

SECTION 12

PORTLAND CEMENT CONCRETE PAVEMENT

12/08/15



STANDARD CONSTRUCTION SPECIFICATIONS

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12.00 SCOPE

The work included in this section shall consist of furnishing all materials and equipment and performing all labor and services necessary to prepare the site and construct the facilities specified herein and shown on the plans. The work shall include clearing and grubbing of any or all types of materials, removal and stockpiling of topsoil, site grading, construction of embankments, equipment and supervision necessary to construct Portland Cement Concrete Pavement. The Contractor shall perform all excavation to the depth shown of the plans or specified herein for all underground structures, including manholes, piers, and all other appurtenances show on the plans.

12.10 GENERAL

Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices. He shall take necessary precautions to protect the work and to safeguard the public. Streets closed to traffic shall be protected by effective barricades and obstructions shall be illuminated during hours of darkness. Warnings signs shall be provided to control and direct traffic properly.

12.20 PAVEMENT MATERIALS

- A. Concrete** - The concrete shall be 47B air-entrained in accordance with the Nebraska Department of Roads most current specifications. Concrete shall meet requirements of ASTM C-94.
- B. Portland Cement** - Portland cement used on City of Kearney projects shall be of Type I or Type II or Type 1PF (with type F fly ash) in accordance with the Nebraska Department of Roads most current specifications.
- C. Gradation Limits- Fine Aggregate** - Shall be as specified in Section 1033 "Aggregates", Table 1033.02A, Class B Aggregate of the most current Nebraska Department of Roads specifications.
- D. Gradation Limits- Course Aggregate** - Shall be as specified in Section 1033 "Aggregates", Table 1033.03A, Class E Aggregate of the most current Nebraska Department of Roads specifications.
- E. Water** - Mixing water shall be as specified in Section 1005 "Water for Concrete" of the most current Nebraska Department of Roads Specifications.
- F. Slump** - Slump for all hand placed concrete shall maintain a consistency between 1 and 3 inches. Slump shall maintain a consistency between ½ and 2 inches when slip-form placement is being used.
- G. Workability** - Concrete shall be of such consistency and composition that it can be worked into the forms and around the reinforcement without excessive vibration.

H. Mixing - Ready-mixed concrete shall be mixed and delivered to the site in accordance to AASHTO M-157 and by means of one of the following combinations of operations:

Mixed completely at a central mixing plant and the mixed concrete transported to the point of delivery in a truck agitator or in a truck mixer operating at agitator speed or in approved non-agitating equipment (known as central-mixed concrete).

Mixed partially at a central mixing plant and mixing completed in a truck mixer (known as transit-mixed concrete).

Aggregates and cement proportioned in a central plant and mixed completely in a truck mixer (known as transit-mixed concrete).

All mixers and agitators shall be operated within the limits of the manufacturer's rated capacity. They shall be operated at the speed of rotation for which the equipment was designed. Attached to each truck mixer and truck agitator shall be a metal plate on which is stated the manufacturer's capacities in terms of volume of mixed concrete and the manufacturer's stated speed of rotation for both mixing and agitation.

The truck mixer or agitator shall consist of a closed water-tight revolving drum suitably mounted and fitted with adequate revolving blades. Truck mixers shall be capable of combining aggregates, cement, and water into a thoroughly mixed and uniform mass of concrete and of discharging the concrete without segregation. Truck agitators shall be capable of transporting and discharging concrete without segregation.

For revolving drum type mixers the mixing speed shall not be less than seven (7) revolutions per minute of the drum nor greater than that which will produce a peripheral velocity of more than 225 feet per minute. For revolving blade type mixers, the mixer speed shall not be less than six (6) nor more than sixteen (16) revolutions per minute of the mixing blades. Agitation speed shall not be less than two (2) nor more than six (6) revolutions per minute of the drum or mixing blades.

Concrete shall not be used when the cement has been in contact with the aggregate more than 1-1/2 hours before it is placed. When the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.

I. Admixtures - Admixtures are materials added to portland cement concrete to change characteristics such as workability, strength, imperviousness, freezing point, and curing. Prior approval from the City Engineer or authorized representative must be obtained when the use of admixtures is warranted by the contractor. Admixtures must meet testing requirements describe in ASTM C-494.

J. Fly Ash - Mixes containing Fly Ash substitute will be allowed in accordance with the Nebraska Department of Roads most current specifications.

K. Water Reducing, Set Controlling Admixture - A Water-Reducing Admixture that reduces the quantity of mixing water required to produce concrete of a given slump may be use following approval of the City Engineer or authorized representative. Admixture must also follow ASTM C-494 specifications.

L. Reinforcing Steel - All steel shall be thoroughly cleaned of oil, mill scale, rust, and dirt before it is tied in place, and shall be re-cleaned if necessary prior to placement of concrete. All steel shall be accurately positioned and securely tied with suitable wire, or clips at intersections, and shall be adequately supported by concrete or metal chairs, spacers, hangers, etc., to prevent movement during placement of the concrete.

The distance between parallel bars shall be exactly as shown on the plans. The bars nearest and parallel to the forms shall be placed such that the minimum distance between the face of the bars and the forms shall be 2 inches.

At splices, bars shall be lapped at least 24 diameters or as shown in details and in all cases the lap shall be sufficient to transfer the stress between bars by bond and shear and to develop the full strength of each bar. Supports and ties shall be placed such that they will not be exposed or discolor the finished concrete.

In the event any steel moves or is displaced during placement of concrete, the steel shall be restored to its proper position before it is completely covered.

M. Reinforcing Bars - Reinforcing steel bars shall meet the applicable requirements and conform to ASTM A-615, Grade 40, Deformed Bars.

N. Dowel Bars - Shall be round bars conforming to ASTM A-615. Imperfections in bars that impair movement within concrete will not be allowed.

O. Expansion Joints - Expansion joint shall be of a premolded bituminous fiber type conforming to these specifications, and shall conform to ASTM M-33, M-153 Type III Standard Specifications and AASHTO M-58-42 and M-59-42.

P. Joint Sealing Material - The joint sealing material shall be melted uniformly and with constant stirring in an asphalt kettle of such design that direct flames are not applied to the immediate surfaces of the kettle which are in contact with the joint sealing material. The material shall be furnished or prepared in pieces of such size and shape that the material can be melted readily to the proper pouring consistency. The rubber-asphalt shall meet Federal Specification SS-S-164 or most current revisions. The heating of the material shall be arranged to minimize the length of time during which the temperature of the material exceeds 350 degrees Fahrenheit. In no case shall the temperature exceed the maximum recommended by the manufacturer. The joints shall be filled with the use of a pouring device which is satisfactory to the City Engineer or authorized representative. Precautions shall be taken to prevent spilling material on surfaces of the pavement adjacent to the joint.

Q. Metal Supports - Metal chairs used to support tie bars or reinforcing bars shall be channel shaped, pressed out of sheet steel of not less than twelve gage metal. Any assembly used to support bars shall be reviewed by the City Engineer or authorized representative.

R. Granular Foundation Course – Foundation course shall be either compacted bituminous, or crushed concrete and shall be in accordance with Section 307 of the Nebraska Department of Roads Standard Specifications.

S. Perforated Drainage Pipe – Perforated drainage pipe , granular bedding and filter wrap shall be in accordance with Section 914 of the Nebraska Department of Roads Standard Specifications. Granular Bedding gradation shall be as indicated in Section 914.

12.30 CONSTRUCTION METHODS

12.31 EARTHWORK

A. Clearing and Grubbing - Except for trees, shrubs, and grasses which are to be preserved as indicated on the plans or as designated by the Engineer, all trees, stumps, hedges, shrubs, weeds, grass, other herbaceous vegetation, and rubbish shall be removed from the right-of-way and from borrow pits furnished by the contracting authority. This work shall be classified as follows:

B. Site Preparation - This work shall consist of removal and disposal of all crosswalks, private walks, driveway approaches, curbs, curb and gutter, and headers as indicated on the plans or as directed by the City Engineer or authorized representative.

Topsoil shall be carefully removed and deposited in storage piles convenient to the area which will subsequently receive topsoil. Topsoil shall be kept separate from other excavated materials and shall be piled free from roots, stones, and other undesirable materials.

C. Excavation - Excavating and trenching operations shall at all times be conducted in a safe, orderly manner using methods and equipment designed and suited to the intended use by personnel experienced in the work being performed. None of the requirements or provisions specified herein or shown on the plans shall nullify or restrict any safety provisions required by any regulation or law governing the protection and/or safety of persons or property.

Common excavation shall include excavation of every description and of whatever substance encountered within the limits of the project and shall be performed by the Contractor to lines and grades as indicated on the drawings. The Contractor at his own expense shall submit a sieve analysis and density curve in accordance with ASTM D-698 or ASTM D-2049 of material encountered for the review by the City Engineer. Adequate drainage must be maintained during excavation efforts. All suitable material removed from the excavations shall be used, insofar as practicable, in the formation of embankments, backfill, and for such other purposes as directed by the Engineer. All excavated materials which are considered unsuitable shall be disposed of by the Contractor at his own expense. All excess excavated materials shall be considered surplus materials and shall be handled as outlined in the section of this specification entitle Surplus Materials.

D. Embankment - Embankment shall be constructed by depositing, placing, and compacting materials of acceptable quality above the natural ground or other surface

in accordance with the lines, grades, and cross sections shown on the drawings, and as required by the City Engineer.

Before any embankments are placed, all clearing, tree removal, sod and topsoil removal over the entire area shall be performed as directed by the City Engineer or authorized representative. Topsoil shall be excavated and stockpiled as directed by the City Engineer or authorized representative.

Sod within the area shall be removed to a depth of 6 inches. Trees, except those designated to be saved, and all stumps shall be removed. All trees designated to be saved shall be protected carefully during clearing and subsequent construction operations.

Each layer of the embankment material not to exceed 8 inches in loose depth shall be disked sufficiently to break down oversized clods, thoroughly mix the different materials, secure a uniform moisture content and insure uniform density and proper compaction. Each layer shall be thoroughly compacted by roller or vibratory equipment suitable for the type of embankment material.

All fill material shall be reasonably free from roots or other organic material, trash, frozen material, and free from all stones having a maximum dimension greater than 7 inches. Any stones larger than 3 inches, will not be permitted in the upper 6 inches of embankments.

Compaction shall be accomplished by sheeps-foot rollers, pneumatic rollers, or other equipment approved to achieve specified density. The Contractor shall add moisture to or dry out material by aeration of each layer as necessary to meet requirements for compaction. Materials must be within 3% plus or minus optimum moisture content to be placed in embankments.

Compaction of fill and embankment shall be as follows:

Under roadway and extending two (2) feet beyond proposed curb line measured perpendicular from the centerline shall be compacted to a density of not less than 95% maximum dry density as measured by ASTM D-698 or 75% relative density, ASTM D-2049.

At any point within the City of Kearney Right-of-Ways all embankments, fills, or trenching shall be compacted to a density of not less than 95% maximum dry density as measured by ASTM D-698 or 75% relative density, ASTM D-2049.

All other areas outside of the City of Kearney Right-of-Ways embankments, fills, or trenching shall be compacted to not less than 90% maximum dry density as measured by ASTM D-698 or 75% relative density, ASTM D-2049 unless otherwise specified.

Compaction testing of all fills and embankments for compliance will be done by the City Engineer or his approved representative.

E. Borrow - The Contractor will supply any borrow material needed to bring project to planned line and grade. Borrow material must be pre-approved by the City Engineer or his authorized representative. The Contractor is responsible for providing

a sieve analysis and density curve in accordance ASTM D-698 or ASTM D-2049 at no expense to the City.

F. Surplus Material:

All surplus earth shall be hauled and stockpiled by the Contractor at the location or locations designated on the plans. If no location is specified, excess materials shall be hauled and stockpile in the city owned property located south of the north channel of the Platte River and approximately one half mile east of avenue M or to a nearer location to be specified by the City Engineer during the construction of the project.

12.32 SUB-GRADE

A. Sub-grade - The sub-grade will be classified as the 6" of material below pavement slabs unless otherwise denoted on the plans. All sub-grade must be excavated or filled to achieve planned grade.

B. Sub-Grade Preparation - All paving sub-grade shall be brought to the exact lines, grades, and cross sections shown on the plans or as directed by the City Engineer or authorized representative.

The entire sub-grade must be scarified, air dried, wetted and/or compacted to 95% of maximum dry density obtained at optimum moisture content, plus or minus 3% as determined by procedure outlined in ASTM D-698 or 75%, ASTM 2049.

The sub-grade shall be constructed to have a uniform density throughout its entire width. All soft or yielding material and other portions of the sub-grade which will not compact readily shall be removed as directed. All hollow places, settlements, or other imperfections shall be filled with approved material and compacted.

In all places where embankment may be required to bring the sub-grade to the required height, it shall be constructed in horizontal layers not to exceed six (6) inches in depth before rolling. Each successive layer of material placed as described shall be wetted to within 3% of the optimum moisture content and compacted to at least 95% of the maximum dry density obtained at optimum moisture content as determined by ASTM D-698 or 75%, ASTM 2049.

C. Faulty Foundation - Work of correcting faulty foundation conditions below the 6 inches of subgrade depth will be performed on an "Extra Work" basis unless such conditions are caused by Contractor's own operations. Faulty foundation caused by Contractor's operations shall be corrected at the Contractor's expense.

D. Granular Foundation Course - This work shall consist of the construction of a compacted foundation course of granular material to the lines, grade, and dimensions shown on the plans on a previously prepared and approved sub-grade.

12.33 PAVEMENT

A. Block Outs - Block out or box out at inlets, curb returns at driveways and intersecting streets and at other locations as necessary to facilitate construction as needed to maintain one (1) foot minimum clearance. Provide for joint construction as specified. Block out of manholes will not be allowed unless approved by the City

Engineer. Adjust manholes, inlets, valve boxes and any other utility appurtenances to design grade prior to placing concrete pavement.

B. Concrete Placement - The City Engineer or authorized representative must inspect the depth and character of the foundations, the formwork, and the placing of reinforcing steel and inserts before the concrete is placed. Unacceptable conditions shall be corrected before concrete placement is allowed.

Rakes shall not be used in handling concrete. Necessary hand spreading shall be done with shovels only.

All water and debris shall be removed from the forms and excavations. Flowing water shall be diverted into side drains or sumps. Concrete shall be placed on clean, damp surfaces and shall not be placed on mud or on dry, porous earth.

Concrete shall be mixed and placed only when the temperature is at least forty degrees Fahrenheit (40°F) and rising.

When necessary, concrete shall be carried from the mixer to the forms in bottom dump concrete buckets, concrete buggies, or wheelbarrows, and shall be deposited as close as practical to its final position in the forms. Place in continuous horizontal layers, approximately twelve inches (12") thick, in order that it can be effectively consolidated with a minimum of lateral movement. Place each batch and each layer immediately following the preceding so that there will be no "cold joints" in the work, yet regulated in such a manner that the design pressure of the form work will not be exceeded. Work concrete into corners and around reinforcement and embedded items, with spades, in a manner that will fill all voids and prevent honeycombing and segregation of coarse aggregate.

Concrete shall not be allowed to drop freely more than five feet (5'). When the vertical distance for placement exceeds five feet (5'), the concrete shall be placed with a tremie.

Concrete shall be consolidated with mechanical, internal vibrating equipment supplemented with hand spading and tamping. Vibrators shall not be used for transporting concrete within the forms. Vibrating equipment shall maintain an impulse rate of not less than six thousand (6,000) impulses per minute when submerged in the concrete. At least one (1) spare vibrator, in good operating condition, shall be maintained on the job site as a relief. Vibrators shall be moved continuously from point to point the duration of vibration at any point being limited to that time necessary to consolidate the concrete without causing objectionable segregation. Apply vibrator at points spaced not farther apart than vibrator's effective radius and close enough to forms to vibrate surface effectively but not come in contact with form surfaces. Vibrator must penetrate fresh placed concrete and into previous layer of fresh concrete below.

Immediately remove any water that accumulates during placement of the concrete.

Top surfaces not covered shall be protected from rain and all other injurious conditions. Formwork and exposed reinforcing steel must not be jarred after concrete has taken its initial set.

Concrete found to be porous plastered, of less strength than specified, or otherwise defective, shall be removed and replaced in whole or in part, or repaired as directed by the City Engineer or authorized representative, at no additional expense to the City.

C. Sub-grade Preparation Requirements - The sub-grade shall be scarified to the depth shown on the Plans and bladed and compacted in a manner that will achieve required compaction. The surface of the sub-grade shall be finished to line and grade as established, and be in conformity with the typical sections shown on the Plans. Any deviation in excess of one-half (1/2) inch in cross-section and in a length of sixteen (16) feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping or compacting by sprinkling and rolling. Material excavated in the preparation of the sub-grade shall be disposed of as directed by the City Engineer or authorized representative.

When the density of the native earth in a Roadway section is determined by the Engineer to be less than that required for the method of compaction specified for the earth embankment, or where the nature or condition of the earth below the designated sub-grade is such that it may impair the stability of the sub-grade, the Contractor shall stabilize the sub-grade by the method selected by the City Engineer or authorized representative from among the following or other approved methods:

Thoroughly loosen the earth to a depth of 6 inches by scarifying, aerating or watering as applicable, and compact to the required density, or; Excavate below grade to the limits and depth designated by the City Engineer or authorized representative and by whose direction the excavated Material shall be temporarily stockpiled for use as backfill, placed in adjacent embankments, or, if unsuitable, wasted and replaced with selected Material or other designated backfill Material. If deemed necessary by the Engineer, the earth at the bottom of the excavation shall be loosened to a depth of 6 inches by scarifying, aerating or watering, as applicable, and compacted to the required density. The excavated area shall then be backfilled with the previously excavated and stockpiled, or selected, Material or with such other Aggregate backfill as may be ordered by the City Engineer or his approved representative. Backfill shall be placed and compacted in successive layers in accordance with the compaction method required for embankments under the provisions of the Contract. Excavation below finish grade as set forth above shall be classified the same as the excavation above final grade.

Once prepared, the sub-grade for surfacing shall be maintained in a finished condition until the first course of crushed rock base or the finish pavement surface is ready to be placed. The Contractor shall maintain the sub-grade by blading and compacting as frequently as may be necessary. All cuts, ruts, and breaks in the surface of the sub-grade shall be repaired in a manner acceptable to the City Engineer or authorized representative prior to placing paving Materials.

The Contractor shall take steps necessary to protect the prepared sub-grade from inclement weather, the Contractor's operations, and public Traffic prior to the placement of crushed surfacing, gravel base, pavement, etc. These steps shall include, but are not limited to, the use of plastic sheeting to protect the sub-grade from inclement weather, planking to protect the sub-grade from the Contractor's Equipment,

and the placing of paving Materials or base Materials from an adjacent lane in lieu of operating Equipment over the prepared sub-grade.

Construction equipment shall not operate in paving lane when conditions of the Project will permit operations from outside lane. Paving lane rutting or subgrade material displacement from equipment operation shall be cause for the Contractor to provide lighter trucks or suitable runways.

Trucks, on site mixers, transit mix trucks, and other heavy equipment shall not be used on previously paved lanes until the concrete is at least seven days old and the field-cured concrete has a flexural strength of 550 psi.

Equipment used for hauling over the prepared sub-grade which, in the opinion of the City Engineer or authorized representative, causes undue damage to the sub-grade or to the underlying materials shall be removed from the Work upon request of the City Engineer or authorized representative.

D. Machine Placement - Machine placement shall be done with the use of an approved self-propped paving machine of either the slipform/extrusion type or the type, which rides on metal forms. Hand operated or tractor drawn strike off and finish equipment will not be permitted for the mainline pavement construction. Slip form/extrusion machine shall be so designed as to place, spread, consolidate, screed and finish concrete in one complete pass in such a manner as to minimize hand finishing necessary to provide a dense and homogeneous concrete section. The slip form/extrusion machine shall be electronically controlled by both horizontal alignment and vertical grade by the use of string lines and sensors. The paving machine will not be allowed to operate off of the sub-grade for vertical control. Machine shall shape, vibrate and or extrude the concrete for the full width and depth of the concrete section being placed. It shall be operated with a continuous forward movement. Operations of mixing, delivery and spreading concrete shall be so coordinated as to provide uniform progress, with stopping and starting of the machine held to a minimum. Slip form/extrusion machine shall not be permitted to ride on or be driven on previously place concrete until concrete has cured a minimum of 3 days and achieved 85% of specified 28-day compressive strength.

E. Formed Method - Hand operated or tractor drawn strike off and finish equipment will not be permitted for the mainline pavement construction.

Outside forms shall be of metal, of depth equal to the design thickness of the pavement at its edge, and straight and free from warp. When integral curb is required, the additional height represented by the curb may be obtained by bolting extra forms upon the top of the main form. Wood forms of flexible or curved metal forms of proper radii shall be used for curves having radii of less than 100 feet. The forms shall be neatly, tightly and securely pinned and staked to the line and grade furnished by the Engineer. They shall not at any time show a variation of more than 1/8 inch in a 10 foot length from the true plane of top of form. Shimming with loose earth, pebbles, etc. will not be permitted. Forms shall be cleaned and oiled before concrete is placed against them.

Concrete shall be deposited into the forms without segregation and then mechanically vibrated for thorough consolidation. No concrete shall be placed against concrete that has taken its initial set unless the specified joint is provided. Concrete shall not be transported by means of mechanical vibration.

When pavement is being laid contiguous to previously finished concrete pavement of the same finished grade elevation or contiguous to previously finished independent curb and gutter, such finished pavement or independent curb and gutter may be made to serve as side forms for the implements for striking, tamping and finishing, so far as such may be found suitable in the opinion of the City Engineer or authorized representative.

F. Alignment and Grade - It shall be the responsibility of the Contractor to check that the correct alignment and grade has been established on all form work and string line guidance systems. Final checks must be done prior to ordering concrete, any deficiencies found must be corrected.

G. Form Removal - Forms shall not be removed until the member supported thereby has acquired sufficient strength to safely support its own weight, and the load imposed on it. Forms must remain in-place for a minimum of 24 hours unless otherwise approved by the City Engineer or his approved representative. Special care shall be taken to not damage structure while stripping forms.

H. Placing Reinforcing Steel - Unless otherwise specified, place reinforcing steel in accordance with CRSI Recommended practice for placing Reinforcing Bars.

I. Floating and Scraping - Concrete shall be struck off and consolidated by mechanical finishing machine method such that after final finishing it shall be at the exact elevation shown on the drawings. The finishing machine shall be provided with a screed, which will consolidate the concrete, by pressure. When hand finishing is used the pavement shall be struck off and consolidated by vibrating screed. When forward motion of the vibrating screed is stopped the vibration shall be disengaged.

After concrete has been struck off and consolidated it shall be scraped with a straightedge a minimum of 10 feet in length and equipped with a handle to permit operation from the edge of the pavement.

The 10 foot straight-edge shall be placed parallel to centerline to detect high spots and depressions in the pavement surface. Cut high areas and fill depressions in the fresh concrete until all irregularities are corrected. After straight edging, the surface of the concrete pavement shall be floated to remove straightedge marks, further consolidate and seal the surface and produce the final finish of the pavement before dragging.

Use of long handled wood floats shall be restricted to correcting unevenness not taken care of by straightedge tool. Pavement shall be checked with a 10 foot straightedge to ensure there are no depressions which will hold water.

J. Edging - All edges of concrete pavements must be finished with ¼ inch radius tool before initial set of concrete has begun.

K. Final Surface Finish - After the concrete has been floated transversely and the water sheen has disappeared from the surface of the pavement, the final finish shall be given with a burlap drag or brooming, or as directed by the City Engineer or authorized representative.

Contractor shall not add water to surface of concrete to assist in finishing operations.

If a broom finish is selected, it shall be accomplished by drawing a broom across the surface from the center line toward each side with the broom held perpendicular to the surface with only one stroke of the broom on each portion of the surface. (If the pavement is being constructed lane-at-a-time, the broom shall be drawn across the full width of each lane in one operation.) The broom shall be of the push broom type not less than 18" wide made from bass or bassine fiber not more than five (5) inches long and with a handle at least one (1) foot longer than the width of pavement being broomed in one operation. The brooming operations shall be executed so the corrugation will be uniform in appearance and not more than 1/16 inch in depth.

If a burlap drag finish is selected, it shall be accomplished by drawing a wet burlap, carpet, or canvas drag over the surface in a longitudinal direction. The drag shall be at least two (2) feet longer than the width of the slab being placed and shall be wide enough so about three (3) feet will be in contact with the pavement while it is in use. If burlap is used, the drag shall consist of not less than two (2) layers. Drags shall be rinsed or washed as often as necessary to remove hardened particles which would mar the uniform surface that would be obtained with a clean drag.

L. Integral Curbs - Integral curb, when required, shall be constructed on the edge of the concrete slab in accordance with the plans and typical cross section. This curb shall be formed integrally with the pavement or placed immediately after the concrete on the pavement has been placed and finished and before it takes its initial set. That part of the pavement which is to be covered by the integral curb shall be cleaned of all laitance and shall be roughened. Depressed curbs shall be provided at all driveway entrances and at such other locations as designated by the Engineer.

Curbs shall be formed to the cross section as shown on the drawings with a mule or templates supported on the side forms, and shaped with a float not less than 4' in length. Bring to proper surface by running a straightedge over steel templates with sawing motion, to fill holes and depressions. Immediately after using the straightedge, float surface with a wood float to draw cement to surface. Edge with appropriate tool.

M. Integral Curb Joints - Transverse construction joints must line up with and extend through integral curbs and pavement when placement of said roadways is planned. Application of joint filler materials must also be applied completely through the joint cut to back of curb.

N. Protection - The Contractor shall provide and maintain substantial barricades, warning signs, and lights to provide the public and the construction work adequate protection and keep all traffic off the pavement.

Contractor shall have materials available at all times to protect the surface of the plastic concrete against the rain. These materials shall consist of waterproof paper or

plastic sheeting. For slipform construction, materials such as wood planks or forms to protect the edges shall also be required.

When it is expected that, during the progress of the work, the air temperature may fall below 40 degrees Fahrenheit, a sufficient supply of burlap, insulated blankets, straw, hay, grass, or other insulation material suitable in the judgment of the Engineer, must be maintained on hand, to cover the concrete and to sufficiently protect the surface and edges against freezing until it is a least 10 days old. Hay, straw or similar lightweight, moisture absorbing material shall be covered with waterproof paper, burlap or plastic anchored to keep the material in place. In such case, at the discretion of the Engineer, wetting and spraying may be omitted. Manure shall not be used as a protection for green concrete. Whenever the temperature falls below 40 degrees Fahrenheit, at the Contractor's option, freshly finished concrete shall be protected by frames enclosed by canvas or other type of housing and the temperature of the air surrounding the concrete shall be maintained at no less than 45 degrees Fahrenheit. Sufficient heating apparatus, such as lanterns, suitable stoves or steam equipment, shall be furnished and maintained by the Contractor. Any concrete showing injury by freezing or uncovering shall be removed and replaced at the expense of the Contractor.

O. Curing - Protect fresh concrete from direct rays of sunlight, drying winds, and wash by rain.

Cure surfaces with curing compound applied in accordance with manufacturer's directions and as soon as surface water has dissipated. Cure exposed surfaces for at least 3 days after placement. Use curing compound complying with ASTM C-309 on all exposed surfaces. Perform application in accordance with manufacturer's directions but at a rate of not more than 400 square feet per gallon. Apply within 4 hours after finishing or as soon as surface moisture has dissipated. Curing shall include back of curb and all exposed surfaces.

Remove and replace concrete damaged by freezing as directed by the City Engineer or authorized representative.

P. Sawing and Sealing - All joints, spaced at intervals shown in the drawings, shall be sawed. In order to prevent uncontrolled cracking, the City Engineer or authorized representative may require selected joints to be sawed as soon as the concrete becomes sufficiently hardened to permit the sawing of a clean cut joint and to preclude the possibility of tearing and raveling. When selected joints have been sawed first, the time and sequence of sawing the remaining contraction joints shall be as determined by the City Engineer or representative. The sawing of all contraction joints, regardless of sequence, shall be completed in a timely manner to avoid premature or random cracking. Any premature or random cracking will require removal and replacement of that entire cracked panel.

The sawed joint must be to the depth, spacing and locations called for in the drawings. Water must be used on the blades during the cutting operations. The sawing of any joints shall be discontinued if a crack occurs at or near the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. A crack developing before sawing commences or cracks developing ahead of the saw shall be routed to a depth of approximately one and one-half inch in width.

When cutting the pavement slab, a chalked or other suitable line or guide shall be used to insure cutting in a true square line. Where there are gutter or integral curbs, they must also be cut to the proper depths to prevent erratic cracking.

Immediately after the joints have been sawed or the premature cracks have been routed, they shall be cleaned thoroughly to remove all dirt and loose material. The joints then shall be dried thoroughly and sealed.

The joint sealing filler shall be poured to seal the joints across the top and down the ends of the joints. Forming shall be used to hold the poured joints sealing material in the joint at each end until it has cooled and set.

The joints to be sealed shall be free of dirt, spills or other materials. If the concrete is cured with impervious membrane compounds, adequate precautions shall be taken to avoid application of the curing materials to the surfaces of the concrete, which will be in contact with the joint sealing filler. In the event that the curing membrane has been permitted to cover or coat any part of the surface of the concrete pavement in any joint, which will come into contact with the joint sealing filler, the Contractor shall remove the membrane from the affected areas. Surfaces to be sealed shall be cleaned thoroughly of all loose scale, dirt and other foreign matter with a jet of compressed air, and if necessary, by flushing with water. If water has been used on the saw blade during the cutting operation, the cleaning shall include flushing with water by use of a high pressure hose and thoroughly dried before pouring the joint sealing filler. Any other joints flushed with water shall also be thoroughly dried before pouring the joint filler.

The joint sealing material shall be melted uniformly and with constant stirring in an asphalt kettle of such design that direct flames are not applied to the immediate surfaces of the kettle which are in contact with the joint sealing material. The material shall be furnished or prepared in pieces of such size and shape that the material can be melted readily to the proper pouring consistency. The rubber-asphalt shall meet Federal Specification SS-S-164 or most current revisions. The heating of the material shall be arranged to minimize the length of time during which the temperature of the material exceeds 350 degrees Fahrenheit. In no case shall the temperature exceed the maximum recommended by the manufacturer. The joints shall be filled with the use of a pouring device which is satisfactory to the City Engineer or authorized representative. Precautions shall be taken to prevent spilling material on surfaces of the pavement adjacent to the joint.

12.34 JOINT APPLICATIONS

A. Contraction Joints - The joint shall be constructed where specified on the applicable construction drawings and shall conform to the joint detail. All joints shall be cleaned and sealed with specified material. The joints shall be true and straight to the center line and surface of the pavement. Variation of more than one half inch in ten (10) feet from a straight line will not be permitted. The joint shall be placed so its junction with the longitudinal joint will be a neat fitting connection. All contraction joints shall be done by the saw cut method to the depth and width shown on the drawings. To prevent the development of random cracks, joints at approximately eighty (80) feet intervals shall be sawed the same day as the pour is made or as needed to prevent cracking.

B. Planned Construction Joints - The joint shall be constructed where specified on the applicable construction drawings and shall conform to the joint detail. All joints shall be cleaned and sealed with specified material. Planned joints shall conform to the Keyed and Tied Joint Detail.

C. Emergency Construction Joints - Whenever concreting is stopped for a period of over thirty (30) minutes, a emergency construction joint shall be formed by finishing the concrete to a bulkhead made of two (2) inch material cut to the exact cross section of the pavement slab, as shown in the plans. Emergency joints shall conform to the Keyed and Tied Detail. When the concreting is resumed, the bulkhead shall be moved taking care not to disturb any concrete placed. The joints shall be constructed perpendicular to both the center line and the surface of the pavement. In no case shall an emergency construction joint be allowed within ten (10) feet after placing a regular expansion or construction joint. If the joint falls within this limit, the concrete shall be removed back to the previously installed joint. All joints shall be cleaned and sealed with specified material.

D. Longitudinal Joints - The joint shall be constructed where specified on the applicable construction drawings and shall conform to the joint detail. All joints shall be cleaned and sealed with specified material. Longitudinal contraction joints, when required, shall be in accordance with the requirements for contraction joints.

E. Expansion Joints - The joint shall be constructed where specified on the applicable construction drawings and shall conform to the joint detail. All joints shall be cleaned and sealed with specified material.

The joint shall extend entirely through the pavement and the joint filler shall be placed so the top edge will be one half inch below the surface of the finished pavement. No section of the joint material shall be shorter than the width of pavement strip between longitudinal joints. Before the pavement is opened to traffic, this space shall be swept, cleaned, and filled with approved joint sealing material.

12.35 ADJUSTMENTS

A. Adjustment of Manholes and Storm Sewer Inlets - Install frame and cover on top of manhole to positively prevent all infiltration or surfaces or groundwater into manhole. The frame shall be set in a bed of mortar with the mortar carried over the flange of the frame. Set frame so top of cover is flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.

All manholes encountered whether shown on the plans or not shall be brought to the proper grade by removing the castings and adjusting the tops of the existing manholes by removal or addition of precast concrete adjusting rings and resetting the frames and covers.

B. Adjustment of Valve Boxes - Valve boxes shall be adjusted to line and grade by removing the casting and adjusting the tops of the existing boxes or by adding the proper extension to achieve needed height of casting.

12.36 BACKFILLING

A. Backfilling - Required backfilling operations shall begin a minimum of 7 days after concrete placement. Excavation materials shall be refilled with suitable materials to the required elevations. Fill material shall be thoroughly tamped in layers. All excess concrete and debris shall be removed from excavation behind curb line before backfilling. The area between the curb and sidewalk or property line where no sidewalk exists shall be graded in a neat and orderly manner.

B. Final Grading and Topsoiling - After other outside work has been finished, and backfilling and embankments completed and compacted, all areas on the site of the work which are to be graded shall be established to grade at indicated elevations, slopes, and contours. If elevations are not indicated, existing elevations shall be matched.

The contractor shall supply and place 6" of topsoil in all areas to be seeded or 4 inches of topsoil prior to the placement of all sod.

After areas to be topsoiled have been approved for final grading, the surface shall be loosened and made friable by cross-disking or other approved methods, to a full depth of at least 2 inches (5 cm) to permit blending of topsoil to the sub-grade. Rake up all stones and debris 2 inches (5 cm) or more in any dimension and remove from the site after diskings. Spread topsoil to obtain a depth of 6 inches (15cm), the surface being at final grade. When finished, surface shall be free of stones and debris, 1 inch (2.5 cm) or more in any direction.

Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the results is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. If additional soil is required to be supplemented or disposed, it shall be a subsidiary obligation of the Contractor.

The areas between curbs and/or sidewalks and property lines; adjacent to driveways, shall be final graded and topsoiled.

12.37 OPENING TO TRAFFIC

A. Opening to Traffic - No section of pavement shall be opened to traffic until approval has been given by the City Engineer or authorized representative. The time for opening pavement will be based on the length of time the pavement is in place and on the strength of the concrete as determined from compressive strength specimens made during the progress of the work. The general public may be allowed on the pavement when the concrete has reached a minimum age of 14 days or when the concrete has reached an age of 7 days and developed a compressive strength of 3600 psi when tested in accordance with AASHTO T 22.

The Contractor's forces may be allowed on the pavement for the purpose of clean up work and sealing procedures any time after the concrete has reached a minimum age of 3 days and a compressive strength of 3000 psi in accordance with ASTM testing methods.

Slipform pavers and ready-mix trucks may be allowed on the pavement after the concrete has reached a minimum age of 3 days and a compressive strength of 3400 psi in accordance with ASTM testing methods.

If the contractor elects to increase the early strength of the concrete by adding cement and/or reducing the water/cement ratio, then the pavement may be opened to traffic after 48 hours provided it has attained a compressive strength of 3600 psi.

When unsatisfactory results or changed conditions make it necessary, the City Engineer may establish different requirements for the time the Contractor's forces may be allowed on the pavement. The City Engineer may order that any section of the project shall not remain closed to traffic for a period of more than 14 consecutive days after the concrete pavement has been placed. Before any area can be open the joints must be completed in accordance to the section "Sawing and Sealing" of these specifications.

12.38 CLEANUP

A. Cleanup - Cleanup shall progress with the project completion, as one area is complete the area shall be finished and clean. In no instance shall debris, waste materials be left lying around the construction site, these materials must be stored and disposed of properly and in a timely manner.

In case the cleanup work has not been done within two weeks or a time period specified by the City Engineer or authorized representative, the Contractor will not begin any new work until the said delay cleanup work has been done.

B. COATING FOR CAST IRON CASTINGS – All cast iron castings furnished and all exposed existing cast iron castings within the work limits are to be coated with standard oil base paint, either shop coated or field coated. Sandblast or power wire brush prior to painting.

12.40 OTHER PAVEMENT OPERATIONS

12.41 COLD WEATHER CONCRETING

A. Cold Weather Concreting - Except by specific written authorization, cease concrete placing when descending air temperature, in shade and away from artificial heat falls below 40 degrees F. Do not resume until ambient temperature has risen to 40 degrees F.

If placing is authorized maintain temperature of mix between 60 and 80 degrees F. Heat aggregates, water or both. Water temperature may not exceed 175 degrees F, aggregates, 150 degrees F.

Remove and replace frost damaged concrete.

Salt or other antifreeze is not permitted.

Comply with ACI 306.

12.42 HOT WEATHER CONCRETING

A. Hot Weather Concreting - Except by specific written authorization, cease concrete placing when plastic mix temperature cannot be maintained less than 90 degrees F.

Aggregates or water or both may be cooled. Cool water with crushed ice; aggregates by evaporation of water spray.

Never batch cement hotter than 175 degrees F.

Comply with ACI 305.

12.43 PAVEMENT PATCHING, REMOVAL AND REPLACEMENT

A. Pavement Patching, Removal and Replacement - Where pavement patching is approved, or concrete slabs are removed and replaced, the work must comply with all standard specifications and the following requirements.

Sub-grade and backfill shall comply with material and density requirements as mentioned elsewhere in this specification. Compaction to be 95 percent of standard density, as per ASTM D-698 or 75 percent relative density, as per ASTM D-2049 and plus or minus 3 percent of optimum moisture content.

Removals will be cut and removed in full panel section along existing joints. Unless otherwise approved by the City Engineer or authorized representative existing panels will not be removed and replaced in sections other than the entire panel.

Drill and grout number 4 rebar on 30" centers on all sides of the patch in accordance with standard drawings.

Fill void under existing pavement full of concrete.

Prior to placing patch, saw cut edge of existing pavement to ¼ depth and remove pavement section to provide a vertical face for a straight and true joint.

Install all reinforcing steel in accordance to the detail contract drawings.

Patch pavement as detailed or specified with concrete materials specified in this pavement section shall be a minimum of 2 inches thicker than the existing pavement structure.

Expansion joints, contraction joints, etc. shall be placed to match the original joint layout or as directed by the City Engineer or authorized representative. All joints shall be cleaned and sealed in accordance with these specifications.

12.70 QUALITY ASSURANCE

A. Concrete Testing Service - Contractor shall employ and pay for services of testing laboratory acceptable to the City Engineer to perform materials evaluation, testing, and design of concrete mixes.

B. Mix Design – Mix designs shall be submitted for review to the engineer at least 15 days before placing any concrete by the Contractor, at no expense to the owner. The design of the proposed concrete shall show water cement ratio, all ingredient weights and other physical properties necessary for the mix design, sieve analysis of the aggregate to be used, amount of air entraining agent required, slump and 7 and 28 day compressive strength in pounds per square inch.

C. Quality Control - All tests shall be performed in accordance with ACI testing procedures.

All tests shall be performed by ACI Concrete Field Testing Technician's or in direct supervision of project engineer.

Sampling procedures, Slump testing, Air Content, and Compressive Strength test will be in accordance to the appropriated ASTM standard: ASTM C-172, ASTM C-143, ASTM C-231, ASTM C-173, ASTM C-138, ASTM C-31.

Subgrade will be tested prior to placing concrete, at a minimum, once for each 180 square yards of subgrade prepared or for each independent pour of less than 18 square yards prepared.

Concrete shall be sampled and tested for each 150 cy of concrete placed or one set for everyday concrete is placed if less than 150 cy are placed. If the day's placement is less than 25 cubic yards tests may be waived with the approval of the City Engineer or authorized representative. Three specimens shall be taken. One specimen will be used to indicate quality and strength on 7 days. The two additional specimens will be used for the 28 day test.

12.71 THICKNESS

A. Requirements for Thickness - It is the intent that the pavement shall be constructed to the exact thickness as shown on the drawings. Determination of pavement thickness shall be based on cores taken from a unit of pavement surface area. The method of measuring the cores shall be in accordance with ASTM Standard Methods.

B. Length and Width of Units - Units will be considered separately and are defined as 750 linear feet of pavement for each separately placed width starting at the end of the pavement. The last unit for the width under consideration shall be 750 feet plus the fractional part of 750 feet remaining. When the length of a separately placed width is less than 750 feet, the length of the unit shall be the actual length. A separately placed width is defined as the width between field constructed longitudinal joints, between a longitudinal construction joint and the edge, or between two pavement edges, as the case may be. Exceptions to the pavement length shall be considered as exceptions in the unit length. In cases of separately place intersection

or blockouts, the normal width of pavement on either side shall be considered as continuing through in the same manner as would be applicable if the section under consideration had been placed continuously through the section. At the option of the City Engineer or authorized representative, cores may not be taken from irregular areas, from a lane less than eight feet in width, or for an entire contract involving less than 5000 square yards of pavement.

C. Cores - Cores shall be taken from within each unit of the pavement at random locations to be selected by the City Engineer or authorized representative. When computing the thickness of a unit which has a deficiency of more than 3.0% from the plan thickness, not less than three cores shall be taken. Special cores may also be taken in any locations where the City Engineer or representative has reason to believe deficiencies in materials or workmanship may exist.

D. Determination of Thickness - The thickness of the pavement at the cored points shall be the average caliper measurement of the cores taken at the respective points. At such point as the City Engineer or authorized representative may select in each unit, one core will be taken. If the core so taken is not deficient by more than 3.0% from the specified thickness, full payment will be made. If the core is deficient in the thickness by more than 3.0% but not more than 8.0% from the specified thickness, two additional cores will be taken from the area within the unit at approximately 250 foot intervals from the initial core when the unit length is 750 feet and intervals approximately equal to one-third the unit length for units more or less than 750 feet in length. The average thickness of three cores will then be determined. If the average thickness of these three cores is not deficient by more than 3.05 from the specified thickness, full payment will be made. If the average thickness of the three cores is deficient more than 3.0% but not more than 8.0% from the specified thickness, and adjusted unit price will be paid for the pavement unit, excluding any area deficient more than 8.0%, in accordance with Table I. In calculating the average thickness of the pavement in a unit, measurements which are in excess of the specified thickness will be considered as the specified thickness and measurements which are less than the specified thickness by more than 8.0% will not be included in the average. In event that the initial or designated additional cores are deficient in excess of 8.0%, the thickness used for determining the average will be considered as the design thickness minus 8.0%. Exploratory cores for determining limits of deficiencies of more than 8.0% or special cores will not be used in determining average thickness.

Average Thickness Deficient in percent of specified thickness	Percent of Contract Unit Paid
0 – 3.0	100.0
3.1 – 3.2	84.0
3.3 – 3.4	83.2
3.5 – 3.6	82.4
3.7 – 3.8	81.6
3.9 – 4.0	80.8
4.1 – 4.2	80.0
4.3 – 4.4	79.2
4.5 – 4.6	78.4

4.7 – 4.8	77.6
4.9 – 5.0	76.8
5.1 – 5.2	76.0
5.3 – 5.4	75.2
5.5 – 5.6	74.4
5.7 – 5.8	73.6
5.9 – 6.0	72.8
6.1 – 6.2	72.0
6.3 – 6.4	71.2
6.5 – 6.6	70.4
6.7 – 6.8	69.6
6.9 – 7.0	68.8
7.1 – 7.2	68.0
7.3 – 7.4	67.2
7.5 – 7.6	66.4
7.7 – 7.8	65.6
7.9 – 8.0	64.8
Above 8.0	No Pay

E. Thickness - Thickness Deficient more than 8.0% - When the measurement of any core is less than specified thickness by more than 8.0% the actual thickness of the pavement in this area will be determined by taking exploratory cores by the following procedure, unless, in the judgment of the City Engineer or authorized representative, this method of taking cores shall be varied to obtain a better check of the pavement. Cores shall be taken five feet on either side of the location of the deficient core parallel to the center line of the pavement. If both of these cores are within the 8.0% tolerance, no further special borings for this individual zone deficiency will be made. If either one or both of these cores are not within the 8.0% tolerance the procedure will be to cut cores in the following order on either side of the original short core parallel to the center line of the pavement: 25 feet, 50 feet, the same to be measured from the location of the original core found to be deficient in thickness, then at 50 foot intervals until a thickness within the 8.0% tolerance is found in both directions. On either side of the original short core, the procedure will then be to make a boring approximately one-half the distance between the first core which comes within the *.0% tolerance and the core nearest it which is below the 8.0% tolerance. The preceding procedure shall be repeated within the unit until the location (plus or minus five feet) at which the pavement comes within the 8.0% tolerance is located. When the thickness of the pavement is deficient more than 8.0% and the judgment of the City Engineer or authorized representative is that the area of such deficiency should not be removed and replaced, there will be no payment for the area retained.

12.80 SUBMITTALS

- A. Submittals** - The Contractor will submit the following:
- Shop Drawings as required by the Specifications
 - Sieve analysis and Density curves
 - Curing compound data
 - Complete data on the concrete mix, including aggregate gradations and admixtures, in accordance with ASTM C-94
 - Manufacturer’s application instructions for curing compound

- Ready-mix delivery tickets for each truck in accordance with ASTM C-94
- Material properties of the Reinforced Concrete Pipe
- Laboratory tests and reports
- Reinforcement details
- Required Permits
- City Engineer requested information.

12.90 MEASUREMENT AND PAYMENT

A. Measurement and payment - The following methods of measurement and payment to the Contractor will be used on all projects Owned and let by the City of Kearney unless otherwise specified in the Detailed specifications. Items not specifically listed in the Bid or defined by this specification shall be considered subsidiary to construction and direct payment will not be made for these items.

B. Clearing and Grubbing - No separate payment will be made for clearing and grubbing, as it shall be considered incidental to the items in the Bid. No separate payment will be made for trees, stumps, hedges, weeds and rubbish, grass, other herbaceous vegetation, and all rubbish encountered on the job site.

C. Preparation - Crosswalks, private walks and driveways approaches lying within the area between construction lines will be measured in their original position “of items to be removed”, and will be measured for payment in square feet.

Existing barrier curb, and curb and gutter to be removed will be measured for payment by length in linear feet. Measurements for the barrier curb will be made along the front face of the curb and measurements for curb and gutter will be made along the flow line of the gutter.

Removal of existing pavement headers will be measured for payment by length in linear feet.

Compaction over all existing utility lines will be measured for payment as a single unit, except when in clay soil, excavation, additional materials and recompaction over utility lines will be paid for as additional excavation.

No payment will be made for removal or replacement in excess of quantities shown on the drawing unless authorized by the City Engineer or authorized representative prior to removal.

D. Common Excavation – When listed as a bid item final measurement of excavation shall not be made. The quantity shown on the plans shall be an established quantity and shall be the basis of payment at the contract unit price per cubic yard bid for COMMON EXCAVATION. Such payment shall be full compensation for all stripping of vegetation, conservation of top soil, excavation, embankment, compaction, incorporation of water when required, materials, equipment, tools, labor and incidentals necessary to complete the work. When COMMON EXCAVATION is listed as a bid item separate payment for embankment will not be made, as this is considered subsidiary to earthwork measured as COMMON EXCAVATION.

E. Embankment – When listed as a bid item final measurement of embankment shall not be made. The quantity shown on the plans shall be an established quantity and shall be the basis of payment at the contract unit price per cubic yard bid for EMBANKMENT. EMBANKMENT is the amount of material to be placed and compacted to complete the required section. Quantities are established by average end areas of the cross-sections with no balance factor used. Such payment shall be full compensation for all excavation loading, hauling, spreading, compacting and other materials, equipment, tools, labor and incidentals necessary to complete the work in conformance with these Specifications and accepted by the Engineer. When EMBANKMENT is listed as a bid item separate payment for EXCAVATION will not be made, as this is considered subsidiary to earthwork measured as embankment.

F. Borrow - Separate payment for borrow will not be made, as this is considered subsidiary to earthwork measured as embankment.

G. Sub-grade Preparation - Sub-grade preparation shall be subsidiary to the pavement construction and no separate payment will be made as such.

H. Granular Foundation Course - Granular foundation course will be measured for payment by area in square yards or cubic yards, as denoted in the Bid.

I. Adjusting Manholes, Inlets and Valve Boxes - Adjusting manholes and inlets to grade will be measured for payment as a single unit for each manhole that is adjusted to grade as shown in the drawings or as directed by the City Engineer or authorized representative.

J. Portland Cement Concrete Pavement - Quantity of pavement laid shall be the number of square yards of full-depth pavement placed. Number of square yards shall be determined by the project Engineer. Quantity of accepted pavement shall be measured as above provided and shall be paid for at contract unit price per square yard as called for in Bid. Price shall constitute full compensation for joints, joint filler, sawing curbs, dowels and reinforcing required in the contract drawings: placing, finishing, curing and all labor, equipment, tools, incidentals and testing necessary to complete these items.

K. Integral Curb - Integral curb will be measured for payment by length in linear feet. Measurement will be made along the back side of the curb.

L. Headers - Concrete headers constructed as part of the paving project or district will be measured for payment by length in linear feet.

M. Transverse Expansion and Miscellaneous Joints - Transverse expansion joints and all miscellaneous joints using pre-molded bituminous fiber will be considered incidental to the paving construction, and not as a separate pay item.

N. Miscellaneous - Any item listed in the Bid and not delineated in the specifications will be measured in the most workmanlike manner for payment according to the designation listed such as cubic yards, square feet, square yards, linear feet, gallons, each, etc.

O. Concrete Testing - The testing of cylinders shall be paid for by the Contractor.

The City Engineer or his approved representative may require testing of coarse and fine aggregates and cement before they are used in the work. If so ordered, the Contractor shall pay the cost thereof.

If requested by the City Engineer or his authorized representative, soil proctors shall be provided by the contractor. If so ordered, the Contractor shall pay the cost thereof.