



# **MASTER SET OF SPECIFICATIONS**

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## INDEX TO 2014 MASTER SET OF SPECIFICATIONS

|                                       |   |       |
|---------------------------------------|---|-------|
| GENERAL CONTRACT SPECIFICATIONS ..... |   | TS2   |
| SPECIFICATIONS FOR CONSTRUCTION       |   |       |
| Section I                             | – Sanitary Sewers.....  | TS12  |
| Section II                            | – Sanitary Sewer Acceptance Tests .....                                 | TS21  |
| Section III                           | – Water Main Installation .....   | TS24  |
| Section IV                            | – Excavation, Trenching, & Backfill .....                               | TS39  |
| Section V                             | – Storm Sewer Pipes .....   | TS43  |
| Section VI                            | – Polyethylene (PE) Pipe .....  | TS45  |
| Section VII                           | – Storm Inlets & Manholes.....  | TS47  |
| Section VIII                          | – RCB Culvert .....   | TS49  |
| Section IX                            | – Excavation and Preparation for Pavement .....                         | TS50  |
| Section X                             | – Subgrade Preparation.....   | TS52  |
| Section XI                            | – Geogrid Material Specification.....                                   | TS53  |
| Section XII                           | – Concrete.....   | TS55  |
| Section XIII                          | – Concrete Pavement, Curb and Gutter,<br>Hot Mixed Asphalt Overlay..... | TS59  |
| Section XIV                           | – Concrete Pavement .....   | TS63  |
| Section XV                            | – Brick Pavement.....   | TS69  |
| Section XVI                           | – Curb & Gutter .....   | TS70  |
| Section XVII                          | – Edge Curb.....  | TS73  |
| Section XVIII                         | – Concrete Entrances .....  | TS74  |
| Section XIX                           | – Remove & Replace Pavement.....  | TS75  |
| Section XX                            | – Concrete Sidewalk .....   | TS76  |
| Section XXI                           | – Concrete Handicap Ramps.....  | TS78  |
| Section XXII                          | – Recycled Hot Mixed Asphalt Leveling & Overlay.....                    | TS79  |
| Section XXIII                         | – Chip Seal.....  | TS82  |
| Section XXIV                          | – Mill Planing.....   | TS83  |
| Section XXV                           | – Fabric Reinforcement for Asphalt Concrete Pavement                    | TS84  |
| Section XXVI                          | – Adjusting Manholes and Valve Boxes to Grade .....                     | TS87  |
| Section XXVII                         | – Thermoplastic ReflectORIZED Pavement Marking.....                     | TS89  |
| Section XXVIII                        | – Pavement Marking/Removal of Existing Pvmt. Marking                    | TS94  |
| Section XXIX                          | – Steel Plate Guard Fence (Galvanized .....                             | TS95  |
| Section XXX                           | – Traffic Control .....   | TS96  |
| Section XXXI                          | – Clearing & Grubbing .....   | TS97  |
| Section XXXII                         | – Seeding .....   | TS99  |
| Section XXXIII                        | – Material Testing .....  | TS104 |

# GENERAL CONTRACT SPECIFICATIONS

## 1. DEFINITIONS AND AUTHORITY:

Whenever in these specifications the words "the City" are used, they shall be understood to refer to the Governing body of the City of Emporia, Kansas or their authorized agents, acting within the authority specifically conferred upon them by said body.

The Construction Engineer on this project shall be the duly appointed regular City Engineer, hereinafter referred to as the "Engineer". He may have such assistant engineers and inspectors as may be necessary; that shall be subject to the directions and orders of the Engineer.

No agent of the City shall have the power to revoke, alter, enlarge, or relax the stipulations or requirements of these specifications except in so far as such authority may be specifically conferred in or by the specifications themselves, without the formal authority to do so, conferred by ordinance, resolution or other usual official action of the City.

The Engineer may assent to any special means for prosecuting the work, but his assent or presence upon the work while methods are in use that are not specially provided for by the specifications and Contract, shall not constitute a waiver of the Contract or any part of it on the part of the City. Nor shall the fact the Engineer has seen the work executed which is found afterwards to be defective, nor shall any act on the part of the assistant or inspector constitute such a waiver of any part of the contract; but the Contractor will be held responsible for the quality of the entire work.

Whenever the words, "the Contractor" are used, it shall be held to mean either any Contractor or Firm of contractors, or any member of the Firm contracting for the work, or any Corporation undertaking the Contract.

## 2. INTERPRETATION OF SPECIFICATIONS AND CONTRACT:

In case of any actual or alleged disagreement or discrepancy between the Contract, these specifications and the plans for the work on file in the office of the City Engineer, the language and provisions of the Contract shall take precedence and prevail; and the Engineer shall determine in each case whether the specifications or the plans shall be followed.

## 3. INSTRUCTIONS TO FOREMEN:

Whenever the Contractor is not present on the work site, the directions or orders by the Engineer to any superintendent or foreman who may have charge of any particular work, shall be received and obeyed the same as if given to the Contractor.

## 4. QUALITY OF MATERIAL AND CONSTRUCTION METHODS:

It is expressly understood and agreed that the entire improvement shall be done in a thorough and workmanlike manner.

The judgment and decision of the Engineer as to whether the materials supplied and the

work done under this contract comply with the requirements of these specifications, shall be conclusive and final.

In general or as otherwise specified, all materials and construction methods will conform to the Kansas Department of Transportation, Standard Specifications for State Road and Bridge Construction, (*Current Edition*).

No material shall be used in the work until it has been examined and approved by the Engineer or his authorized agents. All rejected material must be promptly removed from the work site and replaced with that which is acceptable to the Engineer and all improper or defective work must be corrected and if necessary, removed and reconstructed so as to comply with these specifications, and the instructions of the Engineer. If the Contractor shall refuse or neglect to remedy such defects when ordered, the City may cause such condemned portions to be rebuilt or repaired at the expense of the Contractor.

#### **5. CONTRACTOR'S LIABILITY:**

All losses or damages arising from the nature of the work to be done or from any detention or unforeseen obstructions or difficulties which may be encountered in the prosecution of the work; or from the action of the elements or acts of providence or of a public enemy shall be sustained by the Contractor. The City will not consider itself bound to notify or inform the Contractor where rock or other material, hard or expensive to excavate occurs, or is liable to be encountered. However, where soundings have been made, or information regarding the nature of excavation to be encountered otherwise obtained, such notes of information as may be in the possession of the Engineer will be at the disposal of the Contractor. The City will not be responsible for the accuracy of such notes or information and the Contractor must make his own conclusions as the conditions to be encountered.

The Contractor is alone responsible to notify Utility Companies of intended work and work schedules. The Contractor shall accompany a representative of the Utility over the entire area where work is scheduled. They will consider any problems that might come from construction of this project. If a suitable agreement between Utility company and Contractor is not arrived at, the City Engineer will be notified and the problem presented.

The starting of work on any portion of this project by the Contractor will notify the city in writing that all Utility Companies have been notified and that arrangements have been made to proceed with the project.

#### **6. INSPECTION AND TESTS:**

The Engineer may provide for the inspection, by assistants and inspectors under his direction, of all materials used and all work done under this Contract. Such inspections shall extend to all or any part of the work and to the preparation or manufacture of all materials to be used, whether within the limits of the work or at any other place. The Engineer and his inspectors shall have free access to all parts of the work, including mines, quarries, manufactories or other places where any part of the materials to be used is procured, manufactured, or prepared. The Contractor shall furnish the Engineer all information relating to the work and the material therefore, which the Engineer may deem necessary or pertinent, and with such samples of material as may be required.

The Contractor shall, at his expense supply inspectors with such labor and assistance as

may be necessary for the handling of materials for proper inspection. Inspectors shall have the authority to reject defective materials and to suspend any work that is being improperly done, subject to the final decision of the Engineer. Inspectors shall have no authority to permit deviation, or to relax any provisions of these specifications without the written permission or instruction of the Engineer, or to delay the Contractor by failing to inspect materials and work with reasonable promptness. The Contractor shall assist in making all final inspections.

**7. INCIDENTAL WORK AT THE CONTRACTOR'S EXPENSE:**

All the work to be done by the Contractor, specified and enumerated in the section of the General Clauses of the specifications as well as in any minor details of the work not specifically mentioned in the specifications, but obviously necessary for the proper completion of the work, such as the proper connection of new work to old or removal of excess dirt remaining between curb and sidewalk to provide proper drainage shall be considered as incidental and as being a part of and included with the work for which prices are named in the Contract. Wherever sidewalks, drives, or streets are disturbed because of necessary room for forming or grading, the Contractor shall replace same to a condition as good or better than before. The Contractor will also be responsible for the removal of any mail boxes or street signs necessary for the construction of the project, and to set up the mail boxes and street signs in temporary locations authorized by the United States Postal Service and the City Engineer. Upon completion of the Contract, the Contractor will also be required to replace said mail boxes and street signs in a location designated by the United States Postal Service and the City Engineer. The Contractor will not be entitled to any extra or additional compensation therefore, unless specifically stated otherwise. Downspout and foundation drains, where encountered along curbing, shall be connected through the curbing where possible at Contractor's expense. Any salvage material is to be loaded and hauled to a site designated by the Engineer.

**8. MOVING PIPELINES:**

Should any water or gas mains or sewers be encountered in the work and which require moving for the proper construction of said work, the Utility owner shall remove or relocate such utilities at their expense.

**9. CHANGE IN PLANS:**

The City reserves the right to make any changes in the plans or specifications that it may deem desirable or necessary, even though such changes may increase or diminish the quantity of materials or labor, or the cost of construction of the work. Such changes shall not vitiate or annul the Contract or agreement entered into, but the Contractor shall furnish the necessary labor, equipment, tools, and materials to complete the Contract as amended.

All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Project and (b) for the purpose of comparing the bids submitted for the Project. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated

amounts therefore.

The City may require the Contractor to furnish additional labor and materials and to do any additional work not provided for in the Contract and these specifications, but which may be found necessary or pertinent to the proper prosecution and completion of the work. The value of the work so added or omitted by reason of such changes, or additional work shall be added to or deducted from the Contract price as the case may be.

Wherever possible, unit prices as bid shall apply in determining the value of such added or deducted work.

No changes in plans shall be made unless ordered in writing by the Engineer. Where the Contract unit prices cannot be used in determining the value of additions or deductions caused by a change in plans, the value of the work to be added or deducted shall be agreed upon in writing between the City and the Contractor as a part of a written order for a change in plans and shall be signed by both parties prior to the beginning of such work.

#### **10. SUSPENSION OF WORK:**

Should the weather be wet or cold so that any part of the work cannot be done in a proper manner or with due regard to durability, or such be the case from any other cause, then the Engineer may order such parts of the work suspended until a more suitable season in which case the Contractor shall cover and otherwise sufficiently protect the exposed parts of the work so that it will not be injured by the elements or by other causes.

#### **11. NOTICE OF INTENTION TO BEGIN, CEASE, OR RESUME WORK:**

The Contractor shall give notice to the City Engineer at least forty-eight (48) hours before breaking ground; also to all persons in charge of gas mains, water mains, telephone lines, power lines, or other property which may be affected by his operations. He shall not hinder or interfere with such persons or companies, corporations, or their authorized agents in the work necessary to care for and protect their property from injury caused by the execution of his work.

The Contractor shall also notify the Engineer or his assistants or inspectors who may be in direct charge of the work affected, of his intentions to begin, cease, or resume operations. Such notice shall be given a sufficient time in advance of operations to permit the Engineer to set stakes for line and grade and perform any other necessary preparations for the proper supervision of the work.

#### **12. CALENDAR/WORKING DAYS:**

Any day shown on the calendar and the 24-hour period thereof from 12:01 a.m. to midnight, Monday through Sunday inclusive, shall be considered a calendar day. Holidays shall also be counted as a calendar day. A work notice is required at least forty-eight hours in advance if work requiring inspection is planned for any City observed holiday, Saturday or Sunday and must be approved in writing by the City Engineer.

One whole day shall be assessed for each working day on which the Contractor is not prevented by weather, or other conditions beyond the Contractors control, from proceeding

with normal construction operations in the performance of the current controlling item of work, as determined by the Engineer, for at least 50 percent of the full number of hours in the normal daily schedule.

**13. PATENTED DEVICES:**

All fees for any patented invention, device, article, or arrangement that is used upon, or in any manner connected with the construction, erection or maintenance of the work or any part thereof embraced in the Contract and these specifications shall be included in the price stipulated in the Contract for said work, and the Contractor must hold harmless the City against any and all demands of such fees and claims.

**14. LAWS AND ORDINANCES:**

The Contractor shall be required to familiarize himself with and observe all laws, ordinances, and regulations relating to such work; and said laws, ordinances, and regulations are hereby incorporated in and made a part of these specifications and of the Contract for this Work.

**15. SKILLED LABOR -- DISORDERLY EMPLOYEES:**

All labor requiring special skill shall be done by experienced and competent methods, and any person so employed who shall not show special skill and proficiency in said work, shall at once be removed and replaced by a competent and experienced workman. Disorderly, intemperate, or incompetent persons, or persons who shall commit any trespass on any public or private property in the vicinity of the work, must not be employed, retained, or allowed upon the project. Foremen or workmen who refuse or neglect to comply with the instructions of the Engineer shall, at his request, be promptly discharged, and shall not thereafter be re-employed without his consent.

**16. LOCAL LABOR:**

Local labor shall in all cases be given preference and employed where such labor is competent and obtainable.

**17. LABOR WAGE RATES:**

The minimum wage paid to unskilled labor shall not be less than the prescribed minimum wage rate as determined by the United States Government. Prevailing local wage rates shall be paid to skilled labor as required.

**18. STORMWATER POLLUTION CONTROL; CONVENIENCES:**

Contractors shall use and maintain proper stormwater BMPs to ensure that pollutants do not leave the construction site; per Illicit Discharge Ordinance #09-06. Refer to the City of Emporia Construction Site Erosion and Sediment Control Manual for a list of BMPs and installation specifications.

The Contractor shall provide all necessary privy accommodations for the use of his employees on the streets and shall maintain the same in a clean and sanitary condition. He shall not create or permit any nuisance to the public or to residents in the vicinity of the work.

## **19. PUBLIC CONVENIENCES:**

The materials for construction when brought upon the street shall be neatly piled so as to cause as little obstruction to travel as possible, and so that it may be conveniently inspected.

No material or other obstruction shall be placed within five (5) feet of fire hydrants, which must at all times be readily accessible to the Fire Department. Nor shall such material be piled within two (2) feet of any trees.

During the progress of the work, the convenience of the public and of the residents along the streets must be maintained whenever possible. Temporary approaches to and crossings of intersecting streets and sidewalks must be provided and kept in good condition whenever practicable.

The work shall be done a few blocks at a time where required by the Engineer to do so, and shall be completed as rapidly as possible after the construction phase has started. New work shall not begin nor payment made until work previously started is complete and cleanup operations have been accomplished.

## **20. TRAFFIC CONTROL:**

Contractor shall conduct his work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

In making open cut street crossings, Contractor shall not block more than one-half of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side to facilitate traffic flow. Temporary surfacing shall be provided as necessary on shoulders.

Contractor shall construct substantial bridges at all points where it is necessary to maintain traffic across construction. Bridges in public streets, alleys, and sidewalks shall be acceptable to the authority having jurisdiction there over. Bridges erected in private roads and driveways shall be adequate for the service to which they will be subjected. Bridges shall be provided with substantial guardrail and with suitably protected approaches. Footbridges shall be not less than 4 feet wide, provided with handrails and uprights of dressed lumber. Bridges shall be maintained in place as long as the conditions of the work require their use for safety of the public, except that when necessary for the proper prosecution of the work in the immediate vicinity, the bridge may be relocated or temporarily removed for such period as approved.

Where required by the authority having jurisdiction there over that traffic be maintained over any construction work in a public street, road, or highway, and the traffic cannot be

maintained on the alignment of the original roadbed or pavement, Contractor shall, at his own expense, construct and maintain a detour around the construction work. Each detour shall include a bridge across the pipe trench and all necessary barricades, guardrails, approaches, lights, signals, signs, and other devices and precautions necessary for protection of the work and safety of the public.

Effective barricades on which shall be placed acceptable warning signs shall protect all streets, roads, highways, and other public thoroughfares that are closed to traffic. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions such as material piles and equipment shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with the Manual on Uniform Traffic Control Devices and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction there over. This shall include all permits and flaggers.

## **21. INJURIES TO PERSONS AND PROPERTY:**

The Contractor shall be held alone responsible for all injuries to persons and for all damages to property of the City or others, caused by or resulting from the negligence of himself, his employees, or agents during the progress of or connected with the prosecution of the work whether within the limits of the work or elsewhere. He must restore all injured property, including sidewalks, curbing, sodding, pipes, conduits, sewers, and other public or private property to a condition as good as it was when he entered upon the work, purchasing new material to replace all that which is destroyed or injured by the Contractor or his employees during the course of the work.

The Contractor must use special care to prevent injury to water, gas, electric, TV Cable, sewer mains and services that might result in the interruption of service to the public. Should such interruption of service be made necessary by the progress of the work, or result from accident, the changes or repairs necessary to restore such service shall immediately be made with as little inconvenience as possible to the user. Should the Contractor refuse to make such repairs or not show due diligence therein, the City shall make or cause to be made such necessary repairs, and the cost thereof shall be deducted from any money which is due or may become due from the City.

**All private property shall be left in a condition satisfactory to the owner.**

## **22. OBSTRUCTIONS AND OLD MATERIALS:**

The Contractor shall, at his own expense, remove all obstructions such as trees, posts, stones, crossing stone, planking, brick, and all classes of old pavement and debris that come within the limits of the section upon which improvements are to be constructed.

**23. CLEAN SIDEWALKS AND GUTTERS:**

During the progress of the work, the sidewalks and portions of the streets adjoining the work, or in its vicinity must not be obstructed or littered more than may be absolutely necessary, and the adjacent sidewalks must be kept clean and provisions must be made for free passage of surface water along the gutters and across the streets.

**24. FINAL CLEANING UP:**

Immediately after completion of the work or any portion of it, the Contractor shall remove all unused material; refuse or dirt placed by him in the vicinity of the work, or resulting from its prosecution, and restore the street to a neat and clean condition as directed by the Engineer.

Excess dirt remaining shall be removed after all excavation and construction has been completed and properly backfilled. Excess dirt may be placed on streets, alleys, or other areas as directed by the Engineer. This dirt shall be spread and leveled. The Contractor will do such work without extra charge.

Final cleanup shall be considered a part of the Contract, and shall be charged against the total number of working days authorized for the project.

Should the Contractor refuse or fail to prosecute the cleanup with such diligence as will insure its completion within the stipulated time, or as formally extended, the amount specified in the contract documents for liquidated damages shall be deducted from the monies retained.

**25. CONSTRUCTION STAKING:**

The Contractor shall at his expense be responsible for any and all construction staking necessary to initiate and complete the work under said Contract. Any work done without the supervision and final approval of a representative of the Engineer may be removed and replaced at the Contractor's expense. All construction staking shall be performed by a professional surveyor licensed in the State of Kansas.

**26. PROTECTING STAKES:**

The Contractor shall protect all construction stakes. When construction stakes are once set, the Contractor is required to preserve them. In the event of his failure to do so, the stakes shall be reset by the Contractor at his expense.

**27. CITY MONUMENTS ON STAKES:**

The Contractor must carefully protect from disturbances or injury all city monuments, stakes, and bench marks, and shall not excavate nearer than five (5) feet to any of them without the permission of the Engineer; or until they have been removed, witnessed, or otherwise disposed of by the Engineer.

**28. WATER:**

Such water as may be required for mixing concrete, sprinkling pavement, and subgrade, may be obtained from the fire hydrants upon application to the City Clerk, and by complying with the rules and regulations provided for in such cases. Water used in such manner will be charged for at the regular City water rates. Where it is not practicable to install a water meter, the quantity used shall be based upon an estimate made by the City Clerk.

**29. FREIGHT:**

All materials used upon the work and shipped by freight shall be shipped to "City of Emporia, care of \_\_\_\_\_, Contractor". The Contractor shall pay all demurrage and freight charges.

**30. EMERGENCY PROJECT IDENTIFICATION:**

The Contractor shall provide the Engineer with emergency project contact information. The information shall consist of the name and address of the Contractor, project supervisor's name and phone number and the phone numbers of responsible traffic control personnel for day or night emergency contact. This information shall be kept in the project file as well as distributed to the Police and Fire dispatch department.

**31. PROJECT SIGNAGE:**

The Contractor shall install project descriptive signing which shall be provided with posts by the City in locations as designated by the plans or as directed by the Engineer. The expense of installing and removing the signage and maintaining the signs shall be considered subsidiary to the contract.

**32. PRECONSTRUCTION CONFERENCE:**

Prior to the commencement of work at the site, a pre-construction conference will be held at a mutually agreed time and place. The conference shall be attended by:

Contractor and his superintendent

Principal Subcontractors

Representatives of principal suppliers and manufacturers as appropriate

Engineer and his Resident Project Representative

Representatives of Owner

Utility superintendents or foremen

Governmental representatives as appropriate

Others as requested by Contractor, Owner, or Engineer

Unless previously submitted to Engineer, Contractor shall bring to the conference a tentative schedule for each of the following:

Progress

Procurement

Values for progress payment purposes

Shop Drawings and other submittals

The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

Contractor's tentative schedules

Contractor's emergency project contact & identification information

Transmittal, review, and distribution of Contractor's submittals

Processing applications for payment

Maintaining record documents

Project phasing & Critical Work sequencing

Field decisions and Change Orders

Use of premises, office and storage areas, security housekeeping, and Owner's needs

Major equipment deliveries and priorities

Contractor's assignments for safety and first aid

Engineer will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

### **33. CONSTRUCTION SCHEDULE:**

Before work is started, Contractor shall submit to Engineer for review a schedule of the proposed construction operations. Owner shall cooperate with Contractor in arrangements for continuity of service and operation of valves and other control facilities. The construction schedule shall indicate the sequence of the work, the time of starting and completion of each part, and the time for making connections to existing piping.

The schedule shall be revised as necessary to reflect changes in the progress of the work.

Owner may require Contractor to add to his plant, equipment, or construction forces, as well as increase the working hours if operations fall behind schedule at any time during the construction period.

**SECTION I**  
**CITY OF EMPORIA, KANSAS**  
**SPECIFICATIONS FOR CONSTRUCTION**  
**OF SANITARY SEWERS**

**1. LOCATION AND GRADE:**

The grade line shown on the Plans is the bottom of the inside of the sewer pipe. The Contractor must strictly follow lines and grades. The work shall start from the lower manhole of the sewer system.

**2. TRENCHING:**

**A. Removing Obstructions:**

The Contractor shall remove all fences, posts, culvert pipes, and boxes, and other obstructions and place any fences or any useable materials on the owner's property, and shall remove all brush, rocks, trees, and other obstructions in line with the sewer trench. (See special notations on Plans. Plans may not indicate all obstructions)

**B. Utilities:**

The Contractor is responsible for requesting utility locates by calling Kansas One Call System, Inc. (811) a minimum of 72 hours prior to beginning trenching operations. The Contractor shall use great care to avoid cutting gas, water, or sewer mains, phone and service lines. Whenever any of these lines are broken by the same Contractor, the Contractor shall pay the owner the cost of repairing, or employ a competent plumber to do the work.

The City Underground Utilities Department participates in "Kansas One Call" therefore the contractor does not have to call them separately. But, will cooperate with the Contractor in locating city mains and service lines ahead of the trenching operations, provided that the Contractor gives notification at least 72 hours in advance of commencing work.

**C. Trimming Trees, Shrubbery, and Hedges:**

Where necessary to trim trees to allow room for operation of the excavating equipment, the limbs shall be sawed off in a vertical plane and cut areas painted. Shrubbery and hedges shall be trimmed in a neat and orderly manner, using hedge shears or a saw where necessary to permit sufficient clearance for trenching. All trimmings will be confirmed prior to excavating by the Engineer. Vegetation over sidewalks shall be trimmed to a minimum height of 7'0".

**D. Excavating Equipment:**

The trench shall be excavated either with a trenching machine, backhoe, excavator, or hand labor or a combination of these methods. The use of a dragline or clamshell will

not be permitted on sanitary trenching except in backfilling operations.

**E. Trenching by Hand Labor:**

The Contractor should note that on some sections of the sewer it may be necessary to dig the trench by hand labor due to gas and water lines, fences, poles, trees, hedges, sheds, or other obstructions being close to the sewer trench in place.

**F. Width of Trench:**

The bottom width of the trench shall be not less than 12 inches wider than the outside diameter of the barrel of the pipe or more than 24 inches greater than the diameter of the pipe. The side of the trench must be kept vertical; no undercutting of the trench walls will be allowed. No tunneling will be allowed.

**G. Bracing of Trench:**

Trenches at all stages of excavation must be made safe for workmen to occupy during the progress of the work, and to protect adjoining pavement, utilities, and buildings. All trench shoring shall meet or exceed current OSHA standards. Failure to properly brace and sheet trenches as per OSHA standards shall be the responsibility of the Contractor. The Engineer shall have the authority to shut down excavation operations if in his opinion unsafe conditions exist.

**H. Excavation for Manholes:**

The excavation for manholes shall be sufficient to leave at least 12 inches clear width between their outer surfaces and the face of the excavation.

**I. Removing Rock:**

If rock is encountered in the trench, it must be removed to a depth that will permit at least 4 inches of bedding material to be placed under the pipe and the full width of the trench as directed by the Engineer.

**J. Removing Water:**

Any water entering the trench must be removed immediately from the trench by pumping or bailing.

**K. Depth of Trench:**

Depth of trench will be measured from the surface of the ground to the flow line grade of the sewer pipe.

**L. Basis of Payment:**

The unit price bid for Trenching and Backfilling (Unclassified) of various depths shall include all work listed in this section under "Trenching" and all work listed in this section

entitled "Backfilling", including removing and replacing fences unless otherwise noted on the plans.

The price bid per lineal foot of trench and backfill at various depths shall include all labor, equipment, and materials to excavate any type of material encountered including earth, loose rock, shale, etc. and shall include bedding material, backfilling and necessary hauling of trees, brush, roots, or debris that may be encountered in the work. Rock encountered that is not loose and must be removed by other means shall be listed as another pay item.

### **3. PIPE INSTALLATION:**

#### **A. Poly Vinyl Chloride (P.V.C.) (SDR 35) Sewer Pipe: (Option):**

P.V.C. sewer pipe and fittings shall be used for sanitary sewer lines except where shown on the plans. All P.V.C. sewer pipe and fittings shall comply with ASTM D 3034 (SDR 35). Sanitary sewer service lines are to be Schedule 40.

(1). P.V.C. Pipe Joints - The pipe shall be jointed with an integral bell, bell-and-spigot type elastomeric joint. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Gaskets shall conform to ASTM F 477. Solvent welded joints are specifically prohibited.

(2). P.V.C. Fittings Specifications - All fittings shall utilize rubber gasket (elastomeric) joints.

All joint preparation and jointing operations shall comply with instructions and recommendations of the pipe manufacturer. Immediately before joints are pushed together, all joint surfaces shall be coated with lubricant furnished with the pipe.

#### **B. Ductile Iron Pipe (Option):**

Ductile Iron Pipe option shall be approved by the Engineer. Pipe with mechanical joints or push-on joints shall conform to the applicable standard shown in ANSI A 21.51 and ANSI A 21.11 of latest revisions.

Bell and Spigot ductile Iron Pipe shall conform to ANSI A 21.51 of latest revision. The single rubber-gasket joint as described to ANSI A 21.10 of latest revision shall apply.

Mechanical joint Ductile Iron Pipe shall conform to ANSI A 21.51 of latest revision. The gasket and bolted joint as detailed to ANSI A 21.10 shall apply.

All 6 inches or larger Ductile Iron Pipe shall be Class 50. All 4 inches or smaller Ductile Iron Pipe shall be Class 51. The City Engineer shall specifically approve any deviation from this.

All sewer mains are to be constructed of pipe approved by the national Sanitation Foundation (NSF). Pipe is to be cement lined and asphalt coated.

### **C. Project Inspection:**

Sewer pipe shall not be laid except in the presence of the Engineer or his Inspectors. The Engineer shall have the authority to cause the removal of any sewer pipe laid during his absence from the work. It shall be the duty of the Engineer or his Inspectors to be present at any hour of the day when given at least 24-hour notification that the Contractor will lay the pipe. The Contractor shall provide a minimum of 48-hour notification for work to be performed on weekends or city holidays.

### **D. Defective Pipe:**

Cracked, broken, or defective pipe shall not be used. Bells on pipe shall be intact.

### **E. Condition of Trench:**

No sewer pipe shall be laid when the temperature is below freezing or in a wet or muddy trench. All loose dirt and other material shall be removed from the trench ahead of the pipe laying.

### **F. Pipe Bedding:**

The pipe shall be bedded in clean well-graded crushed gravel conforming to ASTM Designation C33, Gradation #57 or Kansas Department of Transportation Standard Specifications for coarse aggregate CA-5 and shall have a minimum thickness beneath the pipe of 4 inches or one-eighth of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from the bedding material line to 6" above the top of the pipe shall be of the same material as utilized for the pipe bedding. The contractor shall supply the Engineer with a sample prior to starting work.

### **G. Laying Pipe:**

Prior to laying pipe, the trench bottom shall be carefully graded with bedding material and checked for line and grade. Any deviation in line or grade shall be remedied. The spigot end of the first pipe to be laid shall be inserted through the wall of the manhole and the bell end of said pipe pointed to the direction the sewer is being laid. The pipe shall be given the proper amount of slope, and shall be accurately placed on line.

After being brought to correct line and grade, the pipe shall be securely blocked in place. As pipes are being laid, holes must be dug to receive the bell of the pipe. Holes are to be deep enough to allow the entire body of the pipe to rest on the trench bottom, with no weight being carried by the pipe bells.

### **H. Uncompacted Trench Backfill:**

In parks or other unpaved areas that do not support walks or structural loads, the entire depth of trench above the embedment shall be compacted by tamping 12" lifts or other reasonable and approved methods. Materials for backfill shall be such as will readily permit compaction and shall be free from heavy stones, hard masses of consolidated

material, wet or sticky lumps of clay, and from stumps, large roots, trash or debris. Backfill costs shall be included in price bid per linear foot of pipe.

**I. Compacted Trench Backfill:**

Compacted Trench Backfill shall be placed as per "Requirements for Excavation, Trenching, & Backfill" section of these specifications.

**J. Protection of Water Supplies:**

Sanitary sewer lines shall maintain a minimum horizontal distance of 10 feet from and a vertical clearance of 2 feet below any potable water lines. In the event that a sanitary sewer line is forced by field conditions to cross over or within 2 feet under a water line, the Contractor shall ensure that the Engineer is informed that such a crossing will be made and obtain the Engineer's approval to make such a crossing. A full section of sewer pipe shall be installed centered on the crossing with each joint being 10 feet from the crossing.

**K. Basis of Payment Pipe Installation:**

The price bid per lineal foot for sanitary sewer pipe shall include furnishing all pipe, pipe fittings, jointing materials, pipe bedding, installing pipe, backfilling (un-compacted), and including all work listed in this section under "Pipe Installation". **Compacted Trench Backfill will be listed as another bid item.**

**4. WYE CONNECTIONS ON SANITARY SEWERS:**

Sanitary sewer pipe wye connections shall be installed in the sewer where designated on the plans. The wye branch shall be plugged with approved plugs.

**A. Materials:**

All wye connections on sanitary sewers shall be Schedule 40 Pipe when P.V.C. is used.

**B. Basis of Payment:**

The price bid for wye connections shall include furnishing all material and installing wyes.

**5. MANHOLES (Pre-cast Concrete Manholes):**

**A. Pre-cast Concrete Manholes:**

Pre-cast reinforced concrete manholes shall conform to A.S.T.M. C478-64-T.

**B. Joints between Pre-cast Concrete Manhole Sections:**

Joints between pre-cast concrete manhole sections shall be of such design that leakage and infiltration can satisfactorily be reduced to a minimum. The use of mastics or rubber gaskets is required.

### **C. Manhole Bases:**

The manhole base shall be made from vibrated or tamped concrete with a minimum strength of 4,000 psi and a maximum slump of 4 inches. The base shall have a minimum diameter that is 8 inches greater than the outside diameter of the manhole wall. The base shall have a minimum 8-inch thickness beneath the manhole wall.

The use of pre-cast concrete manholes with integral attached bases is approved. Unattached pre-cast concrete bases or pads will be approved only where poor trench conditions warrant their use or when connecting to an existing sewer line.

### **D. Concrete Invert:**

The concrete invert flow channel shall be formed during or immediately after the pouring of the manhole base and brush finished as soon as the concrete has sufficiently set. The flow channel through manholes shall be made to conform in shape and in slope to that of the sewers. Sewer pipe, with the top half removed, should be laid through the manhole whenever possible.

The inside bottom of the manhole shall rise a minimum of 1 inch per foot from the side of the pipe or the flow channel to the wall of the manhole. Dips or projections capable of holding water or solid materials will not be permitted. The concrete shall set for 24 hours before any pipe inside the manhole is trimmed.

### **E. Pipe through Manhole:**

All sewers constructed of rigid or semi-rigid pipe extending from all manholes shall be encased with concrete for a distance of three (3) feet from the outside wall of the manhole. This support shall be deleted if a flexible, watertight gasket **meeting ASTM 923** is used to connect the sewer to the manhole. No support is required for sewers constructed of flexible pipe.

### **F. Cast Iron Manhole Frames and Covers:**

#### **(1). 24" I.D. Manholes (W=24"):**

Manhole Frame and Cover shall be Clay & Bailey No. 2007 MR, Deeter No. 1320 (with brick ring) or approved equivalent with the minimum inside diameter of frame 22 inches, total minimum weight of frame and cover - 350 lbs.

#### **(2). 27" I.D. Manholes (W=27"):**

Manhole frame and cover shall be Clay & Bailey 2032, Deeter .1048 with the inside diameter of frame 24 inches, total minimum weight of frame and cover -- 400 lbs.

Castings that are cracked or have defects that may result in failure of the casting shall not be used. Manhole covers shall fit in the frame without rattling under wheel traffic.

**G. Basis of Payment:**

The price bid for manholes shall include all materials involved -- cast iron frames, cover, brick, cement, plastering, concrete invert, pre-cast sections, grade adjusting rings, necessary excavation and backfill beyond the limits of the sewer trench, and hauling away excess excavation not needed for backfill, and other work described in this section under "Manholes". Depth of Manhole will be measured from the flow line of the sewer pipe to the top of the Manhole ring. (See typical section).

**6. SANITARY SEWER ENCASEMENT:**

Measurement will be by the lineal foot of concrete encasement constructed in place (see Sanitary Sewer Detail Sheet). Payment will be made at the unit price bid per lineal foot of concrete placed for "Concrete Encasement", which price shall be full payment for excavation, backfill, compaction, concrete, forms, and all incidentals and miscellaneous work necessary to complete the work.

**7. CLEANOUTS:**

The sewer cleanouts shall be constructed as shown on the plans. The raised portion of the cleanout shall be laid on undisturbed natural ground or compacted backfill. If compacted backfill is required, it will be the contractor's expense.

**A. Basis of Payment:**

The price bid for cleanout shall include all material, labor, etc. as necessary for the construction of such a cleanout.

**8. SEWER SERVICES:**

Contractor is to maintain existing sanitary sewer service throughout the contract.

**A. Basis of Payment:**

The cost of all material, labor, equipment, etc. shall be included in the bid price for 4" on 8" wye connections.

**9. ABANDONED SERVICES:**

Contractor will plug (a minimum of 3" concrete) all abandoned sewer pipe at the manholes and all abandoned services when encountered. All abandoned manholes will be excavated one (1) foot below subgrade or below conical section, whichever is greater, then backfill with 100% screenings or flowable fill and compact (screenings only).

**A. Basis of Payment:**

The cost of all material, labor, equipment, etc. shall be included in the bid price for unclassified trenching and backfilling.

## 10. BORING

At locations shown on the Plans, or where indicated by the Engineer, the Contractor shall excavate by means of machine boring. The Contractor shall be responsible for obtaining all permits and clearances from the Owners of the facility being bored under. Casing pipe shall be used on all machine borings under roadways for sewer line installations. All equipment to be used and the method of operation of the equipment shall be subject to approval by the Engineer before use on the project. Boring shall be done in such a manner as to permit the installation of the casing pipe to the lines and grades shown on the Plans.

All casing pipe shall be new steel pipe meeting ANSI Standard Weight Schedule (thickness not less than 0.25 inches or as indicated on the Plans. Good used steel pipe meeting the above requirements may be used when approved by the Engineer. Casing pipe shall be of the respective diameter. Casing spacers shall be used **NOT WOOD SKIDS**. Casing spacers shall be made of high-density polyethylene. Spacers shall meet or exceed RACI Casing spacers and installed per manufacturers suggested requirements.

### TABLE OF CASING SIZES

| <u>Pipe Size</u> | <u>Casing Size</u> |
|------------------|--------------------|
| 4"               | 10"                |
| 6"               | 12"                |
| 8"               | 14" - 16"          |
| 10"              | 16" - 18"          |
| 12"              | 18" - 20"          |
| 16"              | 22" - 24"          |

#### A. Construction Method:

Casing pipe shall be installed in the boring hole as the earth is removed. Boring without the concurrent installation of the casing pipe will not be allowed. The use of water in the excavation shall be prohibited. Casing pipe shall be stored to drain.

RACI Casing Spacers must be used for carrier pipe installation inside casing pipe to prevent damage to pipe and bell joints during installation and to provide proper long-term line support. PVC pipe in casings should not rest on bells.

Pipe may be installed in the casing using:

- Winch drawn cable
- Jacking

In both methods, care must be exercised to avoid damage to pipe or bell joints. Use of lubricant (flax soap or drilling mud) between skids and casing can ease installation.

Caution: Do not use petroleum products (e.g. oil or grease). Prolonged exposure to these products can damage some elastomeric gaskets.

Upon completion of pipe insertion, installing 1/8" thick synthetic rubber end seals shall close the ends of the casing.

**B. Basis of Payment:**

Payment will be made at the unit price per linear foot which price shall include all equipment, labor, and materials (including casing and skids, etc.) required to complete this item.

**11. OUTSIDE/INSIDE DROP CONNECTION FOR MANHOLE:**

Outside and Inside drops for manholes shall be constructed as detailed on the plans. The Engineer shall approve all drop manholes. Drop Connections shall not be used unless necessary.

**A. Basis of Payment:**

Payment will be made at the unit price bid for "Outside/Inside Drop Connection for Manhole" for each drop installed in a manhole, which price shall include excavation, sheeting, shoring, forming, backfilling, compacting, sanitary sewer pipe and fittings, concrete, reinforcement, and all labor and incidentals.

## SECTION II

### SANITARY SEWER ACCEPTANCE TESTS

Each reach of sewer shall meet the requirements of the following acceptance tests. All defects shall be repaired to the satisfaction of the Engineer.

#### 1. VIDEO MONITORING:

Unless otherwise indicated on the drawings, each section of sewer line between manholes shall be straight and uniformly graded. Each such section will be video monitored by the City Underground Utilities Department. The Contractor shall furnish suitable assistants to help perform video monitoring.

#### 2. EXFILTRATION:

An exfiltration test shall be conducted on each reach of sewer between manholes. Individual or multiple reaches may be tested at the option of the Contractor.

Exfiltration tests shall be conducted by blocking off all manhole openings, except those connecting with the reach being tested, filling the line, and measuring the water required to maintain a constant level in the manholes. Each manhole shall be subjected to at least one exfiltration test or vacuum test (see manhole testing).

During the exfiltration test, the average water depth above the pipe invert shall be 10 feet, plus or minus one foot, unless manhole depths are such that this is impossible. The maximum depth at the lower end shall not exceed 25 feet and the minimum depth at the upper end shall be at least 5 feet above the crown of the pipe.

The total exfiltration shall not exceed 250 gallons per inch of nominal diameter per mile of pipe per day for each reach tested. For purposes of determining maximum allowable leakage, manholes shall be considered as sections of 48-inch pipe. The exfiltration tests shall be maintained on each reach for at least 2 hours or longer as necessary, in the opinion of the Engineer, to locate all leaks.

The Contractor shall provide, at his own expense, all necessary piping between the reach to be tested and the source of water supply, together with equipment and materials required for the tests. The methods used and the time of conducting exfiltration tests shall be acceptable to the Engineer.

Exfiltration shall be determined by measuring the volume of water needed to bring the water level in the manhole at the conclusion of the testing period back up to the level at the beginning of the test.

#### 3. AIR TESTING:

Air testing may be used in lieu of exfiltration testing for sewer pipe **but not for manholes**. Air testing shall conform to ASTM F-1417. Manholes shall be tested with water as specified

for exfiltration testing. Procedures for air testing and manhole testing shall be submitted to the Engineer for review before testing is started.

#### **A. Air Test**

Not over 3.5 PSIG with a possible drop to 3.0 PSIG. The minimum time shall be not more than the following:

4" - 2½ minutes

8" - 5 minutes

12" - 7½ minutes

6" - 4 minutes

10" - 6 minutes

15" - 9½ minutes

Leaks shall be located by air testing short sections of pipe. Leaks shall be repaired and the reach of sewer retested.

#### **4. MANHOLE TESTING: "A" or "B"**

##### **A. Exfiltration Method:**

Each manhole shall be tested individually by securely plugging all inlet and outlet pipes. The manhole shall be filled with water to its full depth with one-hour absorption time and then be observed for at least six hours for testing. Exfiltration loss from a 4 foot diameter manhole shall not exceed the rate of 1.14 gallons per foot of manhole depth per day.

Example: Depth = 10 ft.

6 hr. = 0.25 day

Max. Loss = (10)(0.25)(1.14) = 2.85 gal/6 hr.

If exfiltration exceeds the maximum limits, the Contractor shall repair leaks and defects and then retest the subject manholes that failed exfiltration.

##### **B. Vacuum Method:**

Each manhole shall be tested individually immediately after assembly and prior to backfilling. Each inlet and outlet pipe shall be securely plugged. All lift holes shall be plugged with an approved non-shrink grout.

The test head shall be placed at the top of the cone section and the seal shall be inflated in accordance with the manufacturer's recommendations (ASTM C923). A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valve closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for 48" diameter, 75 seconds for 60" diameter, and 90 seconds for 72" diameter manholes. (In accordance with standardized ASTM C828.)

If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

**5. INFILTRATION:**

If, at any time prior to expiration of the guarantee period, infiltration exceeds 250 gallons per inch of nominal diameter per mile of sewer per day, the Contractor shall locate the leaks and make repairs as necessary to control the infiltration.

**6. BASIS OF PAYMENT:**

All costs associated with the testing covered in this section on acceptance tests, along with the repair work necessary to correct deficiencies to complete the work on this project, shall be considered subsidiary to the Contract.

## SECTION III

### WATER MAIN INSTALLATION REQUIREMENTS

#### 1. GENERAL SPECIFICATIONS:

Work to be done under these specifications consists of construction of pipelines and appurtenances as shown on the drawings and as herein specified. The Contractor shall furnish all materials and labor and, upon completion of the work, the entire area within the limits of the contract shall be left in a clean and orderly condition. Unless otherwise specified on the plans or in the contract documents, water lines shall be C-900 and C-905 PVC water pipe with integral bell and spigot ends.

Each section of pipe in trenches shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints. Any pipe that has its grade or joint disturbed after installation shall be taken up and reinstalled. The interior of all pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench, and shall be kept clean by approved methods. Pipe shall not be laid when trench or weather conditions are unsuitable for such work. In all cases, water shall be kept out of the trench until all joints have been made secure. When work is not in progress, all open ends of pipes and fittings shall be securely closed to avoid trench water, earth or other substance from entering the pipe or fittings.

#### 2. PLACEMENT OF DEFECTIVE PIPE:

Any pipe already laid and found to be defective shall be taken up and replaced with new pipe without additional expense to the Owner.

#### 3. TRENCHING AND BACKFILLING:

All water lines shall be installed to provide a minimum depth of cover between the top of pipe and the finished ground surface of not less than 4.0 feet.

#### 4. PIPE BEDDING:

The pipe shall be bedded in clean well-graded crushed gravel conforming to ASTM Designation C33, Gradation #57 or Kansas Department of Transportation Standard Specifications for coarse aggregate CA-5 and shall have a minimum thickness beneath the pipe of 4 inches or one-eighth of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. If a stone ledge is encountered in the trench, it shall be removed for a depth of at least 6 inches below the bottom of the pipe and replaced with bedding material(s) having appropriate compaction and load bearing properties. Backfill from the bedding material line to 6" above the top of the pipe shall be of the same material as utilized for the pipe bedding. The contractor shall supply the Engineer with a sample prior to starting work.

## **5. PVC PIPE:**

Pipe shall meet the requirements of AWWA C-900 and AWWA C-905 Polyvinyl Chloride Pressure Pipe, Class 150, and shall conform to the requirements of DR18.

All pipe shall be suitable for use as a pressure conduit. Provisions shall be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral thickened wall section with an elastomeric ring that meets the requirements of ASTM F-477, standard specifications for elastomeric seals for joining plastic pipe. The wall thickness in the bell section shall conform to ASTM D 3139. When used for potable water systems, pipe shall meet the National Sanitation Foundation Standard No. 61. The pipe shall be manufactured to cast iron or ductile iron outside dimensions. Standard laying lengths shall be 20 feet for all sizes.

All fittings shall be mechanical joints to conform to the applicable standard shown in AWWA/ANSI standard specifications.

## **6. TESTING OF PIPE:**

The pipe shall be tested in accordance with the manufacturer's recommendations.

Certified records of the tests made by the Manufacturer or by a reliable commercial laboratory shall be submitted to the Engineer with each shipment of pipe.

## **7. HANDLING PIPE AND FITTINGS:**

Pipe, fittings, valves, and hydrants shall be handled and installed in a manner that will insure a sound and undamaged condition, conforming in all respects to specified requirements. Particular care shall be taken not to injure pipe.

Equipment, tools, and methods used in unloading, storing, reloading, hauling, and laying pipe and fittings shall be such that no damage is done to the pipe.

Care shall be taken so as not to scrape or gouge the pipe. All pipe damaged by the Contractor shall not be installed or will be removed at the Contractor's expense.

## **8. CLEANING AND PROTECTING PIPE:**

The interiors of all pipes and fittings shall be thoroughly swabbed and cleaned of all foreign matter before being installed, and shall be kept clean during and after installation.

Whenever pipe installation is stopped at the end of the day's work, because of rain or for any other reason, the open end of the line shall be sealed with a watertight plug. All water that may have entered the trench shall be removed prior to removing the plug. It is essential that no mud, trench water, or other foreign matter be permitted to get into the line at any time.

## **9. INSPECTION OF PIPE:**

Before installation, each piece of pipe shall be inspected for defects. Any defective, damaged, or unsound pipe shall be rejected.

## **10. ALIGNMENT OF BELL AND SPIGOT PIPE:**

Pipe lines or runs intended to be straight shall be laid straight. Deviations from a straight line or grade, in authorized or specified vertical and horizontal curves or offsets, may be made at the joints between straight pipes; or between straight pipes and valves or fittings; within the allowable deflection limits. Maximum deflections, expressed in inches of deflection per lineal foot of pipe, between centerlines extended of the connecting piping units, shall not exceed the manufacturer's recommendations for the pipe being laid, which shall be submitted to the Engineer prior to starting project.

## **11. CUTTING PIPE:**

Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method which will not damage the pipe. All pipes shall be cut by a tool designed for such use.

## **12. INSTALLING PIPE IN TRENCH:**

Prior to placing a length of pipe or a fitting in the trench, the trench bottom shall be accurately graded or otherwise prepared as provided in the trenching specification. The pipe shall be checked for soundness and the interior surfaces of the pipe or fitting brushed and swabbed until free of mud, mud cake, dirt, dust, and debris.

Every precaution shall be used to prevent the entrance of dirt, mud, water, and other foreign matter into pipe, valve, and fitting interiors during and subsequent to installation.

Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather is unsuitable for proper grading, laying, or jointing operations, except with the permission of the City Engineer in each case.

With the exception of closures and connections with existing lines, pipe shall be laid with the bells facing in the direction of installation.

The proper amount of disinfectant, as recommended by the manufacturer, shall be placed in each joint of pipe as it is placed in ditch. Water shall be admitted to each section of the line slowly to prevent transportation of all disinfectant to the upper end of the line.

AWWA standards include C605, *Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water*.

## **13. SLIP JOINT:**

The installation of slip joint pipe shall be in accordance with the recommendations and instructions of the pipe manufacturer as approved by the City Engineer and as herein specified. Slip joint pipe shall be installed with care to insure proper connection free from foreign material and watertight. As the spigot end is readied for installation into an adjoining bell end, the spigot end shall be cleaned and lubricated with approved lubricants. The bell shall contain a gasket in place, free from cracks or cuts. The pipe shall be rammed home according to proper installation procedures.

#### **14. MECHANICAL JOINTS:**

The installation of mechanical joint pipe shall be in accordance with the recommendations and instructions of the pipe manufacturer as approved by the City Engineer and as herein specified. After the pipe has been installed as specified, the socket, gland, gasket, and spigot end of the entering pipe shall be wiped clean, washed with soapy water, and the gland and gasket slipped over the spigot end of the pipe. The spigot shall be inserted the full depth of the socket and then retracted 1/8 inch. The gasket shall then be coated with approved lubricants and carefully pushed into position until evenly seated in the bell. The gland shall then be shoved in place, the bolts inserted, and the nuts initially tightened with the fingers. Final tightening of the nuts on the bolts shall be done with a ratchet torque wrench adjusted to slip at the torque recommended by the pipe manufacturer for the size of pipe being laid in each case. The use of any other type of wrench will not be permitted. Beginning with a bottom bolt and then the opposite top bolt, bolts 180 degrees apart shall be tightened gradually, alternately, in rotation, and at a uniform rate in such a manner that uniform gasket compression is obtained around the entire circumference of the joint. Each nut shall be tightened to the authorized torque limit.

#### **15. FITTINGS:**

All fittings shall be mechanical joints to conform to the applicable standard shown in ANSI/AWWA C110/A21.10, ANSI/AWWA C11/A21.11, and C-153 Compact Fittings or the latest revision.

Prior to backfilling, fittings and valves shall be securely encased with an 8 mm thickness polyethylene film conforming to ANSI/AWWA C105/A21.5. The polyethylene film shall be of virgin polyethylene and as produced from Dupont Alathon resin or equal. The film overlaps shall be one-foot minimum on each joint. Overlaps shall be secured by the use of adhesive tape, plastic string, or any other material approved by the City Engineer.

#### **16. CONNECTIONS WITH EXISTING PIPE LINES:**

Where connections are made between new work and existing pipe lines, such connections shall be made in a thorough and workmanlike manner and to the satisfaction of the City Engineer, using proper tools and special fittings to suit actual conditions encountered in each case. Each connection with an existing water line shall be made at a time and under conditions which will least interfere with water service to customers affected thereby and as authorized by the Owner. Suitable facilities shall be provided for proper dewatering, drainage, and disposal of all water removed from the dewatered lines and excavations without damage to adjacent property. The Contractor is cautioned to be aware of the fact that intersecting lines with which connections are to be made vary in depth, and it will be necessary to approach each intersection at such an elevation that the two lines will meet properly. In order to minimize the time required to complete the installation at each connection, which installation will generally include the installation of a valve in each connecting main, the Contractor shall carefully plan the sequence of each part of the operation and the total length of time involved. He shall then submit his plan and schedule to the City Engineer who will help arrange a proper time for the connection to be made. If so requested, the connections shall be made at night or at some other time of minimum demand. All pipe, fittings, valves, jointing materials, tools, and equipment required to complete the connection shall be on hand before the water is turned off

in the connecting main or mains.

Great care shall be taken to prevent pipe line contamination when dewatering, cutting into, and making connections with, existing pipe lines. The Contractor shall cooperate with the Owner in isolating services, and shall conduct his operations in such a manner that no trench water, mud, or other contaminating substances are permitted to get into the connected line or lines at any time during the progress of work. The interiors of both new and reused pipe, fittings, and valves, installed in such connections, shall be thoroughly cleaned.

The unit price named for abandoning the existing water main service lines shall include all costs incurred in the excavation and backfilling of the existing connection locations; disconnection, and capping of existing mains; and all other costs not included under other bid items.

The unit price named for the size of PVC Pipe shall include all trenching and backfill (other than compacted backfill), pipe embedment material, connecting to existing mains necessary coupling devices, such as split or solid sleeves, and all labor necessary to install such devices and pipe to form a conduit for carrying water as detailed in the accompanying plans, performing leakage and pressure tests, furnishing all signing and barricading throughout the project, and seeding and sodding the disturbed areas.

#### **17. AUGER BORINGS:**

Water service connections crossing streets shall be installed in auger borings rather than open cutting the street. Bore diameter shall be as small as possible to preclude potential settlement following installation of the service connection piping.

The length of auger borings shall be such that the edges of open excavations on either side of the street are not closer than 12 inches from the back of curb. Where sidewalks lie immediately in back of the existing curb, auger boring lengths may be extended as required to provide the above clearance to the back edge of sidewalk, thereby precluding the need for sidewalk removal and replacement.

Service connection piping shall be installed in the bored length immediately after the auger boring is completed. Filling of the annular space between the service connection piping and the rough bore will not be necessary unless required by the Engineer due to significant caving and subsequent removal of surrounding soil prior to placement of the service connection piping. Any filling so required shall be provided by the Contractor, in a manner acceptable to the Engineer, at no additional cost to the Owner.

No interruption of traffic will be permitted at any location where auger borings are required.

#### **18. GATE VALVES:**

Gate valves shall be iron body, bronze mounted, resilient seat, non-rising stem gate valves which comply with the Standard Specifications of the A.W.W.A. C509 for one hundred fifty (150) pounds working pressure. They shall turn counterclockwise to open and shall be equipped with a 2 inch operating nut. All gate valves approved shall be Mueller or AVK Series 25 Resilient Wedge. Gate valves shall only be installed on 8" and smaller pipe sizes.

## **19. BUTTERFLY VALVE:**

All 10" & larger valves shall comply with the standard specifications of the American Water Works Association C504 for one hundred fifty (150) pounds working pressure and shall be Henry Pratt Ground Hog Butterfly Valve style, Model Number MDT-2. Butterfly valves shall open to the left and close to the right with BUNA-N-Body mating. The valve shall have nichrome seat mating with rubber seat in body only. Valves shall have mechanical to mechanical joints.

## **20. SETTING OF VALVES:**

New valves shall be set where shown on the plans. Valves and valve boxes shall be plumb. When a hydrant valve is used, the valve box shall be placed directly over the valve with the top of the box tangent to the top of the ground. After the valve is in place, earth shall be compacted about it, as specified for the rest of the trench. Before installing any valve, care shall be taken to see that all foreign material is removed from within the valve body. The packing glands shall be inspected to determine they are properly packed. Gland nuts shall be tightened and the valve opened and closed to assure that all parts are in working condition.

## **21. TAPPING SLEEVES, TAPPING SADDLES AND TAPPING VALVES:**

Tapping sleeves shall be manufactured by Mueller or Ford and shall be a mechanical joint type supplied with the proper end gaskets to fit the type and class of pipe intended. Contractor is to verify the pipe size and class prior to ordering the tapping sleeve. The tapping sleeve shall have a minimum rated working pressure of 150 PSIG.

Tapping valve shall be manufactured by Mueller or Ford and shall be a resilient seat non-rising stem gate valve with flange end to mate to the tapping sleeve and a mechanical joint end to connect the pipe. The Mechanical joint end is to have slotted boltholes that fit a standard tapping machine. The valve is to have a minimum rated working pressure of 150 PSIG.

The tapping assembly is to be installed level and with proper support. The tap is to be made full size by a factory authorized representative with the proper equipment. The tap shall be tested to the minimum rated working pressure.

Service clamps or saddles used with PVC water pipe shall:

- A. Provide full support around the circumference of the pipe.
- B. Provide a bearing area of sufficient width along the axis of the pipe, minimum two (2) inches
- C. Meets applicable AWWA C-800 Standards and certified ANSI/NSF Std. 61.

Pre-approved service saddles shall be Smith-Blair series 317. All other styles and manufacturers must be approved by the City Engineer prior to use on City of Emporia projects.

## **22. FIRE HYDRANTS:**

All fire hydrants shall have mechanical joint ends for connection to 6 inch standard ductile iron pipe. Fire hydrants to be traffic model; open right (7/8 inch operating nut); 3-way fire hydrants require two, 2 1/2 inch hose nozzle and one, 4 1/2-inch pumper nozzle; fire hydrants to have 6

inch mechanical joint shoe with attached 6" fire hydrant auxiliary valve with resilient seat mechanical joint to mechanical joint; bonnet and caps to be red in color with remaining portion painted aluminum. Fire hydrants shall be Mueller "Centurion" style, Traffic Model Number A-423 or AVK Series 2780 Dry Barrel conforming to AWWA C-502 Standard 4 ½ or 5 ¼ main valve open. Fire hydrants shall be for a **minimum** 4-foot plus 0.5 O.D. depth setting (see Engineer drawings for Elevations).

Hose caps shall be provided for all outlets and shall be securely chained to the barrel with 1/8 inch galvanized steel chain. A rubber washer shall be provided in the hose cap, set into a groove in such a manner as to prevent its dropping out. The hose cap nuts shall be identical in size and shape to the operating nut.

### **23. SETTING OF FIRE HYDRANT ASSEMBLY:**

Fire hydrants shall be set at an elevation that will provide at least the minimum specified cover over the pipe, and to the grade as set by the Engineer. Any fire hydrant not set to a grade as determined by the Engineer and found incorrect shall be reset at the full expense of the Contractor. The fire hydrant shall be set on a substantial concrete foundation in conjunction with the reaction block to stabilize the fire hydrant. The bowl of the fire hydrant shall be substantially braced against the vertical face of unexcavated soil at the end of the trench. When necessary and approved by the Engineer, the fire hydrant may be tied to the pipe with suitable rods or clamps adequately protected from corrosion.

The fire hydrant shall be provided with adequate drainage facilities as approved by the Engineer. The fire hydrant shall stand plumb with nozzles pointed in the directions the Engineer shall indicate (typically to the street) and a distance back of curb as staked. Immediately prior to the installation of the fire hydrant, the following operations shall be performed: (a) the fire hydrant shall be carefully inspected; (b) the fire hydrant interior shall be thoroughly cleaned; (c) the fire hydrant shall be opened and closed as many times as may be necessary to determine that all parts are in proper working order, valves are seating properly, and the drain valve operating freely; and (d) the packing gland checked to determine if the packing is in place and the gland nut properly tightened.

Fire hydrant assembly shall include all necessary work from the tee on the water main to and including the fire hydrant. Work shall include but not be limited to fire hydrant of correct height, thrust block, crushed rock fill, 6" MJ valve and valve box, 6" piping, and all necessary hardware to complete the connection to the water main tee.

### **24. BRACING, SUPPORTING, AND ANCHORING FITTINGS:**

All fittings at bends and branches in pipe lines shall be adequately supported by reaction or thrust backing installed between solid, undisturbed soil and the fitting to be anchored in each case as per plan sheet. Such reaction or thrust backing shall consist of concrete installed in such a manner that all joints between pipe and fittings are accessible for repair or replacement.

Fittings at bends or breaks in grade shall be provided with adequate concrete embedment at the base of slopes, and shall be adequately anchored to resist the maximum test pressure encountered at the top of slopes.

Restrained joint fittings shall be used in conjunction w/ specified concrete thrust blocking on all vertical bends.

Restrained joint fittings may be used in lieu of concrete thrust blocks on horizontal bends or breaks when special circumstances arise and/or approved by the City Engineer.

## **25. PRESSURE AND LEAKAGE TEST:**

It is the intent of these specifications that the water main constructed hereunder shall be and remain tight and free from weakness and from leakage under all working and service conditions. All joints that are found either by observation or test to leak shall be repaired and made watertight by the Contractor, at his own expense.

The Contractor shall make pressure and leakage tests, as specified herein, under the supervision of the City Engineer. The Contractor shall provide all necessary connections between the pipe line or piping and the nearest available source of test water, test pumping equipment, pressure gauge, water meter (leakage test only), and other equipment, materials, and facilities necessary for the required tests. The Owner will furnish all water necessary for filling the lines and for making the required tests. The specified test pressure shall be applied and maintained in each case by means of a hand-operated force pump or other suitable device approved by the City Engineer.

The Contractor will be permitted, when it is practical to do so, to make pressure and leakage tests either before or after the trench is backfilled, with the understanding that if the line is not strong and tight, he will be required to uncover it to the extent necessary to find and repair all leaks; all such work being done at his own expense. If the test is made before the trench is backfilled, the embedment of the pipe shall have been placed and compacted to a level 6 inches above the center line of pipe with all joints exposed around their entire circumference. The line test shall preferably be made in sections using either the sectionalizing valves shown on the drawings to be permanently installed, or temporary plugs or valves. All bracing and blocking shall be in place.

In making the tests, the section to be tested shall be slowly filled with water, causing all air to be expelled from the pipe. All available hydrants, including auxiliary hydrant valves, and all other vents, should be open during the filling of the line. Where venting facilities are not available at high points in the line, the Contractor will drill and tap the line for venting purposes. As soon as the line is filled with water, the Contractor shall install galvanized plugs in the tapped holes.

Test pressures shall be applied with a force pump of such design and capacity that the required pressures can be applied and maintained without interruption for the duration of the test. Meters and gauges shall be carefully tested and calibrated, as approved by the City Engineer.

The testing procedure shall be as per the KDHE Minimum Design Standards Manual Appendix C "Procedures for Pressure & Leakage Testing of Water Mains."

## **26. CORPORATION STOPS:**

Corporation stop shall be installed at each of the lines (on the line side of valves at ends of lines) and on each side of each intermediate or line sectionalizing valve, or as shown on the drawings, for use in testing the line and, if desired, for use in chlorinating the line by sections. Water required to replace leakage in one (1) section of the line may thus be obtained from an adjacent section and pumped into the section under test through the corporation stops so installed on both sides of a sectionalizing valve. Such corporation stops will be furnished and installed by the Contractor, as a subsidiary part of this Contract.

Corporation stops shall be manufactured to conform with AWWA C-800 Standards and meet ANSI/NSF 61 Standard.

The pre-approved corporation stop for the City of Emporia is the F-600 Series from Ford Meter Box Company, Inc.

Couplings shall be Ford flared copper style.

All other styles and manufacturers shall be approved by the City Engineer prior to use on City of Emporia projects.

## **27. VALVE BOXES:**

Each valve installed shall be covered and enclosed by a valve box designed for each purpose. Pipe substitute is not allowed. The Contractor shall furnish the material and equipment to set the valve box. The box shall be centered on the valve, brought to the proper grade, and thoroughly backfilled and a 2' x 2' concrete cap a minimum of 4" thick, poured around the box. The valve box assembly shall be a Tyler "Series 564-S".

## **28. TIES:**

The Contractor shall provide a full set of ties and measurements upon completion of the job that will allow the location of all fittings, valves, and end of lines in the future. Each fitting, valve, or line end shall have a minimum of two (2) measurements tying it down to a permanent structure. Fire hydrants, buildings, and especially lot corners are excellent for such measurements.

## **29. AIR RELIEF VALVES, COMBINED AIR/VACUUM RELIEF VALVES, AND BLOW-OFF CHAMBERS:**

Blow-off assembly shall include all necessary work and material from the reducer on the water main to and including the 6" M.J. gate valve, 6" - 90° bend, 6" piping, thrust blocks, crushed rock fill, two valve boxes, and all other work and material to complete the installation for the Blow-off Assembly.

At high points in water mains where air can accumulate, provision shall be made to remove air by means of hydrants or air relief valves. Automatic air relief or combined air/vacuum relief valves shall not be used where flooding of the manhole or chamber may occur.

The open end of the air relief pipe from an automatically operated valve shall be extended to at least 1 ft. (0.3 m) above grade and provided with a screened, downward-facing elbow. The open end of the air relief pipe from a manually operated air relief valve should be extended to the top of the pit. Manual operation of an automatic air relief valve shall be possible.

The open end of the relief pipe from a manual or automatic combined air/vacuum relief valve shall always be extended to at least 1 ft. (0.3 m) above grade and provided with a screened, downward-facing elbow. Termination of the open end of the pipe from a manual or automatic combined air/vacuum relief valve at the top of the pit will not be approved. Manual operation of an automatic combined air/vacuum relief valve shall be possible.

Chambers or pits containing valves, blow-offs, meters or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs, air relief valves, or combined air/vacuum relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground.

Air relief and combined air/vacuum relief valves should be located as close to the pipe as possible with all interconnecting (riser) pipe to be oriented upward to the valve from the water line. Isolation valves should be the same size as the interconnecting piping and should be located between the water line and valves.

### **30. METHOD OF PAYMENT:**

Payment will be made for the water main on the basis of the actual measured length of the water line in place. Measurement will be made horizontally along the centerline of pipe from the point of connection straight through all valves and fittings to the end connection. Payment will be made at the unit price named in the Proposal per linear foot of water main complete, and such price shall include the cost of all trenching and excavation, sheeting and bracing, backfilling, compaction of backfill and handling, hauling and installing pipe and fittings. The unit price for the water main shall also include the work of cutting into intersecting lines where connections are to be made and making and completing said connections, testing of the completed pipe line, normal concrete blocking, embedment, and all other work included in the contract but not included in other unit price items as set forth in the Proposal.

Payment for installation of valves with valve boxes will be made at the unit prices named in the proposal and shall include all costs in connection with the installation of the valves and the installation of valve boxes and any other costs not included in other pay items.

Payment for installation of fire hydrant assembly will be made at the unit price named in the Proposal and shall include all materials as shown on the "fire hydrant detail" on the plans. Payment for installation of Blow-off Assembly will be made at the unit price named in the proposal and shall include all materials as shown on the "Blow-off Assembly Detail Sheet."

### **31. BORING**

At locations shown on the Plans, or where indicated by the Engineer, the Contractor shall excavate by means of machine boring. The Contractor shall be responsible for obtaining all permits and clearances from the Owners of the facility being bored under. Casing pipe shall be

used on all machine borings under roadways for main line installations. All equipment to be used and the method of operation of the equipment shall be subject to approval by the Engineer before use on the project. Boring shall be done in such a manner as to permit the installation of the casing pipe to the lines and grades shown on the Plans.

All casing pipe shall be new steel pipe meeting ANSI Standard Weight Schedule (thickness not less than 0.25 inches or as indicated on the Plans. Good used steel pipe meeting the above requirements may be used when approved by the Engineer. Casing pipe shall be of the respective diameter. Casing spacers shall be used **NOT WOOD SKIDS**. Casing spacers shall be made of high-density polyethylene. Spacers shall meet or exceed RACI Casing spacers and installed per manufacturers suggested requirements.

### TABLE OF CASING SIZES

| <u>Pipe Size</u> | <u>Casing Size</u> |
|------------------|--------------------|
| 4"               | 10"                |
| 6"               | 12"                |
| 8"               | 14" - 16"          |
| 10"              | 16" - 18"          |
| 12"              | 18" - 20"          |
| 16"              | 22" - 24"          |

#### **A. Construction Method:**

Casing pipe shall be installed in the boring hole as the earth is removed. Boring without the concurrent installation of the casing pipe will not be allowed. The use of water in the excavation shall be prohibited. Casing pipe shall be stored to drain.

RACI Casing Spacers must be used for carrier pipe installation inside casing pipe to prevent damage to pipe and bell joints during installation and to provide proper long-term line support. PVC pipe in casings should not rest on bells.

Pipe may be installed in the casing using:

- Winch drawn cable
- Jacking

In both methods, care must be exercised to avoid damage to pipe or bell joints. Use of lubricant (flax soap or drilling mud) between skids and casing can ease installation.

Caution: Do not use petroleum products (e.g. oil or grease). Prolonged exposure to these products can damage some elastomeric gaskets.

Upon completion of pipe insertion, installing 1/8" thick synthetic rubber end seals shall close the ends of the casing.

#### **B. Basis of Payment:**

Payment will be made at the unit price per linear foot which price shall include all

equipment, labor, and materials (including casing, skids, seals, etc.) required to complete this item.

### **32. LINE CROSSINGS:**

Special precautions should be taken to prevent possible damage to line crossings.

a. **SURFACE WATER CROSSINGS** – Surface water crossings, both over and under water, present special problems which should be discussed with KDHE before final plans are prepared. Where the ground has inadequate bearing capacity, pile supports, stringers, or other acceptable methods shall be used. A pipeline crossing of a perennial stream having 50 or more square miles (130 km<sup>2</sup>) of drainage area above the proposed project site requires a permit from DWR, except for a directionally bored crossing or a crossing consisting of a pipeline non-obstructively attached to an existing bridging structure.

- 1) Above-Water Crossings – The pipe shall be adequately supported, protected from damage and freezing, and accessible for repair or replacement.
- 2) Underwater Crossings – Underground pipelines shall be buried at a sufficient depth below streambeds to prevent exposure.
  - a. On navigable streams, underground pipelines shall be buried at a minimum depth of 7 ft. (2.1 m) beneath the streambed.
  - b. On all other streams, underground pipelines shall be buried at a minimum depth of 5 ft. (1.5 m) beneath the streambed.
  - c. When crossing water courses which are greater than 15 ft. (4.6 m) in width,
    - 1) The pipe should be of special construction, having flexible, restrained or welded watertight joints.
    - 2) Valves should be provided at both ends of water crossings so that the section can be isolated for testing and repair; the valves should be easily accessible, and not subject to flooding.

Permanent taps or other provisions to allow operators to determine leakage and obtain water samples should be made.

### **33. DISINFECTION OF WATER MAINS:**

All new construction of water mains as well as all existing mains subject to contamination by the work hereunder shall be disinfected by the Contractor as directed by the Kansas Department of Health and Environment and the City of Emporia. After disinfection has been completed, water samples will be taken by the City of Emporia and recorded in the project files. The Contractor shall, however, as a part of his obligation hereunder, keep all pipe, valves and fittings installed by him in a clean and uncontaminated condition.

All new or repaired potable water lines in the public water supply system shall be thoroughly flushed and disinfected before they are put into use. The process of disinfecting the water main shall be per the KDHE Minimum Design Standards Manual Appendix D “Procedures for the Disinfection of Water Mains.”

### **34. SERVICE LINES:**

Service lines shall be installed at locations designated by the owner, as per drawing specifications or in the contract documents. Corporation stops shall be as per Section III Part 26. Service saddles shall be as per Section III Part 21. The service line shall be copper pipe Type K. The bottom 6 inches of the trench shall be hand backfilled with dirt prior to the machine backfilling of the remaining material. The trench backfill shall be thoroughly jetted or tamped. The pipe shall be buried to a depth sufficient to provide a minimum of three (3) feet of cover.

The installation of water service lines under existing pavement or sidewalks shall be placed by boring. Any trenching through proposed pavement or sidewalks (as shown on the plans) shall install compacted backfill through the proposed area, as subsidiary to the service line.

Method of Payment: Water service line shall be paid for at the unit price bid per lineal foot and shall include all costs for unclassified excavation, trenching, boring, backfill, labor, equipment, and materials to install said water service. Corporation taps will be paid for at the bid price per each and shall be compensation for all labor, equipment, and materials to install an appropriately sized corporation for each service line. Removal and relocation of water meters shall be bid per each price and shall include compensation to remove and relocate each water meter setup and to connect to the existing service line to each individual building. The City will provide a new meter tile with ring, lid, yoke, curb stop, and meter for each relocated water service at no cost.

### **35. SEPARATION OF WATER MAINS AND SEWERS:**

When potable water pipes and gravity sanitary sewers are laid parallel to each other, the horizontal distance between them shall not be less than ten (10) feet. The distance shall be measured from outside diameter of water pipe to outside diameter of gravity sanitary sewer pipe. The laying of water pipes and gravity sanitary sewers shall be in separate trenches with undisturbed earth between them.

When a water pipe and a sanitary sewer cross and the sewer are two (2) feet or more (clear space) below the water pipe, no extra protection to the latter is needed. At all other crossings, the sewer is to be constructed for a distance of ten (10) feet in either direction from the crossing of the following pipe materials:

- a. Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.51 with gasketed, push-on, or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.
- b. PVC pipe conforming to ASTM D3034 with gasketed push-on joints in conformance with ASTM D3212.

Joints are not to be in the immediate vicinity of the water main and as far from it as practicable. Where water mains are laid across or through an area where there are existing sewers and extra protection is needed, the existing sewers shall be encased in concrete with a minimum of six (6) inches thickness for a minimum length of ten (10) feet in either direction as measured from the outside diameter of the water pipe being crossed.

The same horizontal separation requirements as listed above apply to water service lines and building gravity sanitary sewer laterals. The same vertical distance separations and the extra projections as required above for potable water mains and gravity sanitary sewers apply in the same manner to water service pipes and building gravity sanitary sewer laterals.

There are to be **no** physical connections between any parts of the potable water system with building sewers, sanitary sewers or wastewater treatment facilities by means of which it would be possible for sewage, even under exceptional circumstances, to reach the wells, storage reservoirs, or distribution system.

**There shall be at least a ten (10) foot horizontal separation between water mains and sanitary sewer force mains. The distance shall be measured from outside diameter of water pipe to outside diameter of sanitary sewer forcemain. The laying of water pipes and sanitary sewer forcemains shall be in separate trenches with undisturbed earth between them. There shall be a two (2) foot vertical separation at crossings as required above. Additionally sanitary sewer force mains must always cross underneath the water main.**

No water pipe shall pass through or come in contact with any part of a sewer manhole.

Underground drains from fire hydrants or valve pits should not be directly connected to sewers or storm drains.

### **36. SEPARATION OF WATER MAINS AND OTHER POLLUTION SOURCES:**

A minimum distance of 25 ft. shall be maintained between all potable water lines and all pollution sources, e.g. septic tank absorption fields, waste stabilization ponds, sewage contamination, wastewater, landfill leachate, and all CAFO facilities.

Under no circumstances shall a water line be extended through an area that is a real or potential source of contamination to the water line or water supply.

Under no conditions shall the encasement of a water line be considered as adequate protection of a water line or a water supply for the purpose of extending the water line through a real or potential source of contamination.

### **37. CROSS CONNECTIONS:**

There shall be no physical connections between the PWSS and any pipes, pumps, hydrants, tanks, or non-potable water supplies whereby unsafe water or other contaminating materials may be discharged or drawn into the system.

### **38. MECHANICAL ENCASEMENT:**

Where a water line must be sleeved within a pipe in order to protect the waterline, such as at road, railroad, or pipe way crossings, the water line must be sleeved with seamless, jointless pipe of equal or greater mechanical strength for distance of at least 10 ft. beyond the crossing in both directions, kept separate from the sleeve pipe with plastic spacers or wooden skids, and the annular spaces formed at the ends of the carrier/sleeve pipes must be made

watertight with flexible boot type end seals.

**39. TRACER WIRE:**

Tracer wire shall be installed along with all PVC Pipe installed. Tracer wire shall be No. 12 gauge solid copper coated wire and shall be continuous without any breaks. Tracer wire will be run up into separate tracer wire boxes. Location of tracer wire boxes will be as shown on the plans or as directed by the Engineer. The Engineer shall approve tracer wire boxes as to suitability and appearance. Tops will be painted blue. Tracer wire shall be placed and secured along top of pipe with duct tape at two locations per each joint of pipe.

## SECTION IV

### REQUIREMENTS FOR EXCAVATION, TRENCHING, & BACKFILL

#### 1. GENERAL REQUIREMENTS

The Contractor shall do all unclassified excavation and trenching required for the installation of new water mains, valves, valve boxes, fire hydrants, and connections to existing water mains. Excavation shall include removal, handling and disposal of all excess excavated materials, cutting and replacement of pavements, tunneling under curbs, gutters and sidewalks, backfilling and compaction of all backfill, and in general, all work not included under the work of installing the pipe, pipe fittings, valves and appurtenances. Blasting shall not be done except with the specific permission of the City Engineer.

All excavated materials, of any kind, not required for backfilling of trenches or other excavations, shall be disposed of by and at the expense of the Contractor. The Contractor shall make arrangements regarding place and method of disposal with the City Engineer.

#### 2. EXCAVATION FOR PIPE STRUCTURES:

Excavation for pipe structures shall be carried only to the lines and depths required for the proper building of such structures. Care shall be taken not to excavate deeper than is required, the bottom of all pipes shall rest on solid bedding material. Excavations shall be kept dry, any water that enters the excavation from any cause shall be immediately removed.

#### 3. TRENCH EXCAVATION - LIMITATIONS:

The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work and in the event that pipe installation is stopped for any cause. One hundred (100) feet will be the maximum length of open trench allowed on any portion of the line under construction. Under ordinary conditions, excavation shall be by open cut from the surface. Tunneling may be required beneath concrete walks, curbs and gutters and may be permitted at other locations as hereinafter specified. Trenches shall be of uniform width with straight, vertical sidewalls. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand-excavating methods shall be used. Trenches shall be kept in a de-watered condition by whatever means are required for proper de-watering of the trenches.

#### 4. CUTTING OF PAVEMENT:

Pavements shall be saw cut only where, in the manner, and to the extent specified herein, as shown on plans, or as authorized by the City Engineer. All pavement cuts shall be cleanly made to straight lines and, unless otherwise required, shall be parallel to the centerline of the trench. Cut shall be made for the full depth of the pavement that is being removed. Care shall be taken to avoid undermining or damaging any pavement not authorized to be removed. Pavement removed for connections to existing lines shall not be of greater extent than absolutely necessary. Pavements shall be replaced in accordance to the City Standard Details (See Detail Sheet for Street Cuts and Repair).

Concrete walks, curbs or gutters damaged in any way by, or in any way due to, any of the Contractor's operations shall be removed and replaced by and at the expense of the Contractor to the reasonable satisfaction of the Owner, or authority having jurisdiction over, such damaged walk, curb or gutter.

Cuts for tunnel shafts shall be made where directed in order to excavate below paving instead of cutting it or for other tunneling authorized or required by the City Engineer.

**5. TRENCH BRACING AND SHEETING:**

Trenches in streets and elsewhere, unless otherwise directed, shall have vertical sides. Where required to prevent caving or sliding, trenches shall be substantially braced and, if necessary, sheeted or stair stepped as per current OSHA standards. Trenches at all stages of excavation must be made safe for workmen to occupy during the progress of the work, and to protect adjoining pavement, utilities, and buildings. All trench shoring shall meet or exceed current OSHA standards. Failure to properly brace and sheet trenches as per OSHA standards shall be the responsibility of the Contractor. After the pipe has been laid, and the work in the trench completed, bracing and sheeting shall be removed except where the City Engineer directs it to be left in place. The Engineer shall have the authority to shut down excavation operations if in his opinion unsafe conditions exist.

**6. ARTIFICIAL FOUNDATIONS IN TRENCHES:**

Whenever so ordered by the engineer, the contractor shall excavate to such depth below grade as the engineer may direct and the trench bottom shall be brought to grade with such material as the engineer may order installed. All concrete or other foundations made necessary by unstable soil shall be installed as directed by the engineer. Compensation for extra excavation, concrete, or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for extra work.

**7. TRENCH WIDTH:**

Trenches shall be of sufficient width to provide ample working space for men engaged in handling pipe and making joints. In no case shall the width of the trench, inside sheeting and bracing lines, be less than 12 inches greater than the internal pipe diameter.

In order to protect pipe from excessive superimposed loads in shallow trenches where the pipe would be subjected to concentrated live loads from trucks, and other heavy moving equipment, the lower portion of trenches, below an elevation six (6) inches above the top of the installed pipe, in or across streets, driveways, parking areas, or similar locations, shall have a maximum width of 18 inches plus the internal diameter of the pipe laid in each case. In no case, however, shall the width of the lower portion of any trench exceed the internal diameter of the pipe laid therein by more than two (2) feet without the specific permission of the City Engineer or to meet requirements set by the current OSHA standards.

**8. BELL HOLES:**

Bell holes shall be dug after the trench bottom has been graded and pipe bedding has been installed. Bell holes for mechanical joint pipe shall provide adequate clearance for the tools

and methods employed in the installation and bolting of the joints. Regardless of the type of joint, all bell holes shall be of sufficient size and depth that the joints can be properly made and that no part of the pipe bell is in contact with the trench bottom.

#### **9. PIPE BEDDING:**

See Sanitary Sewer, Storm Sewer and Water Main sections in these Specifications.

#### **10. UNCOMPACTED TRENCH BACKFILL:**

In parks or other unpaved areas that do not support walks or structural loads, the entire depth of trench above the embedment shall be compacted by tamping 12" lifts or other reasonable and approved methods. Materials for backfill shall be such as will readily permit compaction and shall be free from heavy stones, hard masses of consolidated material, wet or sticky lumps of clay, and from stumps, large roots, trash or debris. Backfill costs shall be included in price bid per linear foot of pipe.

#### **11. COMPACTED TRENCH BACKFILL:**

Compacted Trench Backfill shall be placed beneath and directly adjacent to all proposed or existing streets, sidewalks or driveway surfacing. The contractor may place existing material from the excavation (no rocks larger than 6") in 8" uniform compacted lifts. The Contractor shall have the option of placing pipe bedding material (as described in this section) to the required subgrade elevation or request approval for the use of a diggable concrete flowable fill in lieu of the compacted backfill material. (See Standard Details for Pavement Sections)

All embankment and backfill of trench and manhole replacement shall consist of select earth containing optimum moisture for maximum compaction placed in 8" lifts and compacted by rolling with a sheepsfoot or by mechanical tamping. The sheepsfoot roller when fully loaded, shall have a load on each foot not less than 200 pounds per square inch of cross sectional area. Optimum moisture plus or minus 5% shall be present in the soil to obtain a density equal to or greater than 95% of maximum density as determined by the Standard Proctor Density Test, shall be achieved before placing the next lift.

##### **I. Basis of Payment (Compacted Trench Backfill):**

The price bid per cubic yard for compacted backfill shall include all work described under this section, including material and labor to install, vibrate, and water the compacted backfill. The quantity of compacted backfill measured in cubic yards will be measured from 6" above the top of the pipe to the top of plan subgrade (see typical section). The limit of trench width for pay shall be calculated at a maximum of (5) five feet to allow for utilization of trench shoring. Any additional width excavated beyond the specified 5' shall be at the expense of the contractor unless prior written approval by the Engineer is given.

#### **12. TUNNEL EXCAVATION:**

Tunneling may be required under concrete walks, curbs, and gutters and may be permitted under certain intersections, subject to the direction of the City Engineer.

Tunnel sections shall provide adequate clearance for pipe and workmen for proper lining, grading and jointing of the pipe installed therein. All bracing, shoring, and sheeting necessary for the construction of the tunnel and proper protection of workmen therein shall be furnished and installed in such locations as required to provide adequate protection. All tunnel backfill shall be of proper condition and moisture content to compact readily, and shall be thoroughly tamped and rammed under, around and over the pipe from the floor of the tunnel to the sidewalls and top thereof.

### **13. REPLACEMENT OF PAVEMENT, SIDEWALKS, AND CURBS:**

The replacement of all pavements, sidewalks, and curbs that have been damaged or removed by the Contractor is required. All such walks, curbs, and gutters damaged by the Contractor shall be replaced per City Specifications.

Pavements shall be replaced using materials similar to those used in the pavement as encountered or as specified. All replacements shall be in strict accordance with the requirements and specifications of the City Engineer, and shall be subject to his approval.

The area of pavement, sidewalk, and curb removal and replacement to be paid for at the unit prices named in the proposal shall be limited to the area of each type of pavement actually removed and replaced within the specified pay limits. Replacement of all pavement, removed or damaged, outside of the specified pay limits shall be considered a subsidiary obligation of the Contractor and will not be paid for directly. All replacements shall be in kind and shall at least equal the quality of that which was removed.

Pay limits for pavement removal and replacement shall be limited to a distance of two (2) feet each side of the center line of pipe, as described in the plans, or as approved. **The Contractor shall guarantee all replaced pavement for a period of one (1) year after the date of final acceptance of the work by the Owner.** If within the guarantee period any of the pavement shall prove defective either in materials or workmanship, or if damage occurs due to settlement of the trench backfill, the Contractor shall immediately, upon written notice by the Owner, repair or replace all such damaged pavement at his cost and expense. All such repairs and replacements shall be done to the reasonable satisfaction of the Owner.

### **14. BASIS OF PAYMENT:**

Unless specifically provided in the proposal, the unit price per square yard for removal and replacement of pavement, the unit price per square foot for sidewalk and per lineal foot for curb as provided in this specification will apply; also, no separate payment will be made for any unclassified excavation or trenching as defined under this specification. All cost connected therewith being included in the unit price per linear foot for the project utility in place.

## SECTION V

### STORM SEWER PIPES

#### 1. STORM SEWER PIPE:

**A. Concrete Storm Sewer Pipe** shall be used under all proposed and existing streets. Concrete storm sewer pipe shall be Class II or better. Concrete Storm Sewer Pipe shall conform to the Kansas Department of Transportation Specifications (*Current Edition*). Broken, cracked, or defective pipe will not be used.

**B. Thermoplastic Pipe** shall be either PolyEthylene (PE) Pipe or PolyVinyl Chloride Pipe. Specifications for PE Pipe can be found in Section VIII of these specifications. PVC Pipe shall conform to AASHTO M 278, AASHTO M 304; or ASTM F 679 or F 794; or for corrugated pipe ASTM F 949-93a. The City Engineer shall approve location of Thermoplastic pipe installation.

**C. Corrugated Metal Pipe** shall be zinc coated (galvanized) corrugated steel and shall meet all requirements of Section 1905 of the Kansas Department of Transportation Standard Specifications (*Current Edition*). Connecting bands shall be used where necessary. Corrugated metal pipe may only be used in special cases and with **written** permission of the City Engineer.

#### 2. EXCAVATION:

The trench shall be excavated beginning at the lower end of the pipe and proceeding toward the upper end, and true to line and grade between connecting points, or as established by the Engineer.

The width of the trench shall be at least twelve (12) inches greater than the external diameter of the pipe. Wherever the trench is excavated below proper grade, backfill to grade shall be made of crushed rock tamped in the trench bottom.

#### 3. PIPE INSTALLATION:

Installation of pipe shall start at the lower end of the sewer and the spigot ends of the pipe shall point to the direction of flow.

All pipes shall be laid with ends abutting and true to line and grade. The bottom of the ditch shall be cut so that the lower one-third of the pipe is supported for its entire length on bedding material. Pipe shall be fitted and matched so that when laid they will form a sewer with a smooth, uniform invert. Pipes shall be so lowered into the trench as to avoid damage to the pipe.

For Concrete pipe, joints shall be cemented with a cement mortar composed of one (1) part Portland cement, to two (2) parts of fine aggregate mixed with sufficient water to form a plastic mortar. As each section of pipe is laid, the bell of the preceding pipe shall be cleaned and the bottom portion of the bell filled with mortar. After the pipe is placed, the remaining

portion of the joint shall be filled with mortar. The inside of the joint shall then be finished smooth and wiped clean. Asphaltic type joint sealing material "Mastic" may be used in lieu of concrete mortar joints. This material shall completely fill the pipe joint. The Contractor shall plug all lift holes with manufacturer supplied plugs or with mortar or asphaltic material as approved by the Engineer.

Thermoplastic pipe will be joined with the pipe manufacturer's approved connecting seals.

#### **4. PIPE BEDDING**

The pipe shall be bedded in clean well-graded crushed gravel conforming to ASTM Designation C33, Gradation #57 or Kansas Department of Transportation Standard Specifications for coarse aggregate CA-5 and shall have a minimum thickness beneath the pipe of 4 inches or one-eighth of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from the bedding material line to 6" above the top of the pipe shall be of the same material as utilized for the pipe bedding. The contractor shall supply the Engineer with a sample prior to starting work.

#### **5. UNCOMPACTED TRENCH BACKFILL:**

In parks or other unpaved areas that do not support walks or structural loads, the entire depth of trench above the embedment shall be compacted by tamping 12" lifts or other reasonable and approved methods. Materials for backfill shall be such as will readily permit compaction and shall be free from heavy stones, hard masses of consolidated material, wet or sticky lumps of clay, and from stumps, large roots, trash or debris. Backfill costs shall be included in price bid per linear foot of pipe.

#### **6. COMPACTED TRENCH BACKFILL:**

Compacted Trench Backfill shall be placed as per "Requirements for Excavation, Trenching, & Backfill" section of these specifications.

#### **7. BASIS OF PAYMENT:**

The unit price bid for storm sewer pipe shall include all trenching and uncompacted trench backfilling, and furnishing and laying all pipe and connecting the ends of the pipe to storm sewers or inlets.

## SECTION VI

### POLYETHYLENE (PE) PIPE

#### 1. DESCRIPTION

This specification covers polyethylene (PE) for storm sewers and culvert

#### 2. MATERIALS

**Provide polyethylene pipe** for storm sewers and culverts that complies with the requirement of one of the following:

**A. AASHTO M294** (corrugated pipe) latest version with the following additions or exceptions:

Type S, Type SP, and Type D are acceptable.  
Type C and Type CP will not be accepted.  
Rotational Molded Pipe will not be accepted.

**B. ASTM F 894** (ribbed, profile) with the following additions or exceptions:

AASHTO LRFD Bridge Design Specifications, Section 12, 50 yr. Life requirements.  
Minimum Cell Class per ASTM D 3350 of 334433C or 335434C.  
Minimum Cell Class properties as noted in Section 12.

**C. ASTM F 714** (smooth wall) with the following additions or exceptions:

A DR of 21 or less will be required.  
AASHTO LRFD Bridge Design Specifications, Section 12, 50 yr. Life requirements.  
Minimum Cell Class per ASTM D 3350 of 335434C.

**Soil tight joints** will be required (AASHTO LRFD Bridge Construction Specifications, Section 26.

**A.** No opening may exceed one inch.

**B.** For openings over one-eighth inch, the channel length must exceed four times the length of the opening. Channel length is the length of the path that the soil must infiltrate.

**C.** The  $D_{25}$  soil size to size of opening ratio must be 0.3 for medium to fine sand and 0.2 for uniform sands.  $D_{25}$  is the sieve size that 85% of the backfill material is smaller than.

Provide culvert end sections that conform to the sizes and dimensions on the Plans. Fabricate end sections from materials that meet the requirements of these specifications. Corrugated metal or concrete end sections are also acceptable. Connect dissimilar materials using a concrete collar.

Maximum deflection (reduction of the barrel base inside diameter) must not exceed 5%. Measurement will be made using a mandrel or other method as approved by the Engineer not less than 30 days following the installation. Deflections in excess of 5% may require the pipe to be removed and reinstalled, or replaced if permanently deformed or damaged in any way.

**3. BASIS OF PAYMENT:**

The unit price bid for storm sewer pipe shall include all trenching and uncompacted trench backfilling, and furnishing and laying all pipe and connecting the ends of the pipe to storm sewers or inlets.

## SECTION VII

### STORM SEWER INLETS AND MANHOLES

#### 1. **CONCRETE:**

Concrete shall conform to these specifications and the corresponding section for "Concrete".

The concrete shall be vibrated between the forms. The floor or flow line surfaces of all inlets and manholes shall receive a smooth finish. The top shall receive a broom finish.

Forms shall be constructed mortar-tight, true to line and grade, and securely staked and braced. The inlets shall be constructed in accordance with the details shown on the Plans.

Expansion joints shall be placed as shown on the Plans.

Reinforcing shall be placed as shown on the Plans.

Casting frames shall be set in place before concrete is poured.

Concrete shall be cured in accordance with these specifications.

Concrete shall be poured on four (4) inches of bedding material as described in the Storm sewer section of these specifications for Pipe Bedding.

#### 2. **REINFORCED CONCRETE INLETS:**

Reinforced concrete inlets can be used in lieu of cast in place boxes. Prior to installation the City Engineer in writing will approve all shop drawings.

All boxes will be set on four (4) inches of pipe bedding material as described in the Storm Sewer section of these specifications.

#### 3. **MANHOLE COVERS FOR STORM SEWER INLETS:**

Manhole cover frames on inlets shall either have protruding lugs or a top flange or a center flange for setting in the concrete slab. Minimum weight of frame and cover shall be 185 pounds.

Cast Iron Manhole covers on storm sewer inlets shall be similar or equal to Clay & Bailey No. 2020 or Deeter Foundry No. 2016. All castings shall be free from defects.

All new curb irons, grate inlets, yard inlets, and solid stormwater manhole covers must have an environmentally friendly, educational message permanently attached or cast directly into the structure. This message must be specified on the project submittal sheets for all standard catch basins and stormwater manhole covers. Acceptable messages include any combination of the following, or an approved equivalent message:

- 1) NO DUMPING <icon> DRAINS TO RIVER (or STREAM)

- 2) DUMP NO WASTE <icon> DRAINS TO RIVER (or STREAM)
- 3) DO NOT POLLUTE <icon> DRAINS TO RIVER (or STREAM)

An environmental icon (typically a fish) is preferred but not mandatory. Lettering should be of sufficient size to be easily readable.

**4. MANHOLE COVERS FOR STORM SEWER MANHOLES (in street):**

The minimum weight of the manhole frame and cover shall be 400 pounds, the weight of the cover only to be at least 100 pounds.

For storm sewer manholes, the cast iron manhole covers shall be similar or equal to Catalogue No. 2007-MR manufactured by Clay & Bailey or Catalogue No. 1320 manufactured by Deeter Foundry, Inc. Manhole covers shall fit close enough that they will not rattle under traffic. Castings shall be free from defects.

**5. MANHOLE COVERS FOR STORM SEWER MANHOLES (off street):**

Cast Iron Manhole Covers on storm sewer inlets shall be similar or equal to Catalogue No. 2020 manufactured by Clay & Bailey or Catalogue No. 2016 manufactured by Deeter Foundry Inc. All casting used shall be free from defects.

**6. BRICK MASONRY WALLS:**

Brick or masonry walls shall not be used in storm sewer inlets or manhole construction.

**7. BASIS OF PAYMENT:**

The unit price bid for storm sewer inlets shall include all unclassified excavation and backfilling, furnishing all castings and materials and constructing the storm sewer inlets along with curb and gutter in front of the inlet and for a distance of five (5) feet on either side of the outside walls of the inlet and connecting all storm sewer pipes through the walls of the catch basin and connecting adjoining inlets as shown in the plans.

The unit price bid for storm sewer manholes shall include all excavation and backfilling, furnishing all castings and materials, and constructing the manholes and connecting all storm sewer pipes through the walls of the manholes and pouring of inverts.

## **SECTION VIII**

### **RCB CULVERT**

#### **1. DESCRIPTION:**

RCB Culvert shall consist of all work, materials, and equipment necessary to construct RCB Culvert as detailed on the plans. Principle items of work shall include, but not be limited to the following:

- A.** Excavation, as detailed and as directed by the Engineer
- B.** Foundation, stabilization as directed by the Engineer
- C.** Class AAA Concrete
- D.** Reinforcing steel (Gr. 60)

#### **2. BASIS OF PAYMENT:**

RCB Culvert shall be paid at the contract unit price per lineal foot which shall include all materials, labor and excavation to construct the structure as per plan from outside of hub guard to outside of hub guard.

Wing walls, aprons, and soil savers shall be paid for at the contract unit price per cubic yard for Structural Concrete. The price per cubic yard shall include all material, labor, excavation, drains and form work required to construct the items as per plan and as directed by the Engineer.

## SECTION IX

### EXCAVATION AND PREPARATION FOR PAVEMENT

1. **EXCAVATION (Concrete Pavement, Curb & Gutter, and Hot Mixed Asphalt Base & Surface):**

Stakes for line and grade shall be set by the Contractor and approved by the Engineer and the subgrade shall be excavated to the proper grade for the bottom of the pavement.

The Contractor shall protect all stakes and property pins. In the event of his failure to do so, the stakes and/or property pins will be reset by the Contractor at his expense. The Contractor shall be responsible for any construction staking necessary to complete the work unless otherwise noted on the plans. This item shall include and be in accordance with the Kansas Department of Transportation Standard Specifications, (Current Edition). Payment will also be made in accordance with the Earthwork Section.

The Contractor shall close each end of the street and intersections with barricades and place yellow lanterns or flasher lights on the barricades at night.

Wherever the excavation is carried below the proper grade, the backfill shall be according to the plans.

**A. Basis Of Payment:**

The unit price bid per cubic yard for excavation shall include removing all material encountered to the proper grade and all hauling of the waste material to a contractor furnished site or as directed by the Engineer and all backfilling and compaction caused by excavation made below the proper grade as per plan.

2. **PREPARATION FOR SUBGRADE (Concrete Pavement, Curb & Gutter, and Hot Mixed Asphalt Base & Surface):**

The subgrade shall be brought to the lines, grades, and cross sections shown on the Plans. All soft material in the subgrade that will not compact when rolled or tamped shall be removed. All rock found in the excavation shall be removed or broken off to a depth of not less than six (6) inches below the surface of the subgrade. All holes or depressions made by the removal of material, as described above, shall be filled with suitable material and the whole subgrade brought to the proper grade and rolled or tamped.

The subgrade shall be rolled with a sheepsfoot roller when any fill is necessary or when ordered by the Engineer. The subgrade soil shall have the proper moisture content to obtain maximum compaction by rolling. When the soil is too dry, water shall be added using a spray bar connected to a truck-mounted or trailer-mounted water tank. The sheepsfoot roller shall be hauled to the subgrade and shall not be pulled over paved or bituminous surfaced streets. The entire subgrade shall also be thoroughly rolled with power pneumatic rollers weighing between five (5) tons and eight (8) tons or with a roller having a weight of at least two hundred (200) pounds per lineal inch of roll. Points not accessible to the roller shall be

tamped pneumatically.

Storing and stockpiling of materials on the subgrade will not be allowed. Placement of concrete or Hot Mixed Asphalt material will not be permitted upon a frozen or muddy subgrade.

Hauling over the completed subgrade will not be permitted if it results in ruts or irregularities. When necessary, the Contractor shall plank the subgrade at their expense, for hauling over it. As soon as the forms are set, the subgrade shall be checked with approved crown template and any irregularities shall be corrected.

Where necessary to add additional material to fill low spots, the same shall be rolled or tamped in successive layers, not exceeding two (2) inch thickness.

Before placing the surfacing, the subgrade shall be cleaned of all loose materials.

### **3. Pavement Removal:**

Pavement Removal shall include Curb &Gutter, Hot Mixed Asphalt Base and Surface Course, Concrete Pavement, Aggregate Base, all intersections, and all other material not specifically mentioned or classified in the specifications.

Cost of fine grading for Curb and Gutter, Hot Mixed Asphalt and Concrete Pavement shall be included in those items.

#### **A. Basis of Payment:**

The unit price bid per square yard for pavement removal or unclassified excavation shall include all excavation, materials, labor, equipment, etc., encountered in the completion of the project as specified. The cost of saw cutting shall also be included with this item if a separate bid item was not provided within the contract.

### **4. COMPACTION OF EARTHWORK:**

Compaction of earthwork shall conform to Kansas Department of Transportation Standard Specifications, (*Current Edition*) "Compaction of Earthwork".

#### **A. Basis of Payment:**

The unit price per cubic yard for compaction of earthwork shall conform to Kansas Department of Transportation Standard Specifications, (*Current Edition*), with the exception of Water. Water shall be subsidiary to the bid item Compaction of Earthwork.

## SECTION X

### SUBGRADE PREPARATION

#### 1. LIME-TREATED SUBGRADE:

Lime-Treated Subgrade shall conform to Kansas Department of Transportation Specifications, (*Current Edition*). A ratio of 5% hydrated lime shall be incorporated into the subgrade at a depth as shown on the plans. A ratio of 5% pebble quick lime shall be incorporated into the subgrade to a depth as per plan. **For purposes of calculating lime application quantities, soil shall be assumed to have a density of 110lb/cf unless a different density is shown to exist after a soil density test is conducted.**

##### A. Basis of Payment:

The unit price bid per square yard for Lime-treated Subgrade shall include compensation for all materials, water, pulverizing, mixing, spreading, drying, application, shaping and maintaining, curing and curing materials, for all manipulations required, for all hauling and freight involved, and for all tools, equipment, labor, and incidentals necessary to complete the work.

#### 2. CRUSHED ROCK SUBGRADE:

Crushed Rock Subgrade shall conform to Kansas Department of Transportation Standard Specifications, (*Current Edition*), Section "Aggregates for Aggregate Base Construction", specifically AB-3.

##### A. Basis of Payment:

The unit price bid per square yard for Aggregate Base Construction shall include compensation for all materials, excavation, shaping, watering, maintaining, manipulating, compacting, and all incidentals necessary to complete the work.

#### 3. FLYASH TREATED SUBGRADE:

Fly ash treated subgrade shall conform to Kansas Department of Transportation Standard Specifications, (*Current Edition*), Section, "Fly ash Treated Subgrade." A rate of 15% of Class "C" Fly ash shall be incorporated into the subgrade to a depth as per plan.

##### A. Basis of Payment:

The unit price bid per square yard for fly ash treated subgrade shall include compensation for all materials, water, pulverizing, mixing, spreading, drying, application of fly ash, shaping and maintaining for all curing including all curing water and/or other curing materials, for all manipulations required, for all hauling and freight involved, for all tools, equipment, labor, and incidentals necessary to complete the work.

## SECTION XI

### GEOGRID MATERIAL SPECIFICATION FOR BASE COURSE REINFORCEMENT

#### 1. GEOGRID:

The geogrid shall be an integrally-formed, polypropylene grid structure meeting all of the following characteristics:

| <i>Property</i>                                  | <i>Test Method</i> | <i>Units</i> | <i>Type 1 (MARV)</i>    | <i>Type 2 (MARV)</i>    |
|--|--------------------|--------------|-------------------------|-------------------------|
| Aperture Stability Modulus at 20 cm-kg           | US Army COE        | cm-kg/deg    | 3.2                     | 6.5                     |
| Rib Shape  | Observation        | N/A          | Rectangular or Square   | Rectangular or Square   |
| Rib Thickness                                    | Calipered          | in           | 0.03                    | 0.05                    |
| Aperture Size                                    | I.D. Calipered     | in           | 0.9 to 1.5              | 0.9 to 1.5              |
| Junction Efficiency                              | GRI-GG2-87         | %            | 93                      | 93                      |
| Flexural Rigidity                                | ASTM D1388-96      | mg-cm        | 250,000                 | 750,000                 |
| Minimum True Initial Modulus in Use <sup>1</sup> | ASTM D6637-01      | lb/ft        | MD 17,140<br>CMD 27,420 | MD 27,420<br>CMD 44,550 |
| Traffic Benefit Ratio (TBR)                      | AASHTO PP46-01     | N/A          | 3                       | 6                       |

Note: 1. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing “secant” or “offset” tangent methods of measurement.

#### 2. **GEOGRID MATERIALS NOT MEETING MATERIAL PROPERTIES SHOWN ABOVE:**

For Geogrid Materials not meeting the material properties shown above, submit the following at least 14 days prior to bid letting:

- A.** Full-scale laboratory and in-ground testing of pavement structures reinforced with the specific alternate geogrid material that quantifies a TBR meeting or exceeding that of the design geogrid.
- B.** Independent certified test results stating that the specific alternate geogrid exhibits an aperture stability modulus at 20cm-kg, when testing in accordance with the “Grid Aperture
- C.** Stability In-Plane Rotation” test, of 3.2 cm-kg/deg for Type 1 or 6.5 cm-kg/deg for Type 2 geogrid.
- D.** A list of five comparable projects that are similar in terms of size and application, are located in the United States, and where the results of using the specific alternate geogrid material can be verified after a minimum of one year of service life.

- E. A sample of the alternate geogrid material and certified specification sheets.
- F. Additional information as requested by the Engineer to fully evaluate the product.
- G. Geotextile materials will not be considered as an alternate to geogrid materials.

**3. INSTALLATION OF GEOGRID:**

Geogrid shall be installed in accordance with the installation guidelines provided by the manufacturer or as directed by the Engineer.

**4. BASIS OF PAYMENT:**

The unit price bid per square yard for GeoGrid Material shall include furnishing all materials, labor, and doing all the work covered in this section and as shown on the Plans.

## SECTION XII

### CONCRETE

#### 1. COMPOSITION OF CONCRETE:

The concrete shall consist of a mixture of standard Portland cement, air-entraining, water, fine and coarse aggregates. The mix will conform to the Kansas Department of Transportation Standard Specifications, (*Current Edition*) and as directed by these specifications and the Engineer. The mix shall be so designed as to produce a concrete of such consistency, density, and distribution of aggregate that it can be properly placed using the equipment available on the work.

When an air-entraining agent is used, it shall be mixed with the water in a solution of such concentration that will entrain the required amount of air in the concrete.

The proportioning of aggregates shall be measured by weight and a standard sack of cement as packed by the manufacturer shall be considered as one cubic foot or 94 pounds.

As the work progresses, the Engineer reserves the right to change the proportions from time to time if conditions warrant, in order to produce a satisfactory job. Any such changes may be made within the limits of the specifications with no additional compensation to the Contractor.

The following approximate mixes by volume shall be used, with the volume of cement and water governed by the minimum cement content and maximum water content:

*(The minimum cement content will probably be reached before the maximum allowable water content is attained; in such cases the minimum cement content shall govern and the water content shall be the water content at which the minimum cement content is obtained).*

For Concrete Pavement, Curb and Gutter, Concrete Sidewalk, Storm Sewer Inlets, and Manholes:

*Proportioning: 50% fine aggregate and 50% coarse aggregate.*

*Minimum 6 sacks of cement per cubic yard of concrete.*

*Gallons of water per sack of cement including water in aggregates (maximum - 5.50 gallons). Percentage of air by volume - 6% (plus or minus 2%).*

*Strength - Minimum 28-day compressive strength of 4000 psi.*

#### 2. CONSISTENCY OF CONCRETE:

The slump of the concrete for concrete pavement and sidewalks shall be from 2 to 4 inches maximum; except where a vibrator or mechanical tamper is used, the slump shall be 1 inch to 4 inches maximum.

The consistency of the concrete shall be such as to produce a plastic, workable mix. The mix proportions shall be such that will produce a concrete that will have a minimum tendency to segregate.

The concrete mixture for curb and gutter shall be of such consistency that the curb will remain erect with the face form removed. The slump of concrete for curb and gutter shall not exceed one inch.

The concrete for storm sewer inlets and manholes shall be of such consistency that it can be placed in the forms with a minimum of segregation and will produce a dense concrete free from honeycomb.

### **3. MEASURING MATERIALS:**

**A.** Cement shall be measured by weight, a standard sack of cement as packed by the manufacturer being considered as one cubic foot or 94 pounds. The measurement shall be accurate to within .5 percent of the total required.

**B.** Water shall be measured either by volume or weight, the method of measurement to be accurate to within one percent of the amount of water required.

**C.** Aggregates shall be measured by weight, the method of measurement to be accurate to within .5 percent.

### **4. STOCKPILING AND HANDLING MATERIALS:**

Aggregates shall be assembled in such quantities that sufficient approved material is available at the batching site to complete any day's work. The batching site shall be large enough to permit the stockpiling of sufficient non-segregated materials with uniform moisture content to insure continuous and uniform operation. Fine and coarse aggregates shall be stored in separated stockpiles and batched separately.

All aggregate, whether shipped in railroad cars or transported in trucks shall be stockpiled before use in order to prevent segregation of materials, to insure a uniform moisture content, to provide uniform conditions for proportioning, and to aid in producing concrete that is uniform in texture and moisture content.

Segregated aggregates shall not be used until they have been thoroughly remixed and the entire stockpile is of uniform gradation.

If the moisture content of the aggregates varies so much that successive batches of concrete vary more than 1/2 inch in slump, corrective measures shall be taken to produce uniform moisture content.

No aggregates shall be stored on the subgrade of any pavement. Aggregates that are frozen shall not be used.

Cement in storage or in stockpile on the job shall be protected from any damage due to moisture.

## **5. CONCRETE MIXERS:**

Mixers for concrete shall be a mechanical batch type mixer that operates in such a manner as to insure the uniform distribution of materials throughout the mass being mixed so that the mix is uniform and smooth in appearance. The rated capacity of the mixer in cubic feet shall not be exceeded.

The mixer shall operate at drum speeds as specified by the manufacturer. The internal portions of the mixing drum and blades, charging hopper and discharge chute shall be free of hard cement or concrete at all times and the mixer blades shall not be badly worn.

The mixer for concrete pavement shall be equipped with a timing device which will automatically lock the discharge lever when the drum has been charged and release it after a minimum mixing period of one minute. The device shall be equipped with a bell adjusted to ring each time the lock is released.

The minimum mixing time shall be one minute after all materials, including water, have been placed in the mixing drum.

The mixer used on concrete pavement shall be equipped with a water measuring device accurate to within one percent of the amount required and shall be so arranged that the accuracy of measurement will not be affected by variation in pressure in the water supply line. When the proper quantity of water has been discharged, the flow of water from the tank shall be automatically stopped.

The mixer used on concrete pavement shall have a minimum capacity of a two-sack batch and may only be used upon approval of the Engineer.

## **6. TRANSIT MIXES:**

Transit mixers shall be of the revolving drum type and shall be watertight. Mixers shall be operated at speeds stated on the manufacturer's metal instruction plate which shall be attached to the mixer and indicate correct speed of rotation for mixing and for agitation. The rated capacity of the mixer shall not be exceeded. Transit mixers shall be equipped with a revolution meter.

The mixer shall be equipped with a discharge mechanism that will discharge the batch without segregating the ingredients.

## **7. MIXING CONCRETE:**

Concrete shall be mixed in quantities required for immediate use. Concrete which has developed initial set or is not in place one-half (1/2) hour after the water has been added shall not be used, except that concrete may be kept in transit mixers operated at agitator speed for one hour. Concrete shall be in place within the one hour of mixing time or will be refused by the Engineer.

The contractor shall clean all bins and hoppers before starting to mix concrete for this work.

The concrete shall be delivered to the site of the work in a plastic and workable condition, satisfactory for placement without the addition of more water and the concrete shall not be deposited in place later than one-half hour after mixing, or more than one hour after being

placed in a transit mixer being operated at agitator speed.

When a transit mixer is used, the mixing speed shall be neither less than 6 nor greater than 18 revolutions per minute of the drum. Agitating speed shall be neither less than 2 nor greater than 6 revolutions per minute.

Concrete shall not be mixed when the ambient air temperature is colder than 35 degrees F. The Engineer may request that hot water be incorporated in the concrete mix when ambient air temperature is between 35 degrees F. and 40 degrees F. When temperatures are below 35 degrees F. the KDOT specification shall govern with approval from the City Engineer.

#### **8. PLACING CONCRETE:**

The Contractor shall be responsible for the protection of concrete placed during cold weather and any concrete injured by frost action shall be removed and replaced by the contractor at his expense.

The subgrade shall be moist but not muddy at the time of placing concrete. If necessary in order to obtain the desired moisture content in the subgrade, the soil shall be wetted to a depth of three (3) inches the day before placing concrete. The subgrade shall be sufficiently moist that it will not absorb moisture from the concrete. Construction joints will be constructed at end points of new paving and at connections to old pavements.

**SECTION XIII**  
**SPECIFICATIONS**  
**FOR CONCRETE PAVEMENT, CURB AND GUTTER,**  
**AND HOT MIXED ASPHALT OVERLAY**  
**MATERIALS**

**1. PORTLAND CEMENT:**

Portland cement shall conform to all sections of Kansas Department of Transportation Specifications, (*Current Edition*).

Different brands of cement or the same brand from different mills shall not be mixed during use. Cement shall be stored in railroad cars or in moisture proof buildings or bins. The use of tarpaulins for the protection of cement out-of-doors will not be permitted. No cement will be used which has become caked. Cement that has been held in storage ninety (90) days or more will not be used.

The Contractor shall have the cement mill mail a certified copy direct to the City Engineer of the test report covering each car of bulk cement used in this work.

**2. WATER FOR CONCRETE:**

Water from the City mains shall be used. The Contractor may make arrangements with the City Clerk for connecting to a fire hydrant and shall pay for all water used at the regular City water rates. Where it is not practicable to set a water meter, the quantity of water used will be based on an estimate to be made by the City Clerk.

**3. FINE AGGREGATE FOR CONCRETE:**

Fine aggregate for concrete shall conform to Kansas Department of Transportation Specification for Type FA-A.

Fine aggregate shall consist of sand, a fine granular material resulting from the natural disintegration of siliceous and calcareous rocks. It shall be composed of clean, durable particles, free from coatings. It shall be free of injurious amount of organic impurities. Fine aggregate subjected to the colorimetric test for organic impurities and producing a color darker than the standards shall be rejected. It shall be free from injurious amount of alkali. Other deleterious substances shall not exceed the following percentages by weight:

|                                       |       |
|---------------------------------------|-------|
| Material passing No. 200 (wash)       | 2.0%  |
| Shale, coal, soft, or flaky fragments | 1.0%  |
| Sticks (wet weight)                   | 0.1%  |
| Clay Lumps (wet weight)               | 0.25% |

Fine aggregate shall be uniformly graded from coarse to fine and shall conform to the following sieve analysis:

|                           |           |
|---------------------------|-----------|
| Retained on 3/8"          | 0%        |
| Retained on No. 4 sieve   | 0 to 5%   |
| Retained on No. 8 sieve   | 0 to 24%  |
| Retained on No. 16 sieve  | 15 to 50% |
| Retained on No. 30 sieve  | 40 to 75% |
| Retained on No. 50 sieve  | 70 to 90% |
| Retained on No. 100 sieve | 90 to 98% |

The fineness modulus for fine aggregate shall not vary more than 0.15 plus or minus from the average fineness modulus of the material used on this project.

Fine aggregate that is stockpiled shall either be placed on a concrete slab or on wood planks or metal sheets or the bottom one (1) foot of the stockpile may be left in place in lieu of covering the ground with planks or metal sheets. The bottom one (1) foot of the stockpile may be salvaged by hand shoveling, providing no dirt or foreign material is mixed with the fine aggregates.

#### **4. COARSE AGGREGATE FOR CONCRETE PAVEMENT, CONCRETE CURB AND GUTTER, INLETS AND MANHOLES:**

Coarse aggregate shall consist of crushed limestone and shall conform to Kansas Department of Transportation Specifications for Type CA-5 Coarse Aggregate. It shall be composed of hard, durable pieces, free from coatings. Deleterious substances in the coarse aggregate shall not exceed the following percentages by weight:

|   |      |
|---|------|
| Material passing the No. 200 sieve (wash) | 2.0% |
| Shale                                     | 0.5% |
| Soft Friable pieces                       | 2.5% |
| Sticks                                    | 0.1% |
| Clay lumps (on 3/8" sieve)                | 0.5% |
| Coal                                      | 0.5% |

The total composition of all the above substances shall not exceed 3 percent.

Coarse aggregate when tested for soundness by freezing and thawing shall have a loss ratio value not less than 0.90.

The percentage of loss for the coarse aggregate shall not exceed fifty when tested by the Los Angeles Abrasion Test Method.

Coarse aggregate shall be uniformly graded from coarse to fine and shall conform to the following sieve analysis.

|                         |            |
|-------------------------|------------|
| Retained on 1" sieve    | 0%         |
| Retained on 3/4" sieve  | 0 to 5%    |
| Retained on 3/8" sieve  | 40 to 60%  |
| Retained on No. 8 sieve | 95 to 100% |

The fineness modulus for coarse aggregate shall not vary more than plus or minus 0.25 from the average fineness modulus of the material used on this project.

When the coarse aggregate is stockpiled on the ground, it shall be placed on a concrete slab or on wood planks or metal sheets or the bottom one (1) foot of the stockpile may be left in

place in lieu of covering the ground with planks or metal sheets. The bottom one (1) foot of the stockpile may be salvaged by hand shoveling providing no dirt or foreign matter is mixed with the coarse aggregate. Stockpile of coarse aggregate shall be piled up in layers not more than four (4) feet in depth and with a four (4) foot berm in order to avoid segregation. Each lift shall cover the entire area of the stockpile before the next lift is started.

#### **5. JOINT SEALING MATERIAL:**

The standard material for sealing concrete streets and curb and gutter for concrete streets shall be silicone with backer rod. The standard material for sealing asphalt streets and curb and gutter for asphalt streets shall be hot type sealant.

**A.** Hot type joint sealing compound shall conform to the Kansas Department of Transportation Specifications.

**B.** Silicone joint sealant compound shall be installed with backer rod and conform to the Kansas Department of Transportation Specifications.  
See Plans to determine which joint sealing material is to be used.

#### **6. PREFORMED EXPANSION JOINT FILLER:**

Shall be pre-molded non-extruding type material and shall conform to the requirements of A.A.S.H.T.O., M213 and subsequent revisions. (Kansas Department of Transportation Specification for type "B" pre-molded non-extruding type expansion joint filler (Section 1503).

The material shall be of the dimensions required to conform to the cross section of the concrete pavement or curb and gutter and shall be one (1) inch in thickness.

Redwood board expansion joint filler may also be used. It shall comply with A.A.S.H.O. Specifications M90-42 and subsequent revisions. Kansas Department of Transportation Specification for Type "A" Expansion Joint Filler Section.

#### **7. CONCRETE CURING MATERIALS:**

The materials shall conform to the requirements listed below for each type, and the cost thereof shall be included in the cost of the concrete being cured:

##### **A. Curing Compound (Use White Pigment Only):**

Membrane curing solution may be used. It shall be applied with a pressure spray at a minimum temperature of 35 degrees F. or as approved by the Engineer.

The solution shall contain a fugitive dye (white only), of color strength sufficient to render the film distinctly visible on the concrete for a period of at least four (4) hours.

The solution shall be delivered to the job in the manufacturer's original marked containers and will be applied as directed by the Engineer.

**8. REINFORCING STEEL:**

**A.** Billet-Steel Reinforcement Bars shall conform to the requirements of the Kansas Department of Transportation Standard Specifications.

**B.** Welded Steel Wire Fabric for Concrete Reinforcement:

Welded wire fabric shall conform to the size and dimensions shown on the plans. It shall conform to the requirements of the Kansas Department of Transportation Standard Specifications.

All reinforcing bars and wire mesh shall be stored above the ground in such a manner to insure that the material will be clean and free from all foreign matter when it is placed.

**9. METAL STRIPS FOR LONGITUDINAL CENTER JOINTS:**

The metal strips shall be of sheet steel and shall conform to the cross section and dimensions shown on the Plans. The thickness of the metal shall be not less than U. S. Standard Gauge Number Eighteen (0.05 inch).

The metal strip shall be furnished in sections not less than ten (10) feet nor more than fifteen (15) feet in length. Punched holes for the vertical pins for installing the joints and for transverse bars shall be spaced at a maximum of two (2) feet six (6) inches center to center.

Pins for installing the center joint shall be of sheet steel pressed in a channel shape and not less than eighteen (18) inches long. The metal shall be not less than sixteen (16) gauge, and the pin shall be of a size to exactly fit the punched holes in the metal strip so that a tight fit shall be obtained when the pins are driven.

**10. AGGREGATES FOR BITUMINOUS MIXTURES:**

Aggregates used for Bituminous Mixes shall conform to Kansas Department of Transportation Standard Specifications, (*Current Edition*).

**11. BITUMINOUS MATERIALS:**

Asphalt cement for hot mixed asphalt base and surface courses, and liquid asphalt used for prime, seal, and tack coats shall conform to Kansas Department of Transportation Standard Specifications, "Bituminous Materials".

## SECTION XIV

### CONCRETE PAVEMENT

1. **COMPOSITION OF CONCRETE:**

Shall conform to the requirements of these specifications.

2. **CONSISTENCY OF CONCRETE:**

Shall conform to the requirements of these specifications.

3. **MEASURING MATERIALS:**

Shall conform to the requirements of these specifications.

4. **STOCKPILING AND HANDLING MATERIALS:**

Shall conform to the requirements of these specifications.

5. **CONCRETE MIXERS:**

Shall conform to the requirements of these specifications.

6. **TRANSIT MIXERS:**

Shall conform to the requirements of these specifications.

7. **MIXING CONCRETE:**

Shall conform to the requirements of these specifications.

The Contractor shall be responsible for the protection of the concrete placed during adverse weather and any concrete injured by such adverse weather shall be removed and replaced at his expense.

8. **FORMS:**

Forms shall be either metal or wood. They shall be of a depth at least equal to the thickness of the pavement, and shall be straight and free from warp. The maximum deviation of the top surface of any form shall not vary more than one-eighth (1/8) inch from a straight line. The form shall be securely staked in place true to the line and grade as staked by the Surveyor.

Wood forms shall be constructed of two (2) inch lumber. All forms shall be cleaned and oiled each time before they are used.

9. **PLACING CONCRETE:**

The subgrade shall be at least moist, but not muddy at the time of placing concrete. If necessary, in order to obtain the desired moisture content in the subgrade, the soil shall be

wetted to a depth of three (3) inches the day before placing concrete. The subgrade shall be sufficiently moist that it will not absorb moisture from the concrete.

The concrete shall be deposited on the subgrade in successive batches for the full width between forms in such a manner as to require as little re-handling as possible. Additional spreading shall be done with hand shovels or by approved mechanical means in a manner that will prevent segregation and operation of materials.

The amount of material deposited shall be sufficiently in excess of that required to form the pavement to the proper cross section to provide a roll of concrete ahead of the finishing screed.

If reinforced concrete is specified, the concrete shall be deposited and struck off with a strike-off screed operating from the forms to form a surface that will permit the wire mesh reinforcement to be placed as specified above the subgrade. The additional concrete required above the wire mesh reinforcement shall be placed within thirty (30) minutes after the concrete below the reinforcement has been placed.

#### **10. PLACING REINFORCEMENT:**

All wire mesh reinforcement and tie bars shall be placed as shown on the Plans. The reinforcement shall be placed so that it will lie in a plane parallel to the surface of the pavement and remain in place after the finishing operations are completed. Laps in adjacent sheets or wire mesh shall be made as shown on the Plans. The minimum lap shall be twelve (12) inches. Reinforcing Bars shall be as per plan or City Standard and splices lapped not less than 40 diameters and splices shall be staggered as directed by the Engineer.

#### **11. EXPANSION JOINTS:**

Expansion joints shall conform to the details shown on the plans.

The expansion joint shall be installed at right angles to the centerline of the pavement and in a vertical plane perpendicular to the pavement. The joint and the bulkhead or retainers used to hold it in place shall be securely staked prior to placing concrete so that the joint will remain in proper position after the concrete is placed and finished.

Dowel bars shall be securely fastened and held in place by metal chairs or other metal supports. Each dowel bar shall have a metal expansion tube.

One-half of the length of the dowel bars shall be painted with two coats of red lead paint and one coat of hard grease.

Holes shall be cut in the pre-molded expansion joint to fit the dowel bars.

The lower half of the bulkhead or retainer shall be slotted to fit the dowel bars.

Concrete shall not be dumped from a mixer bucket in a manner that will allow the concrete to flow against the joint. The concrete along the joints shall be thoroughly vibrated.

The finishing operation shall be in a manner that will prevent displacement of the joints.

The bulkhead and retainer shall be removed immediately after the machine finishing has been completed and the concrete shall be rounded with an edger to the radius shown on the Plans.

The removal of the retainer and the final edging and finishing of the concrete shall be done at the proper time and in a manner to form a joint that will retain the correct dimensions without displacement of the edges.

The joints shall be sealed with an approved bituminous material. The concrete shall be thoroughly dry and cleaned of all dirt and loose scale before sealing. Any joint sealing compound extending beyond the edge of the joint shall be removed.

## **12. CONTRACTION JOINTS:**

Contraction joints shall be sawed at right angles to the centerline of the pavement and in a vertical plane perpendicular to the grade of the pavement.

After the pavement has been cured, the sawed grooves shall be cleaned out and when the concrete is dry in the grooves, the grooves shall be filled with silicone sealant. The joints to be sawed shall be as shown on the Plans. The saw cuts shall be one-quarter ( $1/4$ ) the depth of the slab. The joints shall be sawed as soon as possible without undue damage to the slab, but before any random cracks develop.

All Contraction Joints shall line up with joints in the curb and gutter. If the contraction joint cannot be sawed through the edge curb, the joint shall be formed in the curb while the concrete is still workable.

## **13. LONGITUDINAL JOINTS:**

Longitudinal joints shall be installed or constructed on the centerline of the pavement and shall not vary more than one-half ( $1/2$ ) inch from a sprite line. Where a metal strip is used, it shall be held rigidly in place with an adequate number of pins driven into the subgrade to insure that it will remain true to line and grade after the concrete has been placed and finished. When one-half ( $1/2$ ) the width of the pavement is poured at one time, a form shall be constructed on the correct grade along the centerline of the pavement. Holes should be bored into the form for the transverse tie bars and the form should be securely staked in place true to line and grade in a vertical plane.

A trapezoidal or triangular piece of the wood conforming to the dimensions shown on the Plans shall be fastened on the inside of the center form to form a grooved joint in the concrete as shown on the Plans, or a metal center strip may be placed against the center form provided that the material produces a grooved joint in the concrete which conforms to the Plans.

Where the concrete is poured on one-half ( $1/2$ ) the width of the pavement, the concrete on the opposite side of the centerline shall not be placed until the day following. The Contractor shall set stakes for line and grade for the centerline from when one-half ( $1/2$ ) of the width of the pavement is placed at one time.

#### **14. CONSTRUCTION JOINTS:**

A construction joint shall be made perpendicular to the center of the pavement at the close of each day's work and also when the process of depositing concrete is stopped for a length of time which in the opinion of the Engineer is sufficient for the concrete to acquire its initial set.

This joint shall be formed by using two (2) inch planks cut to fit the cross section of the pavement. It shall be securely staked and held in place in a vertical plane at right angles to the centerline. Whenever possible, this construction joint shall conform to the location of a contraction joint.

A construction joint shall be formed around each manhole cover or valve box located in the pavement. The joint shall form a square of 4-foot dimensions minimum for manholes and 2-foot square minimum for valve boxes, with the valve box or manhole cover located in the center of the square. After the pavement has been finished and cured for two days, the valve box or manhole frame and cover shall be adjusted to the proper grade by the Contractor (the Contractor shall furnish and install manhole covers on new storm sewer manholes constructed by the Contractor) and the Contractor shall pour the concrete pavement in the square around the valve box or manhole cover and finish the concrete to proper grade and cure the pavement in the same manner specified for concrete pavement.

A trapezoidal or triangular piece of wood or a section of metal center strip shall be fastened on the header to form a grooved joint similar to the longitudinal center joint. Upon resumption of work, any surplus concrete remaining on the subgrade shall be removed. The header shall be carefully removed from the construction joint and concrete spaded into the groove.

Tie bars spaced at eighteen (18) inch centers and of the same size bars and length of bars as used on the longitudinal center joint shall be placed in the construction joint. The surface edges of the joint shall be rounded with an edger and sealed with bituminous joint compound in the same manner described for contraction joints.

#### **15. JOINTS BETWEEN SECTIONS OF THE SAME STREET**

The joint connecting an existing street and a new asphalt street shall be constructed so that the joint does not protrude more than one-quarter ( $\frac{1}{4}$ ) inch above the adjoining existing or new pavement. The aim is to make the joint as undetectable as possible and avoid constructing poor quality joints.

**A.** If the existing street is concrete, the adjoining new surface course will butt flush against the existing concrete street with no overlap.

**B.** If the existing street is asphalt, it will be saw cut at 5 - 10 degrees to a line perpendicular to the street center line at least two (2) inches deep. The existing surface course will be removed leaving a clean, uniform edge to lay the proposed pavement against.

#### **16. FINISHING CONCRETE:**

The concrete shall be struck-off and tamped with an approved vibrating screed or by hand finishing operations, so that the surface of the pavement will conform to the required grade and crown. A uniform roll or ridge of concrete above the pavement grade shall be maintained ahead of the finishing screed.

The concrete along side forms shall be spaded or vibrated. The mechanical vibrating device

shall be operated in such a manner that vibrator insertions are made on a maximum spacing of 12-inch centers over the entire surface unless otherwise designated by the Engineer. The vibrators shall not be permitted to be dragged horizontally through the concrete. Excessive vibrating or tamping resulting in bringing an excess of mortar to the surface will not be permitted. Vibratory screeds shall be approved as adequate consolidation on pavement up to & including 7" of depth.

A mechanical or hand operated longitudinal float shall be operated over the concrete surface immediately after the transverse finishing operation. The forward motion of the longitudinal float shall be so adjusted that the float passes over each portion of the surface at least twice.

Immediately after the longitudinal floating has been completed, transverse floats shall be operated from the edge of the pavement. The floats shall not be less than five (5) feet in length and shall be operated by floating the surface from the edge to the center and back, overlapping the previously floated area by one-half (1/2) the width of the float.

The transverse floating will be so performed that the proper crown of the pavement will be maintained and that all surface water, laitance and wet material will be worked off the surface.

When the transverse floating has been completed, the entire surface shall be tested with straightedges not less than ten (10) feet in length. The straight edges shall be operated from the sides of the pavement by starting at the center and working towards the forms advancing along the road in successive stages of not more than one-half (1/2) the length of the straightedge. All high places shall be worked down and all low places filled by combined operations of floats and straightedges until no irregularities exist. The proper crown of the pavement shall be maintained throughout the operations.

Upon completion of the floating and straight edging operations, the surface shall be finished by **Brooming**. A coarse fiber street broom attached to a long handle shall be dragged lightly from center to sides of the pavement as soon as the surface water disappears and before the concrete acquires its initial set.

Hand floats, bridges, and similar equipment shall be available at all times for working on the pavement surface before brooming.

After the pavement has taken its final set, the entire surface of the pavement shall be tested for trueness with a 10-foot straightedge at locations selected by the Engineer. The Engineer shall check the variation of the surface from the testing edge of the straightedge from any two contact points, longitudinal or transverse, with the surface, shall not exceed one-eighth inch for a span less than 10 feet . The Contractor shall remove all high spots exceeding one-eighth (1/8) inch from the true surface of the straightedge by use of a carborundum brick and water. A power grinder may be used where necessary. The use of bush-hammers is prohibited.

## 17. **CURING CONCRETE:**

The pavement, curb and gutter, inlet covers, flumes, driveways and sidewalks shall be cured by the following method at all times:

Curing Compound (**Use White Pigment Only**)

Membrane curing solution may be used. It shall be applied with a pressure spray at a minimum temperature of 35 degrees F. or as approved by the Engineer.

The solution shall contain a fugitive dye (white only), of color strength sufficient to render the film distinctly visible on the concrete for a period of at least four (4) hours.

The solution shall be delivered to the job in the manufacturer's original marked containers and will be applied as directed by the Engineer or a City Inspector.

**18. WEATHER LIMITATIONS:**

Concrete will not be placed when the ambient air temperature is colder than 35 degrees F. Concrete will not be placed on frozen subgrade. Concrete after being placed shall not be accepted if the temperature of the concrete falls below 50 degrees. Engineer may request that hot water be incorporated in the concrete mix when ambient air temperature is between 35 degrees F. and 40 degrees F. When temperatures are below 35 degrees F. the KDOT specification shall govern with approval from the City Engineer.

**19. BASIS OF PAYMENT:**

The unit price bid per square yard for concrete pavement shall include fine grading, furnishing all materials, reinforcing, curing, and doing all the work covered in this section on concrete pavement, including all expansion joints, contraction joints, longitudinal joints, and construction joints as shown on the Plans.

## **SECTION XV**

### **BRICK PAVEMENT**

#### **1. DESCRIPTION**

Remove and replace brick pavement to the lines and grade shown on the plans and as directed by the Engineer.

All bricks that are salvageable (as determined by the Engineer) shall be set aside for replacement of brick pavement. The Contractor shall provide all other brick necessary to complete the project.

Replacement of brick pavement shall consist of one (1) inch depth of clean sharp sand for bedding material, followed by the hand placement of brick in a manner that will match the existing brick pattern or as directed by the Engineer and sand shall be placed in the spacing of the joints between the bricks.

#### **2. BASIS OF PAYMENT**

The unit price bid per square yard of Brick Pavement shall include all cost of material (sand, replacement brick, etc.), labor, and equipment as to complete the project.

## SECTION XVI

### CURB AND GUTTER

1. **COMPOSITION OF CONCRETE:**

Shall conform to the requirements of these specifications.

A topping course will not be used in construction of curb and gutter.

2. **CONSISTENCY OF CONCRETE:**

Shall conform to the requirements of these specifications.

3. **MEASURING MATERIALS:**

Shall conform to the requirements of these specifications.

4. **STOCKPILING AND HANDLING MATERIALS:**

Shall conform to the requirements of these specifications.

5. **CONCRETE MIXERS:**

Shall conform to the requirements of these specifications.

6. **MIXING CONCRETE:**

Shall conform to the requirements of these specifications.

7. **FORMS:**

Forms shall be of metal or (2") wood. They shall be of a depth at least equal to the thickness of the gutter and shall be straight and free from warp. The maximum deviation of the top surface of any form shall not vary more than one-eighth (1/8) inch from a straight line. The form shall be securely staked in place, true to the line and grade as staked by the Engineer.

The supply of forms shall be sufficient to permit their remaining in place at least twenty-four (24) hours after the concrete has been placed.

All forms shall be cleaned and oiled each time before they are used.

8. **PLACING CONCRETE:**

The subgrade shall be at least moist but not muddy at the time of placing concrete. If necessary, in order to obtain the desired moisture content in the subgrade, the soil shall be wetted to a depth of three (3) inches the day before placing concrete. The subgrade shall be sufficiently moist that it will not absorb moisture from the concrete.

The concrete shall be deposited on the subgrade in successive batches for the full width

between forms, in such a manner as to require as little re-handling as possible. Additional spreading shall be done with hand shovels or by approved mechanical means, in a manner that will prevent segregation of materials. Concrete consolidation shall be performed using a mechanical vibratory device or as approved by the Engineer.

The amount of materials deposited shall be sufficiently in excess of that required, to form the gutter to the proper cross section and to provide a roll of concrete ahead of the finishing screed.

#### **9. EXPANSION JOINTS:**

One (1) inch pre-molded, non-extruding type expansion joints shall be placed in the curb and gutter, where shown on the plans, including all radius points and connections with existing curb and gutter or pavement at intersections, or as shown on the accompanying "standards" sheets. Maximum spacing shall not exceed 250 feet.

The expansion joint shall be installed at right angles to the centerline of the curb and gutter, and in a vertical plane perpendicular to the grade of the curb and gutter. The joint and the bulkhead, or retainers used to hold it in place shall be securely staked prior to placing concrete so that the joint will remain in proper position after the concrete is placed and finished. No concrete shall be permitted to flow around the expansion joint.

Dowel bars shall be installed as shown on the plans, and shall be securely fastened and held in place by metal chairs or supports. Each dowel bar shall have a metal expansion cap.

Dowel bars shall be painted with two coats red lead paint and one coat of hard grease.

Holes shall be cut in the pre-molded expansion joint to fit the dowel bars. The lower half of the bulkhead or retainer shall be slotted to fit the dowel bars.

Concrete shall not be dumped in a manner that will allow the concrete to flow against the joint. The concrete along the joints shall be thoroughly spaded. The bulkhead or retainer shall be removed immediately after the finishing has been completed on one side of the joint and the concrete along the joint shall be rounded with a 1/4" radius edger.

The final edging and finishing of the concrete shall be done at the proper time and in a manner to form a joint that will retain the correct dimensions without displacement or spalling at the edges.

The joints shall be sealed with hot or cold bituminous material. The concrete shall be completely dry and cleaned of all dirt and loose scale before sealing. Any joint sealing compound extending beyond the edge of the joint shall be removed.

#### **10. CONTRACTION JOINTS:**

Contraction joints (planes of weakness) in curbs and/or gutters may be constructed by sawing through the curb to a depth of not less than 1¼ inches below the surface of the gutter and to a width not to exceed 3/8 inch. The Engineer must approve all other methods.

Contraction joints shall be aligned with transverse joints to be placed in the concrete pavement. If curb and gutter is adjacent to bituminous construction, planes of weakness shall be placed at intervals as shown on the plans but should not exceed 15' and **shall be radially aligned with the contraction joint on the opposite side of the street. Contraction joints in curb and gutter shall be aligned perpendicular to the street centerline. After forming the contraction joint, the curb and gutter will be stabbed vertically at the base at the front and back of the curb and gutter in line with the contraction joint, with a trowel to a depth of 3 inches to enhance the plane of weakness.**

#### **11. FINISHING CONCRETE:**

The concrete shall be struck off and tamped with an approved finishing machine or by hand finishing operations, so that the surface of the curb and gutter will conform to the required grade and cross section. A uniform roll or ridge of concrete above the grade shall be maintained ahead of the finishing screed.

The concrete along side forms shall be spaded or vibrated. Excessive vibrating or tamping resulting in bringing an excess of mortar to the surface will not be permitted.

Care shall be taken in removing the contraction joint templates to avoid breaking the concrete at the edge of the joint. The template shall be removed immediately after the concrete has been tamped in place and struck off. Any concrete broken away shall be replaced. The location of each template shall be marked on the curb and gutter form so that after finishing tools have passed, the joints can be cut in the surface of the concrete with a joint tool edger.

A finishing tool or machine shall be used after removal of the curb face forms to strike off the curb and gutter to the proper cross section.

The curb and gutter surface shall be given a light broom finish. The back of the curb and edge of gutter shall be rounded with an edger of 1/4" radius.

#### **12. CURING CONCRETE:**

The curb and gutter shall be cured by the method listed under the "Concrete" section of these specifications.

#### **13. BASIS OF PAYMENT:**

The unit price bid per lineal foot for curb and gutter removal and replacement shall include furnishing all materials, setting forms and fine grading, and doing all the work covered in this section on curb and gutter, and including all expansion joints and AB-3 Base Material and contraction joints and dowel bars at expansion joints.

## **SECTION XVII**

### **EDGE CURB**

#### **1. DESCRIPTION:**

Edge curb shall be constructed to the lines, grades, dimensions, and cross section shown on the Plans. The concrete used shall be the same as used in the concrete pavement.

Forms shall be of steel or two (2) inch lumber and shall be securely staked and held in place to produce a finished curb of the correct dimensions, line, and grade. Forms shall be cleaned and oiled before each use.

Expansion and contraction joints shall be constructed at the same point as in the pavement.

The edge curb shall be constructed monolithic with the concrete pavement. The area to be covered with the curb shall be cleaned of all laitance and roughened immediately after the pavement is finished. The concrete shall be compacted between the curb forms by use of a vibrator or by hand tamping and spading. The surface of the curb shall be shaped by use of a steel tool to produce the radius and cross section shown on the Plans. The sides and top of the curb shall be finished with a steel trowel. The Contractor may use a fine brush finish as final finish on the curb if approved by the Engineer. The curb shall be cured in the same manner as the concrete pavement. The ground behind the curb shall be backfilled with earth to the top of the curb. The backfill shall be tamped in place after the forms have been removed and the concrete has acquired its initial set.

#### **2. BASIS OF PAYMENT:**

The unit price bid per lineal foot for Edge Curb shall include furnishing all materials and doing all work described in this section on Edge Curb.

## SECTION XVIII

### CONCRETE ENTRANCES

#### 1. **DESCRIPTION:**

Concrete entrances shall be constructed to fit existing entrances or where staked by the Engineer. The radius of the curb and other details shall conform to the Plans or match the existing entrances. The concrete shall be the same as specified for the concrete pavement.

New concrete entrance shall be doveled into the existing concrete entrance pavement with #4 deformed bars 18 inches long and on 18-inch centers. The entrances shall be given a wood float finish and the edge curb finished with a broom. The concrete entrances shall be cured in the same manner as specified for the concrete pavement. The residential entrance pavement shall be six (6) inches thick with a maximum width of 24 feet. Residential entrances do not require steel reinforcing. Commercial entrances 6" thick will require 6" x 6" #6 gauge wire mesh weighing 42 lbs. per 100 square feet or #4 reinforcing bars at 24" centers each way unless the Contractor exercises the 8" concrete option (no reinforcement required). Maximum width for Commercial entrances is 40 feet. Commercial driveway entrances may have radius curbs in lieu of the 5' wings if approved by the City Engineer.

#### 2. **BASIS OF PAYMENT:**

The unit price bid per square yard for concrete pavement in entrances shall include the cost of sawing, pavement removal, unclassified excavation, fine grading, edge curb, expansion joints, and all work incidental to the construction of the concrete entrances.

## SECTION XIX

### REMOVE & REPLACE PAVEMENT

#### 1. **DESCRIPTION:**

This item shall conform to all applicable requirements of these specification, Concrete Pavement and Kansas Department of Transportation Standard Specifications, (*Current Edition*), section "Rigid Pavement", "Flexible Pavement," Materials Details, section "Aggregate for Bituminous Mixtures," section, "Bituminous Materials", and the project plans.

Deviations from the above listed Sections of the Standard Specifications of the Kansas Department of Transportation shall be on the method of payment. Payment in these specifications shall be on the unit price bid per sq. yd. for Remove & Replace Pavement, which shall include, aggregate base material, aggregates for binder and surface courses, asphalt cement and liquid asphalts for tack coats and 7" Plain Concrete.

#### 2. **GENERAL CONSTRUCTION REQUIREMENTS:**

The two (2) inch hot mixed asphalt surface course shall be placed in one compacted layer over a 7" plain concrete slab doweled or underpinned as approved. Tack coats shall be applied prior to placing the surface course at the rate of 0.05 to 0.10 gallons per square yard. Tack coat shall be RC-70 or SS1H.

The Surface course shall be BM-1 or Commercial Grade (Class A) asphalt mix as approved by the Engineer.

#### 3. **BASIS OF PAYMENT:**

The unit price bid for removal and replacement of existing pavement shall be considered full compensation for any labor, equipment, and material used in sawing, removing, and replacing existing street pavements as per plan and in accordance with these specifications.

## SECTION XX

### CONCRETE SIDEWALK

#### 1. DESCRIPTION:

At street intersections, where ordered by the Engineer, four (4) inch concrete sidewalks shall be constructed. The concrete mix shall be the same proportions as specified for concrete pavement. The width of the sidewalks shall be five (5) feet with a transverse slope across the walk of one-fourth (1/4) inch per foot.

One (1") inch of compacted moistened screenings shall be used for leveling existing ground for base material as a minimum. The surface of the concrete shall be struck off with a straightedge riding on the forms and sealed with a magnesium float. Sidewalk surface shall have a light transverse broom finish for the final surface.

The concrete along side forms shall be spaded or vibrated as directed by the Engineer. The mechanical vibrating device shall be operated in such a manner that vibrator insertions are made on a maximum spacing of 12-inch centers over the entire surface unless otherwise designated by the Engineer. The vibrators shall not be permitted to be dragged horizontally through the concrete. Excessive vibrating or tamping resulting in bringing an excess of mortar to the surface and segregation of material will not be permitted. Mechanical vibratory screeds shall be approved for consolidation by the Engineer.

One-half (1/2) inch pre-molded expansion joints shall be installed every 125 feet or as shown on the plans. Contraction joints shall be made at five (5) foot intervals by means of a template or cutting a groove in the concrete, the groove to be one (1) inch deep. The joints and edges of the walk shall be rounded with an edger.

The forms for the sidewalks shall remain undisturbed until the concrete has achieved its final set. Immediately after removing the sidewalk forms, the walk shall be backfilled only with approved materials that will produce a dense, well-compacted backfill.

Backfill procedures should be performed by working parallel with the sidewalk when possible. Care should be taken to provide proper drainage to prevent ponding of water adjacent to the walk.

The new sidewalk shall be barricaded for three (3) days after placing the concrete. The concrete shall be cured by one of the three methods described in these specifications.

#### 2. CURING

Curing compound shall conform to the Concrete section of these specifications and shall be applied to concrete before it takes its initial set but in no case more than 2 hours after pouring.

**3. BASIS OF PAYMENT:**

The unit price bid per square foot or per square yard for four (4) inch concrete sidewalk shall include saw cutting, removing and hauling away the old sidewalk, excavation, fine grading, aggregate base material, constructing the new walk including furnishing all materials and expansion joints and dowels (where applicable), backfilling, abutting curbs on intersection sidewalks, and doing all work described in this section.

## SECTION XXI

### CONCRETE HANDICAP RAMPS

#### 1. **DESCRIPTION:**

At street intersections, where ordered by the Engineer, Handicap Ramps shall be constructed. The concrete mix shall be the same proportions as specified for 4" plain concrete sidewalk.

One-half (1/2") inch pre-molded expansion joints shall be installed at the back of curb portion of the handicap ramp or as directed by the Engineer or approved plans. The joints and edges of the handicap ramp shall be rounded with an edger.

#### 2. **DETECTABLE WARNING STRIP:**

The material used to provide contrast shall be an integral part of the walking surface. The material shall consist of either paving bricks or prefabricated panels. Surface applied retrofit mats shall not be allowed on newly constructed ramps. Color for all detectable warning surfaces shall be "Brick Red". Any variation to meet contrast requirements must be approved by the City Engineer.

**A.** Paving Bricks: Nominal size shall be 2 ¼" x 4" x 8" and shall meet the requirements of ASTM C902 for Class SX, Type 1 brick and ASTM C1272.

**B.** Tiles or Panels: Acceptable products include: Armor Tile's Cast in Place System, ADA Solutions Composite Paver, ADA Arcis Tactile, CASTinTACT Detectable Warning Panel, or submitted and approved equal by the City Engineer.

The use of "Flame Tape""Detect-A-Mark" ADA mats or approved equal shall be allowed on existing handicap ramps which meet all current ADA standards with the exception of the 24" detectable warning strip as determined by the Engineer.

#### 2. **BASIS OF PAYMENT:**

Handicap Ramps will be measured to obtain the area and shall be paid at the contract square yard price for "Handicap Ramp." The unit price bid per square yard shall include saw cutting, removing existing material, excavation, fine grading, base material and all material and labor required to construct the handicap ramp as per plan and all work as described in this section.

## SECTION XXII

### RECYCLED HOT MIXED ASPHALT LEVELING AND OVERLAY

#### 1. **DESCRIPTION:**

This item shall conform to all applicable requirements of Construction Details, "Flexible Pavement," Materials Details", "Aggregate for Bituminous Mixtures," "Bituminous Materials", of Kansas Department of Transportation Standard Specifications for State Road and Bridge Construction, (*Current Edition*).

Deviations from the above listed Sections of the Standard Specifications of the Kansas Department of Transportation shall be on the method of payment and for the maximum absorption for aggregate:

**A.** Payment in these specifications shall be on the unit price bid per ton for Hot Mixed Asphalt in place, which shall include aggregates for base, surface or leveling course, asphalt cement, and liquid asphalt for a tack coat.

**B.** The maximum absorption for combined aggregates as shown in the corresponding Section of the KDOT Standard Specification to be changed to 4.0% maximum absorption.

#### 2. **GENERAL CONSTRUCTION REQUIREMENTS:**

The hot mixed asphalt base shall be placed in lifts not to exceed four (4) inches and then compacted with approved rollers to maximum density. The surface course shall be placed in lifts not to exceed two (2) inches and then compacted with approved rollers to maximum density. Tack coats shall be applied prior to placing each lift at the rate of .03 gallons per square residue. A tack coat of anionic emulsified asphalt shall be applied to the milled of existing surface and shall be Type and Grade SS1H as specified in Section 603 of the Current Edition of the Standard Specifications for State Road and Bridge Construction of the Department of Transportation of the State of Kansas. Tack coats will be subsidiary to the asphalt overlay.

Leveling Course shall be a BM-1 mix with an Asphalt Grade of PG 64-22 or as approved by the Engineer.

Overlay material shall be Commercial Grade (Class A) mix or as approved by the Engineer.

The Contractor shall insure that all areas overlaid shall drain. It may be necessary to "feather" hot mix into gutters, drives, and adjacent paving to eliminate ponding of water and shall be approved by the Engineer. Dirt and grass overhanging the top of the curb shall be removed a minimum of one (1) foot back of the backside of the curb as per detail sheet. Cut the back slope from the top of the back edge of the curb to the original ground line. Dirt, grass, and/or debris shall be promptly removed from the project.

Prior to tacking or the overlay, the street and gutter shall be thoroughly cleaned of all foreign material such as dust, dirt, vegetation, or loose material. A "pickup" type street sweeper may be required as directed by the Engineer.

### **3. HOT MIXED ASPHALT RECYCLING:**

The Contractor shall use a blend of 15% - 25% of Reclaimed Asphalt Pavement (RAP) for virgin aggregates and asphalt cement. The type and source of the RAP shall be identified by the Contractor and approved by the Engineer. RAP shall be processed such that 100% will pass the 1 ½" sieve and shall be free of debris and foreign material. At no option will rubber tire be used.

Care shall be taken, when stockpiling, to separate and label RAP by source. The material shall be free of contamination and uniform in composition. Marshall tests and other tests to determine type or quality of RAP aggregates and asphalt cement and mix designs shall be submitted to the Engineer for approval. An independent lab shall do testing of the RAP material. The Contractor shall arrange for and pay the extra costs incurred for all testing of RAP material.

### **4. COMPACTION:**

All compaction rolling shall be completed prior to the mixture cooling to a temperature less than 185 degrees F (85 degrees C). After spreading and strike-off and as soon as the temperature and mix conditions permit the compacting to be performed without excess shoving or tearing, the mixture shall be thoroughly and uniformly compacted. A minimum of two (2) rollers, one (1) steel wheel and one (1) pneumatic tire type, shall be used with each spreading operation unless otherwise specified by the Engineer. Rolling shall begin as soon as the mat will bear the roller without undue displacement or hair cracking. Rolling shall start longitudinally at extreme sides of lanes and proceed toward the center of the pavement, overlapping on successive trips by at least one-half the width of rear wheel of roller. Alternate trips of roller shall be of slightly different lengths. Motion of roller shall at all times be slow enough to avoid displacement of mixture. Any displacement occurring as a result of reversing direction of roller, or from any other cause, shall be corrected by use of rakes and fresh mixture applied when required. Sufficient rollers shall be furnished to handle output of plant adequately. Rolling shall be continued until all roller marks are eliminated and a density of at least 92 percent of theoretical maximum density has been obtained. Lab mold density shall be 96%.

### **5. 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 or the road surface temperature is equal to or greater than that shown in the following table:

**BITUMINOUS PLACEMENT TEMPERATURE LIMITATIONS**

| Paving Course | Thickness (inches) | Thickness (meters) | Air Temp. (° F.) | Air Temp. (° C.) | Road Surf. Temp (° F.) | Road Surf. Temp (° C.) |
|---------------|--------------------|--------------------|------------------|------------------|------------------------|------------------------|
| Surface       | All                | All                | 50               | 10               | 55                     | 12.8                   |
| Subsurface    | Less than 3        | Less than 0.0762   | 40               | 4.4              | 45                     | 7.2                    |
| Subsurface    | 3 or more          | 0.0762 or more     | 30               | -1.1             | 35                     | 1.7                    |

Regardless of the temperatures herein specified, paving shall not be allowed to proceed unless specified density can be achieved or rolling procedure completed before the bituminous mixture cools to 185 degrees F. (85 degrees C.)

**6. CONSTRUCTION SEQUENCING:**

Sequencing shall be completed prior to bid letting and be included within the bid packet. The sequencing shall include as a minimum the date, area and type of work to be completed by the contractor. The following sequencing shall be adhered to by the contractor while determining their project schedule.

| Street Class | Mill (Day) | Clean and Fabric Reinforcement completed (hours after mill) | Overlay Completed (hours after mill) | Damages per day not completed (Ea. Day) |
|--------------|------------|---|--------------------------------------|---|
| Arterial     | 1          | 24  | 48                                   | \$600                                   |
| Collector    | 1          | 48  | 96                                   | \$400                                   |
| Local        | 1          | 72  | 120                                  | \$250                                   |

Saturdays shall be considered a working day if the street has been milled.

**7. BASIS OF PAYMENT:**

The unit price bid per ton of Hot Mixed Asphalt shall include all aggregates, asphalt cement, tack coats, and incidental work described above.

**NOTE:** Asphalt leveling shall be placed as directed and paid for at the unit price per ton of Hot Mixed Asphalt.

## **CHIP SEAL**

### **SECTION XXIII**

#### **1. DOUBLE CHIP SEAL SPECIFICATIONS:**

The surface shall be steel-wheeled rolled to obtain a smooth surface. A Prime Coat of AE-P or approved equal to be applied as per manufacturer's recommendations is required before Double Chip seal is to be laid.

Asphalt Cement shall be TRMAC AC-20-5TR or equal to and apply product to manufacturer's specifications.

Aggregate shall be 3/8" – 1/2" crushed limestone spread immediately after asphalt cement is applied. Aggregate application rate is one cubic yard per 100 to 120 square yards. All aggregate shall be embedded within 15 minutes of applying the aggregate. Pneumatic roller shall roll aggregate at least 3 passes immediately behind the aggregate spreader. Second application layer shall be applied to the same specifications as the first layer after rolling is completed.

The City of Emporia shall receive a copy of all tickets for the aggregate and oil delivered.

#### **2. WEATHER LIMITATIONS:**

Work may commence only when the ambient temperature is 60°F and rising and when there is no fog or rain. If aggregate retention is unsatisfactory for any reason, work shall be suspended until there are more favorable conditions or until the cause of the problem has been resolved.

#### **3. BASIS OF PAYMENT:**

The unit price bid per sq. yd. of Chip Seal shall include all aggregate, oils, labor and incidental work and equipment required to complete this item as described above.

## **SECTION XXIV**

### **MILL PLANING**

#### **1. LOCATION**

The location of this work will be as described in the Street Quantity Breakdown Sheets and include the intersections as directed by the Engineer.

#### **2. DESCRIPTION**

Mill planing will be done with a machine specially designed for the removal of asphalt and concrete pavement which will produce a particle size less than one (1) inch. This process will not employ the use of heaters or other softening agents.

The intent of the milling is to remove only the asphaltic concrete materials from face to face of curb or edge of gutter to edge of gutter as directed by the engineer.

The milled material shall become the property of the owner and be transported to a location as directed and approved by the Engineer, and stockpiled. The Contractor will relocate any millings hauled to a location not approved by the Engineer to an approved area at no charge to the City. Milled material will not be recycled and incorporated in the bid item Hot Mixed Asphalt. Milled streets shall be broom cleaned immediately after milling and before opening to traffic. Temporary traffic striping to be installed as directed.

Stockpiling will require equipment to stack the milled material at the stockpile site.

#### **3. BASIS OF PAYMENT:**

Payment for mill planing shall be per square yard and shall include all labor, equipment, and materials to mill plane, load, haul, stockpile and stack the milled material and install temporary striping.

**SECTION XXV**  
**SPECIAL PROVISIONS**  
**FOR**  
**FABRIC REINFORCEMENT FOR ASPHALT CONCRETE PAVEMENT**

**1. DESCRIPTION:**

This work shall consist of the application of reinforcement fabric for plant mix asphalt concrete pavement in accordance with these Special Provisions, manufacturers' recommendations, and in reasonable close conformity with the locations and dimensions shown on the plans or established by the Engineer.

**2. MATERIAL:**

**A. Reinforcement Fabric:**

(1). General - The reinforcement fabric shall be an approved paving grade (fused one side), non-woven, needle punched, and polypropylene material.

(2). Test Requirements - The reinforcement fabric shall be an approved paving grade (fused one side), non-woven, needle punched, and polypropylene material.

| <u>Tests</u>                      | <u>Limit</u>                       | <u>Test Methods</u> |
|-----------------------------------|------------------------------------|---------------------|
| Weight                            | 4-6 ounces/square yard             | ASTM D 2646-69      |
| Tensile Strength<br>(Grab Method) | 90 lbs minimum                     | ASTM D 1682-64      |
| Elongation at<br>Break            | 55% minimum                        | ASTM D 1682-64      |
| Asphalt Retention                 | 0.20 gallon/square yard<br>minimum | Manufactories       |

(3). Placement and Weather Limits for Reinforced Fabric - After the roadway has been thoroughly cleaned, the bituminous binder shall be applied at the specified rate. The fabric shall be placed promptly before the bituminous binder has cooled. The fabric shall be unrolled and placed into the binder with the un-fused (fuzzy) side down with a minimum of wrinkles. The reinforcement fabric shall be embedded into the bituminous binder and bonded to the pavement. Self-propelled pneumatic tired rollers may be required if deemed necessary by the Engineer. Asphalt overlay must follow fabric laydown within 48 hours to minimize damage to fabric caused by traffic. A schedule of fabric laydown must be submitted by Contractor and approved by the Engineer prior to installation. All damaged fabric shall be replaced prior to placing asphalt overlay. Asphalt binder for fabric installation shall not be applied when the ambient temperature is less than 50° F (10° C).

(4). Packaging and Storing - The manufacturer shall supply the fabric in rolls of standard widths and lengths uniformly wound onto suitable cylinder forms or cores to aid in handling and unrolling by the use of mechanical laydown equipment. Rolls supplied shall provide full coverage of the pavement with a minimal number of joint splices.

Rolls of fabric shall be furnished with a suitable type wrapping for protection against sunlight and moisture. When stored outdoors, the rolls shall be elevated and covered with a tarpaulin.

(5). Sampling and Testing - The contractor shall furnish a Materials Certification for the reinforcement fabric as advertised. The Resident Engineer shall also furnish a sample of the fabric for testing to the Materials Engineer from each lot or shipment.

Bituminous binder material shall be penetration grade asphalt meeting the requirements of KDOT specification AC-10 w/85-110 pen, or as approved. The bituminous binder must be uniformly sprayed and applied at the specified rate. Quantities specified will vary with the surface conditions, but normally be applied at a target rate of 0.25 gallons per square yard of residual asphalt. At least 0.20 gallons per square yard of residual asphalt under heat of the applied overlay is absorbed by the fabric alone. The Engineer may change the application rate of asphalt on the job site.

### **3. EQUIPMENT:**

#### **A. General:**

The Contractor in conformance with the manufacturer's recommendation shall furnish equipment and tools necessary for performing all parts of the work.

#### **B. Distributors:**

Distributors shall meet the requirements as outlined in the (Current Edition) of the Kansas Department of Transportation Specifications. Distributor units shall also be equipped with a hand spray with single nozzle and positive shut off valve.

#### **C. Fabric Laydown Equipment:**

Mechanical laydown equipment shall be capable of handling full or partial rolls of fabric and shall be capable of laying the fabric smoothly without excessive wrinkles and/or folds. When manual laydown is required, a length of standard one-inch pipe, together with suitable roll tension devices shall be used for proper roll handling. Overlapping the fabric joints should be a minimum of three (3) inches and a maximum of six (6) inches. Transverse joints shall be shingled in the direction of paving to prevent edge backup by the paver as directed by the Engineer. Additional sealant of approximately 0.20 gallons per square yards shall be applied to the fabric joints. In the event that the sealant bleeds through the fabric before the hot mix is placed, it will be necessary to blot the sealant by spreading sand or hot mix over the affected area to prevent pickup by traffic of the fabric. Contractor to avoid movement or damage to the membrane once it is put in place.

#### **4. BASIS OF PAYMENT:**

All cost of material (to include Bituminous Binder), equipment, and labor to complete the installation of Fabric Reinforcement shall be paid at the contract unit price of Fabric Reinforcement per square yard. This shall be full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified.

## SECTION XXVI

### ADJUSTING MANHOLES AND VALVE BOXES TO GRADE

#### 1. DESCRIPTION:

The Contractor shall be responsible to adjust all manholes and valve boxes within the project limits to within one-eighth (1/8) inch below the final surface of the street.

Prior to work beginning on the project, the Contractor shall ensure that all valve boxes and manholes have been accurately referenced to permanent fixtures with at least two reference ties.

After the streets have been overlaid, the Contractor will relocate each manhole or valve box, then saw the pavement full depth around it to form a square "block out" perpendicular to the street centerline. The top of the manhole or valve box shall be centered within the "block-out" and adjusted to fit the contour of the street and 1/8 inch below the surface.

**The Contractor shall take all necessary steps to ensure that debris does not fall into manholes during adjustment. The Contractor shall clean out any debris that does fall into the manhole.** The manhole frame casting shall be set on top of the masonry walls of the manhole in a bed of mortar.

Valve boxes shall be raised or lowered as required to fit the valve shutoff and to accommodate a valve key. The paving shall be formed out around valve boxes. **Water valve boxes adjusted to grade are to be vertically plumb and centered over the valve nut. The City will provide the Contractor with a water valve key, which the Contractor shall use to verify that all adjusted valves can be accessed through the valve box.**

**No payment will be made for the adjustment of manholes and valve boxes until the inspector has verified that manhole are free of debris and water valve boxes are plumb and the valve nuts can be accessed with a water valve key.**

The City Underground Utilities Department will furnish new valve boxes to the Contractor where existing boxes were broken prior to beginning of construction operations or when necessary to provide boxes of correct length.

When valve boxes are broken by operations of the Contractor, the City Underground Utilities Department will charge the Contractor for the cost of all new valve boxes required to replace those broken by the Contractor.

The manholes shall be centered in a 4 foot by 4 foot "block out" and valve boxes shall be centered in a 2 foot by 2 foot "block out". No wood shims or deleterious material may be used to shim the adjusted castings in place. The "block out" shall be doweled into the old pavement with 18 inch long No. 4 deformed bars on 12-inch centers. Concrete shall be a minimum of seven (7) inches thick and shall surround the ring of the castings to hold it permanently in place. Concrete and debris shall be removed promptly from within the manhole or valve box. All concrete shall be cleaned from the top of the castings.

Manhole frame and cover castings broken prior to the beginning of construction work shall be replaced by the City at no cost to the Contractor. The City will furnish new castings to replace obsolete "dome" type manhole covers.

Castings broken by the Contractor's operations shall be replaced by the Contractor at his expense, the new Castings shall conform to current City Specifications.

When manhole covers with water valves inside are encountered, the Contractor shall make the adjustment with a 4' X 4') "block out" as described above. The Contractor will remove the manhole ring and cover and install a valve box furnished by the City. Crushed rock for backfill around the valve box will be provided by the City and placed and installed by the Contractor.

## **2. BASIS OF PAYMENT:**

The price bid per each for Adjusting Manholes and Valve Boxes to grade shall include all work described in this section, also to include all unclassified excavation, compacted backfill, and all brick masonry and mortar, and tamping backfill around castings and concrete to complete the adjustment work for manholes and valve boxes. Basis of Payment for an existing valve in a manhole shall be per each manhole adjustment.

## SECTION XXVII

### THERMOPLASTIC REFLECTORIZED PAVEMENT MARKING

#### 1. DESCRIPTION:

This Special Condition covers thermoplastic materials suitable for use as reflecting pavement markings on bituminous pavement. The materials shall be so manufactured to be applied by extrusion onto the pavement in molten form with glass spheres mixed in and also dropped into the material immediately after it is applied. Upon cooling to normal pavement temperatures, this material produces an adherent reflectORIZED stripe of specified thickness and width and is capable of resisting deformation. The material shall be furnished in two colors, white and yellow.

#### 2. MATERIALS:

##### A. Thermoplastic material and pre-mix beads shall comply with AASHTO DM249-79.

(1) Packaging: The thermoplastic material shall be packaged in suitable containers to which it will not adhere during shipment and storage. The thermoplastic material may be furnished as either a cast block or as a granular form in bags. Bags may be heavy-duty craft paper or may be of a material suitable for melting of the entire bag and contents. Meltable bags shall not result in an adverse effect on the thermoplastic material. Each container label shall contain the following information:

- (a) The color of the material
- (b) The name of the manufacturer
- (c) The date of manufacture (month and year)
- (d) Batch number

##### B. Glass Beads for Top Application:

(1) General Characteristics - The glass beads used for drop-on purposes shall be clean, solid, transparent and conform to the requirements set forth herein.

- (a) Gradation.

| Size of Sieve | Percent Passing |
|---------------|-----------------|
| No. 30        | 95-100          |
| No. 40        | 40-60           |
| No. 50        | 20-35           |
| No. 80        | 0-5             |

- (b) Imperfect Beads - Not more than 30% shall be imperfect.
- (c) Moisture Resistance - Beads shall pass the moisture test
- (d) Index of Refraction - The beads shall have an index of refraction between

1.50 and 1.60 when tested by the oil immersion method under tungsten light at 25 degrees C.

(2) Methods of Test:

(a) Sieve Analysis - Sieve analysis will be determined according to ASTM D 1214, except that a 200-gram sample will be used and the total percentage passing each shall be reported.

(b) Imperfect Analysis - Imperfect beads are defined as beads that are ovate or otherwise non-spherical in shape, two or more beads will be determined by visual inspection on a representative sample of not less than 300 beads using a 45 power magnification. All particles retained on a 100-mesh screen regardless of shape will be counted; particles passing a 100-mesh screen will be discarded and not counted either as perfect or imperfect beads.

(c) Moisture resistance - free flow test. Required apparatus. Standard one-pint screw cap mason fruit jars with two-piece covers consisting of a flat cover plate with sealing gasket attached and a screw ring to hold the cover plate on the jar.

Special 60 degree brass funnel with a four-inch stem. Inside diameter of the stem shall be 0.25 inches plus or minus 0.004 inches. The top of the funnel shall be soldered to one of the screw rings from a jar cover so that the funnel can be screwed to the top of the jar. The inside surface of the funnel shall be kept polished smooth.

Measuring pipette, Mohr type, capacity 0.100 ML with graduation lines at intervals of 1/100 ML.

Procedure. Using a sample splitter, obtain a representative 300 gram sample of the beads. Transfer the sample to one of the pint fruit jars and place the uncovered jar and sample in an air oven at 105 to 110 degrees C for 16 hours. Remove the jar from the oven and immediately seal it with one of the jar cover plates and screw ring, allow cooling to room temperature.

If after cooling, the beads have stuck together forming lumps, shake the jar violently until all lumps are broken up. This must be done without removing the cover. After breaking up lumps, remove the cover and quickly add 0.090 ML of distilled water from the measuring pipette. Immediately seal the jar with the cover and screw ring and shake jar and contents violently for 20 seconds. Let stand four hours; shake and tumble the beads in the sealed jar for 20 seconds at the end of the first, second, and third hour of standing.

At the end of the fourth hour, without shaking, remove the cover and quickly screw the special funnel to the top of the jar. Invert the jar and support it in a vertical position. The beads shall flow from the jar through the stem of the funnel. It is permissible to tap the funnel to start the flow; but if it is necessary to keep tapping the funnel to keep the beads flowing, they do not pass the test. A small amount of beads sticking to the sides of the jar or laying on the jar shoulder shall not be cause for rejection.

(3) Packaging - All beads shall be packed in 50-pound burlap or multi-wall Kraft bags. Bags shall be leak proof, moisture resistant, and of sufficient strength to insure safe delivery, handling, and storage of the beads prior to and during their use. For identification purposes, each bag shall be marked with a lot number assigned by the producer.

**C. Binder-Sealer:**

(1) General Characteristics - The binder-sealer shall be a two-part epoxy resin material containing sufficient solvent so as to be sprayable and to dry rapidly. It shall be compatible with the pavement material, the thermoplastic material, and form a tight bond between the pavement and the thermoplastic material.

**D. Basis of Acceptance:**

(1) Pavement Marking Material and Glass Beads - Material furnished under this Special Provision may be accepted on receipt and approval of a Type D Certification as set forth in the KDOT Standard Specifications.

**3. APPLICATION:**

**A. General Requirements:**

The material shall be applied to the pavement by the extrusion method wherein one side of the shaping die is the pavement and the other three sides are contained by, or a part of, suitable equipment for heating and controlling the flow of material.

**B. Equipment:**

The equipment used to install hot thermoplastic materials under this specification shall be constructed to provide mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the shaping die shall be so constructed as to prevent accumulation and clogging. All parts of the equipment that come in contact with the material shall be so constructed as to be easily accessible and exposable for cleaning and maintenance.

The equipment shall be constructed so that all mixing and conveying parts up to and including the shaping die will maintain the material at a temperature not less than 375 degrees Fahrenheit (191 degrees C).

To assure that the thermoplastic does not fall below the minimum temperature, the shaping die shall be heated by means of a gas-fired infrared heater or a heated, oil-jacketed system.

The equipment shall be so constructed as to insure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off square stripe ends and shall provide a method of applying "skip" lines. The use of pans, aprons, or similar appliances that the die overruns will not be permitted under this specification. The equipment shall be so constructed as to provide for varying die widths and to produce varying widths of traffic marking.

A special kettle shall be provided for melting and heating the thermoplastic material. The kettle must be equipped with a thermostat so that heating can be done by controlled heat transfer liquid rather than by direct flame, so as to provide positive temperature control and prevent overheating of the material. The heating kettle and applicator shall be so equipped and arranged as to meet the requirements of the National Board of Fire Underwriters, of the National Fire Protection Association, of the State, and of the Local Authorities.

Glass spheres applied to the surface of the completed stripe shall be applied by an automatic bead dispenser attached to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line. The glass sphere dispenser shall be equipped with an automatic cut-off control synchronized with the cut-off of the thermoplastic material.

The equipment shall be so arranged as to permit preheating of the pavement immediately prior to application of the thermoplastic material if the thermoplastic manufacturer recommends pre-heating. The applicator shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

The applicator shall be capable of containing a minimum of 125 pounds of molten material.

### **C. Application Techniques:**

The surface shall be dry and all dust, debris, and other foreign matter shall be removed from the road surface prior to the application of the binder sealer and the thermoplastic material. A rough-textured surface shall be cleaned by air blast. A smooth-textured surface may be cleaned by brooming; but if there is any doubt about the resulting cleanliness, the Engineer can require use of air blast.

To insure proper adhesion, the Contractor shall apply the binder-sealer over the application area prior to the actual thermoplastic installation. The binder-sealer shall be applied by spraying, shall form a continuous wet film of approximately 2 - 3 mils thickness, and shall be at least two (2) inches wider than the applied thermoplastic so as to assure an adhesion at the edges. The binder-sealer shall be allowed to set long enough for the solvent to evaporate and become tacky. This can be as much as one hour or longer but not less than 30 minutes. If there is doubt, the longer time shall be used even though some tackiness might be lost.

For bituminous surfaces less than two months old and having less than 20% bare, exposed aggregate, the application of binder-sealer may be waived.

Bubbles forming in the applied thermoplastic is evidence that solvent remains in the binder-sealer. If so, more time should be allowed for evaporation of the solvent before continuing.

To insure optimum adhesion, the pavement and ambient air temperature shall be not less than 65 degrees F (18 degrees C), and the thermoplastic material shall be applied

in a melted state at a temperature of 375 degrees F (191 degrees C) -450 degrees F (232 degrees C). The temperature of the thermoplastic in the shaping die shall be maintained at the manufacturer's recommended application temperature, but in no case shall the temperature fall below 375 degrees F (191 degrees C).

The finished lines shall have well defined edges and be free of waviness. The minimum thickness of thermoplastic lines as viewed from a lateral cross-section shall be not less than 3/32 inch near the edges, nor less than 1/8 inch at the center. Measurements shall be taken as an average throughout any 36-inch section of the line.

A device for gauging the thickness of the material shall be furnished to the Engineer for use on the project. The gauge shall be easy to read and shall readily indicate excessive variations.

The drop on glass beads shall be applied at a rate of one pound per twenty square feet of line.

#### **4. QUALIFICATIONS:**

The contractor or subcontractor must be competent in the application of thermoplastic pavement marking. Before the work is started, he must submit to the Engineer evidence of his competence and previous experience with this type of work. A technical expert (contractor or material representative) having proper credentials for this type of work shall be on the project at all times during application.

#### **5. METHOD OF MEASUREMENT:**

Thermoplastic reflectorized pavement marking will be measured by the units designed on the Plans.

When the Plans designate thermoplastic reflectorized pavement marking to be measured by the Lump Sum, it will be measured by the Lump Sum complete in place.

When the Plans designate thermoplastic reflectorized pavement marking to be measured by the various units, it will be measured by the Lineal Foot for each length of line for the various widths and the number of each of the various symbols or legends complete in place.

Existing pavement marking removal will be measured by the lineal foot for each length of line removed.

#### **6. BASIS OF PAYMENT:**

The amount of completed and accepted work, measured as provided above, will be paid for at the contract lump sum price bid or will be paid for at the contract unit price bid per lineal foot for the various widths of lines or per each for the various symbols and legends for "Thermoplastic Reflectorized Pavement Marking", or per lineal foot for "Existing Pavement Marking Removal", which price will be full compensation for furnishing all materials, for all labor, equipment, tools, and incidentals necessary to complete the work.

## SECTION XXVIII

### PAVEMENT MARKING/REMOVAL OF EXISTING PAVEMENT MARKINGS

#### 1. DESCRIPTION:

This work shall consist of the installation of Pavement Marking, and Removal of Existing Pavement Markings all of which shall be in accordance with the Kansas Department of Transportation Standard Specifications, (*Current Edition*), Section, "Cold Plastic Pavement Marking Material", "Patterned Cold Plastic Pavement Marking Tape", "High Durability Pavement Marking Tape", "Temporary Pavement Marking Tape", "Thermoplastic Pavement Marking Material", "Preformed Thermoplastic Pavement Marking Material", "Sprayed Thermoplastic Pavement Marking Material", "Epoxy Pavement Marking Material", "Traffic Line Paint", "Polymer-Modified Cementitious Pavement Marking Material", "Multi-Component Liquid Pavement Marking Material" and "Removal of Existing Pavement Markings" and as shown on the Plans or as directed by the Engineer.

#### 2. BASIS OF PAYMENT:

The amount of completed and accepted work, measured as provided above, will be paid for at the contract lump sum price bid or will be paid for at the contract unit price bid per lineal foot for the various widths of lines or per each for the various symbols and legends for "Pavement Marking", or lump sum price bid or contract unit price bid per lineal foot for "Removal of Existing Pavement Markings", which price will be full compensation for furnishing all materials, for all labor, equipment, tools, and incidentals necessary to complete the work.

## SECTION XXIX

### STEEL PLATE GUARD FENCE (Galvanized)

1. **DESCRIPTION:**

This work shall consist of the construction of guard fence, the setting of guideposts, and the removal and resetting of guard fence or guideposts in accordance with the Kansas Department of Transportation Standard Specifications, (*Current Edition*), Section, "Guard Fence and Guideposts" and as shown on the Plans or as directed by the Engineer.

2. **BASIS OF PAYMENT:**

The unit price bid per lineal foot for Steel Plate Guard Fence (Galvanized) shall include furnishing all required materials, placing all materials, and all labor, tools, equipment, and incidentals necessary to complete the work.

## SECTION XXX

### TRAFFIC CONTROL

#### 1. **DESCRIPTION:**

All construction signing, barricading, lighting, traffic control, and use of flaggers shall comply with the Manual on Uniform Traffic Control Devices and the City of Emporia Manual on Traffic Control for Street Construction and Maintenance Operations.

The successful contractor may be required to submit to the City Engineer a detailed drawing of traffic control plans for each area designated in these specifications. All such plans are to be submitted in sufficient time for the City Engineer to approve each set of plans prior to beginning a project in a designated area.

The Contractor must provide adequate channelizing, barricades, lights, signs, and traffic control prior to beginning operations, during performance of excavation, forming, pouring, finishing, and curing concrete. Sufficient barricades and lights are required to protect the finished concrete from pedestrian and vehicular traffic for the duration of the required curing time.

The Contractor shall provide the Engineer with emergency project contact information. The information shall consist of the name and address of the Contractor, project supervisor's name and phone number and the phone numbers of responsible traffic control personnel for day or night emergency contact. This information shall be kept in the project file as well as distributed to the Police and Fire dispatch department.

#### 2. **BASIS OF PAYMENT:**

The lump sum price for Traffic Control shall include all materials, labor, installation, maintenance, energy for lights, 24-hour surveillance, temporary striping, and removal of signs and devices from each job site. Payment for traffic control will be 50 percent of the total bid price for Traffic Control on first submitted pay estimate and the other 50 percent on the final pay estimate.

## SECTION XXXI

### CLEARING AND GRUBBING

#### 1. **DESCRIPTION:**

This work shall consist of clearing, grubbing, removing and disposing of all vegetation and debris within the right-of-way and easement areas, except such objects, vegetation and material that are shown on the Plans or are designated by the Engineer to remain.

#### 2. **CONSTRUCTION REQUIREMENTS:**

##### **A. General:**

Unless designated otherwise, the Engineer will establish right-of-way lines and construction limits when necessary and designate all trees, shrubs, plants, and other things to remain. The Contractor shall preserve from injury or defacement all things designated to remain. Surfaces of trees or shrubs that are cut or scarred by the Contractor shall be painted with an approved asphaltum base paint prepared especially for tree surgery.

##### **B. Clearing and Grubbing:**

All surface objects and all vegetation including trees, brush, hedge rows, stumps, roots and other protruding obstructions, not designated to remain, shall be cleared and/or grubbed, including mowing, as required, except undisturbed stumps and roots and nonperishable solid objects which will be a minimum of four feet below subgrade or slope of embankments. When authorized, the Contractor may leave stumps and nonperishable solid objects provided they do not extend more than six inches above the ground line or low water level.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed, shall be backfilled with suitable material. The backfill shall be compacted in accordance with the best standard practice for the area and type of soil encountered.

The method of disposal of all materials shall be accomplished in accordance with all applicable Federal, State and local ordinances and regulations.

The Contractor shall make all necessary arrangements, in writing, with property owners for use of disposal locations outside the limits of the project, except the arrangement need not be in writing when approved dump or waste areas managed by a city or county are used. The Engineer shall furnish a copy of all written agreements. The waste locations shall be approved by the Engineer to avoid leaving unsightly areas. Low hanging branches on trees or shrubs designated to remain shall be removed as directed.

### **3. METHOD OF MEASUREMENT:**

When the Plans and Contract do not include the items of Clearing and Grubbing and Large Trees, or provide for payment therefore, the work prescribed under this item shall not be paid for directly but shall be considered subsidiary work pertaining to other items of the Contract.

When shown as a contract item, trees 40 inches or greater in circumference, measured 24 inches above the natural ground level, and non-decayed stumps 40 inches or greater in circumference measured twelve inches above the natural ground level or at the top of the stump if it does not extend to that elevation shall be measured per each "Large Tree" for payment.

When the Plans and Contract include item Clearing and Grubbing and provide for payment therefore, this work shall be measured by the lump sum. No measurement of the area will be made. This item shall include the removing and disposing of all vegetation, debris, hedgerows, brush and trees necessary for the construction and complete clearing of the project except for those items designated to remain by the Engineer.

### **4. BASIS OF PAYMENT:**

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price for lump sum "Clearing and Grubbing" or per each for "Large Trees", whichever is designated on the Plans and in the Contract, which prices shall be full compensation for furnishing all labor, materials, equipment, tools and incidentals necessary to complete the work.

## SECTION XXXII

### SEEDING

#### 1. **DESCRIPTION:**

This work shall consist of the furnishing and planting of seed at locations disturbed by the Contractor. The work shall include the preparation of the ground for the planting, fertilizing and mulching, and watering as specified.

#### 2. **MATERIALS:**

##### **A. Seeds:**

The Contractor shall provide grass seed of the variety and at the rates as required to produce the live seed rates shown below or as specified on the Plans. The vendor's certified statement for each species of grass and grass mixture stating each variety, percentage by weight, and percentages of purity, germination, and weed seed shall be furnished. Live seed for each grass species is the product of the percentage of purity and the percentage of germination.

The seed shall be new-crop seed complying with and labeled in accordance with U.S. Department of Agriculture "Rules and Regulations under the Federal Seed Act" in effect at date of purchase of seed. All seed shall be furnished in standard containers. Seed that has become moldy, wet, or otherwise damaged in transit or storage shall not be accepted.

A certificate shall be furnished to the Engineer showing the date that the seed was treated. The treated seed shall be planted within twenty-four (24) months after treatment and any treated Buffalo grass seed held by the Contractor or supplied beyond this period shall not be used.

The seed shall be stored in a cool dry place until seeding time. Seed application shall be at a rate of 8 pounds per 1,000 square feet of (Turf Type) Fescue.

##### **B. Fertilizer:**

Fertilizer shall be proportioned as specified on the Plans or shown below and shall be of commercial grade, uniform in composition, free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State Fertilizer Laws, and bearing the same trade name or trade mark, analysis and warranty of the producer. Fertilizer shall be applied at the rate of 1.0 pounds of actual nitrogen, 1.0 pounds of actual phosphorous, .5 pounds of actual potassium, and 100 lbs. of agriculture lime per 1,000 square feet, or as approved by the Engineer.

##### **C. Mulching:**

(1) Hay Mulch - Hay mulch shall normally be used. The hay shall not contain an excessive quantity of noxious weed seeds. The mulch shall be a sharp grade

prairie hay.

(2) Asphalt Mulch - Asphalt mulch shall be of a consistency for application by distributing machines and shall be Emulsified Asphalt type SS-1 of the type and grade as approved by the Engineer.

(3) Wood Cellulose Fiber Mulch - Wood fiber mulch shall consist of specially prepared wood cellulose fibers having no growth or germination inhibiting factors, dyed green, and as manufactured by Weyerhaeuser Company, or approved equal. The wood cellulose fiber shall have the characteristic of dispersing rapidly in water to form a homogeneous slurry and remaining in such state while being agitated in hydraulic-slurry equipment. Wood cellulose fiber mulch shall be shipped packaged or otherwise weighed at a maximum air dry moisture content of 14 percent.

**D. Water:**

Water shall not contain substances in the amounts considered harmful for the normal growth of vegetation. The Contractor shall supply water and watering equipment as required for the establishment and maintenance of grassed areas.

**3. SITE PREPARATION:**

**A. Project Coordination:**

After the construction has been completed, (except as provided below), the site has been brought to final grades as shown on the Plans, and other plantings have been accomplished, the Contractor shall prepare the areas to be grassed as specified. When so directed or permitted by the Engineer, portions of the construction site may be grassed at different periods of time provided that the planting occurs in proper seasons as specified. Any grassed areas damaged by subsequent operations of the Contractor shall be replanted as directed by the Engineer at no additional cost to the Owner.

**B. Tillage:**

The areas required to be grassed shall be prepared for planting by cultivation, removal of all objectionable material, and filling of gullies or depressions. The soil preparation shall be accomplished by disking, harrowing, and firming. (Plowing will also be required if so indicated on the Plans.) The minimum depth of soil preparation shall be three (3) inches. Existing weed stubble, small weeds and grass that can be disked shall be cut by the disk and partially incorporated into the soil. Several disking and harrowing over some areas may be required to provide a satisfactory seedbed. Areas too steep or otherwise inaccessible for disking shall be prepared by hand methods. The minimum depth of preparation of the seedbed where hand methods must be employed shall be two (2) inches. Disking, harrowing, and raking shall be done longitudinally on slope areas.

The soil preparation on all slope areas shall be performed with disks and harrows unless demonstration shows such methods impracticable and that hand methods must be used.

During the process of soil preparation, extreme care shall be exercised to avoid injury

to all trees that have been planted or designated by the Engineer to be saved.

The Engineer may designate local areas of desirable native perennial grasses to be omitted during the soil preparation. Areas of annual grasses such as cheat, crab grass, triple-awn, etc., shall be destroyed by thorough disking prior to seeding.

**C. Application of Fertilizer:**

Fertilizer shall be distributed uniformly at rates shown in Section XXXII Part 2B and over the area to be planted, and shall be incorporated into the soil to a depth of at least 2 inches by disking, harrowing, or other methods approved by the Engineer. Distribution by means of an approved seed drill or hydro seeder equipped to sow seed and distribute fertilizer at the time will be acceptable unless otherwise noted on the Plans.

Additional soil conditioners shall be mixed into the soil by disking, harrowing, etc., when specified on the Plans, or as directed by the Engineer and furnished by the Owner.

**4. SEEDING:**

**A. Time of Seeding:**

The two general seeding seasons shall be (1) Spring Seeding Season, February 15 to April 20, and (2) Fall Seeding Season, August 15 to September 30. The permissible seeding periods for various seeds may be extended a few days in special cases when mulching is specified to follow the drilling of seeds and fertilizer.

The Engineer reserves the right to delay the drilling or seeding of any seeds or to vary the permissible seasons listed above due to weather or soil conditions or for other causes.

**B. Seed Application:**

Seeds shall be uniformly distributed with acceptable drills, hydraulic-slurry, or other equipment approved by the Engineer. Broadcasting with a standard grass seeder will be required on areas where it is impossible to operate a drill and this method may also be required for certain small seeds.

When a standard drill with fertilizer attachment is used, certain mixed seeds may be placed in the seed box and the fertilizer placed in the fertilizer compartment. Both may be applied during one (1) operation, unless notes on the Plans require separate applications. Fertilizer may be drilled into the soil or applied by hydraulic-slurry. Broadcasting fertilizers is permissible on rough, rocky slopes where drills cannot operate.

All drills shall be fully adjustable so that they will deliver the seeds and fertilizer at the rates specified on the Plans or ordered by the Engineer. Drills that are in poor repair or that do not deliver the seeds and fertilizer uniformly in each drill furrow, shall not be used. Drills shall be adjustable so that the seeds can be planted and covered a

maximum depth of one-half (1/2) inch.

Most of the seeds should be drilled about one-half (1/2) inch deep in a well-prepared and firm seedbed. When the fertilizing and seeding operations start on an area, that area shall be completed as soon as possible. No seeding shall be done during windy weather or when the ground is wet or otherwise non-tillable. The grass seed shall then be covered, using a flexible toothed weeder or other suitable equipment. As soon as this covering operation has been completed, the seeded area shall be rolled again with the Culti-packer, the Culti-packer being run over the area only once parallel with the contours of the ground.

Kentucky bluegrass and Bermuda grass and seeds of similar size shall not be mixed with the coarse types of seeds. The finer seeds may be planted with certain drills by removing the seed tubes or they may be broadcast with hand seeder. Broadcast seeding shall be done when the weather is reasonably calm so that the seed will lodge on the prepared areas.

### **C. Mulching:**

(1) Applying Hay Mulch - Hay mulch shall be the required mulching material, unless specified otherwise on the Plans or directed by the Engineer. After seeding operations are complete the mulch shall be spaced uniformly by hand, manure spreader, or other suitable equipment. The mulch shall be anchored to the soil by a V-type wheel land packer, a disk harrow set to cut slightly, or other suitable equipment which will secure the mulch firmly into the ground two (2) inches or more to form a soil-binding mulch and prevent loss or bunching by wind. Spacing between disks shall not exceed 8 inches. Apply hay mulch at the rate of two (2) tons per acre or 90 lbs. per 1000 sq. ft.

(2) Applying Asphalt Mulch - Asphalt mulch shall be used only on very sandy soils and shall not be used unless specified on the Plans or directed by the Engineer. Emulsified asphalt may be diluted with additional water, when permitted by the Engineer, and applied with approved distributing equipment. The asphalt shall be applied to all areas regardless of slope and the rate of application shall provide a bituminous residual of not less than 0.12 gallons per square yard after loss of water.

(3) Applying Wood Cellulose Fiber Mulch - Wood cellulose fiber mulch may be used in lieu of hay mulch, when the Contractor elects to use a hydro seeder and the method is approved by the Engineer. Wood cellulose fiber mulch shall be applied at the minimum rate of 2000 pounds per acre, unless specified otherwise.

**D. Watering:** The Contractor shall water the seeded areas as required to assure an acceptable stand of grass.

## **5. PROTECTION AND MAINTENANCE:**

The grassed area shall be protected against traffic or other use immediately after planting. The Contractor shall be responsible for the proper care of the grassed area until all work on the entire contract has been completed and accepted, or a minimum period of 30 days, whichever is the longest duration. The Contractor will be relieved from watering grassed areas accepted by the Engineer and the Owner.

All planted areas shall be growing when accepted. Areas not showing a stand of grass or evidence of growth shall be replanted in accordance with these specifications. All costs in connection with replanting grassed areas shall be borne by the Contractor until an acceptable stand of grass is obtained, with no additional cost to the Owner.

**6. BASIS OF PAYMENT:**

Payment for seeding shall be "Lump Sum" and payment will be in full upon completion as approved by the Engineer.

## SECTION XXXIII

### MATERIAL TESTING

#### 1. **DESCRIPTION:**

Material Testing shall include the following:

Concrete: One set of cylinders every 500 lin. ft. of paving. One beam will be made during project. Mix design and gradation. (One for each part of project.)

Asphalt: Density taken every 500 lin. ft. Oil content extraction. Mix design.

Box: One set of cylinders for each of the walls, floor, and top.

Earthwork: Contractor to provide proctor results (moisture/density). City personnel will verify compaction with nuclear density meter. (One for each part of project.)

#### 2. **BASIS OF PAYMENT:**

Material Testing will be paid for at the contract lump sum. This item shall include all costs associated with the Contractor providing the above test results.