4. Edges against which additional pavement is to be placed shall be straight and slightly beveled downward toward the unpaved area a maximum of 40 degrees from the vertical plane. A lute or covered rake shall be used immediately behind the paver, when required, to obtain a true line and vertical edge. Any irregularities in the surface of the pavement course shall be corrected directly behind the paver. Excess material forming high spots shall be removed by a shovel or lute. Indented areas shall be filled with hot mix and smoothed with the back of the shovel being pulled over the surface. Fanning of material over such areas shall not be permitted.

5. Hand Spreading: In small areas where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand, if so directed by the Engineer. Approved wood or steel forms, rigidly supported to assure correct grade and cross-sections may be used. In such instances, measuring blocks and intermediate strips shall be used to aid in obtaining the required cross-section. Placing by hand shall be performed carefully; the material shall be distributed uniformly to avoid segregation of the coarse and fine aggregate. Broadcasting of material shall not be permitted. During the spreading operation, all material shall be thoroughly loosened and uniformly distributed by lutes or covered rakes. Material that has formed into lumps and does not break down readily shall be rejected. Following placing and before rolling, the surface shall be checked with templates and straight edges and all irregularities corrected.

F. Compaction:

1. General: As many rollers shall be used as necessary to provide specified pavement density. During rolling the roller wheels shall be kept moist with only sufficient water to avoid picking up the material. After the longitudinal joints and edges have been compacted, rolling shall start longitudinally at the sides and gradually progress toward the center of the roadway pavement. On parking area, pavement rolling shall generally begin on the low side and progress to the high side, overlapping on successive trips by at least 1/2 of the width of tandem rollers and uniformly lapping each preceding tract or covering the entire surface with a slow, but uniform speed with the drive roll or wheel nearest the paver. The speed shall not exceed 3 mph for steel-wheeled rollers or 5 mph for pneumatic-tired rollers.

2. Line of Rolling: The line of rolling shall not be changed suddenly or the direction of rolling reversed suddenly. If rolling causes displacement of the material, the affected areas shall be loosened at once with lutes or shovels and restored to the original grade of the loose material before being rerolled. Heavy equipment or rollers shall not be permitted to stand on the finished surface before it has been compacted and has thoroughly cooled.

3. Paving – Single Width: When paving in single width, the first lane placed shall be rolled in the following manner:

a. Transverse joints;
b. Outside edge;
c. Initial or breakdown rolling, beginning on the low side and progressing toward the high side;
d. Second rolling, same procedure as c. above;
e. Finish Rolling.

4. When paving in echelon, or abutting a previously placed lane, the longitudinal joint rolling shall follow the transverse joint rolling.

5. When paving in echelon, 2 inches or 3 inches of the edge which the second paver is following shall be left unrolled and rolled when the joint between the lanes is rolled. Edges shall not be exposed more than 15 minutes without being rolled. Particular attention shall be given to the construction of transverse and longitudinal joints in all courses. In laying the surface mix adjacent to any finished area, it shall be placed sufficiently high so that, when compacted, the finished surface will be true and uniform.

6. Transverse joints shall be carefully constructed and thoroughly compacted to provide a smooth riding surface. Joints shall be straight edged and string-lined to assure smoothness and true alignment. If the joint is formed with a bulkhead, such as a board, to provide a straight line and vertical face, it shall be checked with a straight edge before fresh material is placed against it to complete the joint. If a bulkhead is not used to form the joint and the roller is permitted to roll over the end of the new material, the line of joint shall be located back from the rounded edge a sufficient distance to provide a true surface and cross-section. If the joint has been distorted by traffic or by other means, it shall be trimmed to line. In either case, the joint face shall be painted with a thin coating of asphalt before the fresh material is placed against it.

a. To obtain thorough compaction of transverse joints, the material placed against the joint shall be tightly crowded against the vertical face of the joint. To accomplish this, the paving machine shall be positioned so that the material shall overlap the edge of the joint 1 inch to 2 inches. The depth of the overlapped material that has dislodged through raking or luting shall be removed from the pavement surface and discarded.

b. If a 3-wheeled roller is used, it shall be placed on the previously compacted material transversely so that not more than 6 inches of the rear rolling wheel rides on the edge of the joint. The roller shall be operated to pinch and press the mix into place at the transverse joint. The roller shall continue to roll along this line, shifting its position gradually across the joint, in 6-inch to 8-inch increments, until the joint has been rolled with the entire width of the roller wheel. Rolling shall be continued until a thoroughly compacted, neat joint is obtained. If only tandem rollers are available, they shall be similarly operated to complete the joint.

7. Longitudinal Joints:

a. Longitudinal joints shall be rolled directly behind the paving operation. The first lane placed shall be true-to-line and grade and have an approximately vertical face. The material being placed in the abutting lane shall then be tightly crowded against the face of the previously placed lane by 1 or 2-inches. The width and depth of the overlapped material shall be kept uniform along the joint for alignment purposes. Before rolling, the coarse aggregate in the material overlapping the joint shall be carefully removed with a rake or lute and discarded.

b. When rolling is accomplished with a 3-wheeled roller, it shall be shifted over onto the previously placed lane so that not more than 6 inches of the rear roller wheel rides on the edges of the newly laid lane. The rollers shall then be operated to pinch and press the fines gradually across the joint.

c. Rolling shall be continued until a thoroughly compacted, neat joint is obtained. If only tandem rollers are available, they shall be similarly operated to complete the joint. When the abutting lane is not placed in the same day, or the joint is distorted during the day's work, the edge of the lane shall be carefully trimmed to line and painted with a very thin coating of asphalt before the abutting lane is placed.

8. Edges: The edges of the pavement shall be rolled concurrently with or immediately after rolling the longitudinal joint. Care shall be exercised in consolidating the course along the entire length of the edges. Before it is compacted, the material along the unsupported edges shall be slightly elevated with a tamping tool or lute. This will permit the full weight of the roller wheel to bear on the material to the extreme edges of the mat. In rolling pavement edges, roller wheels shall extend 2 inches to 4 inches beyond the pavement edge.

9. Breakdown rolling shall immediately follow the rolling of the longitudinal joint and edges. Rollers shall be operated as close to the paver as necessary to obtain adequate density without causing undue displacement. The breakdown roller shall be operated with the drive roll or wheel nearest the finishing machine. Exceptions may be made when working on steep slopes. When both 3-wheeled rollers and tandem rollers are used, the 3-wheeled rollers shall work directly behind the paver followed by the tandem rollers. Only experienced roller operators shall be used for this work.

10. Second Rolling: Pneumatic-tired rollers or tandem rollers shall be used for the second rolling. The second rolling shall follow the breakdown rolling as closely as possible and while the paving mix is still of a temperature that will result in maximum density from this operation. Pneumatic-tired rolling shall be continuous (at least three complete coverages) after the initial rolling until all of the mix placed has been thoroughly compacted. Turning of pneumatic-tired rollers on the hot paving mix which causes undue displacement shall not be permitted.

11. Finish rolling shall be accomplished with 2-axle tandems or 3-axle tandems while the material is still warm enough for the removal of roller marks. If necessary to obtain the desired surface finish, the Engineer shall specify the use of pneumatic tired rollers. All rolling operations shall be conducted in close sequence.

G. Barricades: The Contractor shall safely barricade the completed area until the following morning except when authorized by the Engineer. The barricade may then be removed and that section opened to traffic.

3.5 DENSITY AND SURFACE REQUIREMENTS:

A. General: The completed asphalt concrete paving shall have a density equal to or greater than 95 per cent in Asphalt Concrete Base and Asphalt Sidewalk Pavement and 97 per cent in Asphalt Concrete Surface of a laboratory specimen prepared as specified in the section of these specifications entitled "Mix Design Criteria" and made from plant mix conforming to the job mix formula.

B. Repair or Replacement: All unsatisfactory work as determined by the Engineer shall be repaired, replaced or corrected in a manner acceptable to the Engineer. The surface of the final course shall be of a uniform texture and conform to the line and grade shown on the plans.

C. Control: Both density and thickness shall be carefully controlled during construction and shall be in full compliance with the plans and specifications. During compaction, preliminary tests, as an aid for controlling thickness, shall be made by means approved by the Engineer.

D. Testing: Representative samples of the compacted asphalt paving shall be obtained by the Contractor under the supervision of the Engineer and shall be tested by the testing laboratory as necessary to verify compliance with respective density requirements. The surface of the final surface course shall not vary from a 10-foot straight edge, applied parallel to the centerline, by more than 1/4 inch for parking area pavement, by 3/16 inch for roadway construction, or by 1/2 inch for asphalt sidewalk pavement.

END OF SECTION 2650

SECTION 2810 – SODDING AND SEEDING

PART I – GENERAL

1.1 WORK INCLUDED IN THIS SECTION: The Contractor shall furnish all plant, labor, and materials and perform all operations in connection with the placing, watering, and firming of sodded and seeded areas, complete and in strict accordance with these specifications and applicable drawings, and subject to the terms and conditions of the Contract. The Contractor shall sod disturbed areas where shown on the Drawings. All other areas disturbed for any reason during construction (and not shown to be sodded) shall be seeded.

1.2 RELATED WORK IN OTHER SECTIONS:

Demolition, Clearing and Grubbing............. Section 2100
Excavating, Filling and Grading................. Section 2200

1.3 QUALITY ASSURANCE:

A. Qualifications of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.

1.4 SUBMITTALS: All certificates required by law shall accompany shipments. Upon completion of the installation, deliver all certificates to the Owner's Representative.

1.5 PRODUCT HANDLING:

A. Replacement: In the event of damage or rejection, immediately make all repairs and replacements neccessary to the approval of the Owner and Engineer and at no additional cost to the Owner.

PART 2 – MATERIALS

2.1 TOPSOIL: Topsoil from the project site shall be used for all planting operations. All topsoil shall be to the satisfaction and approval of the Owner's Representative.

2.2 SOD: All grass sod shall be nursery grown native blue grass, zoysia, or fescue as necessary to match existing yard and free of objectionable grassy and broad leaf weeds. Sod shall be considered free of such weeds if less than 5 such plants are found per 100 sq. ft. of area. Sod will not be acceptable if it contains any of the following weeds: common bermuda grass (wiregrass), quackgrass, johnson grass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass. The sod shall be uniform thickness of 3/4" (±¼") and shall be mowed to a height of 2" to 2½" prior to stripping.

2.3 SEED: Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seed shall be furnished in sealed standard containers unless exception is granted in writing by the Owner's Representative. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

Kind of Seed	Percentage
Blue Grass, Kentucky (Poa. Pratensis)	50
Alta Fescus (Festuca Elatior arundances var alta)	20
Red Top (Agrestis alba)	5
Rye Grass, Domestic (Lolium jultiflorum and perene)	20
Total Grass Seed	95
Material Other Than Grass Seed*	5
TOTAL	100

(*) The aggregate percent of material other than grass seed as above stated shall include all non-viable seed, chaff, bulbs, live seed of crop plants other than those specified above, harmless inert matter and weed seed not exceeding 1 per cent by weight of pure live seed and other material in the mixture.

2.4 COMMERCIAL FERTILIZER:

A. Shall be composed of a formula 12-12-12 and shall conform to the applicable State fertilizer laws. It shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original unopened containers each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

B. Agricultural limestone shall be finely ground limestone rock containing a miminum of a combined total of "calcuim and magnesium carbonate equivalent" of from 85% to 90%. All the material shall pass a 3/16" screen, approximately 90% shall pass a #8 screen and approximately 15-20% shall pass a #100 screen.

2.5 MULCHING:

A. All seeded areas shall be mulched with mulch materials as specified hereinbefore or with clean dry straw and other binding materials subject to the approval of the Owner's Representative.

B. Hydro-Mulch: Mulch snall be a natural wood cellulose fiber processed so that it does not contain germination inhibiting factors and shall be dyed green. The fibers shall be capable of remaining in uniform suspension in water under agitation and of blending with grass seed and fertilizer to form a homogeneous slurry.

1. General: This Contractor has the option to hydro-mulch any or all of the areas to be seeded. Prior to carrying out this planting procedure, the Contractor shall submit in writing all materials, quantities, and equipment to be used for hydro mulching to the Engineer for approval.

2. Application: When applied to the ground surface by hydraulic means, the mulch shall be capable of forming a strong moisture holding mat uniformly impregnated with seed; and which after application, will allow absorption of moisture and allow irrigation and rainfall to percolate to the underlying soil. Suppliers shall certify that their product meets the above requirement based on testing.

3. Weight Specifications of this material shall refer only to air dry weight of fiber material. Absolute air dry weight is based on normal standards of the Technical Association of Pulp and Paper Industry for wood cellulose and is considered equivalent to 10% moisture. Containers shall show air dry weight content marked by manufacturer.

2.6 WATER: Water used, hose, and other watering equipment required for the work shall be furnished by the Contractor.

PART 3 – INSTALLATION

3.1 JOB CONDITIONS:

A. Areas to be seeded or sodded includes all project areas disturbed by excavation, grading, and other construction procedures required for the completion of this Contract.

B. Sodding and seeding shall be performed only during the seasons when satisfactory growing conditions exist. The planting operation shall not be performed during times of drought or other unfavorable climatic conditions. Time of planting shall be approved by the Engineer.

C. Prior to the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

D. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION FOR PLANTING: The areas to be sodded or seeded shall be prepared immediately prior to the placing of the sod or seed by thorough cultivating, smoothing, removal of clods, surface stone 1-inch diameter or larger, and weeds. Soil shall be in a moist condition prior to placing sod.

Grades on the areas to be sodded or seeded shall be maintained in true, even, and compacted conditions so as to prevent the formations of depressions. Areas that have washed or eroded shall be brought to grade and compacted thoroughly by the Contractor at his own expense prior to placing the sod or seeding. No grading shall be done when the soil is in a muddy or frozen condition.

Sod placed on slopes steeper than 2 1/2:1 shall be staked with 6 stakes per square yard or roll of sod.

3.3 APPLYING FERTILIZER: The previously described fertilizer shall be applied to the finished grade by approved spreader at the rate of 7.5 lbs. per 1000 square feet and shall be thoroughly raked into the top 2 inches of the surface before planting of seed. Spread ground limestone over all areas to be seeded at the rate of 50 lbs. per 1000 square feet, at least 2 days before spreading the inorganic fertilizer. Lime and fertilizer shall be uniformly incorporated into the soil to a depth of 1 inch by raking, harrowing or other approved method.

3.4 PLANTING SEED: Seed mixed in proportions as hereinbefore specified shall be broadcast by approved sowing equipment at the rate of 400 lbs. per acre. The seed shall be uniformly distributed over the designated areas. The seed shall be covered to an average depth of 1/2 inch by means of a brush harrow, spike-tooth harrow, chain harrow, cultipacker, or other approved device.

When delays in operations carry the work beyond the most favorable planting season for the grasses designated, or when conditions are such, by reason of drought, high winds, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the seeding operation shall be stopped and work shall be resumed only when conditions are favorable again or when approved alternate or corrective measures and procedures have been put into effect. If inspection during seeding operations or after there is a show of green indicates that areas have been skipped, the sowing of additional seed on these areas will be required.

The seeded areas will be inspected for acceptable grass coverage and will be acceptable when the grasses designated are growing and are in good condition, and no area more than 1/2 of one percent of the total area shall be bare, of which no single area shall be more than 3 sq. ft. in area. Any area larger than this will be not acceptable and shall be reseeded.

3.5 MULCHING:

A. All seeded areas shall be mulched at the rate of two tons per acre with clean dry straw and other binding materials and procedures specified hereinbefore.

B. All seeded areas optioned by the Contractor to be hydro-mulched shall be mulched at the following rates:

1. Slopes less than 4:1 = 2000 lbs. per acre

2. Slopes greater than 4:1 = 2500 lbs. per acre

3.6 LAYING OF SOD: Sod shall be laid so that no voids occur between strips and shall be immediately tamped or rolled. The sod shall then be thoroughly watered. The finished sodded surface shall be true to grade, smooth, even and equally firm at all points. Sod will be accepted after it shows definite growth and establishment. Areas of three square feet or more that do not show these signs shall be re-sodded by the Contractor, and those areas shall be in growing condition before acceptance will be made.

3.7 MAINTENANCE: All sodded and seeded areas shall be kept in a healthy, growing condition by watering, weeding, mowing, rolling, trimming, edging, etc., upon completion and acceptance by the Owner.by

END OF SECTION 2810

DIVISION 3 – CONCRETE

SECTION 3000 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION: The work hereunder covers the construction of all portland cement concrete street pavement and integral curbing, curb and gutter, driveway and sidewalk pavement and all other cast-in-place concrete construction required by the drawings or specified herein and includes, but is not necessorily limited to: all cement, aggregates, admixtures, reinforcing, tie bars, dowels, inserts, supports, spacers, form materials, form coatings, curing materials; and all mix design, mixing, transporting, forming, placing and bending of reinforcement, preparation for concrete placement, placement of concrete, consolidation, finishing, curing, and other items or operations required to provide sound and finished concrete work as required by the drawings and/or these technical provisions.

1.2 RELATED WORK IN OTHER SECTIONS :

A. General Requirements.................... Division 1
B. Site Work.................................. Division 2

1.3 APPLICABLE STANDARDS: All material shall conform to the latest editions, supplements and revisions of all standard specifications as referenced herein, applying where applicable to that particular material and work, and as further specified hereafter.

1.4 SAMPLING AND TESTING:

A. Testing Laboratory: A recognized testing laboratory selected by the Contractor but subject to approval by the Engineer and Owner, shall be employed by the Contractor to test all materials, prepare design concrete mixes, and to test all concrete to be incorporated in the project. The Contractor shall include in his proposal the cost of all testing to be performed prior to approval of the design concrete mixes for the project.

The cost of all concrete testing subsequent to approval of the design mixes shall be paid for by the Owner. Both the Engineer and the testing laboratory shall have access to all places where concrete materials are stored, proportioned, mixed and placed. Testing by the testing laboratory shall be performed in accordance with the following:

1. Coarse and fine aggregate shall be sampled and tested as follows:

Sampling – ASTM D-75
Gradation – ASTM C-136 & C-117
Impurities – ASTM C-40 (Sand), C-123, C-142
Soundness – ASTM C-88

2. The determination of slump of concrete shall conform to ASTM C-143. Slump tests shall be made by laboratory personnel for each pour and on an average of one test per 30 cubic yards of concrete throughout the project.

3. Test Cylinders: Concrete test cylinders shall be cast and tested in accordance with ASTM C-172, C-31 and C-39. Air content shall be determined in accordance with ASTM C-231. When ambient temperature is below 40°F. or above 90°F., test reports shall also show temperature of concrete at time of placement. A minimum of 3 job cylinders shall be made for each separate concrete pour, or as directed by the Engineer. Cylinders shall generally be made on an average of 3 per each 100 cubic yards of concrete. The Contractor shall ship the cylinders to the laboratory. One cylinder is to be tested on the 7th day, a second cylinder to be laboratory cured and tested on the 28th day. The third cylinder is to be laboratory cured and held in reserve to verify any questionable cylinder breaks.

4. Test Reports: The testing laboratory shall furnish five (5) copies of test reports for concrete test cylinders to be distributed as follows:

1 Copy Owner 1 Copy Contractor
1 Copy Engineer 1 Copy Concrete Supplier
1 Copy Engineer's Field Representative

5. Unsatisfactory tests of concrete cylinders or excessive slump shall make the concrete concerned subject to rejection, with consequent removal and replacement by the Contractor at his expense. The concrete mix shall be redesigned immediately should concrete cylinder tests prove to be unsatisfactory.

B. Compliance – The Contractor shall be responsible for the compliance of all materials and mixing with the requirements of these specifications. Laboratory certificates shall be furnished to the Owner's Representative, prepared by a commercial laboratory or by the material manufacturer's laboratory, certifying that each material has been tested and conforms with the requirements of these specifications.

C. Concrete may be accepted on the basis of occasional conventional field sampling and testing for characteristics such as slump and air, where specified, and occasional test beams or test cylinders, with only intermittent or random plant inspection as deemed necessary for control by the Engineer and Owner. Under this system arrangements will be made for the producer to state on the delivery ticket accompanying each load of concrete the class of concrete being furnished, the weight of cement, aggregate and water used in the batch and the time of batching. Only tested aggregate and cement or supplier-certified cement may be used. Concrete based on the above-mentioned procedures may be used on the following items:

1. Sidewalks and driveways (not to exceed 500 square yards per day)
2. Paved ditches, flues and steps.
3. Curb inlets and junction boxes.

1.5 CERTIFICATES OF COMPLIANCE: The Contractor shall furnish a manufacturer's certification, in triplicate, showing typical test results representative of the expansion joint materials and certifying that the materials supplied conform to the requirements specified.

PART 2 – PRODUCTS

2.1 PORTLAND CEMENT: Portland cement shall be Type 1A, air entraining cement or may be Type 1 normal portland cement if on approved air entraining agent is added to the six. Air entraining agent shall be added in an amount sufficient to entrain from 4.5% to 7.5% free air. Normal portland cement shall conform to ASTM C-150 and air entraining portland cement shall conform to ASTM C-260. Cement may be bagged or bulk if concrete is furnished by a ready mixed concrete plant, but bagged only if job mixed. The cement shall be used from only one mill throughout the entire project.

2.2 FINE AGGREGATE: Fine aggregate shall be clean processed natural sand conforming to ASTM C-33. The fineness modules shall be between 2.50 and 3.00 and shall have the following gradation:

Sieve Size No.	Percentage Passing
3/8-inch	100
4	95-100
8	70-100
16	45-90
30	15-65
50	5-30
100	0-10

2.3 COARSE AGGREGATE: Coarse aggregate shall be clean processed crushed stone conforming to ASTM C-33. Crushed stone shall have the following gradation:

3/4-Inch Aggregate	Percentage Passing
1-inch Sq. Sieve	100
3/4-inch Sq. Sieve	85 – 100
3/8-inch Sq. Sieve	15 – 55
No. 4 Square Sieve	0 – 10

Flint shall not exceed 4 percent.

2.4 WATER: City water shall be used.

2.5 REINFORCING STEEL:

A. General: All bent bars shall be new billet steel, conforming to ASTM A-615-72, Grade 60. All straight bars shall be new rail, billet or axle steel conforming to ASTM A-616 and A-617, or AASHTO M-42. Submit certificate of ladle analysis, as required by the Engineer, attesting the proper steel has been used. Where plans call for welded steel, the Contractor shall verify the ladle analysis then do all welding in accordance with AWS standards, using proper rods and procedure for that particular steel. Rebar which must be welded shall have weld reinforcing to provide 125 percent splice per ACI Code 318-72. Six (6) pull tests of sample bars of each bar size, spliced for the steel analysis used, shall be made. Pull tests shall be for 100% net cross section, with all reinforcing removed for the test. Submit results to the Engineer per shop drawing requirements prior to any welding on the project.

B. Deformed Bars: All bars are to be of the deformed type with bonding capabilities equivalent to at least 125 percent of plain bars conforming to ASTM A-305.

C. Wire Mesh: All wire mesh shall be welded steel wire mesh conforming to ASTM A-185 or AASHTO M-55. Use 6-inch by 6-inch by 8 gauge wire mesh where size is not indicated on the drawings.

D. Certified Mill Test Reports: The Contractor shall furnish certified mill test reports for all bars and shall submit to the Engineer duplicate copies of bar drawings and schedules for preliminary checking and five (5) copies for final approval.

E. Bent Bars: All bent bars shall be accurately cold bent to conform to the approved drawings. Bending details shall conform to the standards of the Reinforcing Steel Institute. All bars shall be tagged and bundled. Metal marking tags are to be used.

2.6 METAL ACCESSORIES: Spacers, chairs, ties and other devices necessary for properly assembling, placing, and spacing and supporting all reinforcing in place, shall be provided.

2.7 FORMS:

A. General: Forms for structural concrete may be constructed of:

1. Lumber, #2 or better, with minimum thickness of 3/4 inch and containing no holes or loose knots. Lumber forms shall include form liners of 1/4 inch plywood or approved fiberboard on 3/4 inch solid backing.

2. High-density plastic overlaid plywood(60-60 Overlay Class 1, EXT-DFPA) forming material may be used if 3/4 inch plywood forms have studs on 16-inch centers or 5/8 inch plywood forms have studs on 12-inch centers.

3. Metal where applicable and as approved by the Engineer. Combination wood and metal forming will require submittal of form details for approval by the Engineer.

B. Forms for Concrete Flatwork (pavement, steps, sidewalk, drainage flumes, etc.) shall be of steel or wood 2 inches thick, dressed on the top and inside. Flexible forms shall be used for curves of radius less than 100 feet and back edges of sidewalk or curbing in such curved areas, when completed, shall be even without any abrupt angles at changes in horizontal curvature.

C. Bullnose: Provide 1-inch (approx.) radius bullnose on corners of exposed beams and columns and elsewhere as shown on the drawings. Green-Streak corner formers set in forms or 1/2-inch by 1/2-inch chamfer strips of non-absorbent material shall be used.

D. Prohibitive: Built-up, battered, bent, twisted, broken or dirty forms shall not be used.

E. Form Ties: Shall be snap ties. Ties shall be equipped with removable plastic cones nominal I inch in diameter at the point of contact with the form, tapered for removal, with minimum depth of I inch. The system shall be designed so the cone is held tight against the form to prevent loss of grout or paste through the hole. Metal breakoff shall be clean and back of the recessed cone. Tie holes shall be neatly plugged with grout to face of cone. If heavy-duty ties are required (coil ties or she-bolts) they need not be snap ties. Other requirements above shall be met except plastic cone may be maximum of 2 inches in diameter.

PART 3 – INSTALLATION

3.1 STORAGE OF MATERIALS: Concrete materials and reinforcing steel shall be stored in a manner that prevents deterioration or intrusion of foreign matter. Any material which has deteriorated or has been damaged shall not be used for concrete.

3.2 PROPORTIONING AND MIXING CONCRETE:

A. General: All concrete shall be classified as Class "A". Rebar

1. Class "A" Concrete shall conform to the following:
Cement......... 6 sacks per cubic yard – minimum
Water........... 6 gallons per cubic yard – maximum, including water in aggregates
Strength........ 3750 psi at 28 days; 2500 psi at 7 days

2. Class "B" Concrete shall conform with the following:
Cement......... 5.5 sacks per cubic yard – minimum
Water........... 33 gallons per cubic yard – maximum, including water in aggregates
Strength........ 3000 psi at 28 days; 2100 psi at 7 days.

All pavements, integral curbs, curb and gutters, drainage structures, and driveways shall be constructed of Class "A" concrete.

B. Approved Mix: The approved mix as specified shall be used throughout the project. Any change in the source of aggregate or cement or any change in the gradation of the aggregate shall require a redesign of the mix. The original design mix and any redesign of mix shall be done at the Contractor's expense. The maximum allowable slump for all concrete is 3 inch.

3.3 READY MIX CONCRETE: Ready mix concrete shall be used for all work on this project. Two-speed mixer trucks will be required. The concrete must be in place within 45 minutes after water is added to the mix.

3.4 FORMING:

A. General: Forms shall be cleaned and oiled before use and shall conform to the shape, lines and dimensions of members called for on the drawings and shall be rigid and watertight. They shall be properly braced or tied together to maintain their position and shape when concrete is tamped or vibrated. Set edge forms and screed strips for concrete flatwork slabs accurately to produce the designed elevations and contours. Construct forms as necessary to support screeds as approved by the Engineer.

B. Cleanouts: Shall be provided as required in structure forms to remove sawdust and debris. All contact surface shall be sprayed with a form release agent that will not cause injury or stain to exposed concrete surfaces.

C. Approval: The Owner's Representative must approve all forms before any concrete is placed. Such approval shall in no way relieve the Contractor of any responsibility for the structural adequacy of form system.

3.5 SUBGRADE PREPARATION:

A. General: Subgrade beneath concrete pavement and concrete curb sections shall be prepared, shaped, and compacted in accordance with requirements set forth in DIVISION 2, SITE WORK, of these specifications.

B. Site Grading: Prior to pavement construction, all site grading shall be completed and compacted fills and embankments shall have been brought to full elevation. Subgrade for pavement construction shall be graded and rolled to the exact cross section and elevations checked for concreting. High areas shall be reduced to grade and low areas raised to grade with approved material compacted in place. Excavation shall be carried to sufficient widths to permit installation and removal of edge forms by a method which will not result in damage to finished surfaces and edges of concrete. The subgrade shall be moistened in advance of concreting but shall not be muddy or excessively wet.

3.6 PLACING REINFORCING STEEL:

A. General: All reinforcement shall be free from scale, rust or coatings which will reduce the bond to the concrete. Bars shall be accurately bent and placed as indicated on the drawings and securely supported and tied with #16 annealed iron tie wire at all intersections to prevent movement during the placement of concrete.

B. Connections and Splices: Lap and tie or spot-weld the reinforcing steel together at splices. Splices shall be staggered. All bending, placing and splicing of reinforcing shall be done in accordance with all applicable requirements of the ACI Code.

C. Placement: All reinforcing steel shall be placed for minimum concrete covering as follows:

3 inches above the subgrade in excavation;
2 inches above the subgrade in slabs on fill;
3 inches from form when finished concrete is to be exposed to water or earth backfill;
1-1/2 inches from forms in normal walls, beams and columns;
1 inch from forms and top in normal slabs;
1 inch from forms and top in slabs with separate cover.

Consult the drawings for any exception to the above.

D. Approval by the Owner's Representative is required at the completion of placing reinforcing steel prior to the placing of any concrete.

3.7 PLACING CONCRETE:

A. General: Concrete shall be deposited with a minimum of rehandling to avoid segregation. No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the work, nor shall retempered concrete be used. Prior to placing concrete all water shall be removed from excavations, no concrete shall be placed under water. Subgrade for slabs less than 12 inches thick shall be dampened. All debris shall be removed from the forms.

B. Concrete: Shall be placed continuously in horizontal lifts not exceeding 12 inches in thickness. Placing locations shall be not more than 10 feet apart. Tremies or canvas "elephant trucks" will be required when the concrete has to be dropped farther than 5 feet. Surface water shall be drained off and mixing water shall be reduced as required in the top layers of deep pours.

C. All concrete shall be thoroughly compacted by spading or vibrating to eliminate voids. At the Contractor's option, concrete curb where called for on the drawings may be placed by use of a curb machine subject to approval by the Engineer.

D. The working face of the concrete shall be kept plastic and "alive." High frequency vibrators shall be used at all times, supplemented as required with hand tamping, slicing, etc. Avoid vibrator contact against finished face forms or reinforcing steel adjacent to partially set concrete. Avoid over vibration. Tool top edges of all finally exposed walls and beams with sidewalk edging tool. Concrete shall be protected against rain or immersion under water for at least 12 hours.

3.8 JOINTS:

A. Joints in Concrete Roadway Pavement & Integral Curbing:

1. Longitudinal joints: Shall be located as shown on the drawings. Longitudinal joints may be of the keyed construction type or may be sawed and shall be constructed with the bars. Diameter, length and spacing of the bars shall conform to details shown on the drawings. If the Contractor elects to saw longitudinal joints, such sawing shall be performed within 12 hours of placing.

2. Transverse contraction joints: Shall be installed where shown on the drawings. In no case shall intervals between the transverse contraction joints exceed 18 feet spacing. Joints shall be sawed within 12 hours of placing and shall conform to the details on the drawings. Joints shall continue through all integral concrete curbing.

3. Expansion joints: Shall be premolded expansion joint filler of the non-extruding, resilient type and shall be cut to the full size of the pavement and integral curb cross sections. Expansion joints 1/2" in thickness shall be installed where noted on the plans and, unless otherwise determined by the Engineer, at intersections with concrete structures. The top of the expansion joint shall be scraped free of mortar and shall be trimmed so that the top edge is 1 inch below the concrete surface prior to application of joint sealer.

4. Dowel bars: Shall be used to transfer load across all expansion joints and in other locations as shown on the drawings. Dowel bars shall be smooth round rail or billet steel bars placed as shown on the drawings, and shall be held in position exactly parallel to surface and centerline of the slab by a metal device that shall be left in the pavement. The use of stones, bricks, or other bulk material for supporting dowels or sleeves will not be permitted. One-half of each bar shall be coated with basic lead sulphate, blue lead or red lead paint and with a heavy oil to prevent bond. The painted and oiled end of the bar shall be furnished with an approved paper or metal sleeve so designed as to provide a 3/4-inch space at the end of the bar.
5. Construction joints: Wherever the work of placing the concrete is interrupted for a period of 30 minutes or more, a transverse construction joint shall be made. Such joint shall in no case be nearer than 10 feet from any other construction, contraction, or expansion joint. Construction joints shall be of the keyed type as shown on the drawings.

6. Joint Filler: After pavement has been properly cured, all open joints shall be cleaned, primed with a light grade of cut back asphalt and poured full with an approved hot poured joint sealing compound, poured with special equipment and masked to prevent spread of joint material on adjacent concrete surfaces. The joint sealer shall be heated and applied in strict conformance with the manufacturer's instructions. Joints must be clean and dry before seal is poured and sealing compound shall be poured so that the joint is filled to the level of the adjacent concrete surface. Special care shall be taken to be certain that joint sealing compound is not spilled or splattered on adjacent concrete surfaces. Should such spillage occur, pavement surface shall be cleaned to the satisfaction of the Engineer.

B. Joints in Concrete Sidewalk, Paved Ditch, and Driveway Pavements:

1. Expansion Joints: Shall be placed where shown on the drawings and at points of tangency to curves. Expansion joints shall be spaced not more than 100 feet apart on straight runs. Expansion joints shall also be placed where pavement abuts structures, unless shown otherwise on the drawings or directed by the Engineer.

2. Expansion Joints: Shall be 1" non-extruding, non-asphaltic type premolded joint filler and shall be placed as specified or as shown on the drawings. The material shall consist of precut and prepunched strips of a durable plastic sponge rubber compound using synthetic rubber or natural rubber as a base and containing no reclaimed rubber or factice. The sponge rubber shall be light grey to greyish buff or greenish buff in color. This material shall conform to Federal Specification HH-F-341-F, Type II, Class "A" or ASTM D-1752, Type I or AASHTO M-153-70, Type 1, compression deflection 252 deflection PSI 17-25.

3. Concrete along the edges of the joint shall be tooled and finished to a smooth surface and the edges rounded with an edging tool. After concrete has hardened the joint groove shall be cleaned, primed and sealed with joint sealing compound. The joint sealer shall consist of a durable elastic compound capable of effectively sealing joints in concrete against the infiltration of moisture. It shall conform to the requirements of ASTM D-1190-64 (1970), together with the additional requirements and modifications contained within the Illinois State Highway Specifications Section 1057.1.4.1. The sealer shall be trim cut to the effective top elevation of the concrete joint and no material shall extrude above this level.

4. Contraction Joints: Shall be formed by scoring the concrete with a proper tool to a depth of 1/3 of the slab thickness and finished with an edging tool. They shall be perpendicular to the form line. Contraction joints shall be located approximately 10 feet apart on driveway and paved ditch sections, and at intervals approximately equal to sidewalk pavement width on sidewalk sections or as otherwise shown on the drawings for either paved ditch, sidewalks or driveway sections.

C. Joints in Curb and Gutter Sections:

1. Expansion joints in curb and gutter sections shall be installed at right angles to the street unless shown otherwise on the .drawings. Installation of expansion joints and joint materials and sealer shall conform with requirements set forth above for expansion joints in concrete sidewalk pavement except that spacing of expansion joints in curb and gutter sections may be held at a maximum of 240 feet in straight runs. Expansion joints in curbing shall match joints in adjacent concrete pavement.

2. Contraction joints in curb and gutter sections shall be spaced at 10 foot intervals. They shall be formed by scoring the concrete with a proper tool to a depth of 1 1/2 inches along the face and top of the curb section. Contraction joints in curbing shall match joints in adjacent concrete pavement.

D. Joints in Formed Surfaces:

1. Construction or Control Joints: Shall be made only at points shown or noted on the plans except where otherwise approved by the Engineer. Reinforcing shall be carried continuously through all construction joints. Construction joints shall be formed straight and true with finished edges and shall conform with details set forth on the drawings.

2. Where a joint is to be made, the surfaces of the concrete shall be thoroughly cleaned and all laitance removed. The joint shall be thoroughly wetted and slushed with a coat of cement grout immediately before placing of new concrete. Grout shall be mixed using a ratio of one part cement to two and one-half parts sand.

3.9 REMOVING FORMS: Remove forms only after concrete has safe and sufficient strength and only with approval of the Owner's Representative.

3.10 CONCRETE FINISH:

A. Formed Surfaces: Immediately after the removal of forms, the Engineer will examine the exposed concrete. Any concrete not conforming to the lines and grades shown on the drawings or which shows poor joints, voids, stone pockets, honeycomb and otherwise defective areas, shall be considered as not conforming with these specifications and shall be replaced by the Contractor at his expense, except in cases where the Engineer may approve patching the defective parts of the structure. Permission to patch any defective parts of the structure shall not waive the Engineer's right to require the replacement of defective parts if the patching does not, in his opinion, satisfactorily restore the quality and appearance of these defective parts.

Specific concrete finishes required will be as follows: a) outside and inside of all structure walls which are not exposed-ties to be broken and tie holes grouted with honeycombing removed; b) exposed structural surface-rubbed to a smooth finish with a carborundum brick until form prints are removed and the surface has a smooth, even finish free of voids and honeycomb; and c) the surface quality shall be equivalent to that of sand finish plastered surface.

B. Concrete Roadway Pavement:

1. The concrete shall be brought to the proper section by means of a mechanical finishing machine, a vibrating screed, or by an approved type of strike off board. If a strike off board is used, it shall be constructed of a material that will not warp, shrink or sag; and shall weigh not less than 10 pounds per linear foot. The strike off board shall be used as a tamping template, if other equipment is not provided for this purpose, with an up and down motion while being propelled forward. Any of the above devices a shall be adjusted to the exact crown of the pavement.

2. After the concrete has been struck off to the proper crown and thickness, a scraper not less than 6 feet long shall be drawn across the pavement. The scraper shall be used with its length parallel to the centerline of the pavement and shall be operated in a transverse motion, planing off high spots and filling in depressions. Spacing shall overlap each area by one-half the length of the scraper.

3. The surface shall be checked with a straight edge not less than 10 feet in length mounted on a long handle and any low spots filled in and high spots removed. All disturbed areas shall be refloated. The finished pavement shall not vary more than 3/16 inch from a 10-foot straight edge placed parallel to the centerline.

4. After the water sheen has disappeared, the surface shall be belted with a rubber or fabric belt, approximately 6 inches in width, placed transversely across the pavement and dragged forward with a sawing motion. The final finish shall be made by brooming transversely with an approved burlap drag. All exposed edges of the concrete at joints and back of curb shall be finished with an edging tool of 1/4" radius.

C. Concrete Sidewalk, Paved Ditch and Driveway Pavements:

1. Concrete placed for sidewalk pavement shall be floated with a wood float in such manner that will thoroughly compact it and provide a smooth even surface. Final finishing shall be with a light brushing with a coarse hair brush (not a broom). Steps on grade shall be finished in the same manner.

2. All exposed edges of the concrete at expansion joints and edges of sidewalk shall be finished with an edging tool of 1/4" radius or as otherwise indicated on the plans.

D. Concrete Curb and Gutter Sections: All exposed edges of the concrete at joints and back of curb shall be finished with an edging tool of 1/4" radius or as otherwise indicated on the plans. When the concrete in curb sections has attained its initial set, a steel trowel shall be used to impart the last shaping finish, and any minor imperfections remedied with a mason's trowel. Final finishing shall be with a moistened brush, by belting, or with a wooden float.

3.11 INTEGRAL CURBING: Integral curbing, where shown on the drawings, shall be constructed at each side of the pavement, shall conform to the dimensions and design as shown on the plans, and shall be constructed of the same concrete as the pavement.

A. The curb shall be placed immediately after pavement finishing operations and before the concrete has taken its initial set. The time elapsing between placing the pavement and placing the curb shall not be more than 30 minutes. A thorough bond shall be obtained between the pavement and curb. If necessary, the pavement shall be roughened or scored by a trowel or wire brush. After the concrete for integral curbing has been placed, it shall be spaded and tamped to insure sufficient density to prevent honeycomb.

B. When the concrete has sufficiently set, the curb shall be finished to proper alignment, grade and cross section by troweling and floating with properly shaped tools. No plastering with cement mortar will be permitted. The final finish shall be made by brushing transversely with a hair brush from bottom to top.

C. All transverse joints in the pavement shall be matched evenly and continued through the curb and shall conform to the shape of the curb.

3.12 ENVIRONMENTAL CONSIDERATIONS:

A. Cold Weather Requirements: No concrete shall be placed on iced or frozen subgrade or when temperature is below 25°F. Concreting shall not be continued when the air temperature is below 45°F. unless the following conditions are attained:

1. Mixing water shall be heated to a maximum of 150°F.;

2. Aggregates shall be heated until free of all ice and frost;

3. The concrete temperature after mixing shall be between 50 and 70°F. if the air temperature is 20 to 45°F.;

4. After the concrete is placed, it shall be covered, protected and heated so as to maintain a minimum air temperature of 70°F. for the first 24 hours, and 50°F. for the next 6 days;

5. Moist conditions shall be maintained during the heating period;

6. All covering, heating equipment, etc., shall be on hand and approved by the Owner's Representative before any concrete is placed; and

7. Admixtures, such as calcium chloride, shall be used only with the approval of the Engineer.

B. Hot Weather Requirements: No exposed concrete shall be placed in air temperatures above 100°F. Cover, protect and cool work as required to maintain the temperature of the concrete below 100°F. The concrete temperature, after mixing, shall be not greater than 85°F. Spray and/or shade aggregate piles and cool mixing water as required.

3.13 CURING CONCRETE: Curing shall be maintained continuously for 7 days after placing the concrete. Concrete temperature is to be maintained between 50°F. and 100°F. Moisture is to be retained in the concrete by the following means:

A. Walls and Structures: Cover with tarps and leave forms on 7 days, or cover with cotton batts continuously wet, 7 days or spray approved membrane, I gallon to 200 square feet for unfinished surfaces only.

B. Slabs: Pond, or wet cotton batts, or 2-inch wet sand blanket, or curing paper with sealed edges. Apply immediately after finishing, or spray with an approved transparent membrane curing solution, after final finishing and free water has left the surface at the rate of 1 gallon to 200 square feet (sidewalks, driveways, curbing, and pavement slabs only). If curing compound is used, the Contractor shall prevent pedestrian or other traffic or operations on the pavement which would damage the curing compound.

C. Curb and Gutters: Cover with wet cotton batts, moisture-proof burlap, white polyethylene sheeting or other approved impermeable material immediately after finishing operations have been completed. This type of curing shall be maintained for a period of 7 days on the wearing surface. The burlap cure shall be maintained in a saturated condition for the full curing period and shall be so placed and weighted down as to cause it to remain in intimate contact with the surface covered, or an approved curing membrane may be used immediately after finishing of the concrete and before the set of the concrete has taken place. The initial curing period shall be not less than 24 hours after which membrane for curing of the concrete will be permitted for the remainder of the 7 days curing period. The rate of Application of curing compound will be at the rate of 1 gallon to 200 square feet of concrete surface. The curing compound will not be allowed on areas that further concrete placement will be against.

END OF SECTION 3000

PROJECT TITLE

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City of O'Fallon Site Specifications

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