## CITY OF LINCOLN, NEBRASKA, STANDARD SPECIFICATIONS

### CHAPTER 4

#### PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

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PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

4.00 GENERAL

Portland Cement Concrete (PCC) pavement shall refer to, but not be limited to, streets, alleys, sidewalks, driveways, bikeways, concrete curbs and medians. All pavements to be constructed or reconstructed under each contract shall be placed at the locations shown on the plans, on an approved subgrade, in conformance with these Standard Specifications and in conformity with the lines, grades, typical cross section, and details shown on the plans and/or as directed by the City’s Project Manager, and shall be subject to the payment factors in 4.14 with the exception of Pavement Repairs covered in 4.12.

Pavement construction and reconstruction shall include all necessary removal of existing headers, pavement, sidewalks and drives; clearing, grubbing and stripping, excavation within the limits of the Work, removal of obstructions, removal and disposal of unsuitable material and debris, borrow excavation, construction of fills and embankments, haul, preparation and compaction of the subgrade; the construction of curbs, base, pavement, driveways, sidewalks; trimming, shaping and finishing of the parking space; excavation of ditches, grading and construction of approaches on intersecting or entering streets, alleys, driveways, and any other items of Work necessary to conform to these Standard Specifications and the lines, grades and cross sections shown on the plans, all as directed by the City’s Project Manager.

4.01 MATERIALS

Portland Cement Concrete (PCC) pavement shall be constructed of the materials as herein specified. All materials used in pavement construction and reconstruction shall be on the latest edition of the Nebraska Department of Transportation “Approved Products List” or “Nebraska Qualified Material Vendors List” unless otherwise approved by the City Engineer.

A. CONCRETE

Portland Cement Concrete (PCC) Pavement shall be class L-3500 concrete, as defined in Chapter 3, of the thickness, and with or without reinforcement, as shown on the plans unless otherwise specified. In the case of curbs, LC3500 is also an acceptable alternative.

B. REINFORCEMENT

All reinforcement bars shall conform to the requirements of “Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement” ASTM A 615, Grade 40 (300) or grade 60 (420). Bars shall be free from rust, scale, or other substances which prevent the bonding of the concrete to the reinforcement, excluding greasing of dowel bars as required in the plans and or in the contract. Smooth dowel bars shall be epoxy coated and conform to the requirements of “Structural Steel”, ASTM A36. All dowel and tie bar reinforcement in PCC pavement shall be epoxy coated and conform to the requirements of ASTM A775/A775M – 17.

The epoxy coating shall be free from holes, voids, contamination, cracks, or other damaged areas. A suitable patching material compatible with the coating and inert in concrete shall be made available to the Contractor by the manufacturer of the epoxy resin for repair of damaged coating areas at the applicator’s plant or in the field. The patching or repair shall be performed in conformance with the recommendations of the material manufacturer.
MATERIALS (Continued)

B. REINFORCEMENT (Continued)

Patching materials supplied or recommended by the manufacturer of the powdered resin shall be used to repair the coating and shall be applied to provide a minimum film thickness of 5 mils (125 μm) over the bare area. Areas to be patched shall be clean and free of surface contaminants. They shall be properly treated in conformance with the resin manufacturer’s recommendations before detrimental oxidation occurs.

Care should be taken during the patching procedure to assure that the coating thickness on the area adjacent to the patched area does not exceed 15 mils (375 μm). Extensive areas of damaged coating, exceeding that which is unavoidable in careful handling and shipping, may be cause for rejection of the damaged bars.

In no case, however, shall the total bar surface area covered by patching material exceed 5%. (The 5% total bar surface area is the combined area for repairs done in the fabricator’s shop and those done in the field.)

Proper repairs shall be the Contractor’s responsibility even when the work is done by an applicator, fabricator, or other subcontractors.

C. REINFORCING BAR SUPPORTS

Reinforcing bar supports for use in concrete pavement shall be of a design and material satisfactory to the City’s Project Manager and of sufficient strength to hold the metal reinforcement in place while the concrete is being placed.

D. METAL DOWEL OR EXPANSION BAR SLEEVE

Metal or plastic sleeves for dowel or expansion bars shall be satisfactory to the City’s Project Manager and shall be of sufficient size and strength to permit the free sliding of the dowel bar after the concrete is in place.

E. PREFORMED EXPANSION JOINT MATERIAL

For Streets, expansion joint material shall conform to “Standard Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction” (non-extruding and resilient bituminous types) ASTM Designation D 1751. The joint material shall be 1” thick unless otherwise specified.

For all other applications, expansion joint material shall conform to “Standard Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction” (non-extruding and resilient bituminous types) ASTM Designation D 1751 or “Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction” ASTM Designation D 1839. The joint material thickness shall be per Lincoln Standard Plans unless otherwise specified.

F. JOINT AND CRACK SEALER

4.01 MATERIALS (Continued)

G. CURING COMPOUNDS

All curing compounds shall be of the white pigmented liquid membrane-forming type and shall conform to “Standard Specifications for Liquid Membrane -Forming Compounds for Curing Concrete”, ASTM Designation C 309, Type 2, Class A. Only curing compounds included on the latest edition of the NDOT Approved Products list or “Nebraska Qualified Material Vendors List” shall be used unless otherwise approved by the City Engineer.

All curing compounds shall be ready for use as is without further dilution. The rate of application shall be as recommended by the manufacturer, or as stated in these specifications.

H. METAL KEYWAY

Metal keyway, where shown, shall conform to the gauge and cross section shown in the Lincoln Transportation and Utilities Standard Plans.

4.02 PREPARATION OF SUBGRADE

No measurement or direct payment shall be made for preparation of subgrade. The cost of preparation of subgrade shall be considered subsidiary to the other items of Work for which direct payment is made.

The subgrade shall be prepared as specified in Chapter 2 of these Standard Specifications. To prevent the absorption of moisture from the newly deposited concrete, the subgrade shall be kept moist by light applications of water until the concrete has been placed.

4.03 FORMS

A. GENERAL

No direct payment shall be made for forms. The cost of form work shall be considered subsidiary to other items of Work for which direct payment is made.

Upon complete removal of the forms, all honeycombed areas or small defects shall be properly pointed up with an approved grout mix and the concrete previously protected by the forms shall be cured as hereinafter specified or as directed by the City’s Project Manager.

B. RIGID FORMS

Forms shall be of an approved steel section with a minimum base width of 6’ and shall have adequate locking devices. The forms shall have a minimum length of 10’ for street paving. The forms shall be built straight and true and in conformance with established line and grade. On curves having a radius of less than 150’, approved forms may be used. The depth of forms shall equal at least the depth of the concrete to be placed. No built-up forms will be permitted without prior approval of the City’s Project Manager.

All forms shall be free from bends and warps at all times. They shall be cleaned thoroughly each time they are used and adequately oiled before concrete is placed against them. The forms shall be set so that they rest firmly throughout their entire length on the thoroughly compacted subgrade. They shall be neatly and tightly joined. They shall be accurately set to line and grade and sufficiently braced to resist the pressure of the concrete. Forms shall be set at least 150’ ahead of the paving operation.
4.03 FORMS (Continued)

B. RIGID FORMS (Continued)

The forms shall not be removed until new concrete is at least 12 hours old unless approved by the City’s Project Manager. During the operation of form removal, the edges of the concrete shall be cured as hereinafter specified.

When concrete pavement is being laid contiguous to previously finished pavement of the same finished grade elevation or contiguous to previously finished independent curb or curb and gutter, such finished pavement or curb may be made to serve as side forms.

Upon removal of the forms, all honeycombed areas or small defects shall be pointed up properly with an approved mix grout.

For Sidewalks, Driveways, and Bikeways only, the Contractor shall erect substantial forms of a material approved by the City’s Project Manager. Unless otherwise shown on the plans, sidewalks and bikeways shall be constructed so that, when finished, they shall have a uniform transverse slope toward the curb of 2%.

C. SLIP FORMS

Slip form equipment shall be provided with traveling side forms and screed of suitable dimensions, shapes, and strength to support the concrete for a sufficient length of time during placement to produce the required cross section. The equipment shall spread, consolidate and screed the freshly placed concrete in such a manner as to provide a dense and homogeneous product.

The slip form equipment shall have automatic sensor controls for both line and grade which operate from an offset control line.

All curbs shall be constructed using slip form paving equipment, except when specifically authorized by the City’s Project Manager. At the option of the Contractor and with the approval of the City’s Project Manager, slip form equipment may be used for construction of concrete sidewalks or bikeways.

4.04 PLACING REINFORCING STEEL / TIE BARS

No measurement or direct payment will be made for reinforcing steel or Tie bars. The cost of furnishing and placing reinforcing steel or Tie Bars shall be considered subsidiary to other items of Work for which direct payment is made.

All reinforcing steel shall be kept clean and free from foreign material that will prevent the proper bond with the concrete. Reinforcement steel / tie bars shall be placed as shown on the plans or Lincoln Transportation and Utilities Standard Plans. Reinforcement steel / tie bars shall be placed between the concrete driveway and the pavement when a commercial drive is being constructed in conjunction with new paving. The length and location of the reinforcement steel / tie bars shall be as shown on the drawings. The Reinforcement steel / tie bars shall project equally into the driveway and pavement section. The reinforcement shall be placed so that the outside longitudinal members will be located no more than 3” from the edge of the slab section and the ends of all longitudinal members shall extend to within 2” of the ends of the slab sections. All steel reinforcing bars shall be tied securely in place at all points where the bars cross.
4.05 CONCRETE PLACEMENT

No measurement or direct payment will be made for placing and finishing the concrete. Placing and finishing the concrete shall be considered subsidiary to other items for which direct payment is made.

The concrete shall be deposited uniformly on the prepared subgrades and distributed to the required depth for the entire width by shoveling or other approved methods. The concrete then shall be consolidated thoroughly, using an approved vibrating screed or in a manner approved by the City’s Project Manager. The concrete shall be so placed that no segregation of the materials occurs. It shall be struck off and finished, as hereinafter provided. Rakes shall not be used in handling concrete.

A. VIBRATING

No direct measurement or payment shall be made for vibrating or consolidation of the concrete. The cost of vibrating shall be considered subsidiary to other items of Work for which direct payment is made.

The concrete shall be well consolidated against the forms. All concrete, whether placed by machine or by hand methods, shall be thoroughly consolidated by means of mechanical vibrators approved by the City’s Project Manager. The vibrator shall consolidate the full depth and width of the concrete to a uniform mass without segregation and free from excessive surface mortar at a single passage of the machine. Machine mounted vibrators shall be operated only when the machine to which they are attached is moving. The vibrators shall be placed so as to allow a minimum of overlap vibration. The vibration frequency shall be greater than 4,000 impulses per minute. The Contractor shall have a tachometer available to check the speed of the vibrators.

B. FINISHING

1. General Finishing

Finishing the concrete pavement shall not be measured and paid for directly. The cost of the finishing will be considered subsidiary to the cost of other Work for which direct payment is made.

Whether the consolidation and finishing of the concrete is accomplished by either machine or hand methods, the following requirements shall apply and all equipment used shall meet the approval of the City’s Project Manager. Unless otherwise provided in the Special Provisions or approved by the City’s Project Manager, hand finishing as described herein may be employed only in cases of emergency and where mechanical methods are impractical. The consolidation and finishing of concrete sidewalk, bikeway or driveway may be accomplished by either machine or hand methods.

In general, the addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted. The proper use of an approved evaporation reducer is required instead. However, due to unavoidable delay in finishing or an unusual drying condition, a slight quantity of water may be added to the surface of the concrete as an aid in finishing. If it becomes necessary to sprinkle the surface with water to complete the finishing of the concrete, all mixing operations shall be immediately discontinued until the finishers catch up to a point where extra water for finishing is no longer required. If the application of water to the surface is permitted, it shall be applied in a fog spray by means of an approved orchard type sprayer. Spray equipment which is attached to the mechanical finisher, or any other paving equipment, will not be permitted.
4.05 CONCRETE PLACEMENT (Continued)

B. FINISHING (Continued)

1. General Finishing (Continued)

The addition of superficial water to the surface of the concrete shall be at the Contractor’s risk. The pavement shall be given a finish by means of a wet burlap drag. The drag shall be pulled in a longitudinal direction only. The drag shall be adequately maintained so that the resultant finish shall be uniform in appearance. On sidewalks and driveways, the final finish shall be obtained with the use of a broom. Brooming shall be transverse to the direction of pedestrian traffic.

Prior to the time the concrete takes its initial set, all expansion and construction joints and exposed edges shall be carefully finished with an edger having a radius of not less than 1/4". The edge shall be left smooth and true to line and grade. The Contractor shall provide a suitable work bridge spanning the concrete placement to facilitate the edging.

2. Machine Finishing

The concrete shall be deposited in such a manner that adequate concrete remains ahead of the screed and the finish machine to provide the cross section required. The concrete will then be further consolidated and finished mechanically with a power driven, self-propelled machine approved by the City’s Project Manager. The finish machine shall be operated over the entire width of the pavement section and shall achieve uniform consolidation. The tops of the forms and the contact surfaces of the wheels of the finishing machine shall be kept free from concrete and earth.

The finishing machine shall be kept in good repair at all times and shall operate so as to give the desired finish over the entire surface of the pavement. The forward speed of the finishing machine shall be adjusted to the average progress of the concrete production, in order that the strike off operation shall be as continuous and uninterrupted as possible.

After the final pass of the finishing machine, the surface shall be checked and corrected by using approved 10' long straight edges and refinished using long handled floats. The use of the long-handled floats shall be held to a minimum. The straight edge shall be lapped ½ its length on each successive position.

The Contractor shall furnish and keep in a convenient place a master straight edge, made of 6” steel channel, for the purpose of checking all straight edges and the longitudinal float during the progress of the Work. A sufficient number of straight edges shall be kept in readiness so as not to delay the paving operations.

Hand tools that perform the function of the finishing machine shall be immediately available for use in the event of an emergency.

3. Hand Finishing

After the concrete has been placed and spread, it shall be thoroughly consolidated by the use of approved vibrating screeds and struck off to a uniform height above the finished grade to the true cross section. When a non-vibrating hand screed is used or the pavement design thickness is greater than 6", the concrete shall be consolidated with an approved mechanical vibrator before the concrete is struck off.
4.05 CONCRETE PLACEMENT (Continued)

B. FINISHING (Continued)

3. Hand Finishing (Continued)

The screed used shall be of a design and construction suitable and adequate for the purposes required. It shall be designed to ride on the side forms of the pavement. The screed shall be of metal or steel shod wood and shall have sufficient strength and stiffness to retain its shape under all working conditions. The working or screeding edge shall be shaped to match the required cross section of the pavement. The screed shall be operated so that when riding on the side forms, the working edge will have an excess of concrete above grade to produce the required cross section after consolidation.

After the concrete has been consolidated and struck off, the surface shall be finished as specified above under machine finishing.

C. SURFACE TESTS

After the pavement has been set sufficiently to permit foot traffic, the slab will be thoroughly checked by the City’s Project Manager. All variations in excess of 1/8", measured from the surface of the concrete in place with a 10' straight edge or other device used for measuring deviations from a plane, shall be plainly marked. The Contractor shall eliminate such variations. When the surface finish of the pavement has been disturbed by grinding, the surface shall be repaired with the use of an approved sealant. The use of mechanical grinders will be permitted if their use does not, in the opinion of the City’s Project Manager, damage the pavement. Sections of pavement containing depressions which cannot be corrected by grinding shall be repaired or replaced by the Contractor to the satisfaction of the Engineer.

4.06 JOINTS

No direct measurement or payment will be made for joints or joint sealant. The cost of jointing and joint sealing shall be considered subsidiary to other items of Work for which direct payment is made.

A. TRANSVERSE CONSTRUCTION JOINTS

At the end of the day, or in case of an unavoidable interruption of more than 30 minutes, a transverse construction joint shall be placed at the point of the Work stoppage. The joints shall conform to the requirements for construction joints as shown on the plans and as specified herein.

Whenever concrete pavement construction is stopped for a period of over 30 minutes, a transverse construction joint shall be formed by finishing the concrete to a bulkhead made of at least 2" material cut to the exact cross section of the pavement slab, as shown on the plans. The bulkhead shall be placed on the subgrade perpendicular to the pavement surface and at right angles to the center line of the street. An edging tool shall be used along the bulkhead to make the construction joint a well-defined line. Construction joints shall not be spaced closer than 10'. When the placing of concrete is resumed, the bulkhead shall be removed and care shall be taken not to disturb any steel or concrete placed. The new concrete shall be placed directly against the face of the concrete previously placed. The joint shall be formed and finished so the surfaces of the previously placed concrete and new concrete correspond exactly to the cross section and grade shown on the plans.
B. EXPANSION JOINTS

1. Transverse
   When transverse expansion joints are indicated on the plans, they shall be constructed at the location and in conformance with details shown in the plans or Lincoln Transportation and Utilities Standard Plans. The joint material shall extend entirely through the pavement and shall be placed so the top edge will be 3/8" below the surface of the finished pavement and curb.

   During the placing and the finishing of the concrete pavement, the expansion joint material shall be held securely by means of a special holder approved by the City’s Project Manager. Extreme care shall be exercised in placing concrete around the joint so the joint will remain in the true position specified herein.

   After the edges have been rounded, the surface of the pavement across the joint shall be tested with a 10' straight edge placed parallel to the center line of the pavement and drawn from the center of the pavement to the edge. Any high spots or depressions shall be eliminated and the edges rounded as hereinbefore specified. Any surplus concrete at the ends of the joints shall be cut away when the forms are removed.

2. Other
   Expansion material shall be formed around all objects that project through the pavement unless otherwise directed. When the pavement is placed against buildings, sidewalks and other unyielding objects, 1" expansion joint material shall be placed between the object and the new concrete.

C. CONTRACTION JOINTS OR PLANES OF WEAKNESS

Contraction joints or planes of weakness called for on the plans shall be constructed at the locations indicated and in conformance with details shown on the plans or as directed by the City’s Project Manager. Maximum joint spacing shall be 15' unless otherwise directed by the City’s Project Manager.

All joints shall be made with a motor driven concrete saw to a minimum depth of 1/3 the pavement thickness. The sawing shall be accomplished not later than 48 hours after concrete placement nor so soon as to cause spalling of top aggregates. When “extra strength” concrete is used, the joints shall be sawed within 24 hours after concrete placement. Transverse contraction joints generally shall be sawed within 18 hours after concrete placement. In any event, the concrete shall be sawed before random cracks develop. The sawing of any joint 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.

Any cracks that have developed in the pavement shall be routed to a depth of 1" by 3/8" in width and sealed. The joint between the curb and gutter section and concrete pavement shall be sawed to a depth of 1" and sealed.
4.06 JOINTS (Continued)

D. JOINT AND CRACK SEALING

Unless otherwise approved by the City’s Project Manager, joints/cracks shall be sealed before the pavement is opened to traffic or to use by construction equipment, and as soon after completion of the sawing as is feasible. Just prior to sealing, each joint/crack shall be thoroughly cleaned of all foreign material, using approved equipment, and the joint/crack faces shall be clean and surface dry when the seal is applied.

The joint/crack shall be cleaned by high pressure compressed air or other approved methods to remove all residues. The joint/crack shall be filled from the bottom to the top without formation of voids. The top of the finished joint/crack seal shall be between 1/4" and 3/8" below the finished surface, unless shown otherwise on the plans. At the time of application of the joint/crack sealant, the joint/crack and pavement shall be dry and acceptable to the City’s Project Manager. No sealant shall be placed during unsuitable weather or when the atmospheric temperature is below 50°F or when weather conditions indicate that the temperature may fall below 32°F within 24 hours.

The joint/crack sealing filler shall be melted uniformly and with constant stirring in an asphalt kettle of the double boiler design with oil being used as the heating medium. 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 Contractor shall obtain from the supplier or from the manufacturer and furnish to the City’s Project Manager the manufacturer’s recommendations for mixing, application and temperature restrictions. These recommendations shall be followed strictly. In no case shall the temperature exceed the maximum recommended by the manufacturer. When proper pouring consistency is attained, the joints/cracks shall be filled as shown in the plans, through the use of pressure type applicator, of a design approved by the City’s Project Manager and equipped with a nozzle which will fit into the joints/cracks.

All adjoining surfaces shall be carefully protected during the joint/crack sealing operations, and any stains, marks or damage thereto, as a result of the Contractor’s operations, shall be corrected in a manner satisfactory to the City’s Project Manager.

4.07 CURING AND PROTECTION

A. CURING

No direct measurement or payment shall be made for curing and protection. The cost of curing and protection shall be considered subsidiary to other items of Work for which direct payment is made.

1. Curing With Liquid Membrane Curing Compound

Within 30 minutes after the concrete has been finished, the concrete surface and exposed vertical edges shall be sealed with a uniform application, no less than 1 gallon per 100 square feet, of a membrane curing compound as described previously in this chapter. This time may be adjusted by the City’s Project Manager if, in his/her opinion, conditions warrant. Concrete which exceeds the allowed time between finishing and curing operations will be subject to removal and replacement.

An approved self-propelled mechanical power sprayer shall be used to apply the curing compound to the concrete pavement except that approved manual spraying equipment may be employed on narrow or variable width sections where the use of a self-propelled mechanical power sprayer is impractical, and on irregular sections of street returns and alley returns.
4.07 CURING AND PROTECTION (Continued)

A. CURING (Continued)

2. Curing With Wet Burlap

Within 30 minutes after the concrete has been finished, damp burlap shall be carefully placed on the concrete and kept moist in a manner which will not damage the pavement surface. This time may be adjusted by the City’s Project Manager if, in his/her opinion, conditions warrant. Concrete which exceeds the allowed time between finishing and curing operations will be subject to removal and replacement.

The burlap shall be clean, evenly woven, free of encrusted concrete or other contaminating materials, and shall be reasonably free from cuts, tears, broken or missing yarns, and thin, open or weak places. The burlap shall be of sufficient length to cover all exposed surfaces including the vertical edges of the slab. At exposed vertical edges of the slab, earth shall be banked so that the top width of the berm shall be at least 6”.

The burlap shall be kept continuously saturated with water for at least 72 hours following the placing of the concrete, except that the burlap may be temporarily removed so that joints may be sawed and filled, the surface tested, and any grinding or rubbing necessary may be accomplished. While the pavement is uncovered, it shall be kept wet by sprinkling with water. Concreting operations shall be suspended when water is not available to cure the concrete.

B. PROTECTION

The Contractor shall provide and maintain substantial barricades, warning signs, and watchmen, when required, to protect the new pavement and Work site from vandalism and property destruction.

Any concrete showing injury from vandalism shall be repaired or removed and replaced at the Contractor’s expense, to the City’s Project Manager’s satisfaction. No heavy equipment or vehicular traffic shall be allowed on the new construction until the concrete has achieved a compressive strength of 3,000 psi. or 7 days have elapsed. A longer period of time may be required if, in the opinion of the City’s Project Manager, the concrete is not of sufficient strength to support the equipment or vehicles. If no compressive strength data is available, the concrete shall remain closed to all public and/or construction vehicles and equipment for 14 days from date of placement. Any construction vehicles and/or equipment on said concrete prior to meeting these requirements shall be penalized at the rate of $500 for each vehicle or piece of equipment per day.

4.08 INTEGRAL CURB

No direct measurement or payment shall be made for integral curb. The cost of integral curb shall be considered subsidiary to the items for which direct payment is made.

When required, integral curb shall be constructed on the edge of the concrete slab in conformance with the plans and typical cross section. The concrete for the integral curb shall be of the same mixture as used in the concrete slab.

The finish machine screed template should preferably leave enough concrete at the curb location to eliminate further carry back and handling of the concrete. The steel curb template shall be an integral part of the finish machine with a self-contained vibrator for the curb section.
4.08 INTEGRAL CURB (Continued)

When authorized by the City’s Project Manager, the curb may be placed immediately after the concrete in the pavement has been placed and finished, but before the concrete develops its initial set, by means of a curb machine equipped with a steel template and self-contained vibrator. Hand placement methods shall be finished with the aid of a metal mule template. This method shall be used only where specifically authorized by the City’s Project Manager.

4.09 PAVEMENT BASIS OF PAYMENT

A. GENERAL

Such payment shall be full compensation for all preparation of subgrade, forms or slip forming, curb and gutter, integral curb, materials, labor, tools, equipment, jointing, finishing, curing, sawing, sealing, backfilling, guarantee, cleanup and incidentals necessary to complete the Work.

Concrete placed shall be paid for per the concrete mix approved. However, concrete which does not make the minimum required strength for opening to traffic within 24 hours for Class PR or within 48 hours for Class L-5500 shall be paid for as Class L-3500 unless approved otherwise by the Engineer.

Curb drops shall be constructed at locations shown on the plans or as directed by the City’s Project Manager for the future construction or reconstruction of driveways or access ramps. No direct payment will be made for the Work of constructing curb drops. The cost of curb drops shall be considered subsidiary to the items for which direct payment is made.

B. PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

The pavement of the dimensions and thickness called for on the plans, constructed in conformance with the Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per square yard for PORTLAND CEMENT CONCRETE (PCC) PAVEMENT, __". The final measure shall be for pavement only, excluding curb and gutter. Plain (non-reinforced) concrete pavement of the various thicknesses called for in the proposal, constructed in conformance with these Standard Specifications and accepted by the City’s Project Manager.

No additional payment over the unit Contract Bid price will be made for any pavement which has an average thickness in excess of that shown on the Plans.

C. PORTLAND CEMENT CONCRETE (PCC) PAVEMENT with INTEGRAL CURB

The pavement of the dimensions and thickness called for on the plans, constructed in conformance with the Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price per square yard for PCC PAVEMENT with INTEGRAL CURB, __". The final measure shall be for pavement with integral curb and measured from back of curb to back of curb.

No additional payment over the unit Contract Bid price will be made for any pavement which has an average thickness in excess of that shown on the Plans.
4.09 BASIS OF PAYMENT (Continued)

D. REINFORCED PORTLAND CEMENT CONCRETE (RPCC) PAVEMENT

Reinforced concrete pavement of the various thicknesses called for in the proposal, constructed in conformance with these Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per square yard for REINFORCED PORTLAND CEMENT CONCRETE (RPCC) PAVEMENT, ___".  

No additional payment over the unit Contract Bid price will be made for any pavement which has an average thickness in excess of that shown on the Plans.

E. CONCRETE SIDEWALK; CONCRETE DRIVEWAY; CONCRETE BIKEWAY

CONCRETE SIDEWALK, ___" THICK; CONCRETE DRIVEWAY, ___" THICK; CONCRETE BIKEWAY, ___" THICK, that has been completed in conformance with the Plans and Standard Specifications and accepted by the City’s Project Manager shall be measured and paid for at the contract unit price bid per square foot. Sidewalks or bikeways constructed through future driveway locations shall be constructed to the minimum driveway thickness, and shall be measured and paid for at the appropriate unit price bid for Concrete Driveway.

F. COMBINED CURB AND GUTTER, CONCRETE BARRIER CURB, or CONCRETE MEDIAN CURB

COMBINED CURB AND GUTTER, CONCRETE BARRIER CURB, or CONCRETE MEDIAN CURB, completed in conformance with the plans and Standard Specifications and accepted by the City’s Project Manager, shall be measured along the face of the curb through all inlets.

Payment shall be made at the contract unit price bid per linear foot for each type and size constructed.

G. CONCRETE HEADER

Concrete headers shall be placed at the ends of all streets and intersections when the extended street or side streets are unpaved. Concrete headers constructed in conformance with Lincoln Transportation and Utilities Standard Plans and accepted by the City’s Project Manager shall be paid for at the contract unit price bid per linear foot for Install Concrete Header or Remove Concrete Header.

H. CONCRETE MEDIAN NOSE

CONCRETE MEDIAN NOSE completed in conformance with the plans and Standard Specifications and accepted by the City’s Project Manager, shall be paid for at the contract unit price bid per each.

I. CONCRETE MEDIAN SURFACING, 4" THICK

CONCRETE MEDIAN SURFACING, 4" THICK, completed in conformance with the plans and Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per square foot.
4.09 BASIS OF PAYMENT (Continued)

J. TACK-ON MEDIAN

TACK-ON MEDIAN, completed in conformance with the plans and Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per square foot.

4.10 ALLEY PAVEMENT AND ALLEY RETURNS

A. GENERAL

The finishing of concrete alley pavement and concrete alley returns shall proceed, in general, in conformance with the methods specified above under “Hand Finishing”, with the modification that after the required strike off and consolidation, the surface shall be floated longitudinally with a wooden float.

Where walls of buildings or other obstructions exist immediately adjacent to alley lines and against which the new pavement must be placed, an accepted bond breaking material will be applied between the existing building and new pavement necessary modifications of the methods specified in this section will be approved by the City’s Project Manager. No essential requirements, however, relating to quality of workmanship or trueness to grade and cross sections shall be waived. In general, a temporary screed strip shall be set to the proper grade, parallel to the alley line and approximately 1' there from, and a somewhat shorter screed shall be used.

As soon as the necessary screeding has been completed, the screed strip shall be immediately removed and the space filled with fresh concrete. Final finishing shall then be completed as specified under machine finish of these Standard Specifications. All jointing, jointing patterns and typical sections shall conform to Lincoln Transportation and Utilities Standard Plans.

B. BASIS OF PAYMENT

Alley pavement of the various thicknesses called for in the proposals, constructed in conformance with these Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per square yard for PORTLAND CEMENT CONCRETE (PCC) ALLEY PAVEMENT, __") $. Such payment shall be full compensation for all preparation of subgrade, forms or slip forming, curb and gutter, integral curb, materials, labor, tools, equipment, jointing, finishing, curing, sawing, sealing, backfilling, guarantee, cleanup and incidentals necessary to complete the Work.
4.11 CURB RAMPS

A. GENERAL

Curb ramps shall be constructed at the locations shown on the plans or as directed by the City’s Project Manager. Curb ramps thickness shall be equal to the pavement thickness, but no less than 6" and no more than 10". Said thickness shall be carried out a distance measured no less than 4' and no more than 6' measured perpendicular to the back of curb. All curb ramps shall be constructed with DETECTABLE WARNING PANEL material in conformance with the Lincoln Transportation and Utilities Standard Plans.

B. BASIS OF PAYMENT

Curb ramps shall be measured and paid for at the appropriate unit price bid for CONCRETE SIDEWALK, ___" THICK or CONCRETE BIKEWAY, ___" THICK. Such payment shall be full compensation for all preparation of subgrade, forms or slip forming, curb and gutter, integral curb, materials, labor, tools, equipment, jointing, finishing, curing, sawing, sealing, backfilling, guarantee, cleanup and incidentals necessary to complete the Work.

DETECTABLE WARNING PANELS material shall be paid for by the square foot of material in place.

4.12 PAVEMENT REPAIR

A. GENERAL

This work shall consist of repairing Portland Cement Concrete (PCC) pavement with Portland cement concrete (PCC), Asphalitic Concrete (AC), and/or hot-applied, flexible polymer modified concrete (FPMC) at the locations shown in the contract or as designated by the Engineer. The work shall include removing deteriorated concrete, disposing of the old concrete, preparation of the repair area, and furnishing, placing, finishing and curing of the PCC, FPMC, or Asphalt. This work includes full depth and partial depth repairs for pavement, curbs, joints, and cracks. Additional details are included in Lincoln Transportation and Utilities Standard Plans.

Concrete pavement repairs are grouped into 3 types based on the surface area of the patch (see Table 4.12A).

<table>
<thead>
<tr>
<th>Type</th>
<th>Size Square Yards (SY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Less than 5</td>
</tr>
<tr>
<td>B</td>
<td>5 to 15</td>
</tr>
<tr>
<td>C</td>
<td>More than 15 to 45</td>
</tr>
</tbody>
</table>

Repair areas exceeding 45 SY in size and not of full panel width shall also be paid as a Type C concrete pavement repair. Dowel baskets for full depth concrete pavement repairs shall be installed at transverse joints. Repair areas greater than 45 SY in size and of full panel width shall be paid for and constructed per City of Lincoln Standard Specifications for PCC pavement. Dowel baskets for PCC pavement construction shall be installed when present in existing pavement.
4.12 PAVEMENT REPAIR (Continued)

A. GENERAL (Continued)

Full depth concrete pavement repairs shall be a minimum of 4' in length and 4' in width. New curb shall be constructed as indicated on the plans or as directed by the City’s Project Manager, to the same dimensions as the existing curb and measured and paid for in conformance with Chapter 4 of the current City of Lincoln Standard Specifications.

Full depth pavement repair shall be constructed on a prepared subgrade or foundation course as prescribed in the contract. The thickness of the new concrete pavement shall match the existing pavement thickness or as shown on the plans.

Removal of concrete for partial depth pavement repair shall be to the depth necessary to reach sound concrete. The minimum depth of removal shall be 1.5" for FPMC, 2" for asphalt, 3" for PCC, or as shown on the plans. The maximum depth of removal shall be 4". The minimum width of removal shall be 2' for PCC pavement or joint repairs. The minimum width of removal shall be 1' for FPMC or asphalt pavement or joint repairs. The maximum mill width for crack repairs shall be 8".

B. MATERIALS

1. CONCRETE

Repairs shall be made with Class L-3500 if the contract allows for lane closures, partial/full closure of drive access, or detours to accommodate the extended curing period. Repairs made with Class L-5500 or Class PR concrete shall be at approved locations as shown on the plans or as directed by the City’s Construction Project Manager.

All concrete materials furnished by the Contractor shall conform to the requirements set forth in Chapter 3 of the current City of Lincoln Standard Specifications.

2. FLEXIBLE POLYMER MODIFIED CONCRETE

Partial depth concrete repairs constructed with flexible concrete material shall consist of hot applied, polymer modified resin compounds containing mineral fillers, chopped fiberglass fibers, and graded aggregates. The repair material shall conform to the requirements of Table 4.12B.

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Gray</td>
<td>Visual</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.8 – 2 g/cc</td>
<td>ASTM D2726</td>
</tr>
<tr>
<td>Flow</td>
<td>3mm max@60C@5hrs</td>
<td>ASTM D5329, 0.5&quot; thick specimen</td>
</tr>
<tr>
<td>Tensile Adhesion Elasticity</td>
<td>20% min</td>
<td>ASTM D5329, 0.75&quot; thick specimen @ 2&quot;/min</td>
</tr>
<tr>
<td>Resilience</td>
<td>50% Recovery</td>
<td>Tex-547-c</td>
</tr>
<tr>
<td>Flexibility</td>
<td>No Tear at Bend</td>
<td>ASTM D3111, 1&quot; dia., 0.4&quot; thick, 4&quot; wide</td>
</tr>
<tr>
<td>Application Temperature</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Aggregate Settlement</td>
<td>3% Maximum</td>
<td>Tex-551-c</td>
</tr>
<tr>
<td>Maximum Heating Temp</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

*As recommended by the manufacturer
4.12 PAVEMENT REPAIR (Continued)

B. MATERIALS (Continued)

2. FLEXIBLE POLYMER MODIFIED CONCRETE (Continued)

The material shall be suitable for pavement repair depths up to 4"; it shall be durable when subjected to vehicle traffic for climate conditions normal to Nebraska. It shall set up and withstand traffic within one hour. It must be specifically designed for repair of concrete spalls or partial depth repairs. The material must be able to resist water and form a tight seal to the concrete.

The repair material is to be supplied in a powder form, factory blended and bagged in wholly meltable type containers, and any of their components, shall be fully meltable and integrational with the polymer concrete material by the time the manufacturer’s minimum application temperature is reached. Material that is shipped in boxes shall not have staples. Unused material left in machine must be able to be reheated and used at least twice with no effect in the material’s performance.

A manufacturer’s recommended primer agent shall be used to coat the vertical and horizontal repair surface promoting adhesion and preventing moisture intrusion.

Bulking aggregate shall be as supplied by the manufacturer or shall be a hard, durable, clean, crushed rock meeting the gradation requirements of Table 4.12C and approved by the City’s Project Manager.

<table>
<thead>
<tr>
<th>TABLE 4.12C – BULKING AGGREGATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sieve</strong></td>
</tr>
<tr>
<td>1&quot;</td>
</tr>
<tr>
<td>3/4&quot;</td>
</tr>
<tr>
<td>3/8&quot;</td>
</tr>
<tr>
<td>No.200</td>
</tr>
</tbody>
</table>

Surface aggregate shall be as supplied by the manufacturer or shall be a hard, durable, clean, crushed rock meeting the gradation requirements of Table 4.12D and approved by the City’s Project Manager.

<table>
<thead>
<tr>
<th>TABLE 4.12D – SURFACE AGGREGATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sieve</strong></td>
</tr>
<tr>
<td>No. 4</td>
</tr>
<tr>
<td>No. 10</td>
</tr>
<tr>
<td>No. 200</td>
</tr>
</tbody>
</table>

3. ACCEPTANCE REQUIREMENTS

All materials used for concrete pavement repairs and joint repairs, otherwise not listed here shall conform to those requirements in the contract and or Lincoln Standard Specifications.

Flexible polymer modified concrete material and materials used in conjunction with it for repairs shall be accepted based on manufacturer’s certification of compliance letters.
4.12 PAVEMENT REPAIR (Continued)

C. EQUIPMENT

1. CONCRETE EQUIPMENT

A mobile mixer conforming to the requirements set forth in Chapter 3 of the current City of Lincoln Standard Specifications may be used.

Adequate hand tools shall be provided, including an internal vibrator. Internal vibrators and hand tools shall meet the concrete placement requirements of Chapter 4 of the current City of Lincoln Standard Specifications.

Screeds, either mechanical or hand operated, shall be used to finish the concrete except for small patches and integral curb repair. The screeds shall be either a vibrating or roller type screed specifically designed for striking off concrete and in conformance with the concrete placement requirements of Chapter 4 of the current City of Lincoln Standard Specifications.

Drills for dowels or tie bars, shall be capable of drilling the appropriately sized hole parallel to the surface of the concrete and the longitudinal centerline within 1/8".

2. FLEXIBLE POLYMER MODIFIED CONCRETE EQUIPMENT

Repair material must be melted in an appropriate indirectly heated mixing unit with horizontal shaft and full sweep agitation to uniformly mix the product and with an effective product delivery system. The temperature of material shall be controlled with an electronically controlled thermostat.

The repair site shall be milled with an approved milling machine to the specified width and depth. Pot holes or spalls shall be milled, saw cut and/or removed with a 15 lb. maximum chipping hammer.

A hot compressed air lance shall be used to clean and dry the repair surfaces when moisture is present. The hot air lance shall be capable of producing temperatures in excess of 2500° F and flow rates of 185 cfm.

Adequate hand tools shall be provided.

3. ACCEPTANCE REQUIREMENTS

All equipment used for pavement repairs and joint repairs, otherwise not listed here shall conform to those requirements in the contract and Lincon Standard Specifications.
D. CONSTRUCTION METHODS

1. REMOVALS GENERAL REQUIREMENTS

The Contractor shall remove the concrete pavement and curbs, if applicable, without damaging the adjacent concrete pavement and curbs. Repair of any damage caused by the operation is at the Contractor’s expense.

The Contractor shall remove and dispose of all old pavement, reinforcing steel, and all other materials. The repair section shall be removed with minimum disturbance of the underlying foundation course. Any loosened foundation course material shall be removed and replaced with concrete.

If reinforcing fabric is encountered, it shall not be replaced.

The Contractor shall cut around the perimeter of the repair area as shown in the plans. All repairs shall be cut so the edges are parallel or perpendicular to the traveled way. Saw overcuts shall be kept to a minimum.

The Contractor shall use hand or pneumatic tools to remove the concrete pavement. If the patch is full depth Type C, then a drop hammer may be used to remove the pavement.

When tie bars in longitudinal joints are damaged during concrete removal, they shall be replaced by the Contractor at no additional cost to the City with No. 5 reinforcing bars that are 18” in length. The new tie bars shall be installed into holes drilled in the existing concrete and secured in place with a non-shrink grout or epoxy on the Nebraska Department of Transportation (NDOT) Approved Products List.

2. PREPARATION

a. General

The repair sections shall be removed to the lines designated in the plans and or by the City’s Project Manager, including reinforcement that interferes with the operations. The wheel-type cutter shall be operated to produce minimum disturbance of the foundation course material, with no encroachment of the cut into the concrete of the adjoining lane. The Contractor shall uniformly moisten and compact the subgrade or foundation course to the satisfaction of the Engineer.

A bond breaker shall be used as shown in the contract.

Where the repair area is not bordered by existing concrete pavement, a form shall be used as the pavement edge to provide the same surface elevation and edge alignment as the existing pavement. The form shall be supported or braced in position to prevent movement during the placement and finishing of the concrete. Forms for concrete pavement repair shall conform to the requirements of this Chapter 4 of the current City of Lincoln Standard Specifications.
D. CONSTRUCTION METHODS (Continued)

2. PREPARATION (Continued)

b. Preparation Full Depth with Dowels or Tie Bars

Removal shall extend across the existing joint a minimum of 2’ into the adjacent panel in doweled concrete.

Dowel bars or tie bars shall be anchored into the faces of the existing concrete as designated in the contract.

The dowel bar holes shall be drilled at the same plane ± 1/8" and at the spacing shown in the contract.

The tie bar holes can be drilled independently.

The drilled holes shall be thoroughly cleaned with compressed air to remove all dust, dirt, loose material and moisture.

After cleaning and prior to dowel or tie bar insertion, an application of grout or Type IV, Grade 3 epoxy shall be made at the back of the hole. The grout or epoxy shall be from NDOT Approved Products List. Twist the dowel or tie bar one full turn during insertion to completely surround it with the grout or epoxy. The furnishing and installation of dowel and tie bars will not be paid for directly but shall be considered subsidiary to the concrete pavement or joint repair work being performed.

For the new matching transverse joints on repairs that span existing joints, the dowel baskets shall be placed parallel to the joint, and the dowel bars shall be parallel to centerline.

c. Preparation Partial Depth

For partial depth repairs, the Contractor shall cut and chip the pavement edges with a 15 pound (6.8 kg) maximum chipping hammer to form reasonably neat vertical surfaces.

The Contractor shall use a diamond blade to cut around the perimeter of the repair area.

Material shall be removed from the repair area to a depth and width necessary to provide sound pavement that will allow proper bonding and support of the repair material. The Contractor may use an approved milling machine capable of removing material to the horizontal and vertical dimensions needed. Otherwise, hand or pneumatic tools shall be used to remove the concrete pavement.

All surfaces, including the bottom, of the partial depth concrete repairs shall be free from loose concrete, sand, and other debris and shall be maintained in a dry and clean condition. Use a hot compressed air lance to clean and dry the repair surfaces for application of flexible polymer modified concrete.

All surfaces shall be cleaned and dry before the bonding agent is applied. The bonding agent shall be a Type IV, Grade 2 Epoxy Adhesive on the NDOT Approved Products List.
4.12 PAVEMENT REPAIR (Continued)

D. CONSTRUCTION METHODS (Continued)

2. PREPARATION (Continued)

   c. Preparation Partial Depth (Continued)

   The primer agent for flexible polymer modified concrete material utilized in partial depth repairs shall be as recommended by the manufacturer. Apply the primer agent to vertical and horizontal repair surfaces and allow to dry. The repair material shall be installed the same day the primer is applied. Do not use an open flame to dry the primer.

   All preparation of partial depth pavement repairs, otherwise not provided above shall conform to those requirements in the contract and or Lincoln Standard Specifications.

3. PLACING AND FINISHING

   a. Concrete

      The Contractor shall furnish and place the concrete. The concrete shall be handled and consolidated so there will be no separation of the aggregate and the mortar.

      An internal vibrator shall be used to consolidate the concrete.

      A vibrating screed shall be used on a full depth concrete repair that is a full panel width and two or more panels in length, to finish the concrete to the final elevation.

      The concrete shall be floated with a magnesium bull float and then given a drag finish with wet burlap, carpet, or canvas in a direction parallel to the traffic flow. If the surface is not to receive an overlay or smoothness grinding, it shall be finished to match the existing surface.

   b. Flexible Polymer Modified Concrete

      Mix and heat the repair material to a temperature as recommended by the manufacturer. Placement of the material at a temperature outside of the specified or manufacturer recommended temperature range may require removal and replacement of flexible polymer modified concrete material or concrete at the expense of the Contractor. All material heated in excess of the manufacturers maximum heating temperature for more than one hour shall be rejected.

      If bulking or surface aggregate contains surface moisture, dry the aggregate by heating, aerating or other method approved by the City’s Project Manager before placement in repair material.

      The heated repair material shall be placed in lifts with dry bulking aggregate at a rate of 20% to 30% of the repair volume, not to exceed 30% of the entire repair volume.
D. CONSTRUCTION METHODS (Continued)

3. PLACING AND FINISHING (Continued)

b. Flexible Polymer Modified Concrete (Continued)

One lift of heated repair material and bulking aggregate shall be defined as the placement of repair material followed by bulking aggregate uniformly spread over entire repair area and then enclosed by repair material. The bulking aggregate shall be installed such that 50% of the bulking aggregate is encapsulated by the lower layer of repair material and the remaining 50% will be enclosed in the top layer of repair material.

One lift shall fill approximately 1.5" to 2" of a repair depth. The repair material shall always be at least 3/4" thick at the bottom of the repair. Install additional repair material and bulking aggregate in 1.5" to 2" lifts until the repair is level with the existing pavement. Each lift shall cool to 200° F prior to placing the next lift. The final 1/2" of the repair shall consist of only flexible polymer modified concrete material (no bulking stone) for optimum flexibility of repair.

Dress the surface of the repair with surface aggregate. Perform this operation while the repair is still hot. The finished surface shall be within 1/4" of existing pavement. At the discretion of the Engineer, repair areas with depressions greater than 1/4" may be repaired by reapplying the heated repair material with surface aggregate. Do not use air lance or open flame to heat the existing surface material of the depression area.

Sweep the area and remove all debris from the site.

c. Asphaltic Concrete

The Contractor shall furnish and place the asphaltic concrete conforming to those requirements in the contract and or Lincoln Standard Specifications.

4. JOINTS/CRACKS

The Contractor shall create joints in full depth repairs as shown in the contract.

When pavement and joint repairs will not be overlaid, all saw cuts, random cracks, transverse joints, and longitudinal joints shall be thoroughly cleaned with compressed air to remove all dust, dirt, loose material and moisture, and sealed with hot pour joint sealant as specified in section 4.06. D.

Joints/cracks shall not be sealed until after any corrective work or Diamond Grinding and Texturing Concrete Pavement is completed. Formed joint wells that are destroyed shall be reconstructed, and joints/cracks of insufficient depth shall be deepened prior to sealing.
D. CONSTRUCTION METHODS (Continued)

5. CURING AND PROTECTION

a. General Concrete

The Contractor shall apply curing compound to all concrete pavement repairs. The cure compound shall be applied immediately after each patch is completed.

When pavement and joint repairs are overlaid with asphaltic concrete, the curing method shall be with tack coat. An approved asphalt emulsion or bituminous based compound may be used with approval of the City’s Project Manager.

White pigmented curing compound shall be used when the repair will be the wearing surface. The application rate shall be 1 Gallons per 100 Square Feet.

b. Class L-3500 Concrete

Class L-3500 concrete pavement repairs shall not be opened to traffic until the compressive strength reaches 3,000 psi as determined by the Maturity Method or cylinders, at the discretion of the City’s Project Manager. The maturity curve will be developed by the City’s Testing Lab. Concrete shall not be placed when ambient air temperature is expected to drop below 40°F (4°C) during the cure period.

c. Class PR and Class L-5500

Class PR and Class L-5500 concrete pavement repairs shall be covered with polyethylene film and then insulation board or insulated blankets immediately after the curing compound has been applied. The insulation board and insulated blankets shall have an R-value (thermal resistance) equal to or greater than 5 ft²-hr-°F/ BTU [1.0 m² (°C/W)]. Insulation and polyethylene film shall be maintained until concrete reaches opening strength.

Class PR and Class L-5500 concrete pavement repairs shall not be opened to traffic until the compressive strength reaches 3000 psi. This will be determined by use of Maturity Method or cylinders, at the discretion of the City’s Project Manager. The maturity curve will be developed by the City’s Testing Lab.

Table 4.12E is a guide to the minimum time the PR concrete will reach a compressive strength of 3,000 psi.

<table>
<thead>
<tr>
<th>Minimum Ambient Air Temperature</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>(41° – 60°) F (5° – 16° C)</td>
<td>12</td>
</tr>
<tr>
<td>(61° – 80°) F (16° – 27° C)</td>
<td>8</td>
</tr>
<tr>
<td>Above 80° F (27° C)</td>
<td>4</td>
</tr>
</tbody>
</table>

Concrete shall not be placed when ambient air temperatures are expected to drop below 40°F (4°C) during the cure period.
4.12  PAVEMENT REPAIR (Continued)

D. CONSTRUCTION METHODS (Continued)

5. CURING AND PROTECTION (Continued)

c. Class PR and Class L-5500 (Continued)

Class PR Concrete with calcium chloride added will be used for all concrete repairs if the repaired areas must be opened to traffic within 24 hours. Calcium chloride may be excluded from the concrete mix provided the minimum required strength can be attained within the allotted time.

Class L-5500 Concrete will be used for all concrete repairs if the repaired areas must be opened to traffic within 24 to 48 hours provided the minimum required strength can be attained within the allotted time. Non-chloride accelerators may be used to accomplish this with prior approval by the City’s Project Manager.

Concrete placed shall be paid for per the concrete mix approved. However, concrete which does not make the minimum required strength for opening to traffic within 24 hours for Class PR or within 48 hours for Class L-5500 shall be paid for as Class L-3500 unless approved otherwise by the Engineer.

d. Flexible Polymer Modified Concrete

Do not allow traffic over the material until after it has cooled to the point that it does not permanently deform under pressure, as recommended by the manufacturer or as directed. As a guide, allow on hour of cure time from final placement of repair material and surface aggregate for a 2" partial repair depth. Allow an additional 1/2 hour of cure time for each inch of repair depth exceeding 2".

e. Asphaltic Concrete

All curing and protection of asphaltic concrete shall conform to those requirements in the contract and or Lincoln Standard Specifications.
4.12 PAVEMENT REPAIR (Continued)

D. CONSTRUCTION METHODS (Continued)

6. SMOOTHNESS

a. Concrete

The pavement elevation of repair areas shall be corrected in a manner that eliminates
dips or bumps. Dips and bumps are defined as having a 1/8" or greater deviation using
an approved 10' straightedge. If the repair will be the wearing surface, the correction
shall be diamond grinding or replacement as directed by the City’s Project Manager.
The condition of the adjacent pavement shall be considered when evaluating the 1/8"
deviation requirement.

b. Flexible Polymer Modified Concrete

Any repairs that are rejected, at the discretion of the City’s Project Manager, due to
unsatisfactory or improper workmanship including repairs with surface profiles that
vary from the existing street profile by more than 1/4" or failures due to damage by the
operation or public traffic, if opened to traffic prior to approval, shall be removed and
replaced at no expense to the City.

c. Asphaltic Concrete

The smoothness of repairs shall conform to those requirements in the contract and or
Lincoln Standard Specifications.

E. BASIS OF PAYMENT

1. GENERAL

Adjacent pavement repairs of varying widths which are situated such that the removals of
the areas may be accomplished concurrently, shall be considered as a single repair. The
total area of the adjoining areas shall be combined to determine the repair type as shown
in Table 4.12A.

A joint repair shall be considered any repair that extends across the joint (regardless of
width) and is 9' or less in length. Any repair that extends across a joint where the final
measurement is in excess of 9' in length will be paid for as the appropriate pavement repair
item, as determined by Table 4.12A.

Acceptance of L-5500 and PR concrete shall be based on the concrete attaining 4000 psi
within 28 days from date of placement. This may be determined either by the maturity
method or test cylinders.

Acceptance of L-3500 will be based on the 28-day compressive strength of each day’s
production. If the 28-day strength fails, the Contractor has the option to take 3 core
samples, of the concrete in question, at no additional cost to the City. The average
compressive strength of the cores will be used to determine the actual 28-day compressive
strength. The cores must be taken within 35 days from the date the concrete was poured.
The Engineer shall select the site where the cores will be taken and take possession of them
immediately after removal from the pavement. The cores shall be delivered to the City’s
Testing Lab for testing.
4.12 PAVEMENT REPAIR (Continued)

E. BASIS OF PAYMENT (Continued)

1. GENERAL (Continued)

Unless stated otherwise in these specifications concrete not meeting the 28-day required strength based on cylinders or maturity method as determined by the Engineer shall be removed and replaced at no extra cost to the City. Unless stated otherwise the Engineer may evaluate the concrete’s expected use and may allow it to remain in place at 50% pay.

The sealing of all random cracks or joints associated with the pavement repair will not be measured and paid for directly but shall be considered subsidiary to the joint or pavement repair work being performed.

When it is determined by the City’s Project Manager that a partial depth repair needs to be changed to a full depth repair after the area has been prepared for a partial depth repair, the Contractor shall be paid for the area prepared at 50% of the unit price bid for partial depth repair in addition to the full unit price bid for the full depth repair.

Payment is full compensation for all work prescribed in this Section, including but not limited to saw cuts, removals, and reinforcement.

2. CONCRETE PAVEMENT REPAIR, TYPE ___, PARTIAL DEPTH FPMC

Partial depth flexible, polymer modified concrete (FPMC) pavement repair, Types A and B as determined by Table 4.12A, constructed in conformance with the Plans and the Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per cubic yard for CONCRETE PAVEMENT REPAIR, TYPE ___, PARTIAL DEPTH FPMC.

3. CONCRETE PAVEMENT REPAIR, TYPE A, PARTIAL DEPTH ASPHALT, TYPE 3

Partial depth Asphaltic Concrete pavement repair, Type A, as determined by Table 4.12A, constructed in conformance with the Plans and the Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per cubic yard for CONCRETE PAVEMENT REPAIR, TYPE A, PARTIAL DEPTH ASPHALT, TYPE 3.

4. CONCRETE PAVEMENT JOINT REPAIR ___, PCC

CONCRETE PAVEMENT JOINT REPAIR ___, PCC completed in conformance the Plans and Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per cubic yard.

5. CONCRETE PAVEMENT REPAIR, TYPE ___, FULL DEPTH, ___ PCC

Full depth Portland Cement Concrete (PCC) pavement repair, Types A, B, and C, as determined by Table 4.12A, constructed in conformance with the Plans and the Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per cubic yard for CONCRETE PAVEMENT REPAIR, TYPE ___, FULL DEPTH ___ PCC.
4.12 PAVEMENT REPAIR (Continued)

E. BASIS OF PAYMENT (Continued)

6. CONCRETE PAVEMENT REPAIR, TYPE ___, PARTIAL DEPTH, ___ PCC

Partial depth Portland Cement Concrete (PCC) pavement repair, Types A and B, as determined by Table 4.12A, constructed in conformance with the Plans and the Lincoln Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per cubic yard for CONCRETE PAVEMENT REPAIR, TYPE ___, PARTIAL DEPTH, ___ PCC.

7. JOINT SEALING

JOINT SEALING, shall be measured as the number of linear feet of joint sealing completed in place and accepted by the City. It shall be paid for at the contract unit price per linear feet for joint sealing. The width of joints may vary. It is the Contractor’s responsibility to review the existing conditions prior to bidding. This price and payment shall be full compensation for all labor, equipment, tools, material and incidentals required to complete the work.

8. CRACK SEALING

CRACK SEALING, shall be measured as the number of linear feet of crack sealing completed in place and accepted by the City. It shall be paid for at the contract unit price per linear feet for crack sealing. The width of cracks may vary. It is the Contractor’s responsibility to review the existing conditions prior to bidding. This price and payment shall be full compensation for all labor, equipment, tools, material, and incidentals required to complete the work.

4.13 SUBSTANTIAL COMPLETION

All projects involving items of paving shall be considered substantially complete when all items of Work shown on the proposal or called for in any other area of the Contract documents are completed to the satisfaction of the City’s Project Manager. Such items shall include but will not be limited to: curb and gutter, Asphaltic Concrete pavement/Portland Cement Concrete (PCC) pavement, streets, driveways, sidewalks, alleys, bikeways, concrete curbs, medians, adjustment of manholes, valve boxes, water stop boxes, backfilling, park spacing, joint/crack sealing, and pavement markings.

Liquidated damages shall continue to accrue until such time as the Work is deemed to be substantially completed by the City’s Project Manager. However, the Contractor may submit a written request to the City’s Project Manager for approval to suspend such liquidated damages to allow additional time for completion of minor items of the Work, such as seeding, sodding, and survey monuments. Granting the request for additional time by the City’s Project Manager shall not relieve the Contractor of the Contractor’s responsibilities for completion of those items for which the suspension is requested.
4.14 PAY FACTORS

A. COMPRESSIVE STRENGTH

A pay factor will be applied to each unit as required by the Engineer and based on the compressive strength. A unit will be comprised of the concrete represented by the day’s pour, not to exceed 750 linear feet.

Concrete strengths shall be based on the compressive strength of the 28-day cylinder or the maturity method at the discretion of the Engineer and subject to the pay factors in Table 4.14A.

If the compressive strength is below the required strength, the Contractor has the option to request a core sample of the concrete in question. The compressive strength of the core will be used to determine the actual 28-day compressive strength and subject to the pay factors in Table 4.14A. The core must be taken within 35 days from the date the concrete was poured. The Engineer shall select the site where the core will be taken and take possession of it immediately after removal from the pavement. The core shall be delivered to the City’s Testing Lab for testing concrete strength.

If the initial core fails, two additional cores may be taken within 7 days of notification. The additional cores will be taken within 6 inches of the original core in the longitudinal direction under the direct supervision of the Engineer. The average of all three cores will be used to determine the compressive strength pay factor.

<table>
<thead>
<tr>
<th>Percent of Required Concrete Compressive Strength</th>
<th>Pay Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 99.7</td>
<td>100</td>
</tr>
<tr>
<td>Greater than 99.0 to 99.7</td>
<td>99.5</td>
</tr>
<tr>
<td>Greater than 98.0 to 99.0</td>
<td>99</td>
</tr>
<tr>
<td>Greater than 97.0 to 98.0</td>
<td>97</td>
</tr>
<tr>
<td>Greater than 96.0 to 97.0</td>
<td>95</td>
</tr>
<tr>
<td>Greater than 94.0 to 96.0</td>
<td>93</td>
</tr>
<tr>
<td>Greater than 92.0 to 94.0</td>
<td>90</td>
</tr>
<tr>
<td>Greater than 90.0 to 92.0</td>
<td>85</td>
</tr>
<tr>
<td>Greater than 88.0 to 90.0</td>
<td>80</td>
</tr>
<tr>
<td>Greater than 86.0 to 88.0</td>
<td>75</td>
</tr>
<tr>
<td>Greater than 85.0 to 86.0</td>
<td>70</td>
</tr>
<tr>
<td>85.0 or less</td>
<td>Remove and Replace*</td>
</tr>
</tbody>
</table>

*When the compressive strength of the concrete is less than 85.0% of the required strength (after 28 days), the Engineer will evaluate the concrete’s expected use and may allow it to remain in place at 40% pay.
4.14 PAY FACTORS (Continued)

B. PAVEMENT THICKNESS

A pay factor will be applied to each unit as required by the Engineer. Based on the measured thickness the pavement core will be subject to the pay factors in Table 4.14B. The Engineer shall select the site where the core will be taken and take possession of it immediately after removal from the pavement.

If required, one core will be taken from each unit consisting of not more than 300 linear feet of pavement. If deficient by more than 0.25", 2 additional cores will be taken in the same unit and averaged. If any core is deficient by more than 0.50", the limits will be determined by coring the adjacent panels parallel with centerline of the street and repeated until the pavement comes within the 0.50" tolerance. The thickness pay factor in Table 4.14B shall be applied to the representative quantity of pavement.

<table>
<thead>
<tr>
<th>Average Thickness Deficiency</th>
<th>Pay Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0&quot; to 0.25&quot;</td>
<td>100</td>
</tr>
<tr>
<td>Greater than 0.25&quot; to 0.30&quot;</td>
<td>90</td>
</tr>
<tr>
<td>Greater than 0.30&quot; to 0.35&quot;</td>
<td>85</td>
</tr>
<tr>
<td>Greater than 0.35&quot; to 0.40&quot;</td>
<td>80</td>
</tr>
<tr>
<td>Greater than 0.40&quot; to 0.45&quot;</td>
<td>75</td>
</tr>
<tr>
<td>Greater than 0.45&quot; to 0.50&quot;</td>
<td>70</td>
</tr>
<tr>
<td>Greater than 0.50&quot;</td>
<td>Remove and Replace*</td>
</tr>
</tbody>
</table>

*When the thickness of the pavement is deficient by more than 0.50", the Engineer will evaluate the pavement’s expected use and may allow it to remain in place at 40% pay.