not be placed on any wet or frozen surface or when weather conditions otherwise prevent the proper handling and finishing of the mixture.

Bituminous mixtures may only be placed when either the ambient air temperature or the road surface temperature is equal to or greater than that shown in the table.

Regardless of the temperatures herein specified, paving will not be allowed unless specific density, either by percent of field mold density or by rolling procedure, can be achieved before the bituminous mixture cools to 175 degrees Fahrenheit.

Bituminous Placement Temperature Limitations:

<b>Paving Course</b>	<b>Thickness (Inches)</b>	<b>Min. Air Temperature (Degrees F.)</b>	<b>Min. Road Surface Temperature (Degrees F.)</b>
Surface	All	45	50
Subsurface	Less than 3	40	45
Subsurface	3 or more	30	35

#### **403.05 Acceptance of Pavement and Adjustments in Payment.**

(a) **Marshall Mixes.** Acceptance of asphalt payment designed using the Marshall Method shall be according to Section 410.09 of the AHTD Standard Specifications Edition of 1996 except as modified herein.

(b) **Superpave Mixes** Acceptance of asphalt payment designed using Superpave Methods shall be according to Section 410.09 of the AHTD Standard Specifications Edition of 2003 except as modified herein.

**403.06 Modifications and Augmentations of AHTD Standard Specifications.** Modifications and augmentations of AHTD Standard Specifications detailed in this subsection apply to both the 1996 and 2003 Editions of the Standard Specifications.

Samples for all properties except density, thickness, and the investigation of segregation shall be obtained from trucks at the plant. The contractor/testing agency shall clearly mark the load ticket of each sampled truck to indicate that the load has been sampled.

The Contractor shall provide the straight-edge for use in pavement smoothness testing.

Sublot sizes for density and depth measurements will be 500 tons, and lot sizes will be 3000 tons. Locations for cores to be taken for density and depth testing will be determined using AHTD Test Method #465.

Compliance, price reduction, and rejection limits for density will be in accordance with Table 410-1 of the AHTD Standard Specifications. Calculations of price reductions will be in accordance with 410.09(d)(5) of the AHTD Standard Specifications. For asphalt that is outside the limits shown as lot rejection limits but within the limits shown as sublot rejection limits in Table 410-1, the City shall determine if that mix shall be removed at the contractor's expense or left in place without pay to contractor.

All asphalt that is outside the limits shown as sublot rejection limits shall be removed in accordance with this section.

For small projects (less than 1500 tons total) price reduction amounts shall be reduced to 50% of the amounts specified in Section 410 of the AHTD Standard Specifications.

Thickness of the finished asphalt will be monitored by measuring the thickness of the density cores taken. The average of all depth measurements shall not be less than the required depth shown on the plans. Depth of any core in excess of plus three-eighths inch (+ 3/8") will not be used in computing the average depth. If the average depth is less than the required depth, it will be corrected by overlaying with additional ACHM surface, or as directed by the Engineer/City Engineer.

In addition, thickness of individual cores shall not be less than 3/8" less than the plan depth.

The method for determining the limits of removal for density or depth is as follows: If a single core test falls outside of the limits shown as "Sublot Rejection Limits" in 410-1, two additional tests shall be run in close proximity (within three feet). If the average of these

three tests is within the subplot rejection limits in Table 410-1, then this average shall become the value for the density of this subplot. If the average of the three tests is still outside of the subplot rejection limits, tests shall be run at 50-foot intervals in both directions until results are found that are within the subplot rejection limits.

All asphalt that is outside of the limits shown as subplot rejection limits as determined by the above method shall be removed and replaced. After replacement, a core shall be taken in the replacement asphalt and the density determined. The average of this density test and the two isolation tests shall become the density for the subplot.

The contractor shall do all coring and testing for density and depth at no additional cost to the City. The City may require additional cores cut for verification of the contractor's test. Verification testing will be paid for by the City.

When lots and subplot divisions for initial and final courses do not coincide, the Contractor may be required to take additional samples (full-depth) at his expense to determine asphalt thickness. Locations of such cores shall be approved by the Engineer.

Section 410.10 of the AHTD Standard Specifications will not be used under this contract.

**403.07 Method of Measurement.** Asphalt concrete hot mix (ACHM) will be measured by the square yard of material in place as indicated on the plans. Deductions for asphalt placed in areas not designated in the plans and not directed by the Engineer/City Engineer or for asphalt placed at depths more than 1/8" over plan depth will be made at the discretion of the Engineer/City Engineer. Measurement of these deductions will be by a method deemed appropriate by the Engineer/City Engineer.

**403.08 Basis of Payment.** Asphalt concrete hot mix will be paid for at the contract unit price bid per square yard of material placed in plan locations; said price shall include furnishing mix designs, furnishing material, tack coats, for heating, mixing, hauling, placing, rolling, finishing, and for all other labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Asphalt Concrete Hot Mix Binder Course (ACHMBC)	SY
Asphalt Concrete Hot Mix Surface Course (ACHMSC)	SY

## **Section 404. Asphalt Concrete Hot Mix Base Course**

**404.01 Description.** This item shall consist of a base course constructed on an accepted course according to these specifications and in substantial conformity with the lines, grades, and typical cross sections shown on the plans.

**404.02 Materials.** The materials and equipment shall comply with the requirements of Asphalt Concrete Hot Mix Base Course (Section 405 of the AHTD Standard Specifications).

**404.03 Construction Requirements.** Construction requirements shall comply with the requirements of Asphalt Concrete Hot Mix Base Course (Section 405 of the AHTD Standard Specifications).

**404.04 Method of Measurement.** Asphalt Concrete Hot Mix Base Course will be measured by the square yard of material in place as indicated on the plans. Deductions for asphalt placed in areas not designated in the plans and not directed by the Engineer/City Engineer or for asphalt placed at depths more than 1/8” over plan depth will be made at the discretion of the Engineer/City Engineer. Measurement of these deductions will be by a method deemed appropriate by the Engineer/City Engineer.

**404.05 Basis of Payment.** Asphalt Concrete Hot Mix Base Course will be paid for at the contract unit price bid per square yard of material placed in plan locations; said price shall include furnishing mix designs, furnishing material, for heating, mixing, hauling, placing, rolling, finishing, and for all other labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Asphalt Concrete Hot Mix Base Course	SY

## **Section 405. Asphalt Concrete Patching for Maintenance of Traffic**

**405.01 Description.** This item shall consist of an asphalt concrete material composed of mineral aggregate and asphalt binder for use in patching to maintain traffic. This item is to be placed if and where directed on the plans or by the Engineer/City Engineer.

**405.02 Materials and Composition.** Materials and equipment shall conform to the requirements of ACHM Surface Course or Asphalt Concrete Cold Plant Mix (Section 411 of AHTD Standard Specifications).

**405.03 Construction Requirements.** Construction requirements shall conform, insofar as possible, to Section 406.

**405.04 Method of Measurement.** Asphalt Concrete Patching for Maintenance of Traffic will be measured by the ton of mix placed as directed by the Engineer/City Engineer.

**405.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per ton for Asphalt Concrete Patching for Maintenance of Traffic, which price shall be full compensation for furnishing materials; for heating, mixing, hauling, placing, and compacting; and for all labor, equipment, tools, and incidentals necessary to complete the work. No payment will be made for:

- Material placed with out authorization of Engineer/City Engineer.
- Material placed to repair previously patched areas unless approved by the Engineer/City Engineer.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Asphalt Concrete Patching for Maintenance of Traffic	Ton

## **Section 406. Asphalt Concrete Hot Mix Patching of Existing Roadway**

**406.01 Description.** This item shall consist of patching the existing roadway using asphalt concrete material composed of mineral aggregate and asphalt binder.

**406.02 Materials and Composition.** Materials shall conform to the requirements of Section 402, Tack Coat and Section 403.

**406.03 Construction Requirements.** Unstable areas in existing roadways and shoulders, designated by the Engineer/City Engineer to be repaired, shall be removed to provide firm vertical sides and a firm, stable, bottom generally parallel with the existing surface. All loose or foreign material shall be removed from the hole. A tack coat of emulsified asphalt shall be applied to the sides of the hole. Asphalt Concrete Hot Mix Binder or Surface Course shall be placed in the hole in uniform layers, not to exceed 4 inches loose measurement. Compaction, satisfactory to the Engineer/City Engineer, shall be accomplished with a mechanical tamper or other approved methods. The finished surface shall be smooth and level with the surrounding surface.

**406.04 Method of Measurement.** Asphalt Concrete Hot Mix Patching of Existing Roadway will be measured by the ton of mix.

**406.05 Basis of Payment.** Work completed and accepted and measured as provided above, will be paid for at the contract unit price bid per ton for ACHM Patching of Existing Roadway, which price shall be full compensation for excavation of the existing roadway; for removal and disposal of excavated material; for compacting and tacking the excavated area; for furnishing materials; for heating, mixing, hauling, placing, and compacting the materials; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
ACHM Patching of Existing Roadway	Ton

## **DIVISION 500. MISCELLANEOUS CONSTRUCTION**

### **Section 501. Concrete Curb and Gutter**

**501.01 Description.** This item shall consist of the construction of integral curb, concrete curb, or concrete combination curb and gutter according to these specifications and in conformity with the locations, lines, and grades shown on the plans or as directed.

**501.02 Materials.** The Concrete shall be Class B Concrete as provided in Section 601. The maximum allowable slump shall be 4 inches.

When an extrusion machine is used, the Contractor may modify the concrete mix design, upon approval of the Engineer/City Engineer, to improve workability while maintaining the requirements for Class B Concrete.

Material for joint filler shall comply with AASHTO M 213.

#### **501.03 Construction Requirements.**

**(a) Subgrade.** The subgrade shall be shaped to the required depth below the finished surface, according to the dimensions shown on the plans, and shall be compacted to a firm, even surface. Where curb is to be placed as part of a street, the compaction requirements of the street shall apply to the subgrade and base course underneath the curb.

#### **(b) Placing and Finishing.**

- 1) **Integral Curb.** After the concrete pavement has been struck off, the curb forms shall be clamped or otherwise securely fastened in place to the slab form and additional concrete for the curb shall then be deposited and thoroughly tamped. The concrete shall be placed within 30 minutes after the pavement slab has been finished and care shall be taken to secure monolithic construction. The concrete shall be spaded or vibrated sufficiently to eliminate voids and shall be tamped to bring the mortar to the surface. It shall then be finished smooth and even with a wood float and given a Class 6 finish according to Section 601.16. The edges shall be rounded with an approved finishing tool to the radius shown on the plans.
- 2) **Concrete Curb or Concrete Combination Curb and Gutter.** The concrete shall be deposited in the forms upon wetted subgrade and vibrated and spaded until mortar entirely covers the surface, after which it shall be finished smooth and even by means of a wood float and given a Class 6 finish according to Section 601.16. Edges shall be rounded as shown on the plans while the concrete is still plastic.

**(c) Joints.** Expansion joints for concrete curb or concrete combination of curb and gutter shall be installed at stationary structures such as catch basins, drop inlets, etc., and at ends of curb returns. Where curb and gutter is constructed adjacent to or on rigid pavements, the location and width of joints shall coincide with those in the pavement, where practicable. Expansion joints shall have a thickness of ½” and shall be filled with joint filler according to Section 601.11 shaped to the cross section of the curb and constructed at right angles to the curb line.

Contraction joints for concrete curb or concrete combination curb and gutter shall be 1/8” to 3/8” wide x 1 ½” deep and shall be constructed at 15’ intervals. They shall be constructed at right angles to the centerline and perpendicular to the surface of the curb and gutter. Where curb and gutter is constructed adjacent to or on rigid pavements, the location and width of joints shall coincide with those in the pavement, where practicable. Contraction joints shall be formed by sawing, unless otherwise specified, and filled according to the requirements for Joint Seals as specified in Section 601.11, or with a commercially available silicone product approved by the City.

**(d) Surface Tests.** Before the concrete is given the final finishing, the surface of the gutter and the top of the curb shall be true to line and grade. The maximum variation in 10’ shall not exceed 3/8”.

**(e) Curing.** When completed, the concrete shall be cured as specified in Section 601.15.

**(f) Backfilling.** After the concrete has set sufficiently, the space behind the curb shall be refilled to the required elevation with suitable material, free from topsoil, leaves, twigs, or other organic material, trash, large rocks, or other deleterious materials. This material shall be firmly compacted to 90% of the material’s maximum density as determined by AASHTO T99 or ASTM D698 by means of approved mechanical equipment and neatly graded.

**501.04 Method of Measurement.** Curbing will be measured by the linear foot (LF) along the face of the curb at the gutter line. Integral curb placed with concrete pavement will not be measured separately, but shall be included in the price bid for concrete pavement. Modified curbs across driveways and streets will be measured as curb.

**501.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per linear foot (LF) for Concrete Curb or Concrete Curb and Gutter, which price shall be full compensation for furnishing materials, including joint filler; for forms; for mixing, placing, and finishing concrete; and for excavation and backfilling when not included in other items.

**Pay Item**

**Pay Unit**

Concrete Curb and Gutter

LF

## Section 502. Concrete Sidewalks

**502.01 Description.** This item shall consist of the construction of concrete walks according to these specifications and in conformity with the locations, lines, and grade shown on the plans or as directed.

**502.02 Materials.** The concrete shall comply with the requirements for Class B Concrete as provided in Section 601. The maximum allowable slump shall be 4 inches.

### 502.03 Construction Requirements.

**(a) Subgrade.** The subgrade shall be excavated or filled to the required grade. Unacceptable material shall be removed and replaced with suitable material, free from topsoil, leaves, twigs, or other organic material, trash, large rocks, or other deleterious materials, and the entire subgrade shall be thoroughly compacted with approved mechanical equipment to not less than 90% of the material's maximum density as determined by AASHTO T99 or ASTM D698.

**(b) Base Course.** Four inches (4") of Class 7 aggregate base course shall be placed upon the subgrade prior to concrete placement. The base course shall extend six inches (6") to each side of the sidewalk. The base course shall be thoroughly compacted with approved mechanical equipment to not less than 90% of the material's maximum density as determined by AASHTO T99 or ASTM D698.

**(c) Placing and Finishing.** The concrete shall be deposited in the forms upon the dampened base course to such depth that when it is compacted and finished, the top shall be at the required elevation. It shall be thoroughly consolidated and the edges along the forms spaded to prevent honeycomb. The top shall then be struck off with a straightedge and tamped or vibrated sufficiently to flush mortar to the surface, after which it shall be given a Class 6 finish according to Section 601.16. Edges shall be rounded with a ¼" radius, including edges at joints.

Transverse joints in the walks shall be cut with a ¼" jointer at intervals not greater than the width of the walk being constructed, or as directed.

When completed, the concrete shall be cured as specified in Section 601.15.

**(d) Backfilling.** After the forms have been removed, the spaces on each side of the walk shall be backfilled with suitable material, which shall be firmly compacted and neatly graded. Topsoil meeting the requirements of Section 204 shall be used when areas adjacent to the sidewalk are to be seeded or sodded.

**(e) Expansion Joints.** A space not less than ½" wide shall be left between the sidewalks and adjacent structures, except that no space shall be left between the sides of the walks and adjacent curbs. This space shall be filled with approved joint filler complying with AASHTO M 213 and installed with a zip strip which is removed after the concrete has cured and sealed with a mastic sealer. Other approved joint fillers shall be 1"x4" or 2"x4" pressure treated pine, redwood or western red cedar. For the wood joint fillers, nails shall be driven through

each side of the board to interlock with the concrete and prevent the board from being pushed out of the joint over time.

**502.04 Method of Measurement.** Concrete sidewalk will be measured by the square yard (SY).

**502.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per square yard (SY) for Concrete Sidewalks, which price shall be full compensation for furnishing materials including joint filler; constructing the concrete sidewalk; for excavation and backfilling where not included in other contract items; Class 7 aggregate base course and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete Sidewalk	SY

### **Section 503. Driveway Construction or Reconstruction**

**503.01 Description.** This work consists of reconstructing existing driveways or constructing new driveways with concrete, asphalt, aggregate base course, or other materials as shown on the Plans or as directed by the Engineer/City Engineer.

**503.02 Materials.** Concrete for driveway reconstruction shall be Class B according to the requirements of Section 601. Asphalt shall be Surface Course per the requirements of Section 403. Aggregate base course shall meet the requirements of Section 401. All other materials shall be as specified or as directed by the Engineer/City Engineer.

#### **503.03 Construction Requirements.**

**(a) General.** Aprons and driveways shall be constructed in the locations, to the lines and grades, and of the material type shown on the Plans, or as directed by the Engineer/City Engineer. Construction of driveways with greater than 8% slope perpendicular to the street will not be allowed except as approved by the Engineer. Driveway widths shall match widths of existing driveways, with a minimum driveway width of 10'. All driveways designated as commercial driveways shall be constructed with concrete curb and gutter along each side of the driveway.

Driveways and aprons shall be constructed on a compacted subgrade consisting of material approved by the Engineer/City Engineer.

**(b) Driveway Removal.** Existing driveways shall be removed to the locations shown on the plans or as directed by the Engineer to create a smooth transition from the roadway to the

adjacent property. The back limit of the driveway shall be sawed if required to produce a neat line.

**(c) Concrete Apron.** Concrete apron shall be constructed on all driveways beginning at the back of curbs or edge of road if no curb exists and extending to the back of sidewalk, or to 6' behind the back of curb, whichever is greater. Concrete aprons shall be of a residential or commercial type as shown on the plans. The apron thickness shall be as shown on the Plans, but not less than six inches (6"). Mixing, placement, and finishing of concrete shall be as required in Section 601. Contraction joints shall be constructed so that slabs are no more than 15' in any dimension. One half-inch (½") expansion material meeting the requirements of Section 601.11 shall be placed between the backs of curbs and the apron. Joints shall be tooled or sawed at 10' intervals perpendicular to the street. These saw joints shall be filled with joint sealant meeting the requirements of Section 601.11.

**(d) Concrete Driveways.** Concrete driveways shall be constructed where shown on the Plans or as directed by the Engineer/City Engineer. The driveway thickness shall be as shown on the Plans, but not less than six inches (6"). Mixing, placement, and finishing of concrete shall be as required in Section 601. Contraction joints shall be constructed so that slabs are no more than 15' in any dimension. When concrete driveways are constructed monolithically with concrete apron, a contraction joint shall be constructed at the interface between the apron and the driveway. All joints shall be sealed according to Section 601.11.

**(e) Asphalt Driveways.** Asphalt driveways shall consist of approved Surface Mix. Construction of asphalt driveways shall meet the requirements of Section 403. The thickness of the asphalt driveway section shall be as shown on the Plans, but in no case shall be less than 3" of asphalt constructed on 4" of aggregate base course.

**(f) Aggregate Base Driveways.** All existing driveways constructed of soil or gravel shall be reconstructed with aggregate base meeting the requirements of Section 401. Placement of base material shall be according to the lines and grades shown on the plans or as directed by the Engineer/City Engineer. Thickness of base shall be as shown on the plans, but in no case shall be less than 6". Compaction requirements are as specified in Section 401.

**503.04 Method of Measurement.** Asphalt or concrete driveway removal shall be measured by the square yard (SY) from the existing roadway edge to the limits of the driveway removal. Removal of other driveways will not be measured. Concrete aprons and all driveways shall be measured by the square yard (SY). Curb constructed as part of concrete aprons or driveways will be measured as curb.

**503.05 Basis of Payment.** Work completed and measured as provided above will be paid for at the contract unit price bid per square yard for the various items. This price shall be full compensation for furnishing and placing all materials, for excavation and subgrade preparation; for shaping and finishing; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete Aprons	SY
Concrete Driveway	SY
Asphalt Driveway	SY
Aggregate Base Course Driveway	SY
Asphalt/Concrete Driveway Removal	SY

## **Section 504. Headwalls and Retaining Walls**

**504.01 Description.** This item consists of constructing concrete headwalls and retaining walls at the locations and to the lines and grades shown on the plans. **504.02 Materials.** Concrete shall meet the requirements of Section 601 for Class A or B for headwalls, and Class B for retaining walls.

Reinforcing steel shall meet the requirements of Section 602.

**504.03 Construction Requirements.** The subgrade on which the footing is to be placed shall be prepared by excavating to the required grade and thoroughly compacting the existing material. If the existing material at the elevation of the bottom of the footing is soft and yielding, and the Engineer/City Engineer so directs, it shall be removed and replaced with suitable material according to Section 202.

Reinforcing steel shall be placed as shown on the plans. Weepholes of the size shown on the plans shall be set in the forms before concrete is placed.

Concrete shall be furnished, placed, finished, and cured according to the requirements of Section 601.

**504.04 Method of Measurement.** Concrete headwalls will be measured by the unit. Concrete retaining walls will be measured by linear foot parallel to the footing. Additional excavation as required under footings will be measured by the cubic yard compacted in place.

**504.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Concrete Headwalls and per linear foot for Concrete Retaining Walls. Said price shall be full compensation for all materials, labor, tools, equipment, and incidentals necessary to complete the work.

Additional excavation and embankment under footings will be paid for at the unit price bid for Undercut Excavation. No payment for additional excavation will be made unless such excavation is directed by the Engineer/City Engineer.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete Headwalls	EA
Concrete Retaining Walls	LF

## **Section 505. Seeding and Sodding**

**505.01 Description.** This item shall consist of furnishing and applying lime, fertilizer, seed, mulch cover, and water according to these Specifications at locations shown on the plans or as directed.

The work under this item shall be accomplished as soon as practicable after the grading in an area has been completed in order to deter erosion of the roadway and siltation of streams.

### **505.02 Materials.**

**(a) Lime.** Lime shall be agricultural grade ground limestone or equivalent as approved by the City.

**(b) Fertilizer.** Fertilizer shall be a commercial grade, uniform in composition, free flowing, and suitable for application with mechanical equipment. It shall be delivered to the site in labeled containers conforming to current Arkansas fertilizer laws and bearing the name, trademark, and warranty of the producer.

**(c) Seed.** Except as modified herein, the seed shall comply with the current rules and regulations of the Arkansas State Plant Board and the germination test shall be valid on the date the seed is used. It shall have a minimum of 98% pure seed and 85% germination by weight, and shall contain no more than 1% weed seeds. A combined total of 50 noxious weed seeds shall be the maximum amount allowed per pound of seed with the following exceptions: Johnson grass seed, wild onion seed, wild garlic seed, field bindweed seed, nut grass seed, sickle pod seed, sesbania seed, indigo seed, morning-glory seed, and cocklebur seed will not be allowed in any amount. Seed shall be furnished in sealed, standard containers. Seed that has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable.

Seed planted between June 16 and August 31 may require more water than that specified in Subsection 505.03 in order to survive. Therefore, watering shall continue after germination until growth is established.

The seeding mixture may be altered if authorized or directed by the Engineer/City Engineer. The actual mix and varieties used shall be submitted to the City before seed is placed.

Seed shall be provided at the following mix and rates:

**LB/AC**

**SEED TYPE**

**MARCH 15 – JUNE 15**

Turf Fescue	250
Bermuda Grass (common) unhulled	10
Annual Rye	50

**JUNE 15 – AUGUST 31**

Turf Fescue	200
Bermuda Grass (common) hulled	5
Bermuda Grass (common) unhulled	10

**AUGUST 31 – MARCH 15**

Turf Fescue	250
Annual Rye	50

At the Contractor’s option, annual rye only may be seeded at a minimum rate of 30 pounds per acre between the dates of October 31 to March 15. The Contractor shall return between the dates of March 15 and May 1 and reseed with the mix specified for the March 15 – June 15 time period. Preparation for reseeding shall be in accordance with Section 204.

**(d) Sod.** Sod shall be composed of either field grown grass or approved nursery grown grass and shall consist of a densely rooted growth of grass substantially free from noxious weeds and undesirable grasses. Sod type shall be as specified on the plans. When sod is placed to repair damaged areas, the sod shall be of the same type and variety as the existing grass.

The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh, and uninjured at the time of placing. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be placed as soon as possible after being cut and shall be kept moist from the time it is cut until it is placed in its final position.

The source of field grown sod shall be inspected and approved by the City before being cut for use in the work. After approval, the area from which the sod is to be harvested shall be closely mowed and raked as necessary to remove excessive top growth and debris.

Approved devices, such as sod cutters, shall be used for cutting the sod and due care shall be exercised to retain the native soil intact. The sod shall be cut in uniform strips approximately 300 mm (12”) in width and not less than 300 mm (12”) in length, but not longer than can be conveniently handled and transported.

**(e) Mulch.** Mulch cover shall consist of straw from threshed rice, oats, wheat, barley, or rye; of wood excelsior; or of hay obtained from various legumes or grasses, such as lespedeza, clover, vetch, soybeans, bermuda, carpet sedge, bahia, fescue, or other legumes or grasses; or a combination thereof. Mulch shall be dry and reasonably free from Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All material will be inspected and approved prior to use.

**(f) Tackifiers.** Tackifiers used in mulch anchoring shall be of such quality that the mulch cover will be bound together to form a cover mat that will stay intact under normal climactic conditions.

All tackifiers used shall have prior approval or be listed on the AHTD Qualified Products List (QPL). The type and brand of tackifier to be used shall be submitted to the City for approval.

**(g) Water.** Water shall be of irrigation quality and free of impurities that would be detrimental to plant growth.

### **505.03 Construction Requirements.**

**(a) Seeding.** Areas to be seeded shall be dressed to the shape and section shown on the plans. A 4" layer of topsoil, if required, shall be furnished, placed, and prepared as specified in Section 204.

Fertilizer shall be applied at the rate of 800 pounds per acre of 10-20-10, or the equivalent amount of plant food. Fertilizer shall be uniformly incorporated into the soil alone or in conjunction with the required lime. If the Contractor so elects, the fertilizer may be combined with the seed in the hydro-seeding operation.

Broadcast sowing may be accomplished by hand seeders or by approved power equipment. Either method shall result in uniform distribution and no work shall be performed during high winds. The area seeded shall be lightly firmed with a cultipacker immediately after broadcasting.

If a hydro-seeder is used for seeding, fertilizer and seed may be incorporated into one operation but a maximum of 800 pounds of fertilizer shall be permitted for each 1500 gallons of water. If the Contractor so elects, the fertilizer may be applied during preparation of the seedbed. The area shall be lightly firmed with a cultipacker immediately before hydro-seeding.

Mulch cover shall be applied immediately after seeding and shall be spread uniformly over the entire area. If the Contractor so elects, an approved mulching machine may be used whereby the application of mulch cover and tackifier may be combined into one operation. Mulch shall be placed so that the ground is completely covered to a thickness of approximately 2 inches. Care shall be taken to prevent tackifier materials from discoloring or marking structures, pavements, utilities, or other plant growth. Removal of any objectionable discoloration shall be at no cost to the City.

Immediately following or during the application of the mulch cover on seeded areas, the mulch shall be anchored by one of the following methods:

**Tracking or Roller Method.** The mulch shall be effectively pressed into the soil using steel cleated track or cleated roller equipment. The anchoring shall be performed so that the grooves formed are perpendicular to the flow of water down backslopes and foreslopes. The equipment and method used shall produce acceptable results.

**Other Tackifiers.** An approved tackifier shall be applied according to the rates recommended by the manufacturer. Asphalt tackifier will not be allowed.

The method used shall be at the Contractor's option unless otherwise specified or directed. In lieu of separate application of tackifiers, the Contractor may use equipment that combines the application of mulch and tackifier into one operation. Application shall be at the specified rates.

After application of the mulch cover, water shall be applied in sufficient quantity, as directed by the Engineer/City Engineer, to thoroughly moisten the soil to the depth of pulverization and then as necessary to germinate the seed.

When directed by the Engineer/City Engineer, the Contractor shall apply water in an amount such that, in conjunction with any rainfall, the seeded and mulched areas will receive an amount equivalent to a minimum of 1" of water each week beginning the week after seeding and continuing for a minimum of three (3) weeks. Water applied at this rate will not be paid for separately but shall be considered subsidiary to seeding. If directed by the Engineer/City Engineer, additional water shall be applied to sustain grass growth.

Failure to meet this requirement will result in a partial withholding and/or recovery of payments for the seeding and mulch cover. Additional work and materials required due to the Contractor's negligence in maintaining completed work or failure to water grass as directed shall be accomplished at no cost to the City.

For all areas seeded, final acceptance will be delayed until an acceptable stand of grass of uniform color and density is established to the satisfaction of the City. Before final acceptance, the Contractor shall repair or replace any seeding or mulching that is defective or damaged. If the defect or damage is due to the Contractor's negligence, the work shall be done at no additional cost to the City. If the damage or defect is not the Contractor's fault, the work will be measured and paid for according to these Specifications.

**(b) Sod.** Areas to be sodded shall be dressed to the shape and section shown on the plans and the top and bottom of slopes shall be rounded to a radius of approximately 3' unless otherwise directed. The finished slopes shall be prepared with 4" of topsoil meeting the requirements of Section 204. Water may be applied before, during, and after slope preparation, as directed by the Engineer/City Engineer, in order to maintain the desired moisture content in the soil.

Immediately before placement of sod, fertilizer shall be broadcast at the rate of 250 pounds per acre of 10-20-10, or the equivalent amount of plant food, and incorporated into the top 1" of soil.

Sod shall be moist and shall be placed on a moist earth bed. Sod strips shall be laid along contour lines, by hand, commencing at the base of the area to be sodded and working upward. The transverse joints of sod strips shall be broken, and the sod carefully laid to produce tight joints. At the top of slopes the sod shall be turned into the embankment slightly and a layer of earth placed over it and compacted to conduct surface water over and onto the sod. The sod shall be firmed, watered, and refirmed immediately after it is placed. The firming shall be

accomplished by use of a lawn roller or approved tamper, with care being taken to avoid tearing end strips of sod.

When sodding is completed, the sodded areas shall be cleared of loose sod, excess soil, or other foreign material; a thin application of topsoil shall be scattered over the sod as a top dressing; and the areas thoroughly moistened. Water shall be applied as necessary at the direction of the Engineer/City Engineer for a period of at least 3 weeks. The time required for application of water will not be included in the computation of contract time for completion of the project provided all other work under the Contract has been completed.

The Contractor shall maintain sodded areas from the time of completion until final acceptance of the project by the City. Additional work and materials required because of the Contractor's negligence in maintaining the work shall be accomplished at no cost to the City.

**505.04 Method of Measurement.** Seeding will be measured by the acre of actual area covered. Sod will be measured by the SY yard of actual area covered. Additional watering if so directed will be measured by thousands of gallons (MG) applied.

**505.05 Basis of Payment.** Seeding completed and accepted and measured as provided above will be paid for at the contract unit price bid per acre for Seeding, which price shall be full compensation for seedbed preparation; for furnishing and applying fertilizer, lime, seed, mulch, and tackifier; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payments for seeding will be made according to the following schedule:

50 % On the first regularly scheduled estimate after the Seeding and Mulch Cover are completed.

25% On the next regularly scheduled estimate, provided that the Engineer/City Engineer determines that the seeded and mulched areas have received at least the amount of water specified in Section 505.03 above.

25% On the succeeding regularly scheduled estimate, provided that the Engineer/City Engineer determines that a dense lawn of permanent grass has been established.

Sodding completed and accepted and measured as provided above will be paid for at the contract unit price bid per square yard for Sodding, which price shall be full compensation for bed preparation; for furnishing and applying fertilizer, topsoil, and sod; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Additional watering above and beyond the 1" per week for the first three weeks will be paid for at the unit price per thousand gallons (M.G.) of water applied. This work will be paid for only when directed to by the Engineer/City Engineer. Any watering to be paid for under this item shall be conducted in the presence of the Engineer/City Engineer.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Seeding	Acre
Sodding	SY
Additional Watering	MG

## Section 506. Mailboxes

**506.01 Description.** This item shall consist of furnishing and erecting mailbox posts and installing existing mailboxes on the new posts. When required, it shall also include furnishing and installing new mailboxes. It shall also include maintenance of existing mailboxes during construction to ensure uninterrupted mail service in the construction limits.

**506.02 Materials.** The mailbox post shall be either metal or coniferous wood. All mailbox posts placed under the contract shall be of the same type. Wood posts shall be 4"x 4" square and shall be pressure treated with creosote, pentachlorophenol or chromated copper arsenate. Metal posts shall be 2" in diameter and shall be galvanized.

Mailbox support hardware, including shelf, platform and bracket shall be as shown on the plans. Anti-twist plate, clamps, spacers, nuts, bolts, and washers shall be galvanized steel.

New mailboxes, when specified on the plans or directed by the Engineer/City Engineer, shall comply with the U.S. Postal Service and shall be the same size as the existing mailbox.

**506.03 Construction Methods.** Mailboxes shall be constructed in the same locations as the existing mailboxes. It is the Contractor's responsibility to note the locations of existing mailboxes before construction begins. The bottom of the box shall be set at an elevation 3'-6" above the roadway surface. The roadside face of the box shall be 6" from the face of the curb. Where a mailbox is located at a driveway entrance, it shall be placed on the far side of the driveway in the direction of the delivery route. Where a mailbox is located at an intersecting road, it shall be located a minimum of 100' beyond the center of the intersecting road in the direction of the delivery route. If requested by the local postmaster, height and placement of mailboxes may vary slightly as directed by the Engineer/City Engineer.

No more than two mailboxes may be mounted on one post. Post spacing for multiple mailbox installations shall be a maximum of 36".

The mailbox post shall be embedded a minimum of 24" into the ground. A metal post shall have an anti-twist plate that extends no more than 10" below the ground surface.

The existing mailbox shall be separated from the existing post and attached to the new post. If the existing mailbox is damaged beyond repair by the Contractor, the mailbox shall be replaced at no cost to the City. If the existing mailbox cannot physically be removed from the existing post and re-used, the mailbox shall be replaced under the item Mailboxes. When a mailbox is replaced, the Contractor shall be responsible for placing identification markings on the new mailbox corresponding to the markings on the original mailbox.

Unless otherwise specified, all existing mailbox supports shall be removed and replaced with new supports. If directed by the Engineer/City Engineer the existing mailbox shall be restored under the Contract item Remove and Replace Mailboxes. If directed by the Engineer/City Engineer, the existing support and mailbox shall be removed and protected until placement in its planned location. This work shall be paid for under the item Mailbox/Support Relocation.

**506.04 Method of Measurement.** Mailbox Supports, Mailboxes, Remove and Replace Mailboxes, and Mailbox/Support Relocation will be measured by the unit.

**506.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Mailbox Supports of the type specified, for Mailboxes, or for Remove and Replace Mailboxes, or for Mailbox/Support Relocation; which price shall be full compensation for furnishing all materials: for setting posts; for removing and reattaching existing mailboxes; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Mailbox Supports (single)	EA
Mailbox Supports (double)	EA
Mailboxes	EA
Remove and Replace Mailboxes	EA
Mailbox/Support Relocation	EA

## **Section 507. Pavement Markings**

**507.01 Description.** This item shall consist of furnishing and placing pavement markings, including words, arrows, and emblems, of the color, type and material specified, in accordance with these specifications and to the dimensions and at the locations shown on the plans or as directed.

The markings are to be placed under existing traffic conditions. The work shall meet the requirements of the MUTCD except as modified by these specifications.

**507.02 Materials. (a) Paint.** Paint shall be a ready mixed white and yellow paint suitable for application on concrete and bituminous pavements. All paints used for this application shall be listed on the AHTD Qualified Products List (QPL). The manufacturer shall furnish a certification for each lot certifying that the materials supplied conform to all the requirements specified and stating that the material is formulated the same as the material tested for QPL listing.

**(b) Thermoplastic Material.** Thermoplastic material used shall meet all requirements of Section 719.02 of the AHTD Standard Specifications.

**(c) Pavement Marking Tape.** Pavement marking tape shall be a preformed tape conforming to Section 720.02 of the AHTD Standard Specifications for Type 5.

### **507.03 Construction Requirements.**

**(a) General Requirements.** All pavement markings shall be applied to clean, dry surfaces. If necessary, the Contractor shall clean the surface of the pavement to receive markings before beginning marking operations. Cleaning of the pavement is considered subsidiary to other items of work and will not be paid for separately.

Pavement markings shall be placed at the locations shown on the plans, or as directed by the Engineer/City Engineer. All markings shall have well defined edges, shall be uniform in thickness, and shall be straight and true. No stripe shall be less than the specified width. Any corrections of variations in width or alignment of the stripes shall not be made abruptly. Markings that cannot be corrected to meet these requirements shall be removed at the Contractor's expense and will not be paid for.

Removal of markings shall be performed in such a manner that no conflicting pavement marking will be left in place. Removal of the pavement marking by a means that will gouge the surface will not be permitted.

**(b) Reflectorized Paint.** Reflectorized paint shall be applied at a minimum wet film thickness of 15 mils (a minimum of 16.5 gallons per mile of 4" line). The painted line shall be uniform in thickness and appearance across the width of the stripe. Glass beads shall be placed on the surface of the wet paint in the amount of not less than 6 pounds per gallon.

**(c) Thermoplastic Markings.** The thermoplastic compound shall be screed or ribbon extruded to the pavement surface unless a specific application method is specified.

The thermoplastic material shall be dispensed at a temperature recommended by the manufacturer. The applicator shall include a cutoff device remotely controlled to provide clean, square stripe ends and to provide a method for applying skip lines.

Beads applied to the surface of the completed stripe shall be applied by an automatic bead dispenser attached to the pavement marking equipment in such a manner that the beads are immediately dispensed upon the completed line. The bead dispenser shall be equipped with an automatic cutoff control, synchronized with the cutoff of the pavement marking equipment.

Thermoplastic markings shall not be applied to the pavement surface when the pavement surface temperature is less than 50° F or when the pavement shows evidence of moisture.

On pavements where no pavement markings exist or where the existing pavement markings are paint or thermoplastic and do not conflict with the proposed pavement markings, blasting with water or sand or a combination thereof will be required to remove any curing compound, oxidized paint or thermoplastic, or dirt to ensure a good bond. This blasting is considered surface preparation and will not be paid for separately.

Conflicting pavement markings that exist shall be removed by blasting with water and/or sand or by grinding. This blasting or grinding is considered pavement marking removal.

The thickness of all thermoplastic markings above the roadway surface shall be 90 mils (a minimum of 1584 pounds per mile of 4" line). The minimum thickness will be measured in the center of the line. The minimum ½" from the edges shall not be less than 75% of the thickness required in the center. Maximum thickness of markings is 3/16".

On concrete pavements, paint pavement markings meeting the requirements of this section shall be applied as a primer for the thermoplastic markings, except where thermoplastic markings are to be applied over existing thermoplastic markings. Paint applied to concrete pavement solely as a primer will not be measured or paid for separately, but full compensation therefor will be considered included in the contract unit prices bid for the various items of Thermoplastic Pavement Markings. A primer other than paint may be used when recommended by the thermoplastic manufacturer.

**(d) Pavement Marking Tape.** The placement of the pavement marking tape shall comply with the manufacturer's recommendations.

Air temperature shall be a minimum of 60° F and rising or the road temperature shall be a minimum of 70° F before installation of marking tape will be allowed.

The roadway surface shall be cleaned by the Contractor with high pressure air or by sweeping. The roadway shall then be marked where the pavement marking polymer is to be applied.

The polymer can then be applied by hand or with a manual or mechanical highway tape applicator designed for that purpose. Only butt splices will be allowed with no overlapping.

After application, the tape shall be firmly tamped with a minimum 200 lb. Load or by slowly (2-3 mph) driving over the tape with a vehicle tire. The Contractor shall ensure that all edges are firmly adhered.

**507.04 Method of Measurement and Basis of Payment.** Pavement markings will be measured as follows:

**(a)** 4" center lines, skip lines, lane lines, and edge lines will be measured by the linear foot of markings actually placed.

**(b)** Words, arrows, and other symbols will be measured by the unit.

**(c)** Crosswalks will be measured by the LF of crosswalk placed, measured perpendicular to the orientation of the crosswalk bars.

**(d)** Pavement marking removal, when specified on the plans, will be measured by the square foot of marking actually removed.

Work completed, accepted, and measured as provided above will be paid for at the contract price bid per linear foot for 4" lines, per each for symbols, per linear foot for crosswalks, and per square foot for pavement marking removal.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
4" Striping (Thermoplastic)	LF
Pavement Symbols (Thermoplastic)	EA
Crosswalks (Thermoplastic)	LF
Pavement Marking Removal	SF

## **Section 508. Street Signs**

**508.01 Description.** This item shall consist of installing new signs and supports, and relocating existing signs as shown on the plans, or as directed by the Engineer/City Engineer.

### **508.02 Materials.**

(a) **Signs.** Materials used in the fabrication of street signs shall comply with the latest edition of the AHTD Standard Specifications, AHTD Standard Drawings, and the MUTCD. Signs and equipment manufactured in accordance with the above mentioned specification will not be required to be submitted for approval.

(b) **Supports.** Materials used for new and relocated street sign supports shall comply with the AHTD Standard Specifications and the AHTD Standard Drawings.

**508.03 Construction Requirements.** The Contractor shall furnish and install new signs and supports at the locations as shown in the plans or as directed by the Engineer/City Engineer. The Contractor will maintain existing signs during construction, and install the signs at the locations as shown in the plans or as directed by the Engineer/City Engineer. Should the sign or support become damaged during construction, the Contractor will furnish the replacement.

Unless specifically shown in the plans to be relocated, new signs shall be provided by the contractor. Any sign not indicated to be relocated as shown on the plans, or as directed by the Engineer/City Engineer shall be salvaged and delivered to the Rogers Street Department.

**508.04 Method of Measurement.** Signs that are relocated or installed new shall be measured by a complete unit in place (including required footings).

No payment will be made for salvaged signs delivered to the City.

**508.05 Basis of Payment.** Work completed and accepted under this item and measured as provided above shall be paid for at the Contract unit price bid for each sign, which price shall be full compensation for the relocation, or erection of each sign, including support and footing; and for tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Street Sign Installation	EA

## **Section 509. Erosion Control**

**509.01 Description.** This item shall consist of measures taken to limit, control, and contain fill materials, soil erosion, sedimentation, and other harmful wastes resulting from construction operations that could result in harm to the private properties as well as public streams and waterways. These requirements apply even if Corps of Engineer (COE) Section 404 or National Pollutant Discharge Elimination System (NPDES) Permits are not required for the project.

This Section applies to all activities under the Contract. The Contractor should be aware that requested modifications to the Contract and/or individual permits may not be approved.

**509.02 Responsibility of the Contractor.** The Contractor shall comply with the requirements of the Federal Water Pollution Control Act, the Arkansas Water and Air Pollution Control Act, and the regulations, orders, or decrees issued pursuant thereto.

The National Pollutant Discharge Elimination System (NPDES) requires a permit to discharge storm water associated with industrial activity or construction sites into the waters of the United States. The Arkansas Department of Environmental Quality (ADEQ) issues these permits.

The Contractor shall be responsible for submitting the Notice of Intent, developing a Storm Water Pollution Prevention Plan, implementing the plan, stabilizing the land, submitting the Notice of Termination, and complying with all requirements in the permit and any revisions or additions to it.

Additionally, Contractor's operations on lands located off the right-of-way, such as borrow pits, plant sites, waste sites, or other facilities, may require an NPDES permit.

All work required due to the violation of provisions of COE Section 404, NPDES Permits, or other requirements of these specifications which results from Contractor negligence, carelessness, or failure to perform work as scheduled, shall be performed by the Contractor at no cost to the City. In addition, the Contractor will be assessed the amounts of any and all fines and penalties assessed against and costs incurred by the City which are the result of the Contractor's failure to comply with a COE Section 404 Permit or NPDES Permit.

Failure to comply with the conditions of the COE Section 404 Permit may result in the Corps of Engineers issuing a cease and desist order for all permitted activities. To obtain a new Section 404 Permit from the Corps may require 60-120 calendar days processing time.

The City will not be responsible for any delays or costs due to the Contractor's failure to comply with the conditions of the 404 permit. The Contractor will not be granted additional compensation or contract time due to loss of Permits for noncompliance.

In the event that pollutant spills occur which are the result of the Contractor's actions or negligence, the clean up shall be performed by the Contractor at no cost to the City.

**509.03 Method of Measurement and Basis of Payment.** No measurement of this item will be made. Payment will be made at the lump sum price bid. Pay will be prorated on each pay estimate based on the percentage of the contract completed.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Erosion Control	LS

## **Section 510. Traffic Control and Maintenance**

**510.01 Description.** This work consists of furnishing, installing, and maintaining necessary traffic signs, barricades, lights, signals, cones, concrete barriers, pavement marking, and other traffic control devices and shall include flagging, pilot car operations, and other means for guidance of traffic through the work zone. The work shall be done according to the MUTCD and the approved traffic control plan. An approved plan is required before any construction begins. This also includes maintenance of roadway surface.

**510.02 Maintenance Requirements.** Unless otherwise provided, the road, while undergoing improvements, shall be kept open by the Contractor to all traffic. When so provided on the plans, the Contractor may bypass traffic over an approved detour route. The Contractor shall keep the portion of the project being used by public traffic, whether it is through or local traffic, in such condition that will permit the safe, continuous flow of two-way traffic at all times. When a part of the plans or when approved by the City, areas where the nature of the work restricts or prohibits two-way flow, one-way operation may be maintained by using flaggers or timed signalization. The Contractor shall also provide and maintain in a safe condition temporary approaches, crossings and intersections with trails, roads, streets, businesses, parking lots, residences, garages, farms, etc.

As part of regular traffic maintenance, the Contractor shall remove all snow and ice accumulated on the traveled roadway. Exposed soil that becomes muddy due to rains or other precipitation shall be removed or covered with aggregate base material to the satisfaction of the City. Dust shall be controlled at all times. In the event that watering does not satisfactorily control the dust, other methods of dust control will be required.

Necessary traffic control devices shall be properly placed and in operation before starting construction. When work of a progressive nature is involved, such as resurfacing, the appropriate traffic control devices shall be kept current and placed only in the areas of actual

work activities. All traffic control devices shall meet the requirements of the AHTD Standard Specifications Section 604.02 and the most current version of the MUTCD.

If the City determines that provisions for safe traffic control are not being provided or maintained, the work will be suspended. In cases of serious or willful disregard for safety of the public or construction workers, the City will place the traffic control devices in proper condition and deduct the costs from monies due the Contractor.

The Contractor shall designate a traffic control supervisor to furnish continuous surveillance over traffic control operations. This supervisor shall be available at night and weekends to respond to calls involving traffic control. The name of the traffic control supervisor shall be provided at the preconstruction conference and to local police.

Types of barricade supports or devices not specifically described in the MUTCD shall not be used. The methods used to control traffic for lane changes or other diversions shall meet the MUTCD and the traffic control plan.

Portable changeable message signs meeting the requirements of Section 604 of the AHTD Standard Specifications shall be used if and where directed by the City.

**510.03 Method of Measurement.** Aggregate base for traffic maintenance, if specifically included as a bid item, will be measured by the ton of material placed for traffic control. No payment will be made under this item unless base placement is specifically directed by the Engineer/City Engineer. No base so directed shall be placed without the Engineer/City Engineer or authorized representative present. The tonnage of material placed shall be substantiated by truck tickets delivered along with the base material and presented to the Engineer/City Engineer at the time of base placement. If an item for aggregate base for traffic control is not included, it shall be considered subsidiary to other items.

When directed or approved for use by the City, portable changeable message signs meeting the requirements of Section 604 of the AHTD Standard Specifications will be measured for payment by the number of days each sign is required and authorized by the City. Payment for a full day will be made for any portion of a day that the panel or sign is used, but the measurement shall not exceed one per sign on any calendar day.

No other traffic control items will be measured.

**510.04 Basis of Payment.** Payment for aggregate base for roadway maintenance as measured above will be made at the unit price bid per ton.

All other traffic control and maintenance materials and activities will be paid for at the lump sum price bid for traffic control.

Payment will be made under:

**Pay Item**

**Pay Unit**

Traffic Control	LS
Aggregate Base for Roadway Maintenance	Ton
Portable Changeable Message Sign	Day

**Section 511. Mobilization**

**511.01 Description.** This item shall consist of preparatory work and operations, including those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site.

This item shall also include other work and operations that must be performed, or for expenses incurred, before beginning work on the various Contract items on the project site. It shall also include pre-construction costs which are necessary direct costs to the project and are of a general nature rather than directly attributable to other pay items under the Contract.

**511.02 Measurement and Payment.** Mobilization will be measured as a complete unit and will be paid for at the contract lump sum price bid. In computing the allowable partial payments from the schedule below, the percentage of the original Contract earned will be based on all items exclusive of the item of Mobilization, and payment for this item at any of the listed stages of completion will be made on the basis of the percentage of the item allowed less all payments made.

**PARTIAL PAYMENT SCHEDULE**

<b>Percent of Original Contract Amount Earned</b>	<b>Percent of Bid Price for Mobilization Allowed</b>
First Pay Estimate	25%
10%	50%
25%	100%

This item will be paid for on regular estimates. Payments on percentages of the original Contract amount other than those set out above will not be considered. No adjustment in the amount bid for this item will be made for additional quantities or items of work required to satisfactorily complete the Contract.

IN NO CASE SHALL THE AMOUNT BID FOR THE ITEM OF “MOBILIZATION” EXCEED 5% OF THE TOTAL CONTRACT AMOUNT FOR ALL OTHER ITEMS LISTED IN THE PROPOSAL. Should the amount entered in the Proposal for this item exceed 5%, the City will reduce it to the maximum allowed amount to determine the correct total bid.

Payment will be made under:

**Pay Item**

**Pay Unit**

## Section 512. Fences

**512.01 Description.** This item shall consist of furnishing and erecting wire fence, chain link fence, wood privacy fence and gates according to the plans and these specifications, and in reasonably close conformity to the lines, grades, and alignment shown on the plans or as directed.

### 512.02 Materials.

**(a) General.** All materials used shall be new and shall comply with the requirements for the class and type of material specified. Previously used materials will be allowed for temporary fencing.

Concrete for setting posts shall comply with Section 601 for Class A Concrete.

**(b) Wire Fence.** Wood posts and braces shall be pressure treated, seasoned, sound, and reasonably straight southern pine or Douglas Fir of the West Coast Region. The posts shall be round and free from excessive end splits. Before pressure treatment, the posts and braces shall have the bark removed, the knots trimmed flush, and the ends cut square. Posts that are to be driven shall have the small end tapered. Posts shall be treated by a standard empty cell or full cell process according to AWPA practice using creosote and retaining a minimum of 8 pounds per cubic foot of wood; or using pentachlorophenol, or chromated copper arsenate and retaining a minimum of 0.4 pounds per cubic foot of wood.

Metal posts and braces shall be of good commercial quality iron or steel and may be tubular, T, U, Y, or other shape manufactured for use as fence posts or braces.

Woven Wire Farm Fence shall be AASHTO Design Number 1047-6-11 AASHTO M 279 or ASTM A116, Class 3 galvanizing.

Barbed wire shall be 12 ½ gauge with 4-point barbs and shall comply with AASHTO M 280, Class 3 galvanizing.

As an alternate to the barbed wire specified above, high tensile wire having the same galvanizing and breaking strength as Class 3, 12 ½ gauge wire, and complying with the remaining requirements of AASHTO M 280 for a four point barb may be used.

The minimum gage of the high tensile barbed wire shall be as follows:

Strand wire gage	15 ½
Barb wire gage	17

Staples used to attach the wire fencing to wood posts shall be galvanized 9 gage, 38 mm (1 ½") in length.

Steel line posts shall be galvanized or painted and comply with AASHTO M 281. Tubular steel posts shall comply with Grade 1 or Grade 2 of AASHTO M 181, or an approved alternate of Grade 2.

Hardware and fittings shall comply with ASTM F 626. Any miscellaneous hardware or fittings not mentioned in ASTM F 626 shall be galvanized according to the applicable requirements of AASHTO M 111 or M 232.

**(c) Chain Link Fence.** Material for chain link fence shall comply with AASHTO M 181 Types I, II, or III. Steel members for posts, rails, expansion sleeves, and gate frames may be either Grade 1 or Grade 2. The shape, size, and length of posts and rails, and the height of fabric shall be as shown on the plans.

Hardware and Fittings shall comply with ASTM F 626. Any miscellaneous hardware or fittings not mentioned shall be galvanized according to AASHTO M 111 or M 232. Tension wire shall be minimum 7 gauge.

Aluminum alloy fabric shall be used only with aluminum posts. Aluminum coated steel fabric and galvanized steel fabric, Class C, shall be used only with Grade 1 or Grade 2 steel posts. Fence fabric shall be minimum 9 gauge wire for 6' fencing and 12 gauge wire for 4' fencing.

Frames for gates shall be galvanized steel or aluminum of the type and length shown on the plans. Frames shall be Grade 1 or Grade 2. Welds shall be galvanized. Commercial gates may be used if they are equal to or better than the planned gates as determined and approved by the Engineer/City Engineer.

The gate fabric shall be of the same type material and be in accordance with the same specifications as the adjoining fence.

**(d) Wood Privacy Fence** All pine wood material shall be pressure treated with pentachlorophenol or chromated copper arsenate and shall retain a minimum of 0.4 pounds per cubic foot of wood. Cedar panels shall be reasonably straight and free from knots, warping, and other defects.

**(e) Temporary Fencing** Materials for temporary fencing shall be appropriate for the use intended.

### **512.03 Construction Requirements.**

**(a) General.** The fence shall be erected parallel to the right-of-way line, or as directed. Unless otherwise specified, the fence shall be a minimum of 6" and a maximum of 1' behind the right-of-way line. The fence grade shall generally follow the ground contour, but shall present a uniform appearance. Minor grading along the fence line may be necessary to obtain the desired uniformity in fence grade. The fence alignment may be adjusted by the Engineer/City Engineer to preserve trees, land monuments, and property corner markers.

**(b) Wire Fence.** Line posts and pull assemblies shall be spaced as shown on the plans. Wood corner, gate, and pull posts may be driven in place provided the driving does not damage the post; or they may be set in dug holes and set in concrete. Metal corner, gate, end,

and pull posts shall be set in concrete. Wire shall not be stretched onto posts set in concrete until seven days after placement of posts. Posts shall be set plumb.

The Contractor has the option of using wood or steel posts and braces unless otherwise specified, but shall use the same material on the entire project. Wood end, corner, and pull posts may be used with steel line posts.

When solid rock is encountered, the posts shall be set into the rock a minimum of 10" for line posts and 16" for end, corner, gate, and pull posts. The hole in the rock shall have a minimum cross section dimension 1" greater than the post to be set. The posts shall be cut before setting to give the proper length above ground surface. The hole shall be filled with Concrete or a grout consisting of 1 part portland cement and 3 parts concrete sand.

Wire tension braces for wood pull, end, and corner assemblies shall consist of a 9 gauge wire passed around the posts to form a double wire. The wire shall be fastened to each post and the ends fastened together to form a continuous wire. The wires shall then be twisted together until the wire is in tension.

Where the new fence joins an existing fence, the two shall be attached in a satisfactory manner, with end posts being set as directed. Where the proposed fence intersects an existing fence, the end post shall be set for the existing fence clear of the proposed fence line as shown on the plans. The wire of the existing fence shall be stapled to the end post.

Pull post assemblies shall be placed at intervals of not more than 300' in straight alignment on level or uniformly sloping ground. Pull posts shall also be placed at all sharp vertical angle points in the line.

Corner post assemblies shall be placed at all horizontal angle points of 15° or more in the fence. When the distance from a corner post to the next corner or pull post is less than 165', one approach span on the corner assembly may be omitted.

End post assemblies at fence ends, gates, bridge abutments, and on banks of streams shall be erected in the same manner as corner construction. Extra length posts shall be provided for crossing small streams, ditches, ravines, or soft ground. Additional depth of set shall be secured in soft ground as directed.

The wire shall be attached to the face of the post away from the street. The wire shall be attached to wood line posts with staples driven at right angles to the grain and at a slight downward angle to attain the best anchorage. The staples shall not be driven tightly against the wire but shall leave free space for adjustment in tension due to changes in temperature. Wire shall be attached to steel line posts with approved galvanized clips. All barbed wire and alternate line wires of woven fabric shall be fastened to each line post. Barbed wire and all line wires of woven fabric shall be fastened to end, corner, and pull posts by wrapping the wire around the posts and tying the wire back on itself with not less than 3 tightly wrapped twists. Splicing of barbed wire and woven wire shall be done according to the plans. Gates of the same width and material type shall be placed at locations of existing gates as shown on the plans. Gates may be re-used if they have not been damaged during the construction

period. If existing gates are not in satisfactory conditions for reuse, they shall be replaced at no cost to the City.

**(c) Chain Link Fence.** All posts shall be set in concrete as shown on the plans, plumb, and true to line and grade. Concrete shall comply with Section 601 for Class A and shall be thoroughly tamped around the posts. The posts shall be equally spaced in the line of fence not to exceed a spacing of 10 feet. The top of the footing shall be domed to drain water away from the post. Concrete in post footings shall be at least 7 days old before stretching and securing fabric to posts, bracing, or hanging gates.

Top rails shall pass through post caps and shall be securely fastened to end, brace, pull, and corner posts. Joints in top rails shall be made with expansion sleeve couplings to provide a substantial connection and allow for expansion and contraction of the rail.

Before the fence fabric is placed, the tension wire shall be placed at the proper location; stretched taut; securely anchored to each end, corner, or intermediate brace post; and satisfactorily fastened to each line post.

The fence fabric shall be attached to the face of the post facing the street.

The end of the fabric shall be attached to the posts by means of a stretcher bar threaded through the end loops of the fabric and secured to the posts with clamps and bolts. The fabric shall be stretched to remove all slack with approved stretching equipment. The stretched fabric shall be secured to line posts, top rail, braces, and tension wire with specified fabric fasteners. Fabric fasteners shall be placed on line posts at not greater than 24" centers. Stretching operations shall be repeated at approximately every 100' for each run of fence. The use of trucks, tractors, and similar equipment will not be permitted in the stretching operation, except as anchors.

Splicing of the fabric shall be done by interweaving a wire picket through each end loop of each piece of fabric in a manner that will neatly and securely fasten the lengths of fabric together.

**(d) Wood Privacy Fence** Wood privacy fence shall be constructed at all locations where existing privacy fence is required to be removed, at other locations shown on the plans, or as directed by the Engineer/City Engineer.

Wood privacy fence shall be constructed as shown on the plans or shall match the existing fence in materials and configuration as closely as possible. Materials and workmanship of wood privacy fences, including gates, shall be of the same or better quality as the existing fence.

**(e) Gates.** Gates of the length and type of existing gates shall be constructed at the locations shown on the plans or as directed.

**(f) Temporary Fencing.** Temporary fencing shall be installed as required to contain livestock, pets, and to maintain safety and security of adjacent properties. Fences shall be installed and maintained that their intended purpose is accomplished.

**512.04 Method of Measurement.**

(a) Fence will be measured by the linear foot in place along the midpoint in height of the fence from outside to outside of the end posts. The lengths of gates will be excluded from this measurement.

(b) Gates will be measured by the Linear Foot.

(c) Temporary fencing, if included as a bid item, will be measured by the linear foot (LF). If this item is not included as a pay item, temporary fencing will be considered subsidiary to other items and will not be measured.

**512.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for as follows:

Barbed Wire Fence will be paid for at the contract unit price bid per linear foot for Barbed Wire Fence. Barbed and Woven Wire Fence will be paid for at the unit contract price per linear foot for Woven and Barbed Wire Fence. Chain Link Fence will be paid for at the contract unit price bid per linear foot for Chain Link Fence of the height specified. Wood Privacy Fence will be paid for at the contract unit price bid per linear foot for Wood Privacy Fence of the height specified. Gates will be paid for at the contract unit price bid per linear foot for Gates of the type and dimensions specified. Temporary fencing will be for at the contract price per linear foot for temporary fencing of appropriate materials and heights.

The contract unit prices mentioned above shall be full compensation for clearing, grading, setting posts, erecting fence, and removing temporary fences; for excavation and backfill; for furnishing materials; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Barbed Wire Fence	LF
Woven and Barbed Wire Fence	LF
Chain Link Fence	LF
Chain Link Gates	LF
Wood Privacy Fence	LF
Gates for Wood Privacy Fence	LF
Temporary Fencing	LF

**Section 513. Handicap Ramps**

**513.01 Description.** This item shall consist of the construction of handicap ramps in accordance with these specifications and the Standard Drawings at the locations shown on the plans or as directed by the Engineer/City Engineer.

**513.02 Materials.** Concrete used shall meet the requirements for Class B Concrete as provided in Section 601. The maximum allowable slump shall be 4 inches. The maximum water-cement ratio for the mix selected shall not be exceeded.

Cast-in-place tactile panels used shall be composed of a vitrified polymer composite material. The color of the tactile panels shall conform to Federal Color No. 33538, and shall be homogeneous throughout the product. The tactile panels shall be cast into the wet concrete. Surface applied products shall not be allowed. The cast-in-place tactile panels shall meet the size and spacing requirements shown in the plans.

**513.03 Construction Requirements.** When a ramp is to be constructed on an existing sidewalk, any items that are planned to be retained but are damaged during the removal or construction operations shall be repaired at no cost to the City.

Handicap Ramps shall be constructed in accordance with Section 502 and the current City of Rogers Standard Drawings. Cast-in-place tactile panels shall be installed into the wet concrete per the manufacturer's specifications.

**513.04 Method of Measurement.** Cast-in-place tactile panels will not be measured but will be considered subsidiary to the Handicap Ramp item. Handicap Ramps will be measured by the complete unit in place.

**513.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid for each Handicap Ramp of the type specified, which price shall be full compensation for excavation and backfilling; for furnishing materials including joint filler; for constructing the ramp, for furnishing and placing cast-in-place tactile panels; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Handicap Ramp Concrete	EA

## **Section 514. Project Signs**

**514.01 Description.** This item shall consist of installing new project signs and supports furnished by the Contractor as shown on the plans, or as directed by the Engineer/City

Engineer. The layout of the sign shall be per the Standard Detail and must be submitted to the Engineer for approval prior to manufacture and installation.

**514.02 Materials and Construction Requirements. (a) Signs.** Materials used in the fabrication of project signs shall comply with the latest edition of the AHTD Standard Specifications, AHTD Standard Drawings, and the MUTCD. Signs and equipment manufactured in accordance with the above mentioned specification will not be required to be submitted for approval.

**(b) Supports.** Materials used for new project sign supports shall comply with the AHTD Standard Specifications and the AHTD Standard Drawings.

Installation of the signs shall be according to the Standard Details included in the Plans. The signs shall be maintained, cleaned, repaired and/or refinished as necessary throughout the project so that they are easily readable from the traveled way. Any damage to the project signs shall be repaired immediately at no additional cost to the City.

**514.03 Construction Requirements.** The Contractor will furnish new project signs and supports and shall install the signs at the locations as shown in the plans or as directed by the Engineer/City Engineer. The Contractor will maintain the signs during construction. Should the sign or support become damaged during construction, the Contractor will furnish the replacement. The project signs shall be installed within two days after commencement of mobilization. Project signs are to be removed following the announcement of the project's Final Completion by the Engineer/City Engineer. Final payment will be withheld until project signs have been removed.

**514.04 Method of Measurement and Basis of Payment.** Projects signs will be measured on a per each basis. Payment will be made for each sign constructed and installed according to the Plans and Specifications in the locations designated by the City. The price bid for each sign will be full compensation for all construction, installation, and maintenance of the signs.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Project Signs	EA

## **Section 515. Handrail**

**515.01 Description.** This item shall consist of furnishing and erecting galvanized steel handrail on box culverts, headwalls, retaining walls, sidewalks, or steps, where shown on the Plans, or as directed by the Engineer/City Engineer, in accordance with the details shown on the Plans and with these specifications.

**515.02 Materials.**

**(a) General.** All materials used shall be new and shall comply with the requirements for the class and type of material specified.

All handrail materials shall be galvanized steel, coated at the rate of 2.0 ounces of zinc per square foot of surface coated, and in accordance with the current provisions of the following ASTM Designations:

Galvanize – A 123.

Pipe – A53, Type E or S, Grade B

Plates – A36

All handrail materials shall also be cleaned per ASTM D6386 and powder coated RAL 8019 grey brown or Federal Standard Color 20062.

### **515.03 Construction Requirements.**

**(a) General.** All welding shall be in accordance with current provisions of Specifications for Welded Highway and Railroad Bridges, American Welding Society. Welding shall be done by the shielded arc method and shall be done only by certified welders. Welding rods shall be low hydrogen suitable for use with the metal being welded. Welds joining sections of handrail shall be ground smooth prior to field galvanizing. All welds shall be field galvanized, and all galvanized areas which have been damaged shall be repaired as follows: All galvanizing that has been chipped off or damaged in handling or transporting or in welding or riveting shall be repaired by field galvanizing by the application of a paste compound of approved zinc powder and flux with a minimum amount of water. The places to be coated shall be thoroughly cleaned, including removal of slag on welds before the paste is applied. The surface to be coated shall first be heated with a torch to a sufficient temperature so that all metallics in the paste are melted when applied to the heated surface. Extreme care shall be taken to see that the galvanized surfaces are not damaged by the torch. The flux in the paste will cause a black substance to appear on the surface of the coated parts, and this black substance shall be removed by wiping off with waste or by quick application of cold water.

Other galvanizing methods may be used if approved by the Engineer/City Engineer.

Prior to installation, the Contractor shall contact the Engineer/City Engineer for his inspection of the Handrail.

### **515.04 Method of Measurement.**

**(a)** Galvanized steel handrail will be measured by the linear foot, completed and accepted.

**515.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for as follows:

Galvanized steel handrail acceptably completed and measured as provided above, will be paid for at the contract unit price per linear foot bid for “Galvanized Steel Handrail,” which price

shall be full compensation for furnishing and installing all materials, including sleeves with plates, grout; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Handrail	LF

## **Section 516. Cold Milling Asphalt Pavement**

**516.01 Description.** This item shall consist of cold milling the asphalt pavement at the locations designated on the plans or by the Engineer/City Engineer and removing the resulting material from the street right-of-way. Unless otherwise provided, the reclaimed pavement shall become the property of the Contractor. The pavement remaining after milling shall provide a surface suitable for maintaining traffic.

### **516.02 Equipment.**

(a) **General.** The Contractor shall provide self-propelled equipment with sufficient power, traction, and stability to maintain an accurate depth of cut and slope. The equipment shall be capable of accurately and automatically establishing profile grade along each edge of the machine by referencing from the existing pavement by means of a ski or matching shoe, or from and independent grade control and shall have an automatic system for controlling cross slope at a given rate. The milling machine shall have an effective means for preventing dust resulting from the operation from escaping into the air.

Provision shall be made, either integrally with the milling machine, or by the use of additional equipment, to remove the material being cut from the surface of the roadway.

### **516.03 Construction Requirements.**

(a) **General.** The existing pavement shall be cold milled to a minimum depth as shown on the plans.

### **516.04 Method of Measurement.**

(a) Cold Milling Asphalt Pavement will be measured by the square yard (SY) of pavement milled to the depth specified. No separate payment will be made for repair or replacement of manholes, valve boxes, or other appurtenances which are located and identified in advance of the cold milling operation and which are damaged by the Contractor.

**516.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per square yard for Cold Milling Asphalt Pavement, which price shall be full compensation for all work as prescribed herein, and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

**Pay Item**

**Pay Unit**

Cold Milling Asphalt Pavement

SY

**DIVISION 600. MATERIALS**

**Section 601. Cast-in-Place Concrete**

**601.01 Description.** This item shall consist of concrete in pavements, culverts, and miscellaneous structures, prepared and constructed in accordance with these specifications and conforming to the lines, grades, dimensions, and designs shown on the plans. Concrete shall consist of approved portland cement, fine aggregate, coarse aggregate, water, and any approved chemical admixtures mixed in the proportions specified for the various classes of concrete. All concrete shall be from a supplier approved by the Arkansas State Highway and Transportation Department.

**601.02 Materials.** The materials used in concrete shall conform to the requirements of AHTD Standard Specifications Section 802.02. Coarse aggregate gradation shall conform to the requirements for Class A, S, S(AE), and Seal Concrete in Section 802.02.

Admixtures shall be used to improve certain characteristics of the concrete when specified on the plans. They may also be used when requested by the Contractor and approved by the City. The Contractor's request shall be supported with the manufacturer's certified formulation of the proposed admixture and with sufficient evidence that the proposed admixture has given satisfactory results on other similar work. Permission to use the admixture may be withdrawn at any time by the City when satisfactory results are not being obtained.

Admixtures shall be approved by the City. Admixtures shall be compatible with each other, as advised by the manufacturer. The admixture dosage rate range as recommended by the manufacturer shall be used. Should the dosage rate for any admixture not yield desirable characteristics in the concrete, the dosage of admixture used shall be based on test results obtained by trial batches.

Admixtures shall be added to the mixing water by means of a mechanical dispenser that will accurately meter the additive throughout the mix water cycle. The dispenser shall be constructed and connected so that the Engineer/City Engineer can readily determine the amount of admixture entering the mixing water.

Fly ash may be used as a partial cement replacement not exceeding 20% by weight of the cement when approved by the City. When fly ash is used, the total weight of both cement and fly ash will be used in design calculations. Fly ash used in concrete shall meet the requirements of ASTM C 618, Class C or F. Mixing of Class C and Class F fly ashes will not be permitted. Use of fly ash shall be discontinued immediately, as directed by the Engineer/City Engineer, when such use is determined to be causing the production of concrete that does not meet Specifications.

**601.03 Classes of Concrete.** Two classes of concrete are provided for in these specifications. The appropriate class of concrete shall be used as specified below or where designated by the Engineer/City Engineer.

The following requirements shall govern unless otherwise shown on the plans:

Class A concrete shall be used in miscellaneous concrete items.

Class B concrete shall be used in curb and gutter, sidewalks, drop inlets, junction boxes, box culverts, bridges and concrete pavement.

These classes of concrete shall not be used if concrete is to be placed underwater. Concrete to be placed under water shall meet AHTD Specifications for Seal Concrete.

**601.04 Classification and Proportioning.** The concrete mixture shall be proportioned to insure a workable and durable concrete, as specified in the following table:

Characteristic	Class A	Class B
Minimum Compressive Strength (psi at 28 days)	3000	3500
Minimum Cement Content (bags per cu. yd.)	5.5	6.0
Maximum Net Water Content Per Bag (94 lb.) of Cement (Gallons)	6.5	5.5
Slump Range (Inches)	1-4*	1-4*
Air Content Range (%)	4-7	4-7
Maximum Fly Ash Content	20%	20%

\*Maximum slump shall be 2" when slip form paving methods are used.

For all classes of concrete, the concrete materials shall be using the Absolute Volumes method in accordance with the requirements for the class specified.

The Contractor shall submit a mix design meeting the requirements of these Specifications. Certification that all materials used in the concrete mix meet the requirements of these Specifications shall be included with the mix design. No concrete shall be placed until a mix design is approved by the City.

Compressive strengths for all classes of concrete will be determined from test cylinders made in accordance with AASHTO T 23. If the strength required for the class of concrete being produced is not obtained with the minimum cement content specified, additional cement shall be used at no extra cost to the City.

**601.05 Sampling and Testing.** During the progress of work, concrete test specimens will be made by the City or its authorized representative in accordance with American Concrete Institute testing procedures. Sampling frequency will be as specified in Section 103.04.

Slump will be determined using AASHTO T 119. Air content will be determined using AASHTO T 152. Compressive strength specimens will be made in accordance with AASHTO T 23 and tested in accordance with AASHTO T 22.

Specimens for determining when forms may be removed, when a structure may be put in service, or when concrete piling may be driven will be cured, as nearly as practicable, in the same manner as the concrete in the structure and in accordance with AASHTO T 23.

**601.06 Measurement of Materials.** Materials will be measured by weighing, except as otherwise specified or where other methods are specifically authorized by the Engineer/City Engineer. Aggregates shall be measured separately and accurately by weight. Measuring devices shall be operated in a manner that will consistently weigh the cement within  $\pm 1\%$  and the individual aggregates within  $\pm 2\%$  of the required weight. Measuring devices shall be so designed and plainly marked that the weights can be accurately and conveniently verified for the quantities of each component actually being used.

Cement in standard packages (sack) need not be weighed, but bulk cement shall be weighed.

The mixing water shall be measured by weight or by volume. The water measuring device shall be accurate to within 1%.

When the aggregates contain more water than the quantity necessary to produce a saturated surface-dry condition, representative samples shall be taken and the moisture content determined for each kind of aggregate.

**601.07 Mixing Concrete.** Concrete shall be thoroughly mixed in a mixer of an approved size and type that will insure a uniform distribution of the materials throughout the mass.

The concrete shall be mixed only in the quantity required for immediate use. Concrete that has developed an initial set shall not be used. Re-tempering concrete will not be permitted.

Mixers and agitators shall not be charged in excess of the manufacturer's rated capacity. Concrete shall be delivered and discharged from the truck mixer or agitator into the forms within 1½ hours after the introduction of the mixing water to the cement. In hot weather, or under other conditions contributing to quick setting of the concrete, the maximum allowable time may be reduced by the Engineer/City Engineer. Each mixture shall be accompanied by a truck ticket issued at the batch plant. This ticket shall include the following information:

Unique ticket number.

Identification of the truck.

Date and time of batching.

Total weights and/or volumes of each component.

Total volume of mix.

Total quantity of water added after batching.

Time of discharge.

Plants and transit mix trucks shall be equipped with adequate water storage and a device for accurately measuring and controlling the amount of water used in each batch.

Truck mixers shall be capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass, and of discharging the concrete within the specified range of consistency. The concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation specified by the manufacturer as the mixing speed.

The pick-up and throw-over blades in the drum of all mixers shall be maintained in satisfactory condition to assure thoroughly mixed concrete.

If additional mixing water is required to maintain the specified slump, approximately 20 revolutions of the mixer drum at mixing speed shall be required before discharge of any concrete. No additional water shall be added without approval of the Engineer/City Engineer.

#### **601.08 Handling and Placing Concrete.**

**(a) General.** The Contractor shall provide sufficient supervision, manpower, equipment, tools, and materials and shall assure proper production, delivery, placement, and finishing of the concrete for each placement in accordance with the specifications.

The time interval between batches of concrete in a continuous placement shall not exceed 20 minutes. The minimum placement rate shall be 20 cubic yards per hour in bridges, box culverts, and retaining walls.

In preparation for the placing of concrete, construction debris and extraneous matter shall be removed from the interior of forms. Struts, stays, and braces, serving temporarily to hold the forms in correct shape and alignment pending the placing of concrete, shall be removed when the concrete placement has reached an elevation rendering their service unnecessary.

**(b) Conveying.** Concrete shall be placed to avoid segregation of the materials and the displacement of the reinforcement. The use of long troughs, chutes, and pipes for conveying the concrete to the forms will be permitted only when authorized by the Engineer/City Engineer. In case an inferior quality of concrete is produced by the use of such conveyors, the Contractor shall cease the use of that conveyor until such corrections in procedure are made to insure work of the quality specified.

Open troughs and chutes shall be of metal or metal lined. Where steep slopes are required, the chutes shall be equipped with baffles or be in short lengths that reverse the direction of movement. Aluminum chutes, troughs, and pipes shall not be used for depositing concrete.

Chutes, troughs, and pipes shall be kept clean and free from coatings of hardened concrete by thoroughly flushing with water after each run. Water used for flushing shall be discharged clear of the structure.

When placing operations involve dropping the concrete more than 5', it shall be deposited through approved pipes. Walls of 10" thickness or less may be placed without the use of pipes, provided the concrete can be placed without segregation.

**(c) Placing.** Concrete shall be placed in horizontal layers not more than 18" thick except as hereinafter provided. When less than a complete layer is placed, it shall be terminated in a vertical bulkhead. Each layer shall be placed and consolidated before the preceding batch has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the batches. Each layer shall be consolidated so as to avoid the formation of a construction joint with a preceding layer that has not taken initial set.

Concrete in footings shall be placed in the dry unless natural conditions prohibit. In that case, concrete shall be placed in accordance with Subsection 601.10. In order to separate water from the concrete, it will be permissible to utilize polyethylene sheeting or tarpaulins to maintain a physical barrier between the water and the concrete.

When the placing of concrete is temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete. To avoid visible joints as far as possible upon exposed faces, the top surface of the concrete adjacent to the forms shall be smoothed with a trowel. Where a “feather edge” might be produced at a construction joint, an inset form shall be used to produce an edge thickness of not less than 6 inches.

Immediately following the discontinuance of placing concrete, accumulations of mortar splashed upon the reinforcing steel and the surfaces of forms should be removed. Dried mortar chips and dust shall not be puddled into the concrete. If the accumulations are not removed prior to the concrete becoming set, care shall be exercised not to damage or break the concrete-steel bond at or near the surface of the concrete while cleaning reinforcing steel.

After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of projecting reinforcing bars.

Concrete in walls and top slabs of box culverts shall not be placed less than 24 hours after the concrete in previous placements has set. Provision shall be made for bonding the walls to the bottom slab or footing and the top slab to the walls by means of roughened longitudinal keys. Before concrete is placed in the walls or top slabs, the bottom slab, footing, or walls shall be thoroughly cleaned of extraneous material. No horizontal construction joints will be allowed in any wall of a box culvert unless provided on the plans or approved by the Engineer/City Engineer.

**(d) Consolidating.** All concrete, during and immediately after depositing, shall be thoroughly consolidated. This shall be accomplished by mechanical vibration subject to the following provisions:

The vibration shall be internal unless special authorization of other methods is given by the Engineer/City Engineer.

Vibrators shall be of a type and design approved by the Engineer/City Engineer. They shall be capable of transmitting vibration to the concrete at rated frequencies of not less than 4500 impulses per minute.

The intensity of vibration shall be such as to visibly affect a mass of concrete over a radius of at least 18 inches.

The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms and shall have in reserve at all times sufficient vibratory equipment to guard against shut down of the work because of the failure of the equipment in operation.

Vibrators shall be manipulated to thoroughly work the concrete around the reinforcement and embedded fixtures and into the corners and angles of the forms.

Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted and withdrawn out of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly consolidate the concrete, but shall not be continued so as to cause segregation. Vibration shall not be continued at any one point to the extent that localized areas of grout are formed. Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective.

Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete that have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation, and vibrators shall not be used to transport concrete in the forms.

Vibration shall be supplemented by such spading as is necessary to insure smooth surfaces and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrators.

These provisions shall apply to precast products except that, if approved by the Engineer/City Engineer, the manufacturer's methods of vibration may be used.

**601.09 Pumping.** Concrete may be placed by pumping. The equipment for pumping shall be arranged and operated so that no vibrations result that might damage freshly placed concrete.

The Contractor will be permitted to furnish coarse aggregate for concrete that is to be pumped in a size smaller than that specified provided that a suitable mix can be produced that will conform to the requirements for the class specified.

Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall be adequate in capacity for the work. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pipe, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

Concrete for slump and air content requirements shall be obtained at the discharge end of the pipe.

The use of aluminum pipe as a conveyance for the concrete will not be permitted.

**601.10 Depositing Concrete Under Water.** Concrete shall not be deposited in water except when shown on the plans or with the approval of the Engineer/City Engineer. No concrete shall be placed underwater without an approved mix design which meets the AHTD requirements for Seal Concrete.

The supply of concrete shall be maintained at the rate necessary to raise the elevation over the entire seal by a minimum of 1' per hour or an approved retarder shall be used as necessary for lesser placement rates.

For parts of structures under water, seal concrete shall be placed continuously from start to finish. The surface of the concrete shall be kept as nearly horizontal as practicable. The Contractor shall provide equipment and personnel to sound the top of the seal in the presence of the Inspector in order to verify the location of the seal at all times. Previously placed seal concrete shall not have taken its initial set prior to the placement of adjacent concrete.

Concrete shall be carefully placed by means of a tremie or other approved method. Still water shall be maintained at the point of deposit. Concrete shall be deposited in such a manner that the planned horizontal concrete flow shall be no more than 15 feet.

A tremie shall consist of a tube having a diameter of not less than 10", constructed in sections having flanged couplings fitted with gaskets and an approved foot valve. The tremie shall be supported so as to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of the work so as to prevent water from entering the tube and shall be entirely sealed. The tremie tube shall be kept sufficiently full to prevent the loss of the concrete seal. When a batch is dumped into the tube, the flow of concrete shall be induced by slightly raising the discharged end, always keeping it in the deposited concrete. If at any time the seal is lost, the tremie shall be raised, the discharge end closed for a new start, and then lowered into position with the discharge end in the previously deposited concrete. Aluminum tremies will not be permitted.

Dewatering may proceed when the seal concrete has been allowed to cure for a minimum of 72 hours at a water temperature above 45° F. All laitance or other unsatisfactory materials shall be removed from the exposed surfaces that are to support other structural loads.

#### **601.11 Joints.**

**(a) Construction joints.** Construction joints shall be made only where located on plans or shown in the placement schedule, unless otherwise approved by the Engineer/City Engineer.

The placing of concrete shall be carried continuously from joint to joint. The face edges of all joints that are exposed to view shall be carefully finished true to line and elevation.

The surface of the hardened concrete shall be roughened in a manner that will not leave loosened particles of aggregates or damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance and saturated with water.

If not detailed on the plans, or in the case of emergency, construction joints shall be placed as directed by the Engineer/City Engineer. Shear keys or inclined reinforcement shall be used where necessary to transmit shear or bond the two sections together. When shear keys or inclined reinforcement is not provided, the concrete shall be roughened as directed.

**(b) Expansion and Fixed Joints.** Joints shall be constructed according to the details shown on the plans.

- 1) **Open Joints.** Open joints shall be placed in the locations shown on the plans and shall be constructed by the insertion and subsequent removal of a wood strip, metal plate, or other approved material. The insertion and removal of the template shall be

accomplished without chipping or breaking the corners of the concrete. Reinforcement shall not extend across an open joint unless specified on the plans.

- 2) Filled Joints.** Poured expansion joints shall be constructed similar to open joints. When premolded types are specified, the filler shall be in the correct position when the concrete on the second side of the joint is placed. An approved joint sealer meeting the requirements of Subsection 601.11(d) is required in addition to the joint filler. The cavity for the sealer shall be formed by the insertion and subsequent removal of a wood strip, metal plate, or other approved material.

All faces of the joint to be sealed shall be thoroughly cleaned by sand blasting, water blasting, or other approved methods prior to placing the joint seal material.

Preformed expansion joint filler, non-extruding and resilient types, shall meet the requirements of AASHTO M213 OR M153. Type 2 (sponge rubber) shall be required to have a minimum expansion of 125% and be within  $\pm 0.1$ " of the specified plan thickness.

Other types of joint fillers may be allowed if approved by the Engineer/City Engineer.

**(c) Contraction Joints.** Contraction joints shall be constructed according to the dimensions specified in the plans and these specifications. The joints shall continue continuously across the full width of the concrete surface. Contraction joints shall be 1/8" to 3/8" wide and shall extend to a depth equal to 1/4 to 1/3 of the thickness of the concrete being placed. All contraction joints shall be sealed with an approved sealant meeting the requirements of Subsection 601.11(d) for types 3, 4 or 5.

**(d) Joint Materials.** Materials for filling and sealing joints shall be as shown on the plans and shall comply with the following requirements, as applicable:

**Type 1.** A joint filler that is a uniform mixture of sawdust and asphalt material in the proportion of one part asphalt to four parts sawdust, by volume. Asphalt material used shall be either MC-250 or SS-1. When this material is specified, the joint shall be filled to within 25 mm (1") of the pavement surface. The top 1" shall be sealed with a material complying with the requirements of AASHTO M 173.

**Type 2.** A joint filler that is preformed, non-extruding, and resilient type, complying with AASHTO M 153 Type I (sponge rubber).

The material for filling and sealing longitudinal, warping, contraction, and other specified joints shall be as shown on the plans and shall comply with the following requirements:

Backer rod filler for Types 3, 4, and 5 joint shall be of resilient material approximately 3 mm (1/8") larger in diameter than the width of the joint to be sealed. All components of the joint sealant system, including the backer rod, shall be compatible. No bond shall occur between the backup material and the sealant system for types 3 and 4 joint sealer.

**Type 3.** A joint sealer that is a one part silicone formulation that does not require a primer for bond to concrete. The compound shall be compatible with concrete. Acetic acid cure sealants are not acceptable. The material shall be one that has been approved by the Engineer.

**Type 4.** A joint sealer that is a one part silicone formulation that does require a primer for bond to concrete. The compound shall be compatible with concrete. Acetic acid cure sealants are not acceptable. The material shall be one that has been approved by the Engineer.

**Type 5.** A joint sealer that is a hot poured elastomeric joint sealant. The material shall comply with AASHTO M 282. The appendix of that specification shall be considered a part of this specification.

**Type 6.** A joint sealer that is a 2 component, cold poured, synthetic polymer, complying with ASTM D 1850 with the exception of penetration, which shall not exceed 100, and resilience, both original cured sample and oven aged, which shall be a minimum of 70%.

**Type 7.** A joint sealer that is a hot poured elastic type complying with AASHTO M 173.

**601.12 Forms.** Forms shall be mortar-tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints due to shrinkage of the lumber.

The forms shall be substantial and unyielding and shall be so designed that the finished concrete will conform to the proper dimensions and contours. The design of the forms shall take into account the effect of vibration of concrete as it is placed.

Forms for exposed surfaces shall be made of dressed lumber or plywood of uniform thickness, steel, or other approved materials that will provide a smooth surface, and shall be mortar-tight. Forms shall have a  $\frac{3}{4}$ " chamfer at all sharp corners unless otherwise directed. In the case of projections, such as girders and copings, forms shall be given a bevel or draft to insure easy removal.

Metal snap-ties within the forms shall be so constructed as to permit their removal to a depth of at least 1" from the face of the concrete. Metal inserts or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 1" from the face of the concrete or be covered by being embedded a minimum of 1" in the concrete. In case ordinary wire ties are permitted, all wires, upon removal of the forms, shall be cut back at least  $\frac{1}{4}$ " from the face of the concrete. All cavities shall be filled with cement mortar and the surface left sound, smooth, even, and uniform in color.

Forms shall be set and maintained true to the line designated until the concrete is sufficiently hardened. Before depositing new concrete on or against concrete that has hardened, the forms shall be re-tightened. Forms shall remain in place for the periods specified in Subsection 601.13. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the Engineer/City Engineer shall order the work stopped until the defects have been corrected.

The shape, strength, rigidity, watertightness, and surface smoothness of re-used forms shall be maintained at all times. Any warped or bulged lumber must be re-sized before being re-used.

Forms shall be cleaned before being set to line and grade and shall be oiled prior to placing reinforcing steel in the vicinity of the forms. Materials or methods used in oiling the forms shall not result in the discoloration of the concrete.

**601.13 Removal of Forms.** In the determination of the time for the removal of forms and the discontinuance of heating, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete, and the materials used in the mix.

Removal of forms shall be in accordance with the following schedule:

Item	Minimum Time	Strength Requirement
Top Slabs of RC Box Culverts	7 days	80% Specified
Forms for Columns and Vertical Walls	24 hours	N /A
Side Forms for Parapets, Median Barriers, and Curb Faces	6 hours	N/A

Forms on surfaces that will require a Class 2 finish in accordance with Subsection 601.16 shall be removed at the earliest time permitted under these Specifications in order to begin finishing operations.

Forms and their supports shall not be removed without the approval of the Engineer/City Engineer. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight. Methods of form removal likely to cause overstressing of or damage to the concrete shall not be used.

**601.14 Weather and Temperature Limitations.**

**(a) Hot Weather.** When the internal temperature of the plastic concrete reaches 85° F, the Contractor shall take the necessary precautions to insure that the temperature of succeeding batches does not exceed 90° F. Concrete batches with temperatures in excess of 90° F will be rejected. The method used to control the concrete temperature shall be approved in writing by the Engineer. The temperature of the plastic concrete shall be determined immediately prior to its being deposited in the forms by inserting a thermometer to a depth consistent with the capabilities of the thermometer being used to obtain a true reading. Prior to beginning placement, the Contractor shall insure that sufficient materials, labor, and equipment are available during placement to implement the previously approved cooling process.

**(b) Cold Weather.** Concreting operations will not be permitted when a descending air temperature falls below 40° F nor resumed until an ascending air temperature reaches 35° F without specific authority from the Engineer/City Engineer. Under no circumstances will the placing of concrete on a frozen subgrade or base aggregate be permitted. No concrete shall be placed unless the temperature of the concrete is more than 50° F when placed. If heating of the ingredients is necessary to meet this criterion, it shall be accomplished by a method such as dry heat or steam and not by direct flame. Water shall not be heated to more than 180 degrees F, and shall be combined with the aggregate before the addition of cement. Frozen aggregates may not be used.

After concrete is placed, it shall be protected by insulated forms, blankets, enclosing and heating, and/or any other method approved by the Engineer/City Engineer that will maintain the temperature adjacent to the concrete at a minimum of 50° F for at least 5 days. Concrete that has been frozen or damaged due to weather conditions shall be removed and replaced by the Contractor at no cost to the City.

**(c) Protection Against Rain.** In order that concrete may be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor shall have available at all times materials for the protection of the edges and surface of the unhardened concrete. Such protective materials shall consist of standard metal forms or wood planks having a nominal thickness of not less than 2” and a nominal width of not less than the thickness of the pavement at its edge for the protection of the pavement edges, and covering material such as burlap or cotton mats, or plastic sheeting material for the protection of the surface of the pavement. When rain appears imminent, all paving operations shall stop and all available personnel shall begin protection of the sides of the pavement and covering the surface of the unhardened concrete with the protective covering. Any surface finish damaged by rain shall be repaired or replaced to the satisfaction of the City at no cost to the City.

#### **601.15 Curing Concrete.**

**(a) Materials.** Materials used in curing concrete shall conform to one of the following types:

Burlap-polyethylene sheeting shall meet the requirements of AASHTO M 171.

Polyethylene sheeting shall meet the requirements of AASHTO M 171.

Copolymer/synthetic blanket shall meet the requirements of AASHTO M 171. Copolymer/synthetic blankets shall be a composite of a copolymer membrane material coated over a layer of absorbent nonwoven synthetic fabric weighing at least 6 ounces per square yard, uniform in appearance, and free from visible defects.

Other approved sheeting materials shall meet the requirements of AASHTO M 171.

Membrane curing compound shall meet the requirements of AASHTO M 148, Type 1-D or Type 2.

**(b) Application.** The exposed concrete, immediately after finishing, shall be covered with one of the curing materials listed above and shall be kept continuously and thoroughly wet for a period of not less than 5 days after the concrete is placed. Membrane curing does not require the application of additional moisture.

Membrane curing compound shall not be used on surfaces requiring a Class 2 finish.

When membrane curing is used, the exposed concrete shall be thoroughly sealed by applying the membrane curing solution immediately after the free water has left the surface. The concrete inside the forms shall be sealed immediately after the forms are removed and necessary finishing has been done. For uniform application in the field on vertical concrete surfaces, the specified rate of application may be achieved by two coats applied at an interval of approximately 1 hour.

The Contractor shall provide satisfactory equipment and means to properly control and assure the direct application of the curing solution on the concrete surface so as to result in a uniform coverage at the rate of 1 gallon for each 125 square feet of area.

If rain falls on the newly coated concrete before the film has dried sufficiently to resist damage, or if the film is damaged in any other manner, a new coat of the solution shall be applied to the affected portions equal in curing value to that specified above.

**601.16 Finishing Concrete Surfaces.** Surface finishes shall be classified as follows:

- Class 1. Ordinary Surface finish.
- Class 2. Rubbed finish.
- Class 3. Sprayed finish.
- Class 4. Exposed Aggregate finish.
- Class 5. Tined Surface finish.
- Class 6. Broomed finish.
- Class 7. Grooved finish.

All concrete shall be given a Class 1, Ordinary Surface Finish. In addition, if further finishing is required, such other types of finish will be as specified herein.

Payment for finishes will be considered a part of the applicable item of concrete used.

The following surfaces shall be given a Class 2 finish except when a Class 3 finish is specified in the plans:

Exposed surfaces of retaining walls and box culvert wingwalls, surfaces of concrete rails, rail posts, rail end posts, rail bases, and parapets, including the outside face.

At the option of the Contractor, a Class 3 finish may be used on all surfaces requiring a Class 2 finish provided the same class of finish is used on the entire job.

Sidewalks, curbs, exposed horizontal surfaces of inlets and junction boxes, and exposed horizontal faces of miscellaneous concrete items shall be given a Class 6 finish.

Concrete pavement surfaces shall be given a Class 5 finish.

The various classes of surface finish are defined as follows:

**(1) Class 1, Ordinary Surface Finish.** Immediately following the removal of forms, fins and irregular projections shall be removed from all surfaces except from those that are not to be exposed or are not to be waterproofed. On all surfaces, the cavities produced by form ties and all other holes, broken corners or edges, and other defects shall be thoroughly cleaned, and after having been thoroughly saturated with water, shall be carefully pointed and trued with a mortar of cement and fine aggregate mixed in the proportion of 1:2. Mortar used in pointing shall be not more than 1 hour old. The concrete shall then be rubbed or sprayed, if required, and cured as specified under Subsection 601.15. Construction and expansion joints in the completed work shall be left carefully tooled and free of mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

The resulting surfaces shall be true and uniform. Repaired surfaces, the appearance of which is not satisfactory to the City, shall be rubbed as specified under Class 2 finish.

Exposed surfaces not protected by forms shall be struck off with a straightedge and finished with a wood float to a true and even surface. The use of additional mortar to provide a plastered or grout finish will not be permitted.

The tops of caps in the area of the bridge seat shall be finished with a steel trowel or by grinding to a smooth finish and true slope at the proper elevation.

**(2) Class 2, Rubbed Finish.** After removal of forms, the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work the concrete shall be thoroughly saturated with water. Sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing of rod holes and defects to thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished. Rubbing shall be continued until form marks, projections, and irregularities have been removed, voids filled, and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place at this time.

After concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

After the final rubbing is complete and the surface has dried, it shall be rubbed with burlap to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks.

**(3) Class 3, Sprayed Finish.** The material furnished for sprayed finish shall be a commercial paint type texturing product produced specifically for this purpose, and shall consist of a synthetic non-alkyd resin containing mica, perlite, non-biodegradable fibers, and durable tinting pigments. The material shall be approved by the City. Unless otherwise specified in the Contract, the color of the sprayed finish shall be concrete gray, equal or close to Shade 36622 of the Federal Color Standard 595 A.

Surfaces to be coated shall be free from efflorescence, flaking, coatings, dirt, oil, and other foreign substances. The sprayed finish shall not be applied over surfaces cured with membrane curing compound until 30 days has elapsed from application of the membrane. Prior to application of spray finish, the surfaces shall be free of moisture, as determined by sight and touch, and in a condition consistent with the manufacturer's published recommendations.

The spray finish shall be applied at a rate as recommended by the manufacturer and as approved by the Engineer/City Engineer. The spray finish shall be applied with heavy duty spray equipment capable of maintaining a constant pressure as necessary for proper application.

The completed finish shall be tightly bonded to the structure and shall present a uniform appearance and texture equal to or better than that required for rubbed finish. If necessary, an additional coat or coats shall be applied to produce the desired surface texture and uniformity. Upon failure to adhere positively to the structure without chipping or cracking, or to attain the desired surface appearance, the coating shall be removed from the structure and the surface given a rubbed finish, or another approved finish satisfactory to the City.

**(4) Class 4, Exposed Aggregate Finish.** This type of finish shall be produced by scrubbing the surface of green concrete with stiff wire or fiber brushes, using a solution of muriatic acid in the proportion of 1 part acid to 4 parts water, or by sand blasting, until the cement film or surface is completely removed and the aggregate particles are exposed. The amount of aggregate exposure will be specified on the plans or designated by the Engineer/City Engineer. Any surface treated with muriatic acid shall be thoroughly washed with water to which a small amount of ammonia has been added to remove all traces of the acid. The resulting surface shall be an even pebbled texture.

**(5) Class 5, Tined Roadway Surface Finish.** The concrete roadway surface shall be given a finish with a burlap drag, followed by tining.

The surface shall be finished by dragging a seamless strip of damp burlap over the full width of the roadway surface. The burlap drag shall consist of sufficient layers of burlap and have sufficient length in contact with the concrete to slightly groove the surface, and shall be moved forward with a minimum bow of the lead edge. The drag shall be kept damp, clean, and free of particles of hardened concrete.

The final finish shall be accomplished by using the drag finish as described above with the further application of a metal tine finishing device. The tine shall be approximately 0.032" by 0.125" of steel flat wire, 2" to 5" in length, and spaced on 1/2" to 3/4" centers. The grooves produced in the concrete shall be substantially from 1/8" to 3/16" in depth. The grooves shall be transverse to the centerline of the surface. The metal tine device shall be operated by approved mechanical or manual means. Other texturing equipment may be approved by the Engineer/City Engineer provided it produces a texture equivalent to that produced by the metal tine.

The tining shall be terminated with a transition in depth 18" from the gutter line. The outer 18" of the tined surface shall receive a Class 6, broomed finish.

**(6) Class 6, Broomed Finish.** After the concrete has been deposited in place, it shall be consolidated and the surface shall be struck off by means of a strike board, floated, and broomed. An edging tool shall be used on edges and expansion joints. The surface shall not vary more than 1/4" under a 10' straightedge. The surface shall have a granular or matte texture.

**(7) Class 7, Grooved Finish.** The roadway surface shall be grooved perpendicular to the centerline with grooves extending across the slab to within 18" of the gutter line. The grooves shall be cut using a mechanical sawing device that will leave grooves 1/8" to 3/16" in depth and spaced on 1/2" to 3/4" centers.

## Section 602. Reinforcing Steel

**602.01 Description.** This item shall consist of reinforcing steel and miscellaneous accessories of the quality, type, size, and quantity designated, which shall be furnished and placed in concrete according to these specifications and in conformity with the details shown on the plans, or as directed.

### 602.02 Materials.

(a) **Bar Reinforcement.** Bar reinforcement for concrete in sizes up to and including #18 shall conform to the requirements of AASHTO M 31 or M 53.

(b) **Wire and Wire Fabric.** Wire, when used as reinforcement in concrete, shall conform to the requirements of AASHTO M 32 or M 225.

(c) **Bar Mat Reinforcement.** Bar mat reinforcement for concrete shall conform to the requirements of AASHTO M 54.

(d) **Epoxy Coating.** When specified, reinforcing steel bars shall be coated according to AASHTO M 284 using a coating material that meets the requirements of Annex A1 of AASHTO M 284.

The Contractor shall supply to the Engineer a written certification that properly identifies the number of each batch of coating material used in the order; the material, quantity represented, date of manufacture, and name and address of the manufacturer; and a statement that the supplied coating material meets the requirements of Annex A1 of AASHTO M 284.

Patching material, compatible with coating material, inert in concrete, and meeting the requirements of Annex A1 of AASHTO M 284, shall be provided by the epoxy coating manufacturer.

**602.03 Bar Lists and Bending Diagrams.** All reinforcing steel shall be fabricated to conform to the details shown on the plans. Pins used for bending reinforcing steel shall be equal to or larger than that shown on the plans. Bar lists and bending diagrams for reinforcing steel and bar supports will not be reviewed or approved by the Engineer. The Contractor shall be responsible for the accuracy of the fabricated reinforcing steel.

**602.04 Fabrication.** Bar reinforcement shall be bent to the shapes shown on the plans.

Bars shall be bent cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be field bent, except as shown on the plans or specifically permitted by the Engineer.

Radii for bends shall be as shown on the plans. When not shown on the plans, radii bends on the inside of bars shall be as specified below.

Bar Number	Minimum Radii
Stirrups and Ties	4 bar diameters

3,4,5,6,7, or 8	6 bar diameters
9,10, or 11	8 bar diameters
14 or 18	10 bar diameters

The Engineer/City Engineer or his representative shall have free access to the shop for inspection, and every facility shall be extended to him for this purpose. On a random basis, samples of bars, other than the additional test bars, may be taken by the Engineer.

Epoxy coating applicators shall be CRSI certified. The Contractor shall inform the Engineer, in writing, at least 10 days prior to performing any of the cleaning or coating operations. The Contractor shall furnish to the Engineer the coating applicator's certification certifying that all materials used, the preparation of the bars, coating, and curing were done according to these specifications and that no bars contain more than six holidays per yard. The certification shall include or have attached specific results of tests of coating thickness and flexibility of coating.

**602.05 Shipping, Handling, and Protection of Material.** Bar reinforcement shall be shipped in standard bundles, tagged and marked according to the *Code of Standard Practice* of the Concrete Reinforcement Steel Institute.

Steel reinforcement shall be protected from damage. When placed in the work, it shall be free from dirt, detrimental rust or scale, paint, oil, or other foreign substance. Steel reinforcement shall be stored above the ground on skids, platforms, or other supports. Epoxy coated reinforcing steel that is not incorporated into the work within 90 calendar days after delivery to the project shall be protected from exposure to the sun.

Epoxy coating damaged during fabrication, shipping, or installation shall be repaired according to AASHTO M 284. Damaged areas less than 0.10 square inch need not be repaired but all areas larger than 0.10 square inch shall be repaired. The maximum amount of damage shall not exceed 2% of the surface area of each bar. All damaged areas shall be repaired according to the manufacturer's instructions. Repairs will be required on all sheared or cut ends of bars, end areas left bare during the coating process, and any areas where the entire coating is removed. All repairs shall be completed as soon as practicable and, in the case of bare end areas and sheared ends, before visible oxidation of the surface occurs. Epoxy coated bars shall not be flame cut.

The Contractor shall exercise caution when placing and vibrating concrete to prevent any damage to epoxy coated bars. In order to prevent the vibrator from damaging the coated bars, the head shall be covered with a sheet of rubber or a similar material as approved by the Engineer/City Engineer.

**602.06 Placing and Fastening.** Steel reinforcement shall be accurately placed in the positions shown on the plans and firmly held during the placing and setting of concrete. Bars shall be tied at all intersections except where spacing is less than 12" in each direction, in which case alternate intersections shall be tied. Bundled bars shall be tied together at not more than 6' centers.

Bar positions or clearances from the forms shall be maintained by means of stays, ties, hangers, or other approved devices. Reinforcing steel shall not be welded unless detailed on the plans or authorized in writing by the Engineer. Metal bar supports that are in contact with the exterior surface of the concrete shall have protection conforming with the CRSI Specifications, Class 1 for Plastic Protected Bar Supports or Class 2 for Stainless Steel Bar Supports, with the further provision that the plastic protection may be applied either by a dipping operation or by the addition of premolded plastic tips to the legs of the supports. Epoxy Coated Bar Supports that are coated according to the provisions of AASHTO M 284 using a coating material meeting the requirements of Annex A1 of AASHTO M 284 may be substituted for Plastic Protected Bar Supports or Stainless Steel Bar Supports. All high chairs and bar bolsters shall be metal. Any bar supports that deform under foot traffic or other construction activities shall not be used.

When concrete is to rest on an excavated surface, layers of bars shall be supported above the surface by metal chairs or by precast mortar or concrete blocks. The use of rocks, pieces of stone or brick, pipe, wooden blocks, or chunks of concrete will not be permitted as bar supports or spacers.

Reinforcement shall be placed by the Contractor and inspected and approved by the Engineer/City Engineer before the placing of concrete begins. Concrete placed in violation of this provision may be rejected and removal required. Unless otherwise shown on the plans, the spacing of supports shall conform to the recommendations of CRSI.

Epoxy coated bars shall be placed on plastic coated or epoxy coated metal supports and shall be held in place by use of plastic coated tie wires or molded plastic clips especially fabricated for this purpose. Bar supports for epoxy coated bars shall be fully coated metal supports. Epoxy coated bar supports shall be coated according to the provisions of AASHTO M 284 using a coating material meeting the requirements of Annex A1. In placing epoxy coated bars, care shall be maintained to prevent coated bars from being damaged.

After the coated bars are secured to bar supports, a final visual inspection shall be made and all uncoated or damaged areas coated or repaired as required by the Engineer/City Engineer.

**602.07 Splicing.** Reinforcing steel shall be furnished in the full lengths specified on the plans. Bars spliced as a result of unforeseen construction conditions or sequences will require the written approval of the Engineer. Splices shall meet the requirements of the current edition of the *AASHTO Standard Specifications for Highway Bridges*.

Secondary reinforcing used for distribution of loads, such as longitudinal bars in box culverts and retaining walls may be lapped 32 bar diameters minimum if bars are #6 or smaller. Primary reinforcing for columns and retaining walls which require splicing as a result of the lowering of footings shall be spliced at the upper end of the original bars. Required lengths of splices for primary reinforcing will be determined by the Engineer.

In lapped splices, the bars shall be placed in contact and fastened together in such a manner as to maintain the minimum distance to the surface of the concrete as shown on the plans.

Sheets of wire fabric or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges. The lap shall be not less than one space of wire fabric or bar.

## **DIVISION 700. TRAFFIC CONTROL FACILITIES**

### **Section 701. Actuated Controller**

**701.01 Description.** This item shall consist of furnishing and installing an actuated controller and other associated equipment according to these specifications and at the locations shown on the plans or as directed. All requirements of Standard Specifications for Highway Construction, AHTD Edition of 2003 Division 700 Traffic Control Facilities, and specifically Section 701 Actuated Controller, shall apply. Portions of the AHTD Standard Specifications may be superseded by these provisions.

The Contractor shall pretest all electronic equipment before installing any such electronic equipment.

**701.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications with the following exceptions:

**(a) General.** Controller and radio equipment supplied shall match the brand, type, and configuration currently used by the governing authority. System software is currently licensed to the City and to the State. All equipment shall be completely compatible with existing hardware and software.

**(b) Fan and Ventilation.** The second sentence of the third paragraph of Subsection 701.02 Materials (c) Cabinet (5) Fan and Ventilation is hereby deleted and the following substituted therefore:

The fan shall be thermostatically controlled and shall be manually adjustable to turn on between 70°F (32°C) and 150°F (66°C).

**(c) Power Panel.** Subsection 701.02 Materials (d) Cabinet Auxiliary Equipment (7) Power Panel is hereby deleted and the following substituted therefore:

The cabinet shall have a power distribution panel containing a 50 amp radio interference suppressor, a 30 amp main circuit breaker, a 15 amp auxiliary equipment circuit breaker, a 15 amp circuit breaker for a GFCI receptacle, fan, and light, and a 15 amp circuit breaker for a non-GFCI protected receptacle.

**(d) Subsection 701.02 (d)(10) Wiring Diagrams and Controller Manual.** Is hereby deleted and the following substituted therefore:

Three copies of the Cabinet wiring Diagram and one copy of the controller manual shall be supplied with each cabinet. One diagram and the manual shall be placed in the "Cabinet Drawer Assembly". The "Cabinet Drawer Assembly" shall be fabricated

to the approximate dimensions shown on the plans. Included with the “Cabinet Drawer Assembly” will be all hardware necessary to fasten and install the Assembly to the underside of a cabinet shelf roughly at the midpoint of the Cabinet vertically.

One diagram shall be delivered to the local or state authority before final inspection of the intersection. One diagram shall be given to the Engineer.

**701.03 Construction Requirements.**

(a) **General.** Construction shall be in accordance with the AHTD Standard Specifications.

(b) **Pretesting.** The Contractor shall pretest all electronic equipment before installing any such electronic equipment. Unless approved otherwise by the Owner, the pretesting shall include a minimum of seven (7) consecutive days of test operation. No separate payment shall be made for any and all pretesting but such pretesting shall be considered subsidiary to the applicable equipment.

**701.04 Method of Measurement.** Actuated Controllers will be measured by the unit. One unit shall include the controller, the controller cabinet; the pad on which the cabinet is installed, when required; and all hardware required for installing the cabinet.

**701.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each Actuated Controller of the phases and the NEMA TS type specified, which price shall be full compensation for furnishing the Actuated Controller and mounting the controller cabinet; for installing, wiring and testing the controller; for excavation and backfilling; for construction of the mounting pad; and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Actuated Controller TS1 (___ Phases)	EA
Actuated Controller TS2-Type 2 (___ Phases)	EA

**Section 702. Traffic Signal Head**

**702.01 Description.** This item shall consist of furnishing and installing 300 mm (12") diameter Traffic Signal Heads and components based on Light Emitting Diode (LED) technology according to these specifications as well as **SECTION 706, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**702.02 Materials.** The LED modules shall be suitable for span wire and mast arm mounted signals. Units must meet the following specifications to be accepted.

**(a) General.** Acceptable units shall be pre-approved as indicated on the Arkansas Highway & Transportation Department's "Qualified Products List" (QPL). The LED modules shall be suitable for span wire and mast arm mounted signals. Units must meet the following specifications to be accepted.

**(b) Physical and Mechanical.** LED traffic signal modules designed shall not require special tools for installation. Retrofit replacement LED signal modules shall fit into existing traffic signal housings built to the VTCSH Standard without modification to the housing. Installation of a retrofit replacement LED signal module into an existing signal housing shall only require the removal of the existing optical unit components, i.e., lens, lamp, and gaskets; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring utilizing spade connectors. It shall not be necessary to remove reflector or lamp module. Reflector and lamp module is not required where new housings are provided.

**(c) Optical Requirements.** The RED and GREEN modules shall be measured per ITE specifications, and are required to meet luminous values that are a minimum of 115 percent greater than the required minimum values in the specifications at the time of production. The YELLOW modules shall be tested for luminous output at 25°C, allowing the modules to achieve thermal equilibrium for 60 minutes, while the modules are energized at nominal operating voltage, at a 8.3% (or 1/12) duty cycle or 5 sec on/55 sec off). The yellow modules shall meet all other ITE specifications.

**(d) Optical Unit.** LED signal modules shall meet the following requirements:

- 1) **Optical Unit Replacement.** The LED module shall be constructed to allow the replacement of the outer lens and/or the light engine when needed.
- 2) **Lens Surface.** The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup.
- 3) **Tinting.** The RED, YELLOW and optionally on GREEN lens shall be tinted or shall use transparent film or materials with similar characteristics.
- 4) **Chromaticity.** The measured coordinates of LED signal modules shall conform to the chromaticity requirements of Section 8.04 and Figure 1 of the VTCSH standard.
- 5) **Environment.** The LED signal module shall be rated for use in the ambient operating temperature range, measured at the exposed rear of the module, of -40° C (-40° F) to +74°C (+165° F). The LED sign module shall be protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991, sections 4.7.2.1 and 4.7.3.2, for Type 4 enclosures to protect all internal LED, electronic, and electrical components. The LED signal module lens shall be UV Stabilized.
- 6) **Pre assembly.** The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing. The

power supply for the LED signal module may be either integral or packaged as a separate module. The power supply may be designed to fit and mount inside the traffic signal housing adjacent to the LED signal module. The assembly and manufacturing process for the LED signal assembly shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

- 7) **LED Drive Circuitry (parallel).** The individual LED light sources shall be wired so that a catastrophic failure of one LED light source will result in the loss of only that one LED light source, and the loss of no more than 1% of the total LED'S within the LED signal module.
- 8) **Material Composition.** Materials used for the lens and signal module construction shall conform to ASTM specification for the materials where applicable. Enclosures containing either the power supply or electronic components of the signal modules shall be made of UL94VO flame retardant materials. The lens of the signal module is excluded from this requirement.
- 9) **Identification Markings.** Each individual LED signal module shall be identified for warranty purposes. Each LED signal module shall be identified on the backside with the manufacturer's name and serial number. The following operating characteristics shall be identified: nominal operating voltage, power consumption, and Volt-Ampere. Modules shall have a prominent and permanent vertical indexing indicator, i.e. UP ARROW or the word UP or TOP, for correct indexing and orientation inside a signal housing. Modules conforming to this specification may have the following statement: "Manufactured in Conformance with the Interim Purchase Specification of the ITE for LED vehicle Traffic Signal Modules" on an attached label.

(e) **Manufacturer's Warranty.** The standard contract warranty shall apply with time extensions applied to materials. The contractor shall provide a written manufacturer's guarantee to the City. Warranty shall provide the following stipulations:

- Isolated Failures Warranty Period not less than 7 Years
- Design Failure Warranty Period not less than 5 Years

Warranty for isolated lens failure shall include replacement LED module at no cost for materials and shipping for a period of 7 years from the date the intersection is considered substantially complete by the engineer. An LED module shall be considered failed when the luminosity drops below the ITE requirements listed above.

A product "Design Failure" is considered to have occurred if, within a period of 5 years or less, a total of ten percent (10%) of the LED modules supplied on a particular Job are considered failed as described above. The supplier shall then "recall" the entire shipment at no cost to the agency maintaining the equipment. This shall include labor and equipment necessary to replace the units.

**702.03 Construction Requirements.** Construction shall be in accordance with the AHTD Standard Specifications.

**702.04 Method of Measurement.** LED Traffic Signal Heads will be measured by the unit. One unit shall include the number of faces and sections specified, together with all mounting brackets and hardware; signs, where required; and other incidentals to provide a signal head complete in place.

**702.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Traffic Signal Head of the type and size specified, which price shall be full compensation for furnishing and installing all materials and signs; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Traffic Signal Head, LED (3-Section)	EA
Traffic Signal Head, LED (5-Section)	EA

### **Section 703. Pedestrian Signal Head**

**703.01 Description.** This item shall consist of furnishing and installing 300 mm (12") diameter Traffic Signal Heads and components based on Light Emitting Diode (LED) technology according to these specifications as well as **SECTION 707, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**703.02 Materials.** The LED modules shall be suitable for span wire and mast arm mounted signals. Units must meet the following specifications to be accepted.

**(a) Physical and Mechanical.** LED pedestrian signal modules designed shall not require special tools for installation. Retrofit replacement LED signal modules shall fit into existing pedestrian signal housings built to the VTCSH Standard without modification to the housing. Installation of a retrofit replacement LED signal module into an existing signal housing shall only require the removal of the existing optical unit components, i.e., lens, lamp, and gaskets; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring utilizing spade connectors. It shall not be necessary to remove reflector or lamp module. Reflector and lamp module is not required where new housings are provided.

**(b) Optical Requirements.** The modules shall be measured per ITE specifications, and are required to meet luminous values that are a minimum of 115 percent greater than the required minimum values in the specifications at the time of production. The YELLOW modules shall be tested for luminous output at 25°C, allowing the modules to achieve thermal equilibrium for 60 minutes, while the modules are energized at nominal operating voltage, at a 8.3% (or 1/12) duty cycle or 5 sec on/55 sec off). The yellow modules shall meet all other ITE specifications.

(c) **Optical Units.** LED signal modules shall meet the following requirements:

- 1) **Optical unit replacement.** The LED module shall be constructed to allow the replacement of the outer lens and/or the light engine when needed.
- 2) **Lens Surface.** The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup.
- 3) **Chromaticity.** The measured coordinates of LED signal modules shall conform to the chromaticity requirements of Section 8.04 and Figure 1 of the VTCSH standard.
- 4) **Environment.** The LED signal module shall be rated for use in the ambient operating temperature range, measured at the exposed rear of the module, of -40° C (-40 ° F) to +74 ° C (+165 ° F). The LED sign module shall be protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991, sections 4.7.2.1 and 4.7.3.2, for Type 4 enclosures to protect all internal LED, electronic, and electrical components. The LED signal module lens shall be UV Stabilized.
- 5) **Pre assembly.** The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing pedestrian signal housing. The power supply for the LED signal module may be either integral or packaged as a separate module. The power supply may be designed to fit and mount inside the pedestrian signal housing adjacent to the LED signal module. The assembly and manufacturing process for the LED signal assembly shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- 6) **LED Drive Circuitry (parallel).** The individual LED light sources shall be wired so that a catastrophic failure of one LED light source will result in the loss of only that one LED light source, and the loss of no more than 1% of the total LED'S within the LED signal module.
- 7) **Material Composition.** Materials used for the lens and signal module construction shall conform to ASTM specification for the materials where applicable. Enclosures containing either the power supply or electronic components of the signal modules shall be made of UL94VO flame retardant materials. The lens of the signal module is excluded from this requirement.
- 8) **Identification Markings.** Each individual LED signal module shall be identified for warranty purposes. Each LED signal module shall be identified on the backside with the manufacturer's name and serial number. The following operating characteristics shall be identified: nominal operating voltage, power consumption, and Volt-Ampere. Modules shall have a prominent and permanent vertical indexing indicator, i.e. UP ARROW or the word UP or TOP, for correct indexing and orientation inside a signal housing. Modules conforming to this specification may have the following statement: "Manufactured in Conformance with the Interim Purchase Specification of the ITE for LED vehicle Pedestrian signal Modules" on an attached label.

**(d) Manufacturer’s Warranty.** The standard contract warranty shall apply with time extensions applied to materials. The contractor shall provide a written manufacturer’s guarantee to the City. Warranty shall provide the following stipulations:

- Isolated Failures Warranty Period not less than 7 Years
- Design Failure Warranty Period not less than 5 Years

Warranty for isolated lens failure shall include replacement LED module at no cost for materials and shipping for a period of 7 years from the date the intersection is considered substantially complete by the engineer. An LED module shall be considered failed when the luminosity drops below the ITE requirements listed above.

A product “Design Failure” is considered to have occurred if, within a period of 5 years or less, a total of ten percent (10%) of the LED modules supplied on a particular Job are considered failed as described above. The supplier shall then “recall” the entire shipment at no cost to the agency maintaining the equipment. This shall include labor and equipment necessary to replace the units.

**703.03 Construction Requirements.**

**(a) General.** Construction shall be in accordance with the AHTD Standard Specifications.

**703.04 Method of Measurement.** LED Pedestrian Signal Heads will be measured by the unit. One unit shall include one complete signal assembly; pedestrian actuated push button detectors and signs; and all wiring except signal cable necessary to provide a complete functioning unit.

**703.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each LED Pedestrian Signal Head, which price shall be full compensation for furnishing and installing all materials and signs; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Pedestrian Signal Head w/ Push Button, LED	EA

**Section 704. Countdown Pedestrian Signal Head**

**704.01 Description.** This item shall consist of furnishing and installing Countdown Pedestrian Signal Heads and components based on Light Emitting Diode (LED) technology according to these specifications as well as **SECTION 707, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. The basic configuration

consists of the “filled”, symbolic single section design. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**704.02 Materials.** The LED modules shall be suitable for span wire and mast arm mounted signals. Units must meet the following specifications to be accepted.

**(a) Physical and Mechanical.** LED pedestrian signal modules designed shall not require special tools for installation. Retrofit replacement LED signal modules shall fit into existing pedestrian signal housings built to the VTCSH Standard without modification to the housing. Installation of a retrofit replacement LED signal module into an existing signal housing shall only require the removal of the existing optical unit components, i.e., lens, lamp, and gaskets; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring utilizing spade connectors. It shall not be necessary to remove reflector or lamp module. Reflector and lamp module is not required where new housings are provided.

The countdown feature will be displayed only during the flashing “Don’t Walk” segment of the pedestrian phase. This feature should be able to restart at the correct part of the signal cycle after a power outage or a signal pre-emption has been activated.

**(b) Optical Requirements.** The modules shall be measured per ITE specifications, and are required to meet luminous values that are a minimum of 115 percent greater than the required minimum values in the specifications at the time of production. The YELLOW modules shall be tested for luminous output at 25°C, allowing the modules to achieve thermal equilibrium for 60 minutes, while the modules are energized at nominal operating voltage, at a 8.3% (or 1/12) duty cycle or 5 sec on/55 sec off). The yellow modules shall meet all other ITE specifications.

**(c) Optical Units.** LED signal modules shall meet the following requirements:

- 9) Optical unit replacement.** The LED module shall be constructed to allow the replacement of the outer lens and/or the light engine when needed.
- 10) Lens Surface.** The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup.
- 11) Chromaticity.** The measured coordinates of LED signal modules shall conform to the chromaticity requirements of Section 8.04 and Figure 1 of the VTCSH standard.
- 12) Environment.** The LED signal module shall be rated for use in the ambient operating temperature range, measured at the exposed rear of the module, of -40° C (-40° F) to +74° C (+165° F). The LED sign module shall be protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991, sections 4.7.2.1 and 4.7.3.2, for Type 4 enclosures to protect all internal LED, electronic, and electrical components. The LED signal module lens shall be UV Stabilized.
- 13) Pre assembly.** The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing pedestrian signal housing. The power supply for the LED signal module may be either integral or packaged as a separate module. The power supply may be designed to fit and mount inside the

pedestrian signal housing adjacent to the LED signal module. The assembly and manufacturing process for the LED signal assembly shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

**14) LED Drive Circuitry (parallel).** The individual LED light sources shall be wired so that a catastrophic failure of one LED light source will result in the loss of only that one LED light source, and the loss of no more than 1% of the total LED'S within the LED signal module.

**15) Material Composition.** Materials used for the lens and signal module construction shall conform to ASTM specification for the materials where applicable. Enclosures containing either the power supply or electronic components of the signal modules shall be made of UL94VO flame retardant materials. The lens of the signal module is excluded from this requirement.

**16) Identification Markings.** Each individual LED signal module shall be identified for warranty purposes. Each LED signal module shall be identified on the backside with the manufacturer's name and serial number. The following operating characteristics shall be identified: nominal operating voltage, power consumption, and Volt-Ampere. Modules shall have a prominent and permanent vertical indexing indicator, i.e. UP ARROW or the word UP or TOP, for correct indexing and orientation inside a signal housing. Modules conforming to this specification may have the following statement: "Manufactured in Conformance with the Interim Purchase Specification of the ITE for LED vehicle Pedestrian signal Modules" on an attached label.

**(d) Manufacturer's Warranty.** The standard contract warranty shall apply with time extensions applied to materials. The contractor shall provide a written manufacturer's guarantee to the City. Warranty shall provide the following stipulations:

- Isolated Failures Warranty Period not less than 7 Years
- Design Failure Warranty Period not less than 5 Years

Warranty for isolated lens failure shall include replacement LED module at no cost for materials and shipping for a period of 7 years from the date the intersection is considered substantially complete by the engineer. An LED module shall be considered failed when the luminosity drops below the ITE requirements listed above.

A product "Design Failure" is considered to have occurred if, within a period of 5 years or less, a total of ten percent (10%) of the LED modules supplied on a particular Job are considered failed as described above. The supplier shall then "recall" the entire shipment at no cost to the agency maintaining the equipment. This shall include labor and equipment necessary to replace the units.

### **704.03 Construction Requirements.**

(a) **General.** Construction shall be in accordance with the AHTD Standard Specifications. No distinction is made for span-wire installations, post mount, mast arm mount, or other mounting methods as described on the plan sheet(s).

**703.04 Method of Measurement.**

(a) **Countdown Pedestrian Signal Head, LED.** Work completed and accepted and measured as provided above will be measured by each unit.

(b) **Pedestrian Signal LED Lens Retrofit (Ret).** Work completed and accepted and measured as provided above will be measured by each unit.

**704.05 Basis of Payment.**

(a) **Countdown Pedestrian Signal Head, LED.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Pedestrian Signal Head, LED of the type, display and size specified, which price shall be full compensation for furnishing and installing all materials and signs; and for all labor, equipment, tools, and incidentals necessary to complete the work.

b) **LED Pedestrian Signal Lens Ret.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for LED Pedestrian Signal Lens Ret. of the type, number of sections, color and display specified, which price shall be full compensation for removing existing unnecessary hardware and modifying existing housing; and for furnishing and installing all materials; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
Countdown Pedestrian Signal Head, LED	EA	
Pedestrian Signal LED Lens Ret.		EA

**Section 705. Traffic Signal Cable**

**705.01 Description.** This item shall consist of furnishing and installing traffic signal cable according to these specifications and at the locations shown on the plans or as directed.

**705.02 Materials.** The cable shall be #14 AWG copper with the number of conductors as shown on the plans and shall comply with the *International Municipal Signal Association Specification 20-1 or 20-3* for 600 volt polyethylene insulated and jacketed signal cable.

The Contractor shall furnish and install acceptable bands, ties, and other supports for the cable in poles and control boxes according to the best modern practice.

Cables shall be marked for phase identification according to the manufacturer's standards.

**705.03 Construction Requirements.**

(a) **General.** Connections to signal heads shall be made with a polyethylene jacketed stranded wire cable. The Contractor will be allowed to make connections to the signal heads by the “line tapping” method.

Splices shall be moisture proof and have a dielectric strength at least equal to that of the original insulation. The sweating or soldering shall be accomplished by pouring, using solder hot enough to run properly. Splices shall be made according to the best modern practice and may be accomplished by methods approved by the Engineer. Splices will be allowed only at pole bases.

**705.04 Method of Measurement.** Traffic Signal Cable will not be measured and will be paid at a lump sum price.

**705.05 Basis of Payment.** Work completed and accepted as provided above will be paid for at the contract unit price bid per lump sum for Traffic Signal Cable, which price shall be full compensation for furnishing and installing all materials; making all splices and connections; and for all labor, equipment, tools, and incidentals necessary to complete the work:

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Traffic Signal Cable	LS

## **Section 706. Galvanized Steel Conduit**

**706.01 Description.** This item shall consist of furnishing and installing hot dipped galvanized steel conduit of the size and at the locations shown on the plans and according to these specifications as well as **SECTION 709, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**706.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications.

### **706.03 Construction Requirements.**

Construction shall be in accordance with the AHTD Standard Specifications.

**706.04 Method of Measurement.** Galvanized Steel Conduit will be measured by the linear foot (meter) measured along the axis of the conduit in its final position. It will not be considered complete until backfill and compaction have been satisfactorily performed. All necessary conduit fittings will be included as part of the conduit run and will not be measured separately.

**706.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per linear foot for Galvanized Steel Conduit of

the size specified which price shall be full compensation for furnishing and installing conduit fittings, and drag rope; for jacking, drilling, excavation, backfill, compaction, removal of surplus material, and replacement of existing surfaces; and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
____” Galvanized Steel Conduit	LF

## **Section 707. Non-Metallic Conduit**

**707.01 Description.** This item shall consist of furnishing and installing PVC (polyvinyl chloride) or PE (polyethylene) conduit according to these specifications as well as **SECTION 710, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**707.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications.

**707.03 Construction Requirements.** Construction shall be in accordance with the AHTD Standard Specifications with the following exceptions.

**(a) Depth.** The first sentence of the first paragraph of Subsection 710.03 Construction Requirements is hereby deleted and the following substituted therefore:

Conduit shall be installed in trenches or predrilled tunnels not less than 24” below final grade except where otherwise indicated on the plans or as directed by the Engineer/City Engineer.

**707.04 Method of Measurement.** Non-Metallic Conduit will be measured by the linear foot along the axis of the conduit in its final position. It will not be considered complete until backfill and compaction have been satisfactorily performed. All necessary conduit fittings will be included as part of the conduit run and will not be measured separately.

**707.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per linear foot for Non-Metallic Conduit, of the size specified, which price shall be full compensation for furnishing and installing the conduit, fittings, and drag rope; for excavation, backfill, compaction, removal of surplus material, and replacement of existing surfaces; and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

**Pay Item**

**Pay Unit**

\_\_\_\_” Non-Metallic Conduit

LF

**Section 708. Concrete Pull Box**

**708.01 Description.** This item shall consist of furnishing and installing at locations shown on the plans or as directed, a Concrete Pull Box of the type specified and according to these specifications as well as **SECTION 711, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**708.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications.

**708.03 Construction Requirements.** Construction shall be in accordance with the AHTD Standard Specifications.

**708.04 Method of Measurement.** Concrete Pull Boxes, in place with lids, will be measured by the unit.

**708.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Concrete Pull Box of the type specified, which price shall be full compensation for furnishing and installing the pull box; for excavation, backfill, compaction, removal of surplus materials and replacement of existing surface; for furnishing and placing the bedding material; and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

**Pay Item**

**Pay Unit**

Concrete Pull Box (Type \_\_\_\_ )

EA

**Section 709. Traffic Signal Mast Arm with Pole and Foundation**

**709.01 Description.** This item shall consist of furnishing and erecting steel traffic signal mast arms and poles with foundations according to these specifications as well as **SECTION 714, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**709.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications with the following exceptions:

(a) **Ground Rods.** The first sentence of the first paragraph of Subsection 714.02 Materials (j) Ground Rods is hereby deleted and the following substituted therefore:

Ground rods shall be 3/4" x 10' or larger with cad welded ground wire.

**709.03 Construction Requirements.** Construction shall be in accordance with the AHTD Standard Specifications.

**709.04 Method of Measurement.** Traffic Signal Mast Arm and Pole with Foundation will be measured by the unit.

**709.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Traffic Signal Mast Arm and Pole With Foundation of the arm length specified, which price shall be full compensation for furnishing and installing the pole and arm; for excavation, backfill, compaction, and removal of surplus material; for furnishing and placing reinforcing steel and concrete; and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
___' Traffic Signal Mast Arm and Pole With Foundation	EA

## **Section 710. Traffic Signal Pedestrian Pole with Foundation**

**710.01 Description.** This item shall consist of furnishing and erecting steel traffic signal mast arms and poles with foundations according to these specifications as well as **SECTION 715, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**710.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications with the following exceptions:

(a) **Ground Rods.** The first sentence of the first paragraph of Subsection 715.02 Materials (g) Ground Rods is hereby deleted and the following substituted therefore:

Ground rods shall be 3/4" x 10' or larger with cad welded ground wire.

**710.03 Construction Requirements.** Construction shall be in accordance with the AHTD Standard Specifications.

**710.04 Method of Measurement.** Traffic Signal Pedestal Poles with Foundation will be measured by the unit.

**710.05 Basis of Payment.** Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per each for Traffic Signal Pedestal Pole With Foundation, which price shall be full compensation for furnishing and installing the pole; for excavation, backfill, compaction, and removal of surplus material; for furnishing and placing reinforcing steel and concrete; and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

**Pay Item**

**Pay Unit**

Traffic Signal Pedestal Pole With Foundation      EA

**Section 711. Traffic Signal Equipment Performance Test**

**711.01 Description.** This item shall consist of providing a 6 month guarantee and proving the soundness of all traffic signal equipment and related electrical components installed at each location according to these specifications and at locations shown on the plans or as directed.

The Contractor shall conduct a performance test, which shall consist of a continuous 30 day period of operation without a major malfunction. A major malfunction is considered to be any occurrence, other than a power failure beyond the Contractor's control, that renders the installation inoperative either momentarily or for a longer period. Lamp burnouts are not considered a major malfunction unless 2 or more bulbs in the same socket burn out within a 30 day period.

The contractor shall obtain and assign to the City transferable manufacturer's warranties or guarantees on all electrical and mechanical equipment, consistent with those provided as customary practice. The Contractor shall guarantee satisfactory in-service operation of the mechanical and electrical equipment and related components for a period of 6 months following completion of the 30 day performance test, at no cost to the City.

Defective equipment or accessories shall be repaired or replaced according to applicable specifications and to the satisfaction of the Engineer, within a reasonable period of time during the 30 day performance test and the 6 month guarantee period. Any equipment repaired or replaced within the 30 day performance test or the 6 month guarantee period shall have a 6 month guarantee period from the date that the equipment is repaired or replaced.

**711.04 Method of Measurement.** Work completed and accepted under this item will not be measured and paid for directly but will be considered a part of the traffic signal equipment involved at each installation. Partial payments will be made as the various items of work are satisfactorily completed and accepted by the Engineer/City Engineer.

## **Section 712. Video Detector with Radio Interface**

**712.01 Description.** This item shall consist of furnishing and installing a Video Detector, Video Processor, Cable, Video Monitor, Radio Interface and other hardware and software in accordance with these specifications as well as **SECTION 715, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.** Subject to approval of the Engineer/City Engineer. Portions of the AHTD Standard Specifications will be superseded by these provisions.

**712.02 Materials.** Materials shall be in accordance with the AHTD Standard Specifications.

**712.03 Construction Requirements.** Construction shall be in accordance with the AHTD Standard Specifications.

**712.04 Method of Measurement.** Work completed and accepted under this item will be measured as follows:

- (a) **Video Detector** shall be measured by the unit.
- (b) **Video Detector Relocation** shall be measured by the unit.
- (c) **Video Processor**, of the number of channels specified, shall be measured by the unit.
- (e) **Video cable** shall be measured by the lump sum.

### **712.05 Basis of Payment.**

(a) **Video Detector.** Work completed and accepted under this item and measured as provided above, shall be paid for at the contract unit price bid per each Video Detector; which price shall be full compensation for providing and installing the device, wiring and testing, aligning the zones; and shall also be for all labor, equipment, tools and incidentals necessary to complete the work.

(b) **Video Detector Relocation.** Work completed and accepted under this item and measured as provided above, shall be paid for at the contract unit price bid per each Video Detector Relocation; which price shall be full compensation for removing the device from present site, installing the device at the new location, and for furnishing and installing brackets and extensions, wiring and testing, and for all labor, equipment, tools, and incidentals necessary to complete the work.

(c) **Video Processor.** Work completed and accepted under this item and measured as provided above, shall be paid for at the contract unit price bid per each Video Processor of the number channels specified; which price shall be full compensation for providing and installing the device, wiring, configuring, and testing the device; furnishing and installing wiring and wiring harness from the video processor unit to the traffic signal controller; and for all labor, equipment, tool and incidentals necessary to complete the work.

(d) **Video Cable.** Work completed and accepted under this item will not be measured and shall be paid for at the contract price bid per lump sum for Video Cable; which price shall be

full compensation for providing and installing all cable, including video, power supply and data cable from the Video Processor to the Video Detector and shall include all labor, equipment, tools and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Video Detector	EA
Video Detector Relocation	EA
Video Processor (__ Channel)	EA
Video Cable	LS

### **Section 713. Radio Communication System**

**713.01 Description.** Radio Communication System shall be provided as required by the plans and special specifications and installed by the Contractor.

**713.02 Materials.**

**713.03 Construction Requirements.**

(a) **General.** Contractor shall coordinate installation of the signal with the Rogers Street Department.

**713.04 Method of Measurement.** Work required for coordination of this item will not be measured and will be considered incidental to the other items.

### **Section 714. Electrical Conductors in Conduit**

**714.01 Description.** This item consists of furnishing and installing electrical conductors from point to point as indicated on the plan sheets.

**714.02 Materials.** The electrical conductors shall consist of cables of the gauge and number of conductors specified on the plan sheets, and shall be USE rated (single conductor) or UF rated, suitable for underground duct installation in wet or dry locations. Electrical conductors shall be solid or stranded copper unless otherwise approved by the Engineer/City Engineer.

Where specified "Equipment Ground Conductor" (EGC), conductor shall be a copper safety ground of either bare copper or green insulated of the size and quantity shown.

**714.03 Construction Requirements.**

(a) **General.** Splices are allowed at pole bases or as approved by the Engineer. Unless waterproof quick disconnects are used, Splicing methods considered acceptable are: Soldered, compression connectors of proper size employing cyclic crimping devices, terminal strips, or

other method approved by the Engineer. Splices on terminal strips shall utilize proper spade lugs. All splices shall be waterproof. When taping is required, the wire shall be covered with six (6) layers of plastic electrical tape and sealed with "Scotch-Coat" or other similar electrical sealing material. Where wire nuts are used, soldering, taping and sealing is still required. Electrical insulating putty may be used to round off sharp corners of wire or connectors before applying tape. Slack cable (3 ft. min.) shall remain at each splice location.

**714.04 Method of Measurement.** The work required by this item will be paid for at the lump sum price for "Trench and Excavation Safety Systems".

**714.05 Basis of Payment.** Work completed and accepted as provided above will be paid for at the contract unit price bid per lump sum for Electrical Conductors-In-Conduit, which price shall be full compensation for furnishing materials, splicing and connections and for all tools, equipment, labor, and incidentals necessary to complete the work.

Payment will be made under:

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Electrical Conductors-In-Conduit	LS