DETAILED SPECIFICATIONS

Supplemental to the Subdivision Regulations

Lake Charles, Louisiana

Revised 09/10/07

GENERAL

Structures: All public utility structures, such as poles, valves, hydrants, and pipes will be moved by the utility companies at their expense. All other structures encountered will be removed or relocated by the Contractor at his expense.

Fine Grading: The Contractor will grade the area between the pavement and sidewalk and the area between the sidewalk and the property line and dispose of any excess material in this area. These items of grading will be included in the unit bid price per square yard of pavement and per foot of sidewalk.

Where sidewalks are not to be installed, the Contractor will grade the area between the edge of pavement and the property. All such work will be included in the unit price per square yard of pavement and per square foot of sidewalk.

Existing Drainage Pipe: Existing drainage pipes are the property of the City of Lake Charles. The Contractor will use reasonable care in the removal of the pipes in order that they may be reused by the City of Lake Charles. No extra claim will be allowed for this but shall be included as part of the excavation and subgrading.

Clean-Up: The intent of these plans and specifications is to provide a completed workmanlike job, including all fine grading and clean-up work, and upon completion and before acceptance of the work, the Contractor shall clean the dirt and debris from all pavement and sidewalk, storm sewers, manholes, so as to leave the job in first class condition.

ORDINANCE NO. 10336

AN ORDINANCE approving amendments to Lake Charles Subdivision Regulations, Detailed Specifications - A Supplemental to the Subdivision Regulations.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LAKE CHARLES, LOUISIANA, in Regular session convened, that:

SECTION 1: The City Council of the City of Lake Charles, Louisiana, does hereby approve the amendments to the Lake Charles Subdivision Regulations, Detailed Specifications - A Supplemental to the Subdivision Regulations, as approved by the Lake Charles Planning and Zoning Commission on November 21, 1994, attached hereto and made a part hereof.

PASSED AND ADOPTED at Lake Charles, Louisiana, on this the 21st day of December, 1994.

/s/ Mike Huber
MIKE HUBER
VICE-PRESIDENT OF THE COUNCIL

ATTEST:

/s/ Elizabeth Eastman
ELIZABETH EASTMAN
CLERK OF THE COUNCIL

APPROVED by the Mayor on this the 29th day of December, 1994.

/s/ Willie L. Mount
WILLIE L. MOUNT
MAYOR OF THE CITY OF
LAKE CHARLES, LOUISIANA

SANITARY SEWER PIPE

.01 DESCRIPTION AND SCOPE:

Sanitary sewer pipe shall consist of furnishing and installing PVC pipe designated for gravity flow sanitary sewers, service lines and riser pipes, in accordance with these specifications or Special Provisions, and in conformity with the lines and grades shown on the plans or established by the Engineer. This item includes furnishing, transporting, excavations, bracing, bedding, dewatering, laying, jointing, testing, backfilling, and surface cleanup.

.02 MATERIALS:

Where a certain pipe material is specified on the plans, only that material can be used. All pipe material used between consecutive manholes in the sewer line, including fittings, service connections, plugs, etc., shall be of the same kind unless otherwise provided by the plans.

A. PVC Pipe: Polyvinyl chloride pipe shall conform to ASTM Standard D-3034, and SDR 26 will have a minimum wall thickness of 0.241" for 6" dia. pipe, and 0.323" for 8" dia. pipe, and 0.404" for 10" dia. pipe. The SDR 35 will have a minimum wall thickness of 0.180" for 6" dia. pipe, 0.240" for 8" dia. pipe.

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

B. Pipe Testing: All pipe may be inspected and representative tests made at the place of manufacture by representatives of the City of Lake Charles to verify conformity with the specifications. A close check will be made for correct dimensions in the joint. Pipe may be inspected and tested prior to delivery to the site of the work and shall be checked for joint tolerances on the site prior to laying. The City of Lake Charles, at its discretion, may select at random any number lengths of pipe up to one length per hundred lengths from each run of pipe to the routine tests made under ASTM or AWWA specifications. The results of these special tests will be a prime factor in the acceptance or rejection of any given run of pipe.

C. Concrete: Concrete shall be proportioned to produce a twenty-eight (28) day compressive strength of 3000 psi and contain 5.5 bags of cement per cubic yard.

D. Pipe Foundation Material: Pipe foundation material, where required, shall be crushed limestone as directed by the Engineer.

E. Pipe Embedment – Sanitary Sewers: The initial backfill will be compacted to 12" above the top of the pipe using sand. Compaction and backfill will be in accordance with the Standard Specifications. The cost of this material and work is to be included in the unit price for pipe laying.

.03 LAYOUT OF WORK:

The Engineer will establish the location of all sewer lines to be constructed and will set bench marks at prominent points adjacent to the work. He will set stakes at each manhole, off-set markers at 50' centers along the lines, and will develop and present to the Contractor all necessary cut sheets. The Contractor shall develop all grades, slopes, etc., there from and shall be responsible for the conformity of the work to the layout, cut sheets, elevation, etc. provided him.

.04 TRENCHING AND FORMING PIPE BED:

A. Excavation: Excavation shall include the removal, handling, rehandling, refill or backfilling, and disposal of any and all materials encountered in the work, and shall include all pumping, bailing, drainage, and sheeting and bracing, and trench box. The work of excavation shall also include the responsibility of added expenses or other liability that may arise from quicksand, obstacles or conditions, foreseen or unforeseen, which may be encountered in the work. It includes clearing and the removal of pavements, curbs, sidewalks, shrubbery, and other obstructions not otherwise provided for.

B. Lines of Excavation: All excavation shall be made in such manner and to such widths as will give ample room for properly installing and inspecting the piping. All excavation necessary for laying pipe, constructing manholes, etc. shall be made to line and grade as indicated on the plans and as specified herein. Trenches shall be dug to the alignment and depth required and only so far ahead of the pipe laying as the Engineer will permit. The trench shall be braced and drained as may be required so that workmen may work therein safely and efficiently. A trench box may be used in lieu of sheeting and shoring.

Bottoms of trenches shall be excavated and formed to provide for pipe bedding or pipe foundations as hereinafter specified or as required by the plans or Special Provisions.

Bell holes, where necessary to make up the joints, shall be dug of sufficient size that the whole length of the pipe barrel be bedded as required, and to allow all of the joints to be properly made.

All excavation shall be open cuts with vertical sides except in special cases where the Engineer may permit sloping sides above a point two feet (2') above the top of the pipe, or except where tunneling is permitted or required.

If tunnels are authorized or required, they shall be only as large as necessary for the installation of the pipe and as approved by the Engineer or as detailed on the plans.

The maximum width of trench or sewer pipe installation at a point two feet (2') above the top of the pipe shall be the external diameter of the barrel of the pipe plus nine inches (9") on each side of the pipe.

C. Methods of Excavation: The Engineer shall have the authority at any time to require the Contractor to discontinue the use of any excavating machine or other appliance which, in his judgment, is not adapted to the purpose for which it is used.

D. Exclusion of Removal of Water: The Contractor shall at all times during construction provide proper and satisfactory means and devices for the exclusion of water or removal of all water entering the excavation and shall remove all such water as fast as it may collect in such a manner as shall not interfere with the prosecution of the work.

No water shall be diverted into any operating sewer line.

The Contractor shall use due vigilance and care so that no water originating on his work or due to his work or which he is obligated to handle and dispose of under this contract shall discharge or be discharged on the work or into the trenches of another contractor unless a mutual agreement of the parties affected. Should any disagreement arise from this cause, this matter shall be referred to the Engineer for final settlement. Nothing in this section is to be construed as preventing the reasonable use by the contractor of any ditch, channel, storm drain, or gutter, which is designated and used for City or Parish drainage.

The Contractor shall keep the completed sewer lines free of water at all times and until final acceptance.

E. Maintenance of Excavation: The Contractor shall maintain all excavation in good order during the construction, so as not to hinder or injure the pipe laying, masonry, or other work. He shall take all reasonable precautions to prevent movement of the sides of such excavation, and shall remove at his own expense any material sliding into the excavation.

F. Sheeting and Bracing: The Contractor shall furnish and put in place such sheeting and bracing as may be required to support the sides of all trenches or other excavations and, where required, remove, or cut off, as directed, such sheeting at his own expense. A steel trench box, supplemented with additional sheeting, may be used in lieu of total sheeting and bracing.

G. Disposal of Excavated Material: All material excavated shall be placed so as to interfere as little as possible with public travel. In case the street is not wide enough to allow the dirt to be piled up without blocking the sidewalk, the Contractor shall, at his own expense, maintain an open passageway not less than two and one-half feet (2 ½') wide on the sidewalk and shall keep this passageway free from mud and slush.

At such street crossings and other points as may be directed by the Engineer, the trenches shall be bridged in a proper and secure manner so as to prevent any serious interruption of travel upon the roadway or sidewalks, and also to afford necessary access to particular public premises. The cost of all such work must be included in the prices bid for the various items of the Contract.

The Contractor shall leave a berm of at least two feet (2') in width on one side of the trench, between the trench and the spoil bank, to allow free passage of the Engineer and to permit him to perform his work in an expeditious and satisfactory manner.

The Contractor may deposit excavated materials directly in permanent position insofar as is consistent with the proper prosecution of the work. Materials that cannot be placed at once in permanent position shall be deposited in temporary storage piles. All this work shall be done with reasonable neatness and excavated materials shall not be carelessly strewn over the area.

Surplus excavated material over and above that required for backfilling, mounding over the pipe and making other fills and embankments to the finished lines and grades indicated on the drawings shall be disposed of as directed by the Engineer. The Contractor shall be responsible for seeing that the material is dumped in an orderly manner within the limits designated. The surface of the dump shall be neatly graded to blend with the natural contours of the existing ground surface. If the City or Drainage Board has no use for the surplus material, it will be the responsibility of the Contractor to properly dispose of said surplus.

.05 BEDDING:

All pipe shall be bedded in a foundation constructed as called for on the plans or directed by the Engineer. Where the bottom of the excavation is not, in the opinion of the Engineer, of suitable material for the construction of required pipe foundation, the excavation shall be deepened and a limestone foundation shall be placed under the pipe as directed by the Engineer. This stone foundation is not to be included in the price bid for laying pipe and will be paid for as a separate item.

Where the Contractor exceeds the maximum trench width to the extent that excessive backfill loads are imposed on the pipe, or where the trench is over-excavated, as determined by the Engineer; the Contractor shall provide limestone or such additional pipe foundation as the

Engineer may require without any additional compensation. Over-excavated trenches shall not be brought up to grade with excavated material.

.06 LAYING PIPE:

All pipe shall be laid with the use of a laser. Pipe shall be laid in the trench on bedding or cradle as called for on the plans or as ordered by the Engineer. After the sewer is completed, the interior surface on the bottom thereof shall conform accurately to the grade and alignment indicated on the plans or directed by the Project Engineer. At any stage of construction of a straight stretch between any two consecutive manholes, the starting end of the pipe shall be clearly visible on looking through the pipe from the other end, with full cross section of the interior of the pipe in clear view. Any pipe which is not true in alignment or which has shown settlement after laying, shall be taken up and re-layed at the Contractor's expense.

Before being set in place, each section of pipe shall be thoroughly cleaned and freed of dirt. All bells shall be laid on the upstream end.

Whenever pipe laying is stopped, either for the night or for any other cause, the end of the pipe shall be securely closed to prevent the entrance of water, mud or other matter, and shall be secured in such manner as to prevent the pipe from being dislodged by movement of backfill. While pipe laying is in progress, the Contractor shall keep the trench clear of water.

Wye and tee branches shall be placed in the sewer lines at points indicated by the Engineer. Riser pipe and service lines shall be laid at points and to grades indicated by the Engineer. Riser pipe shall be encased in crushed limestone as shown on the plans. Service lines will be laid in accordance with the requirements for sewer pipe. The ends of all service lines and other points for future connections are to be capped with a suitable watertight cap as manufactured for use with the type of pipe being used.

.07 JOINTING PVC PIPE AND FITTINGS:

Thoroughly clean the bell or coupling end and the plain end of the pipe and apply the joint lubricant liberally, shove the plain end of the pipe into the bell and coupling end of the pipe until the pipe hits the bevel of the bell, fitting or coupling.

.08 BACKFILL:

A. General: No backfilling of trenches shall be done until the pipe work to be covered has been inspected.

Where any sheeting or bracing is withdrawn as backfilling progresses all voids or spaces left thereby shall be carefully and thoroughly filled and compacted with proper tools.

The Engineer shall have the right to reject compaction methods and/or equipment, which do not produce satisfactory results.

Material for backfill shall contain no rubble, trash, broken concrete, asphalt or other objectionable materials.

All backfill compaction operations shall be subject to the approval of the Engineer. The Contractor shall be responsible for the stability of all backfill made under the contract until one year after final acceptance of the work and shall bear the expense of replacing any portions which have become displaced due to carelessness or negligent work on the part of the Contractor or to

damages, resulting from natural causes, such as storms, and not attributable, in the opinion of the Engineer, to unavoidable movements of the ground upon which the backfill is made.

Backfilling of trenches for pipe sewers shall start as soon as the Engineer considers the joints to be satisfactory. Sand shall be carefully placed in six-inch (6") layers in the trench so as not to move the pipe or dislodge any of the jointing material and thoroughly, but carefully compacted under or to the level as directed by the Engineer, and around the pipe to 12" over the top of the pipe. The utmost care shall be taken not to disturb the pipe by stepping on or near it or by throwing earth upon it from the bank above, or not to shift a pipe from its proper position by careless or unskilled ramming around it or by unequal filling on the sides.

Equal and similar care shall be exercised in filling up above the top of the sewer pipe.

B. Compaction of Backfill in Highways or Streets: Where a trench is in a highway or city street right of way, backfill for the balance of the trench shall be compacted by placing in layers of not more than eight inches (8") thickness and compacting with mechanical tampers or by any satisfactory method or methods that will obtain density hereinafter specified. The density of compacted material in each layer of backfill shall not be less than ninety percent (90%) of the maximum density as measured by Method A of AASHO Designation T-180.

The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures, which may be damaged as a result of backfill failure.

C. Compaction of Backfill Not in Highways or Streets: Where a trench is in open ground and not in a highway or street right of way, the balance of the trench may be filled and compacted by approved equipment or mechanical tampers to obtain density equal to that of the adjacent undisturbed soil, and the surface mounded over the top to provide for some after-settlement. About two months after completion of this type of backfilling, the Contractor shall go over the trench again with a roller, refill to the surface of the ground, and re-roll or tamp to a satisfactory condition. The final surface shall be left in a condition equal to that originally found at the start of the work.

D. Compaction Adjacent to Structures: In those portions of the backfill which are adjacent to structures, or are for other reasons, inaccessible to the equipment used, the Contractor shall use mechanical tampers approved by the Engineer to obtain the specified density. Backfill shall be carefully placed so as to be equally distributed on all sides of the structure and so as not to damage the structure in any way.

E. Cleaning Up, Removing Surplus Earth, Etc.: The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated there from which may be suitable for backfilling or surfacing until the excavation has been refilled and surfaced.

As soon as the backfilling of any excavation is completed, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of all filling unless otherwise provided in the Special Provisions. He shall also remove all pipe and other material placed or left on the street by him except material needed for the replacement of the paving. The street shall be opened up and made passable for traffic and the City of Lake Charles shall be notified, in writing, to that effect at once. Following the above work, the repairing and complete restoration of the street surface, bridges, crossing all places affected by the work shall be done as promptly as possible. No measurement for payment will be made on any work whereon the above requirements are not fulfilled.

.09 INFILTRATION TESTS:

At no point in new sanitary sewer line shall the leakage of ground water into the system exceed an amount calculated on the basis of 250 gallons per day per mile per inch of diameter of sewer mains contributing at the flow at the point in question. THE FULL LENGTH OF ALL SEWER PIPE WILL BE TESTED FOR INFILTRATION.

Leakage tests may be made by the following:

Low Pressure Air Testing: After the line between manholes has been properly cleaned and backfilled, plugs shall be placed in either end of the line and inflated. Low-pressure air shall be introduced into the sealed line to a pressure of 4 psig and allowed to stabilize (a minimum of two [2] minutes) to a minimum pressure of 3.5 psig. If the time required to drop the air pressure to 2.5 psig is less than the time scheduled as follows for the various diameters, then the test has failed. The test may be concluded if the pressure does not fall to 2.5 psig in the time scheduled.

Minimum holding time required for pressure to drop from 3.5 psig to 2.5 psig shall be 10 min. for 12" and 4 min. for 8" diameter sewer pipe.

If the ground water table is above the top of the sewer pipe, the test pressure shall be adjusted upward to give a net pressure differential of 3.5 psig.

Any obvious excessive leaks in the system shall be repaired immediately upon discovery. Costs for repairing faulty work, including re-excavating and re-backfilling and for making tests, shall be included in the price bid for installing sewers.

.10 JACKING AND BORING:

Where pipe lines are permitted or required to be jacked under roadways or other locations (with or without a sleeve pipe), the sleeve pipe or pipe line shall be installed by means of a boring machine or auger and hydraulic jack, or by other means satisfactory to the Engineer. In the event subsurface operation results in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor at no additional cost to the owner. In the event the paving cracks on either side of the pipe line, or is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace same at his own expense without further compensation.

Where the boring location crosses a State or Federal highway, installation of the casing shall also be in accordance with all the requirements of the D.O.T.D. project permit issued for that location and the Contractor shall bid accordingly.

Any pipeline installed through a casing will be installed according to manufacturer's recommendation, including, but not limited to, the following:

1. Pipe line properly supported on skid
2. Sand bedding of pipe line in casing
3. Properly sealing ends of casing pipe

The cost of this work and material shall be included in the unit price for installation of casing pipe.

The material cost of the carrier pipe installed in the casing shall be paid for separately under the bid unit price listing the total linear feet of each of the various sizes of PVC pipe as listed in the proposal.

The material cost of the carrier pipe installed without a casing shall be paid for separately under the bid unit price listing the total linear feet of each of the various sizes of PVC pipe as shown in the proposal.

The material cost of the service line installed by jacking and boring shall be included in the jack and bore bid unit price as listed in the proposal.

CULVERTS, STORM BASINS, CATCH BASINS & INLETS

.01 DESCRIPTION:

This work consists of furnishing and installing pipe culverts, pipe arch culverts, storm drains and sewers, herein referred to as “conduit”, and drainage structures, in accordance with these specifications and in conformity with lines and grades shown on the plans or established by the Engineer.

.02 STANDARD SPECIFICATION:

By reference, the latest edition of the Louisiana Standard Specifications for Roads and Bridges, Sections 701 “Culverts and Storm Drains”, Section 702 “Manholes, Junction Boxes, Catch Basins, and End Treatments”, Section 1006 “Concrete and Plastic Pipe” shall apply to the design and construction of those items with the following exclusions/additions:

a. Only Type 3 Joints (T3) will be allowed.
b. Plastic pipe will only be allowed for use as side drains when outside of pavement.
c. Catch basin inlets shall be a two-piece cover type with the inscription “City of Lake Charles” in the center and “DUMP NO WASTE”, “DRAINS TO LAKE” shall be inscribed on the perimeter.

WATER DISTRIBUTION SYSTEM

01. SCOPE:

The work shall include the installation of water distribution lines complete with all necessary pipe, fittings, adapters, valves, valve boxes, thrust blocks, fire hydrants, complete and operable, pressure tested and sterilized. The work shall also including tying into the existing main lines where indicated on the drawings. All work shall be in accordance with requirements of the owner and Engineer.

.02 MATERIALS:

The Contractor shall prepare submittals (3 sets) for all materials proposed to be used on the job for approval by the Engineer prior to beginning work. All materials shall be new and in good condition.

A. PVC Pressure Pipe: Pipe shall meet the requirements of AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water" and AWWA C905, "Polyvinyl chloride (PVC) Water Transmission Pipe, nominal diameter 14 in. through 36 in.". Class 150 pipe shall meet the requirements of DR 18.

All pipe shall be suitable for use as pressure conduit. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900. Installation shall be according to manufacturer's specifications.

B. Short Body Ductile Iron Fittings: All ductile iron fittings required at tie-ins and hydrants shall conform to AWWA C153, or AWWA C110, 350 psi, and shall be mechanical joint. Gaskets shall conform to AWWA C-111. All bolts for mechanical joint shall be corrosion resistant cast iron alloy such as USALLOY by U.S. Pipe, CORTIN by U.S. Steel, or approved equal. Fittings are to be cement lined, in accordance with ANSI A21.4, and asphalt coated.

C. Valves: Valves shall be iron body, bronze mounted double disc gate with a square operating nut or hand wheel, when specified. Valves shall be designed for 200 psi working pressure with a 400 psi test. Valves shall have a non-rising stem, Mueller A-2380 series or equal. Valves shall conform to AWWA C500-61. Valves may also be Mueller Resilient seat gate valves or equal AWWA C509. All valve bolts shall be corrosion resistant cast iron alloy or equal, including bolts holding the valve body together, as well as the mechanical joint fittings. Furnish one (1) operating wrench to the Owner.

Valves 2 ½" and larger to be bronze fitted; valves 2" and smaller to be all bronze.

Valves in the distribution system shall be mechanical joint ends adaptable to PVC pipe or cast iron pipefittings.

Flanged valves, where specified, shall conform to the American 125 pound standard flanges and drilling.

Valves shall be installed in a vertical position, unless otherwise directed by the Engineer. Stem seals shall be O-ring, and wrench units shall turn left (counter-clockwise) to open. Wrench nuts shall be 2 inch square. The Contractor shall provide the Owner with one (1) valve wrench equivalent to Mueller No. H-24610.

D. Valve Boxes: Each gate valve shall be provided with a valve box and cover. Valve box shall be of the two-piece screw sleeve adjustable type. Valve box shall be Mueller 10360, 562-S Tyler, or equal, suitable for the various line depths. Entire unit shall be coated by dripping in a bituminous solution. At the Contractor's option, Tyler cast iron boxes for pipe bottoms No. 6895 or 6895-1 can be used. The 6-inch diameter PVC stack pipe is to be supplied by the Contractor for the various lengths needed. There will be no direct payment for the valve box, the valve pipe stack, nor the concrete pad. The cost of this work shall be included in the price bid for the valve and valve box assembly.

E. Hydrants: Fire hydrants shall be 3-way type, 5 ¼" valve opening, 6" mechanical joint shoe for a 4'0" bury (or for the bury as called for in the proposal). Hydrants shall be standard AWWA Type Mueller Centurion, A423, 2-½" hose nozzles and 4 ½" Pumper nozzle, with Lake Charles standard threads. The Contractor shall note that the finished elevation of the fire hydrant shall be so that it provides a minimum of 18 inches clear between the ground line and the bottom of the pumper nozzle.

F. Tracer Wire: All water mains and service lines shall be installed with tracer wire along its entire length. Tracer wire shall be 12 gauge stranded wire. The wire shall be held in place by tacking it to the top of the pipe using duct tape at approximately 10-foot centers and shall be continuous for the entire length of the water line. Sufficient slack shall be provided at each valve location in order that the wire can be pulled up into the valve box for easy access. There will be no direct payment for the wire, nor its installation.

G. Tapping Sleeves and Valves: Tapping sleeves shall be JCM Model JCM412ESS or approved equal. Tapping sleeves shall have stainless steel 18-8 Type 304 nuts and bolts and the body shall be finished with a fusion-applied epoxy coating.

Tapping valves shall be Mueller Model H 667 or approved equal.

H. Casing Pipe: Casing pipe shall be of the size indicated on the plans ASTM A-53 Grade B seamless steel or electric resistant weld pipe, standard wall or better. Casing may be new or used.

I. Concrete: Concrete for thrust blocks and pads shall be 3000 psi at twenty-eight (28) days. Concrete shall be ready mix; not Saccrete.

J. Ductile Iron Pipe: Ductile iron pipe shall be Class 50 and shall be manufactured in accordance with ANSI A21.51, ANSI B2.1, asphalt coated and cement lined in accordance with ANSI A-21-4.

All ductile iron pipe shall be installed with an 8-mil thick polyethylene wrap per manufacturer's recommendations.

K. Restraining Glands: All mechanical joint fittings shall be installed with restraining glands in addition to concrete thrust blocks. Restraining glands shall be Series 1300C by Uniflange; Megalug Series 1100 PV or Series 2000PV by EBAA Iron Sales, Inc. There will be no direct payment for this work, but shall be included in the price bid for each fitting installed.

L. Corporation Stops: Corporation stops for 1" diameter service lines shall be Mueller (CC) Thread Cat. #H-15008, or approved equal. Corporation stops for 2" diameter service lines shall be Mueller (CC) Thread Cat. #H-15013, or approved equal.

M. Service Saddles: Service saddles shall be ROMAC 101N for 12" main and under, and 202N for 14" main and over, or approved equal. Saddles shall be ductile iron with a finish coat of fused nylon approximately 10-12 mils thick. The straps, nuts, and bolts shall be stainless steel.

N. Curb Stops: Curb stops shall be Mueller H15172, or equal.

O. Service Pipe: Service pipe shall be high-density polyethylene, SDR9. Service pipe shall be 1" diameter unless otherwise shown on the drawings. Pipe shall meet the requirements of AWWA C-901, "Polyethylene Pressure Pipe, Tubing and Fittings, ½" through 3" for Water". Service pipe shall be installed with tracer wire.

P. Compression (Flex) Couplings: Compression couplings shall be as manufactured by Rockwell Type 411 or Type 441, or JCM #212, or equal, with stainless steel bolts. PVC couplings are not allowed.

.03 ALIGNMENT AND GRADE:

The Contractor shall use a chalk line to assist in alignment of the pipeline.

Whenever obstructions not shown on the plans are encountered, and the Engineer deems it necessary to change alignment to expedite the work, if the change in plans result in a change of the amount of work by the Contractor, such altered work will be allowed the Contractor on the basis of bid unit prices or extra work order, whichever the case may be.

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part. Unless specifically ordered by the Engineer, the minimum coverage of this pipeline shall be forty-eight inches (48").

.04 WATER IN TRENCHES:

The trenches shall be maintained free of water at all times while work is in progress, and water shall not be allowed to flow over or rise upon earth foundations, pipe, concrete masonry, or other work, except as otherwise specified for bayou crossings and special "wet areas". The Contractor shall not open more trench than the available pumping facilities can dewater to the satisfaction of the Engineer. The Contractor shall assume all responsibility for disposing of all water so as not to injure or interfere with normal drainage of the locality. In no case shall water pipe lines be used as drains for such water. The ends of water pipe lines shall be adequately and properly plugged during construction by the use of approved stoppers (a garbage bag is not an approved stopper), and all necessary precautions shall be taken to prevent the entrance of ground water, mud, sand, or any other objectionable material into the pipe lines. If such materials enter the pipelines, they shall be removed by the Contractor as soon as possible after discovery thereof.

No separate payment will be made for dewatering.

.05 SETTING VALVES AND FITTINGS:

Valves, fittings, plugs, caps, etc., shall be set and jointed to pipe in the manner specified in the preceding paragraphs for cleaning, laying, and jointing pipe.

Valve boxes shall be provided for every valve except as shown on the plans. Before placing in the trench, all valves shall be carefully inspected for possible damage.

The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement, or such other level as may be directed.

.06 INSTALLING PVC PIPE:

PVC pipe shall be installed in conformance with manufacturer's recommendations, these specifications, and the special provisions.

The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated no more than 500 feet in advance of pipe laying. If necessary, the trench shall be braced such that the men may work therein safely and efficiently. The trenches shall be free of water at the time of pipe laying. The minimum width of the unbraced trench shall be 18 inches or one foot greater than the outside diameter of the pipe, whichever is greater. The pipe shall be laid on stable soil, free from rocks, clods, or sharp-edged objects. Any part of the trench excavated below grade shall be backfilled to grade with thoroughly compacted material approved by the Engineer. The maximum deflection per length of pipe shall be as recommended by the pipe manufacturer.

In most cases, four men constitute a crew – two men above and two men in the trench. Pipe 8" and smaller can be lowered by hand into the trench. The men in the trench should look through the pipe as it is being lowered to make sure the inside is free from earth and foreign matter, which if found, shall be satisfactorily removed to the satisfaction of the Engineer.

At the end of each day's installation, a plug shall be installed in the end of the pipe. Visqueen taped over the end of the pipe is not considered a sufficient plug.

.07 TESTING:

All pipe lines shall be tested as specified herein and as otherwise required to demonstrate that they will successfully withstand 150 psi operating pressure without leakage in excess of the specified maximum in any test section of the pipe line, all as approved by the Engineer.

Whenever conditions will permit, in the opinion of the Engineer, the pipelines shall be tested before the pipe joints are backfilled. All uncovered joints shall be examined during the tests and all visible leaks shall be entirely stopped. Joints which leak shall be re-made and retested until found to be satisfactory.

Water used for testing shall be reasonably clean and free from oil, silt, mud, sticks, vegetable matter, and other objectionable materials. All water required for testing shall be furnished by the Owner.

Corporation stops shall be provided at high places on the pipeline for expelling air from the line, except at the high points where air valves may be indicated on the plans. Also, one corporation stop shall be furnished and installed for each test pump location. No direct payment.

When a section of pipeline of a length deemed suitable by the Engineer is ready for testing, it shall be given the specified leakage test and, if defects are discovered, it shall be retested after replacement of all defective items found therein. On the water distribution system, where practicable, the test length preferably shall not exceed 2,000 feet, and it shall not exceed 4,000 feet unless specifically approved by the Engineer due to the location of valves or other pipeline conditions.

For each leakage test, the air shall be completely expelled from the section of pipe line to be tested, and the test shall be made at a hydrostatic pressure of not less than 150 psi for a duration of not less than four (4) hours, during which the leakage shall not exceed one (1) gallon per inch of nominal diameter per mile of pipe per hour. In all cases, the test period shall be of sufficient duration to permit proper examination of pipe joints and other items in the test section of pipeline.

All pipe, joints, fittings, valves, hydrants, and other items found to be cracked, leaking, or otherwise defective, shall be removed and replaced, and the pipelines shall be retested until the test requirements have been complied with.

.08 BACKFILLING:

After the pipelines have been laid and approved, the trenches shall be backfilled with sand up to a foot above the top of the pipe. The remainder of the backfill shall be with fine, loose, selected materials free from clods, clumps, sticks, stones, and foreign matter. The sand shall be carefully deposited on both sides of the pipe at the same time and thoroughly tamped and rammed under and around the pipe until enough fill has been placed to provide a cover of at least one foot above the pipe bells. All trenches shall be backfilled by hand from the bottom of the trench to the centerline of the pipe.

The trench shall be backfilled to grade by approved methods and uniformly compacted. The trench shall be backfilled according to Article 701.08, “Backfilling”, of the LA. DOTD Standard Specifications for Roads and Bridges, latest revision.

Laboratory services for backfill density shall be performed by a commercial laboratory approved by the Engineer, but paid for by the Contractor. If settlement occurs, the trenches shall be refilled, compacted, and made to conform to the original ground surface. The Contractor shall maintain the trenches in good and safe condition until final acceptance of work by the owner, and he will be held responsible for any accident or damage to persons or property during the period of construction and for one year following the date of acceptance.

.09 DISINFECTING WATER LINES:

After satisfactory tests have been performed and before being placed in service, all pipe lines shall be disinfected. The expense involved shall be borne by the Contractor except for the water required which shall be furnished by the owner from the waterworks system without charge to the Contractor.

Disinfecting the water mains shall be done according to the provisions of AWWA C651-86. This work shall be performed in segments of the pipeline in accordance with a schedule to be submitted by the Contractor and approved by the Engineer before any work is commenced. As segments are disinfected and put into service after the Louisiana State Board of Health approval, periodic samples shall be taken from completed sections as an added safety precaution until completion of the entire project.

Samples shall be taken from corporation stops installed in the lines as directed by the Engineer, and installed for the sole purpose of testing the lines as hereinbefore specified in Article 2.07, "Testing".

After thorough flushing, sufficient available chlorine shall be added to the water in the line to show a minimum residual of 50 PPM. This chlorinated water shall then be drawn off from each dead-end until an orthotolidin test shows a strong indication of chlorine. As the water is drawn off and new water added, this new water shall be chlorinated. After all points show an indication of chlorine, the chlorinated water shall remain in the system for twenty-four (24) hours, after which period it shall be flushed out with potable water. Should subsequent bacteriological tests show any pipelines to be contaminated, the chlorination process shall be repeated in such pipelines until satisfactory results of tests are obtained. No water from any pipeline shall be used for human consumption until bacteriological tests indicated that the water is entirely free of bacterial contamination.

Chlorine in liquid gas form, calcium hypochlorite, chlorinated lime, or sodium hypochlorite may be used, but the Engineer's approval of the material and procedure shall be given before any work is commenced.

.10 JACKING AND BORING:

Where pipe lines are permitted or required to be jacked under roadways or other locations (with or without a sleeve pipe), the sleeve pipe or pipe line shall be installed by means of a boring machine or auger and hydraulic jack, or by other means satisfactory to the Engineer. In the event subsurface operation results in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor at no additional cost to the Owner. In the event the paving cracks on either side of the pipeline, or is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace same at his own expense without further compensation.

Where the boring location crosses a State or Federal highway, installation of the casing shall also be in accordance with all the requirements of the D.O.T.D. project permit issued for that location, and the Contractor shall bid accordingly.

Any pipeline installed through a casing <u>will</u> be installed according to manufacturer's recommendation, including, but not limited to the following:

1. Pipe line properly supported on skid
2. Sand bedding of pipe line in casing
3. Properly sealing ends of casing pipe

The cost of this work and material shall be included in the unit price for installation of casing pipe.

The material cost of the carrier pipe installed in the casing shall be paid for separately under the bid unit price listing the total linear feet of each of the various sizes of PVC pressure pipe as listed in the proposal.

The material cost of the carrier pipe installed without a casing shall be paid for separately under the bid unit price listing the total linear feet of each of the various sizes of PVC pressure pipe as shown in the proposal.

The material cost of the service line installed by jacking and boring shall be included in the jack and bore bid unit price as listed in the proposal.

ONE COURSE CEMENT CONCRETE SIDEWALKS

2.01 SUBGRADE:

The subgrade for sidewalks will be constructed as provided for under Reinforced Concrete Paving. Rolling of the subgrade will not be required, but the surface shall be thoroughly hand or mechanically tamped if required by the Engineer. All soft and spongy places shall be thoroughly compacted in layers not exceeding six (6) inches in thickness.

2.02 PORTLAND CEMENT CONCRETE:

The number of sacks of cement per cubic yard of concrete in place shall not be less than six (6) for all sidewalks.

All materials used shall be of the same quality or provided for in reinforced concrete paving for City Streets, City of Lake Charles.

2.03 REINFORCED CONCRETE SIDEWALKS:

Reinforced concrete sidewalks shall be a minimum of six (6) inches thick with welded wire fabric W4W4 6" x 6" in areas where traffic is expected. Reinforced concrete sidewalks are to be placed at intersections and extend back eight (8) feet from the curb before changing to the standard section.

2.04 FORMS:

Forms shall be wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, clean, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. If wood forms are used, they shall be securely staked with a minimum of one 2" x 4" stake every five (5) feet, or closer if required so as to support the weight of the workmen stepping on the forms without sinking.

2.05 JOINTS:

Three-fourth inch (3/4") thick expansion joints will be placed at intervals not to exceed thirty-two feet (32') or as shown on the plans, and at all junctions of new walks with drives, curbs, buildings, and structures. Expansion joint material will be redwood or cypress. Contraction or dummy joints to be as shown on the plans.

2.06 DEPOSITING AND FINISHING CONCRETE SIDEWALKS:

The concrete shall be deposited between the forms on the moistened subgrade and shall be struck off and compacted to the required thickness. It shall be tamped sufficiently to bring the mortar to the top surface. The surface shall be finished with a wood float or steel trowel, provided that the surface is finally brushed in order to leave a slightly rough finish. All joints and edges shall be rounded with an edging tool having a one-fourth (1/4) inch radius.

2.07 CURING:

Concrete shall be cured for at least 72 hours. Curing shall be done with the use of liquid membrane curing compound or by other approved methods. During the curing period, traffic detrimental to the structure shall not be permitted. Vehicular traffic shall be excluded for such additional time as the Engineer directs.

2.08 BACKFILLING:

After the concrete has set sufficiently, the forms shall be removed and the space adjacent to the sidewalks shall be backfilled with suitable material, which shall be firmly compacted and neatly graded.

2.09 MAINTENANCE OF DRAINAGE:

All existing drains or ditches shall be kept alive by placing a four inch (4") or six inch (6") diameter drain pipe under the sidewalk. No direct pay item, unless otherwise noted.

2.10 TESTING:

The materials shall be tested in accordance with the reinforced concrete pavement specification except that a minimum of four (4) cylinders will be made for each 20 cubic yards of concrete or for each days pour; two (2) seven (7) day break cylinders and two (2) twenty-eight (28) day break cylinders. There will be no direct payment for the testing laboratory services, but it is to be included in the unit price for installation of walk.

2.11 EDGING:

All edges shall be tooled with a ¼" radius or as approved by the Engineer.

2.12 VIBRATORS:

An approved mechanical vibrator is required to be used during all pouring operations.

2.13 LINES AND GRADES:

All lines and grades of the walkway shall be approved by the Engineer prior to pouring.

DETAILED SPECIFICATIONS
PORTLAND CEMENT CONCRETE PAVEMENT

1. Description: This work shall consist of constructing a pavement composed of Portland cement concrete, with or without reinforcement as specified, on a prepared subgrade or base course in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

2. Equipment: All equipment necessary for the proper preparation of the subgrade, mixing concrete, the laying and finishing of the pavement shall be on the project, in satisfactory working condition, and shall have been inspected and approved by the Engineer before concreting operations will be permitted to begin. All equipment shall meet the specific requirements hereinafter set forth. The contractor shall maintain all equipment in satisfactory working condition throughout the construction of the project.

3. Testing Concrete:

a. Laboratory Services: Laboratory services shall be performed by a commercial laboratory approved by the Engineer, but paid for by the Contractor.

b. Duties: The laboratory will review the Contractor furnished design mix to determine compliance with these specifications. The laboratory will inspect and test all materials entering concrete, analyze aggregate for quality, durability, grading and free water content, take representative specimens of ingredients and mixes, and make test cylinders and measure compressive strength of same. The laboratory shall check the moisture content of aggregate and control the mix. It is the intent of these specifications to have batch plant and job site laboratory control. Job site laboratory control shall include job mixing, handling, and placing of concrete.

c. Test Procedures: All test specimens shall be taken and laboratory tests conducted in conformance with the latest standard test procedure of the ASTM, as amended to date of contract, and when not covered therein shall be sampled and tested in accordance with the “Standard Specifications for Roads and Bridges” of the Louisiana Department of Highways, 1982 Edition, with subsequent revisions to date of contract. All tests not covered by the above shall be performed as specified by the Engineer.

d. Test Reports: The laboratory shall furnish promptly to the Contractor and the Engineer written reports covering the results of all tests and inspections made.

e. Test Cylinders: A minimum of two (2) sets of four (4) cylinders each will be made for each day’s pour for over 25 cubic yards, and one (1) set will be required for 25 cubic yards or less. Of each set of test cylinders, two (2) will be tested for compressive strength at the age of seven (7) days; and two (2) will be tested at the age of twenty-eight (28) days. If any cylinder fails to meet the specified strength requirements, the Owner shall have the right to require changes in proportions, require additional curing time, and/or take other measures for enforcement of strength requirements.

f. Contractor’s Responsibility: It shall be the responsibility of the Contractor to provide the concrete mix design, to produce concrete of the strength, durability, workability and finish specified, submit the mix design for approval, furnish representative material for specimens in quantities required by the testing laboratory; cooperate and assist in taking samples of materials for testing.

4. Cement – Standard Specifications for Type I Portland Cement: A.S.T.M. Designation C-150 with latest revision to date of the contract are adopted as part of these specifications. The cement shall be shipped in bags containing 94 pounds net or barrels containing 376 pounds net. All packages shall be in good condition at the time of inspection.

Cement in bulk meeting the above requirement may be used provided the manner and method of handling is approved by the Engineer.

The cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment, and in a suitable weathertight building which will protect the cement from dampness. Any cement which contains hard lumps or for any reason has become partially set shall be rejected. Cement of different brands shall not be mixed.

Batches shall be delivered to the mixer separate and intact and each batch container shall be dumped cleanly into the mixer without loss of cement or spilling of materials from one batch compartment into another. Protection of the cement from the wind and rain while enroute to the mixer will be required.

Should bulk cement be used, the weighing and handling equipment shall be inspected and approved by the Engineer in writing prior to use.

5. Water: Water for concrete shall be clean and free from injurious amounts of oils, acids, alkalies, organic matter or other deleterious substances. The water shall be tested as outlined in Standard Method T-26 A.A.S.H.T.O. The Contractor will purchase and furnish his own water which must meet the above requirements.

6. Fine Aggregates: (Standard La. Highway Specifications). Sand shall consist of clean, hard, durable grains, graded from coarse to fine, it shall be substantially free from lumps of clay and all vegetable or other deleterious substances. The maximum percentages of deleterious substances shall not exceed the following values:

	Percent by Weight
Removed by decantation	3.0
Coal or lignite	0.25
Clay lumps	0.5

Fine aggregate subjected to the colorimetric test for organic impurities and producing a color darker than plus three (3) Standard Method T-21, A.A.S.H.T.O. shall be rejected.

Fine aggregate shall be uniformly graded from coarse to fine and conform to the following grading requirements:

Sieve Size	Percent Passing
3/8”	100
No. 4	95 to 100
No. 16	45 to 90
No. 50	7 to 30
No. 100	0 to 7
No. 200	0 to 3

7. Coarse Aggregate: (Standard La. Highway Specifications). Coarse aggregate shall consist of gravel, crushed stone or a combination of gravel and crushed stone.

All gravel shall consist of clean, tough, durable stone of high resistance to abrasion, free of clay coating of any character. "Run of Bank" gravel which contains disintegrated or soft stone or shale, or excess of flat pieces shall not be used. The gravel shall not contain more than 15 percent of thin and elongated particles and shall have a percent of wear (Deval abrasion test) of not more than 15. The maximum amounts of deleterious substance shall be as follows:

	Percent by Weight
Removed by washing	1.0
Clay lumps	0.25
Soft fragments	5.0
Iron Ore (included in soft fragments)	
Maximum retained ¾"	1.5
Maximum passing ¾"	0.5
Coal and lignite	1.0
Sticks (wet)	0.25
Totals, clay lumps, soft fragments, coal and lignite, and sticks shall not exceed	5.0

All coarse aggregate shall be uniformly graded from coarse to fine, and when tested by means of laboratory sieves shall meet the following gradation requirements:

Gravel, from different pits, even if tested and approved, shall not be mixed during use, nor used alternatively.

8. Mix: This concrete pavement shall be composed of one part of Portland cement and five parts of total fine and Grade "B" gravel coarse aggregate by dry rodded volume, measured separately. The mix will be approximately one part cement, two parts fine aggregate and three parts of gravel coarse aggregate, by volume.

The Contractor will be permitted substitution of fly ash for Portland cement up to a maximum of 15% by weight. Fly ash shall be from an approved source listed on the D.O.T.D.'s Qualified Products List.

The Engineer may vary the relative weights of fine and coarse aggregates to improve the workability or consistency, but in no case shall it be varied so much as to materially affect the unit volume of cement per unit volume of concrete as determined by original proportions.

The unit weight of the aggregates in a dry and rodded condition shall be determined by the "Testing Laboratory". The unit weight of aggregates, of a given specific gravity, is controlled by the voids and may effect the yield of concrete materially and the Contractor's attention is directed to the type and grading requirements of the coarse aggregate hereinbefore specified for this type of mix.

The minimum cement content in sacks per cubic yard of concrete for this type of mix shall not be less than 5.8 sacks per cubic yard. The maximum water content, including free water in the aggregate, in gallons per bag of cement shall not be greater than 6.0 gallons per sack.

The Contractor shall submit for approval on the attached form his intended source of materials and the mix design for concrete he proposes to furnish. No work shall be started until the Portland Cement Concrete Job Mix Release has been approved by the Engineer. When unusual material conditions necessitate tests or trial mixes, such testing will be performed by the laboratory and will require 45 days.

9. Joint Sealant: Joint sealant shall conform to ASTM:3406 Specification for Joint Sealant, Hot-Poured, Elastomeric Type, for Portland Cement Concrete Pavements, and Federal Specification SS-S-164 and SS-S-1401B, such as Superseal 444 or equal.

Hot Poured Sealants: The joint sealant shall be applied uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. A backing material shall be placed as shown on the plans and shall be non-adhesive to the concrete or the sealant material. The heating kettle shall be an indirect heating type, constructed as a double boiler. A positive temperature control and mechanical agitation shall be provided. The sealant shall not be heated to more than 20 degrees F. (-11 degrees C.) below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the joint shall be provided. Any sealant spilled on the surface of the pavement shall be removed immediately.

Installation of Sealants: Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed, unless otherwise directed. Sealants shall be installed in accordance with the following requirements:

Sufficient joint sealer shall be placed into the joints so that upon completion of the work, the surface of the sealer in the joint shall be within ¼ inch, but below the level of the adjacent pavement surface, or at the elevation as directed by the Engineer. The Contractor shall "spot up" or refill all unsatisfactory joints before final acceptance. Any excess filler on the surface of the pavement shall be removed and the surface shall be left in a clean condition.

The use of a backup material or bond breaker in the bottom of the joint to be filled is recommended to control the depth of the sealant, to achieve the desired shape factor, and to support the sealant against indentation and sag. Backup materials and bond breakers should be compatible with the sealant, should not adhere to the sealant, should be compressible without extruding the sealant, and should recover to maintain contact with the joint faces when the joint is open.

10. Expansion Joint Filler: Timber used for expansion joint filler shall be Redwood or Cypress. The filler shall be selected from sound, clear, all heart, low density redwood or sound clear heat wood cypress, free from sapwood, knots, cluster birds eye, hard streaks, shakes, splits, and shall comply with the following requirements:

Dimension shall be as specified on the plans and tolerances of ± 1/16 inch thickness, ± 1/8 inch depth, and ± ¼ inch length will be permitted.

11. Wire Fabric Reinforcement: Wire fabric shall consist of sheets or strips manufactured for the purpose. The finished material shall comply with the Standard Specifications of Welded Steel Wire Fabric for Concrete Reinforcement, A.S.T.M. Designation A-185.

The fabric shall be of a series of longitudinal wires arranged at right angles thereto and electrically welded at all points of intersection. The size and spacing of wires in the fabric shall be as shown on the plans. Welds shall be of sufficient strength that they will not be broken during handling or placing.

Reinforcing fabric shall be furnished in flat sheets. Any sheets that may have become bent or distorted must be straightened and otherwise put in proper condition before using. When placed in the work, the fabric shall be free from excessive rust, scale, or coating of any character which will impair its bond with the concrete.

At all places where the continuity of reinforcement is required, adjacent sheets of the fabric shall be properly lapped. Unless otherwise shown on the plans where laps are made along the sides of the sheets, the transverse wires of fabric shall be lapped not less than six inches, and where laps are made at the ends of the sheets, the longitudinal wires of the fabric shall be lapped not less than twelve inches.

12. Handling Materials: (Standard La. Highway Specifications) In stockpiling aggregates, the location and preparation of the sites, the minimum size of pile, the method adopted to prevent "coning" or to provide segregation of the component sizes shall be subject to the approval of the Engineer. In any case, stockpiles shall be at least 6 feet in height and built up in layers of not more than 3 feet in thickness. Each layer shall be completely in place before beginning the next, which shall not be allowed to "cone" down over the under layer. Aggregates from different sources and of different gradings shall not be stockpiled together. Each "separated size" of coarse aggregate, if Type E pavement is furnished, shall be stored separately. The Contractor shall avoid as much as possible the mixing of materials from the stockpile with material from the cars when filling the proportioning bins and shall not fill the proportioning bins alternately from the stockpile and cars, except when directed to do so by the Engineer for the purpose of changing the gradation of the materials. He shall fill the bins exclusively from the stockpile. Storing of aggregates in stockpiles or otherwise upon the subgrade or shoulders will not be permitted.

The aggregates shall be handled from the stockpile or other sources to the batching plant in such a manner as to secure a typical grading of the material. Aggregates that have become mixed with earth of foreign material or coated with dust shall not be used. All aggregates, where handled by hydraulic methods or where washing is involved, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Aggregates shall be transported from the batching plant to the mixer in batch boxes, vehicle bodies or other containers of adequate capacity and construction to properly carry the volume required. Partitions separating batches shall be adequate and effective to prevent spilling from one compartment to another while in transit or being dumped. Where cement is batched in bulk, the contractor shall use a suitable method of handling the cement from the weighing hopper to transporting container or into the batch itself for transportation to mixer, with chute, boot or other approved device, to prevent loss of cement and arrange to provide positive assurance of the actual presence in each batch of the entire cement content specified.

Cement in original shipping packages may be transported on top of the aggregates, each batch containing the number of bags required by the job mix. Loose cement shall be transported to the mixer either in waterproof compartments carrying the full amount of cement required for the batch or between the fine and coarse aggregate. Batches where cement is placed in contact with the aggregate may be rejected unless mixed within 1 ½ hours of such contact.

Batches shall be delivered to the mixer separate and intact and each batch container shall be dumped cleanly into the mixer without loss of cement or mixing or spilling of material from one batch compartment into another.

13. Devices for and Methods of Measuring Materials: (Standard La. Highway Specifications). All cement and aggregate for concrete pavements shall be measured by weight. Cement packed in bags by the manufacturer shall be considered to weigh 94 pounds. Batches involving

fractional bags will not be permitted. If bulk cement is used, separate scales and hoppers shall be used for the cement, with a device to indicate positively the complete discharge of the batch of cement into the batch box or container. The weights of coarse and fine aggregates to be used shall be calculated from the proportions specified by the engineer for the job mix. Water shall be measured by volume or by weight.

14. Weighing and Batching Equipment: (Standard La. Highway Specifications)

Bins: The batching plant shall include batcher bins, of either stationary or portable type, with adequate separate compartments for cement and for each required "separate size" of fine and coarse aggregate, each compartment designed to discharge efficiently and freely into the weighing hopper or hoppers. Means of control shall be provided in each case so that as the quantity desired in the weighing hopper is being approached, the material may be added slowly in small quantities and shut off with precision. Means of removing an overload of any one of the several materials shall be provided. Hoppers shall be constructed so as to eliminate accumulation of tare materials and to fully discharge without jarring the scales. Adequate partitions shall separate the cement and aggregates both in the weighing bins and hoppers. Partitions between compartments, both in bins and in hoppers, shall be ample to prevent spilling under any working condition. All batching plant structures shall be maintained properly leveled within the accuracy required by the design of the weighing mechanism.

Scales: The scales for weighing aggregates and cement may be of either the horizontal beam or the springless dial type, designed as an integral unit of the batching plant and of rugged construction to withstand hard usage due to working conditions. When beam type scales are used, provisions, such as a "telltale" dial, shall be made for indicating to the operator that the required load to the weighing hopper is being approached, which device shall indicate at least the last 200 pounds of load. There shall be a device on weighing beams which shall indicate the critical position clearly. Poises shall be designed for locking in any position and to prevent unauthorized removal. The weigh beam and "telltale" device shall be in full view of the operator in charge of the hopper, and he shall have convenient access to all controls. Multiple weigh beams on scales to be used for weighing more than one kind of material shall have as many beams as the number of different kinds of material to be weighed on the scale. The individual beams shall have such capacities as will allow the required weight of each kind of material to be set off on a single beam or on a single beam and fractional beam. The cement and water (if weighed) shall be weighed on separate scales. The capacity of any scale shall not be greater than twice the weight of the amount required for the smallest batch size normally weighed.

Graduated dials shall be provided with suitable markers, inside the glass cover and in front of the dial, which may be set to indicate the position of the dial indicator for predetermined loads in the weighing hopper.

The hopper and scales shall be suitably enclosed for protection against the influence of wind.

Ten 50-pound standard test weights shall be provided at each batch plant for testing weighing equipment.

The scales shall be maintained within a tolerance of ½ percent of the net load in the hopper. The minimum graduation of the beam or dial shall not be greater than 0.2 percent of the rated capacity of the scales. All cement handling, weighing and batching apparatus shall be protected from the weather.

Clearance between scale parts, hoppers and bin structure shall be such as to avoid displacement of or friction between parts due to accumulations, vibration or other causes. Pivot mountings shall be designed so none of the parts will jar loose and so as to assure unchanging spacing of

knife edges under all circumstances. Scales shall be so designed that all exposed fulcrums, clevises and similar working parts may readily be kept clean. The weighing mechanism of the scales shall be constructed of non-corrosive materials, excluding material softer than brass. Weigh beams shall have leveling lugs, and weighing parts of other types shall be provided with means for precision adjustment. Scales shall be sealed at the expense of the contractor when required by the Engineer. If necessary, to provide stability, concrete foundations for batching and weighing equipment shall be provided. All structural members of the batching plant shall be of sufficient size to withstand the load to which they shall be subjected and the engineer may require the contractor to submit for approval plans showing structural design and type of foundation to be used. The contractor shall maintain the equipment in good condition and adjustment and shall provide for accurate operation. If, for any reason, equipment previously approved becomes unsatisfactory, it shall be repaired or replaced before proceeding with the work.

Accuracy of the water measuring equipment shall be within a range of error of not over one percent (1%) and shall be so arranged that the measurement will not be affected by variations of pressure in the water supply line and will be accurate under all construction conditions encountered. Unless the water is to be weighed, the water measuring equipment shall include an auxiliary tank from which the measuring tank shall be filled. The measuring tank shall be equipped with an outside tap and valve to provide for checking the setting of same unless other means are provided for readily and accurately determining the amount of water in the tank. The volume of the auxiliary tank shall be at least equal to that of the measuring tank.

15. Forms: Side forms shall be made of steel except that on curves having radii of three hundred feet (300') or less, wooden forms of approved thickness may be used. Metal forms shall have a minimum length of ten feet (10'). The forms shall be of approved section, straight, free from warp or bends and of sufficient strength when staked to resist the pressure of the concrete and finishing machine or finishing tools without springing, settlement or lateral movement. The width of the forms at their base shall not be less than eight inches (8"). Only approved steel forms shall be used, weighing not less than twelve pounds (12#) per lined foot. Forms shall have a minimum thickness of 3/16 inch.

Forms varying more than one-eighth (1/8) of an inch in ten feet (10') from a true line on the upper edge or more than one-fourth (1/4) of an inch from a true line on its inside face shall be rejected.

The method of connection between sections shall be such that the joint thus formed shall be free from movement in any direction and will allow no leakage.

Bent, twisted or broken forms shall be removed from the work until satisfactorily repaired and straightened. Repaired forms shall not be used until inspected and approved by the Engineer. Built up forms shall not be used.

The supply of forms shall be sufficient to permit their remaining in place not less than twelve hours after the concrete has been placed or longer if deemed necessary by the Engineer.

16. Setting Side Forms: (Standard La. Highway Specifications). Forms shall be set so that they rest firmly throughout their entire length upon the thoroughly compacted subgrade. Any subgrade, which at the form line is found below established grade shall be filled to grade in lifts of one-half inch (1/2") or less for a distance of eighteen inches (18") on each side of the base of the forms and thoroughly re-rolled or tamped. Imperfections and variations above grade shall be corrected by tamping or cutting as necessary. After the forms have been set to correct grade, the subgrade shall be thoroughly tamped by means of mechanical tampers at both inside and outside edges of the base of the forms. In exceptional cases, the Engineer may require suitable stakes driven to the grade of the bottom of the forms to afford suitable firmness. The Engineer may

require the contractor to operate the finishing machine and subgrade over the forms prior to the starting of construction in order to determine whether the forms will remain true to line and grade during the construction of any portion of the pavement. Any weakness or defects which may develop in the forms under this operation will be cause for their immediate rejection. The length and number of pins required for each section of forms shall be such as may be required to maintain the form at the correct line and grade at all times, but in no case shall less than 3 pins for each 10-foot section be used and a pin shall be placed at each side of every joint. Conformity of the alignment and grade elevation of forms with the alignment and grade elevation shown on the plans, or designated by the Engineer shall be checked and necessary corrections made by the Contractor immediately prior to placing the concrete. Where any form has been disturbed, or any subgrade becomes unsuitable, the form shall be reset and rechecked. Forms shall be set for at least 500 feet in advance of the point where concrete is being placed.

Forms shall be cleaned and oiled each time they are used.

17. Consistency of Concrete: The composition of the combined mixture shall be such as to produce concrete of maximum density consistent with workability, containing no free water, with the specified cement content and not more than the volume of water specified.

The quantity of water used shall not be changed without the consent of the Engineer.

The consistency of the concrete shall be such as to have a slump of not less than two inches (2") and not more than three inches (3") when tested in accordance with the Standard Method of Slump Test for consistency of Portland Cement, A.S.T.M. Designation.

18. Concrete Strength Requirement: When required by the Engineer, samples of concrete for compression tests as prescribed in the A.S.T.M. Designation C 31-33 shall show a minimum compression strength of 3,000 lbs. per square inch in seven (7) days and 4,000 lbs. per square inch in twenty-eight (28) days. A minimum of two sets of test cylinders for each 100 cubic yards of concrete poured or portions thereof will be required.

19. Batch Mixers for Use at Site of Work: (Standard La. Highway Specifications). Mixers, except those at central mixing plants shall be of the boom and bucket type, full power controlled, and no mixer shall be used which requires less than five bags of cement per batch except that where it is impracticable to use machine methods of placing and finishing the concrete, a smaller mixer of the design approved by the Engineer and having a capacity of not less than two bags will be permitted.

Mixers shall operate at the drum speed shown on the manufacturer's name plate which, unless otherwise approved, shall be not less than 14, nor more than 20 revolutions per minute.

The mixer shall be equipped with an approved batch meter and timing device which will automatically lock the discharge lever and release it only at the end of the mixing period; the device shall be equipped with a bell adjusted to ring each time the lock is released. If the timing device becomes broken or out of order, the contractor shall be permitted to operate the mixer while same is being repaired, provided he furnished an approved timepiece equipped with a minute hand and a second hand and each batch is mixed 1-1/2 minutes while the timing device is out of order. If, in the opinion of the Engineer, the repair of the timing device is reasonably delayed, the failure of the timing device shall be cause for the discontinuance of the use of the mixer until the device is repaired or a new timer substituted.

Pickup and throw over blades in the drum of the mixer which are worn down ¾ of an inch or more in depth must be replaced by new blades.

Tandem or duel drum mixers will be permitted provided the mixer units are designed and built for synchronized operation and provided the material is mixed in the first drum for a period of not less than 30 seconds.

20. Mixing Concrete: (Standard La. Highway Specifications). Concrete shall be mixed in a batch mixer of approved type and capacity for a period of not less than one minute after all materials, except water, are in the drums. If tandem or duel drum mixers are used, the mixing time required shall be exclusive of the time of transfer of materials between mixing drums or compartments.

The batch shall be so charged into the drums that some water shall enter in advance of cement and aggregate and shall continue to flow at a uniform rate for a period not exceeding 20 seconds. The rate of flow shall be so regulated that the water will enter the drum for approximately five (5) seconds before the materials and continue to flow for approximately ten (10) seconds after the materials have been charged into the drum, and after the mixing time begins.

During the period of mixing, the drum shall operate at the speed for which it was designed. Any concrete mixed less than the minimum mixing time specified, shall be rejected. If, in the opinion of the Engineer, the concrete resulting from mixing the specified minimum time is not of a uniform texture, a sufficient number of additional revolutions of the drum at the same rate shall be given until a thorough mixing of each batch of concrete is secured.

No batch shall be run requiring fractional sacks of concrete, unless bulk cement is furnished, and the volume of mixed concrete per batch shall not exceed the manufacturer's rated capacity by more than 10 percent, except where the rated capacity of the mixer exceeds the volume of the mixed concrete for the nearest to capacity bag batch by a volume of concrete involving 3/10 or more of a bag of cement, in which case the volume of concrete produced per batch may be that produced from a number of bags of cement which exceeds the nearest to rated capacity number by one bag. The entire contents shall be removed from the drum before the succeeding batch is introduced. The skip and the throat of the drum shall be kept free of accumulations.

21. Subgrade: The subgrade shall be properly shaped so that it conforms to the lines and grades as shown on the plans, and shall be constructed to have, as nearly as practicable, a uniform density throughout its entire width. Where necessary or when directed by the Engineer, compression of the subgrade material shall be accomplished with a self-propelled roller weighing not less than three (3) tons, or other approved mechanical compaction. In cases where hand tamping is permitted, the tamper shall be an approved mechanical type.

All soft and yielding material and other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material, tamped if required, and the whole subgrade brought to line and grade and to foundation of uniform compaction and supporting power. In preparing the subgrade, the material excavated shall not be piled outside and along the forms in such a manner as to interfere with the proper operation of all the finishing tools.

After the subgrade has been prepared as specified above, the Contractor shall maintain it free from ruts and depression and all damage resulting from the hauling or handling of any materials, equipment, tools, etc., and if ruts are formed, the subgrade shall be planked to prevent further rutting, if necessary, in the opinion of the Engineer.

After the forms have been set and approved, the subgrade shall be tested in advance of the mixer as to crown and elevation by the use of an approved template. The subgrade template shall be so constructed that its lower or testing edge will come to the true position of the subgrade when the template is riding on the forms. Testing of the subgrade surface shall be done by moving the template back and forth on the forms without tilting or lifting. Any excess material

indicted by this template shall be removed and deposited upon the adjacent shoulders, or disposed of as directed. The subgrade shall be kept in a condition so that it will drain readily.

The subgrade shall be in a moist, but not muddy condition, at the time of placing the concrete. If required by the Engineer, it shall be saturated the previous night or not less than six hours previous to the placing of the concrete. If it subsequently becomes too dry, the subgrade shall be sprinkled, but the method of sprinkling shall be such as will not form mud or pools of water.

22. Placing Concrete: (Standard La. Highway Specifications). Concrete shall be placed only on a subgrade prepared and maintained as hereinbefore prescribed and no concrete shall be placed until the subgrade has been approved by the Engineer. The concrete shall be deposited on the subgrade in such manner as to require as little rehandling as possible. It shall be thoroughly spaded against and along the face of the forms. Necessary hand spreading shall be done with shovels, not with rakes. Workmen shall not be allowed to walk in the green concrete with boots covered with earth. The concrete shall be distributed to such depth and sufficiently above grade that, when consolidated and finished, the required slab thickness will be obtained and the surface will at all points be true to the grade specified for the finished surface.

In placing concrete adjacent to transverse expansion joints and other transverse joints, the concrete shall be spaded around the joint filler and around and under the bars and load transmission devices in such manner as to avoid displacement of any part of transverse joints. Concrete shall not be dumped directly upon or against such joints and any displacement of wood filler, tie bars and/or load transmission devices caused by placing concrete and subsequent operations shall be immediately corrected.

No concrete shall be placed around manholes or other structures until they have been brought to the required grade and alignment and all structures, or other fixtures such as valve boxes, poles, etc., shall be separated from the concrete by expansion joints constructed as hereinafter specified in the specifications or on the plans.

The pavement may be constructed to its full width in a single construction operation unless the plans or special provision require construction in longitudinal sections. Concrete in a longitudinal section shall not be placed until the adjacent slab has attained an age of ten (10) days, or has attained a modulus of rupture of 600 pounds as shown by a test of standard specimens cured under the same climatic and moisture conditions as the slab. The junction line shall not deviate from a true line by more than ½ inch at any point and shall be tooled to the radius shown on the plans.

Placing shall be continuous between transverse joints without the use of intermediate bulkheads.

All ends of pavement slabs not supported by dowel bars embedded in adjoining concrete slabs or directly supported by bearing on adjoining structures shall be thickened as required by the plans.

No more concrete shall be mixed and placed than can be properly compacted and finished, as hereinafter specified, during daylight hours, without the written consent of the Engineer and then only when an adequate lighting system satisfactory to the Engineer is provided.

Concrete shall not be placed on frozen subgrade or where the subgrade under adjacent pavements is frozen. Concrete may be placed when the air temperature in the shade and away from artificial heat is not less than 40 degrees F., and rising.

Concrete shall not be placed when the temperature is 40 degrees F., or less and falling. The temperature of the concrete in the drum of the mixer shall not be less than 60 degrees F., nor more than 100 degrees F.

23. Ready-Mixed Concrete: The use of truck mixers or truck agitators is permitted under these specifications provided there is not segregation of material when the concrete is deposited on the subgrade. The concrete shall conform to Tentative Specifications for Ready-Mixed Concrete, ASTM Designation C-94.

The time lapse from the addition of the water until depositing on the subgrade shall not exceed sixty (60) minutes when hauled in truck mixers. The concrete shall be deposited in a plastic and workable condition and its slump shall be within the limits previously specified.

Ready mix concrete shall be delivered with a Ready Mix Concrete Haul Ticket: Form 03-40-3078 (Figure 6-21). The contractor's qualified concrete technician is responsible for completing the plant portion of Form 03-40-3078. This form is given to the truck operator, who must turn it over to the Testing Laboratory's Certified Concrete Technician at the jobsite. The Testing Laboratory Technician is then responsible for completing the field portion of the haul ticket. It is his responsibility to verify that the plant and field data required on the form are compatible with the requirements of the mix design and Standard Specifications. The Testing Laboratory will furnish two (2) copies of each completed form to the Engineer.

24. Retempering: Retempering of concrete which has partially hardened; that is, remixing with or without additional materials or water will not be permitted.

25. Forming Joints: Expansion joints, unless otherwise provided, shall be formed with the specified joint filler and sealer with a bituminous filler meeting the requirements of the specified poured filler. The kind of joint filler to be used in the expansion joints will be shown on the drawings.

Longitudinal joints and transverse joints shall be constructed in all cases where and as indicated on the plans and construction joints shall be made as herein prescribed. Longitudinal joints shall be metal strip joints, except when otherwise noted on the plans. Transverse joints shall be expansion joints, dummy joints or construction joints. Unless other locations are shown on the plans, all longitudinal joints shall be along or parallel to the centerline of the pavement and all transverse joints shall be at right angles to the centerline and shall extend the full width of the pavement. All joints shall be perpendicular to the surface of the slab and when tested with a straightedge, the surface across any joint shall not vary from the straightedge by more than one-eighth (1/8) inch. Concrete edges at all joints shall be tooled to the radius shown on the plans.

26. Longitudinal Joints: Tie bars shall be placed across longitudinal joints and as shown on the plans and shall be held in position at the spacing shown, by approved chairs or other supports at both ends. Sleds shall not be used. Tie bars shall be deformed bars and of the diameter and length shown on the plans and in no case shall the bars be painted, greased or otherwise treated to prevent bonding with the concrete. Any other approved method of tying the adjacent slabs together, shown on the plans, may be used. Tie bars shall not be used across expansion joints.

Longitudinal metal strip joints shall be formed by first installing a metal parting strip of the required gauge, shape and dimensions, to be left permanently by approved steel channel pins, at intervals not greater than three feet. Adjoining sections shall be securely fastened together by lapping and pinning, or by means of slip joints or other approved methods. The Contractor shall furnish an approved gauge, riding on the side forms, for accurately checking the position of the parting strip before concrete is placed against it. The parting strip shall not extend across any transverse joint.

27. Transverse Joints: (Standard La. Highway Specifications). Expansion joints shall be installed at intervals shown on the plans and in conformity therewith.

Transverse expansion joints shall be formed during the placing of the concrete and such methods of construction shall be employed that joints to the full depth and width of the slab are secured. The finished joint shall be true to the line prescribed within an allowable variation of ¼" in the width of one traffic lane.

The specified joint filler shall be cut to the required section and appropriately punched to admit the dowels. All holes for dowel bars shall be accurately spaced as specified on the plans and shall be of the same diameter as the bars to be placed therein. All filler shall be furnished in pieces of the required width and thickness, and not less than five (5) feet in length, except where the joint for which the filler is intended is less than five (5) feet long, the length of the piece shall be equal to the entire length of the joint. Where more than one section is allowed and used in a joint, pieces of filler less than one lane width in length shall be laced or clipped together and all abutting ends of filler shall fit tightly together, so that no concrete can get into the joints. When in position, the filler shall be accurately perpendicular to the surface of the pavement. The bottom edge of the filler shall project to or slightly below the bottom of the slab and the top edge, unless otherwise prescribed, shall be held about three-fourth inch (3/4") below the surface of the proposed pavement to provide space for the sealing of the joint with a joint sealer and bond breaker rope. The top edge of the filler shall be protected, while the concrete is being placed, by the proper size redwood or cypress filler securely attached to the expansion board or by a metal channel cap of at least ten (10) gage material, having flanges not less than two inches (2") in depth. The clear width between the flanges shall be three-sixteenth inch (3/16") greater than the width of the filler. The channel cap and filler shall be securely held in place with the top thereof about one-fourth inch (1/4") below the proposed surface of the pavement in order to allow the finishing operation to be executed continuously.

After the concrete on both sides of the joint has been placed and struck off, the channel cap shall be withdrawn. Unless otherwise directed, preference shall be given to the use of the protecting cap as a guide in edging the joints. After the removal of the protecting cap, the filler must be exposed for the full width of the slab. After the removal of the side forms, the ends of the transverse expansion joints at the edges of the pavement shall be carefully opened for the entire depth of the slab.

Transverse dummy joints shall be formed by impressing a groove or cleft in the slab, of the dimension shown on the plans. The groove formed in the soft concrete by a suitable tool or device, shall extend across the width of the slab in a straight line and shall extend vertically downward from the surface to the depth shown. The groove shall be filled with joint sealer and bond breaker in the manner specified under Art. 9, "Joint Sealant". When the paint has dried and immediately before placing the bar in position, it shall be coated with a heavy grease equivalent to 600W, or cup grease, to prevent bonding with the concrete.

Unless otherwise prescribed joints occur at the same points, transverse construction joints shall be made at the end of each day's run or where interruption on the concreting operations of more than 30 minutes occurs and where the length of pavement laid from the last joint is more than ten (10) feet. Sections less than ten (10) feet in length between joints will not be permitted. A clean plank having a thickness of not less than three inches (3") and cut to conform with the typical cross section of the slab may be used as a header board. The header board shall be accurately set and held in place in a plane perpendicular to the surface. The edge along the end of the pavement shall be finished with an edging tool of the radius shown on the plans. Upon resumption of work, the header board shall be carefully removed and any surplus concrete on the subgrade shall be cleaned away and the fresh concrete deposited directly against the old.

Construction joints shall then be completed in accordance with the plans and in the same manner as prescribed hereinbefore for dummy joints.

28. Dowel Assembly: Dowels shall be prepared and placed across all transverse joints unless otherwise provided by the plans. The dowel bars shall be held in position, parallel to the surface and centerline of the slab by an approved device which shall be left in the pavement. The dowel bars, for their entire length, shall be painted with one coat of red lead paint.

Each dowel bar placed in an expansion joint shall be provided with an approved close fitting, closed end metal or plastic sleeve, of the dimensions indicated on the plans, with suitable flange or other approved device to hold the end of the sleeve from the end of the bar during placing of the concrete so that a space of not less than the proposed thicknesses of the joint will be provided for subsequent movement of the bar in the sleeve. The type of metal sleeve to be used on the dowel bars must meet the approval of the Engineer.

The dowel bars shall be of smooth round steel if a diameter and length shown on the plans and shall be placed as shown on the plans.

29. Pouring Joints: (Standard La. Highway Specifications). Prior to the acceptance of the project and before pavement is opened to traffic, all expansion joints shall be sealed and all dummy and construction joints, cracks and fractures shall be filled with approved joint sealant. All joints, cracks and fractures shall be filled immediately after the curing operation is completed and all joints, cracks and fractures, together with any new cracks or fractures, shall be filled and kept filled with the specified filler until the entire project is completed and accepted by the Engineer. Prior to the sealing of the expansion joints, the top of the joint shall be thoroughly cleaned and the top edge of the joint filler trimmed with a special tool or device so that the top of the joint filler shall not be less than the required ¾ inch below the surface of the pavement. All joints shall be clean and dry before being poured and, in the event the impervious membrane method of curing the pavement is used, all joints, to their full depth, shall be thoroughly cleaned out with approved steel brushes.

The poured filler shall be heated to such temperature that it will satisfactorily penetrate to the full depth and width of the joint. In pouring, the opening shall first be poured part full, allowed to settle and then completely filled. Any material spilled over the surface of the adjacent pavement, curbs of structures shall be immediately and completely removed by the Contractor at his expense. After the pavement is opened to traffic, and prior to final acceptance, all filler in joints which extend above the surface of the pavement shall be trimmed flush with the pavement as often as directed by the Engineer and to his satisfaction.

30. Consolidating and Finishing: The machine method of strike off and consolidation shall be employed. The finishing machine shall be form-riding, self-propelled, and shall be of the oscillating screed, or pan type, designed and operated both to strike off and consolidate. The finishing machine's oscillating screed or float pan shall be adjustable in width so as to span the entire distance between forms. The finishing machine may also be equipped with an additional oscillating screed in the rear of the machine in lieu of the rear float pan. The finishing machine shall be of ample strength to withstand severe use and shall be fully and accurately adjustable for loss of crown, or other derangement due to wear. The finishing machine shall be CURBMASTER, PAV-SAVER, or equal.

The "Clary" screed or roller type screed shall be as manufactured by J.D. Concrete Screed, C & S Manufacturing, Bunyan Industries, or equal. The roller type screed shall only be used where approved by the Engineer in writing, such as for small area patching, ditch linings, or other tangent cross slopes. It is the intent that the CURBMASTER or PAV-SAVER type full width finishing machine be used to the maximum extent possible as appropriate. The roller screed is

not intended to be a substitute for the full width oscillating or pan type screed and finishing machine.

The BIDWELL type paving machine, or equal, is approved for bridge decks, bridge ramps, paved ditches, and parking lots. On new roadway paving, the full width oscillating or pan type screed and finishing machine described above shall be employed.

Compacting and finishing by hand will be allowed only where machine finishing is impracticable. After a breakdown of the finishing machine, only material which is already in transit shall be finished by hand. All finishing tools and equipment shall be cleaned as often as required by the Engineer.

The pavement shall be struck off and consolidated with a mechanical finishing machine. This machine shall strike off the concrete at such a height that, after consolidation and final finishing, it shall be at the exact elevation and have the exact crown as shown on the plans. A depth of at least two (2) inches of concrete shall be carried in front of the strike off screed for the full width of the slab, when the screed is first being used to strike off the pavement.

The finishing machine shall go over each area of pavement as directed, as many times and at such intervals as necessary to give the proper compaction, and to leave a surface of uniform texture, true to grade and contour. If necessary to insure the required density and finish, additional screeding will be required. Prolonged operation over a given area shall be avoided. Where mechanical finishing is used, if the rate of depositing the concrete in the opinion of the Engineer is in excess of the amount which the finishing machine can strike off and consolidate in full compliance with these specifications, a second finishing machine shall be provided and used. The compacting and finishing operations shall at all times be such as to produce a satisfactory surface in accordance with these specifications. If, in the opinion of the Engineer, a satisfactory surface is not being produced, paving operations shall be stopped by the Engineer and the Contractor will not be permitted to proceed until satisfactory results are assured. The top of the forms shall be kept free from accumulations by an effective device attached to the finishing machine, and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision of finish.

No finishing machine shall be used unless operated by an experienced operator.

Finishing Tools: After the concrete has been struck off, the Contractor shall provide and use as hereinafter provided and directed by the Engineer the following named tools: Longitudinal float, transverse float, straightedge float, bow belt, long handle float, hand float and edging tools. All tools for finishing the pavement and straightedges shall comply with the requirements of the City's Standard Plan for Finishing Tools for Concrete Pavement unless other equipment is specifically permitted by the Engineer. The continued use of tools other than those specifically provided for will not be permitted unless same is found to be effective for the purpose used. Any and all tools and equipment necessary for the finishing and checking of the pavement surface shall be furnished and used by the Contractor as directed. Tools or equipment adjudged by the Engineer as unfit for use shall be immediately discarded by the Contractor. For checking centerline, a ten-foot (10') aluminum straightedge will be required.

Longitudinal Floating: In this operation, a longitudinal float shall be worked with a sawing motion while held in floating position parallel to the road center line and passed gradually from one side of the pavement to the other. Movements ahead along the centerline of the road shall be in advances not more than one-half (1/2) the length of the straightedge. Any depressions found shall be immediately filled with freshly mixed concrete, struck off, consolidated and refinished. High areas shall be cut down and refinished. Straightedge testing and surface correction shall continue until the entire surface appears to conform to the required grade and contour.

Transverse Floating: After the concrete has been floated with the longitudinal float and all depressions and high spots have been removed, it shall be floated with a transverse float. A long sweeping strike shall be used for one time over. If required, an additional transverse float may be used ahead of the longitudinal float.

Straightedging: While the concrete is still plastic, the slab surface shall be tested for trueness with a straightedge. The straightedge shall be held in successive positions parallel to the road centerline in contact with the surface and the whole area gone over from one side of the slab to the other as necessary. Advance along the road shall be in successive stages of not more than one-half (1/2) the length of the straightedge. Any depressions found shall be immediately filled with freshly mixed concrete, struck off, consolidated and refinished. High areas shall be cut down and refinished. Straightedge testing and surface correction shall continue until the entire surface appears to conform to the required grade and contour.

Belting: When straightedging is completed and water sheen has practically disappeared and just before the concrete becomes non-plastic, the surface shall be belted with a suitable belt of 2-ply canvas, or other material acceptable to the Engineer, approximately six inches (6") wide and two feet (2') longer than the pavement width. Hand belts shall have suitable handles to permit controlled, uniform manipulation. The belt shall be operated with short strokes transverse to the road centerline and with a rapid advance parallel to the road centerline.

Finished Surface: The finished surface shall be free from porous spots, irregularities, depressions and small pockets or rough spots such as are or may be caused by accidental disturbing during the finish finishing operations, or of particles of coarse aggregate embedded near the surface. Immediately after finishing is completed, channels through the shoulders or other means shall be provided to drain away surface water.

The edges of the slab shall be carefully finished with an edger of the radius required by the plans at about the time the concrete becomes hard and nonplastic and the pavement edge left smooth and true to line.

Hand Finishing: Hand finishing shall comprise the operations of striking off, longitudinal floating, scraping, testing and final surfacing.

When hand finishing is permitted, the pavement shall be struck off with a screed, cut to the form of the pavement surface and weighing at least fifteen pounds per lineal foot. The screed shall rest on the side forms, gutter apron or curb and be drawn forward with a sawing motion. A depth of at least two inches (2") of concrete shall be carried in front of the strike off screed for the full width of the pavement, whenever the screed is being drawn forward.

In intersections where warped surfaces make it impracticable to use a screed, the correct pavement contour may be secured by the use of a lute. In that case, steel grade stakes provided with lugs shall be driven into the subgrade with the top of the lugs accurately set at the elevation for the finished pavement. These stakes shall be set at intervals of ten feet along the subgrade and in a straight line perpendicular to the centerline of the pavement, one at the centerline and one at each quarter point and so many additional points as the Engineer may direct. The concrete shall then be spread to the elevation indicated by the stakes.

Cement mortar gathered from the surface of the concrete already placed shall not be used in filling boot tracks or stony areas, but such imperfections shall be dug out and refilled with concrete to the depth of the reinforcing and worked smooth.

No workmen shall then be allowed to walk over the area so completed.

Following the initial screeding, the pavement shall be screeded a second time.

Tamping shall be done only after screeding, and then only when required by the Engineer where mortar fails to come properly to the surface during the screeding. A separate template may be used for tamping, or the strike off template may be used if it is of suitable construction. In the tamping operation, one end of the template shall rest on the side form or edging, while the other is lifted and dropped, advancing at such a rate that the whole surface is struck at least once. The opposite end shall then be lifted and dropped in the same manner. Neither end shall be advanced more than one foot (1') ahead of the other.

Following the second screeding, the pavement shall be floated longitudinally.

After excess water has come to the surface, the pavement shall be scraped with a straightedge as specified above under "Machine Finishing".

Following the scraping, the surface shall be straightedged, corrected and disturbed places floated and final finishing applied as specified above under "Machine Finishing".

31. Correction of Defective Surface: After the concrete has hardened, and not later than ten o'clock of the morning following the placing of the concrete, the surface of the pavement shall be again tested with a ten foot straightedge so as to reveal any and all irregularities. Any portion of the pavement which shows a variation or departure from the testing edge of more than one-eighth (1/8) inch and has not been satisfactorily corrected by rubbing or other approved methods, shall be removed and replaced by and at the expense of the Contractor. Any area of section so removed shall not be less than ten feet in length and for the full width of the section under construction.

32. Curing of Concrete: After finishing operations have been completed, the newly laid concrete shall be protected and cured by an approved membrane curing compound.

Membrane Curing Compound: This method shall be used on horizontal surfaces only.

Curing: Immediately after completion of finishing operations and as soon as marring of concrete will not occur, the entire surface of newly place concrete shall be covered and cured with a white pigmented impervious membrane. The concrete shall not be left exposed for more than ½ hour during the curing period.

The Contractor shall have available at the job site sufficient covering material to cover and properly protect the last hour's pour against the effects of rain. This covering material may be burlap mats, waterproof paper or combined burlap and white polyethylene sheeting. Failure to provide sufficient cover material or to adequately take care of curing requirements shall be cause for immediate suspension of concreting operations.

The required white-pigmented impervious membrane curing method is as follows:

a. Liquid Membrane-Forming Compounds: This material shall conform to AASHTO Designation: M 148, except that specimens tested for drying time shall be maintained at a temperature of 100° F ± 2° F and a relative humidity of 32 ± 2 percent. When so tested, the membrane-forming compound shall dry to touch in not more than two (2) hours.

b. White Pigmented Impervious Membrane: The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after completion of surface finishing and before the concrete sets. If the pavement is cured initially with burlap mats and the

mats are removed prior to expiration of seventy-two (72) hours, curing compound shall be applied immediately. Curing compound shall not be applied during rainfall.

33. Cold Weather Curing: (Standard La. Highway Specifications). When concrete is being placed during cold weather and the air temperature may be expected to drop below 35° F, a sufficient supply of straw, hay, grass or other suitable blanketing material shall be provided along the line of the work and at any time when the temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete before it has thoroughly hardened. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather and any concrete injured by frost action shall be removed and replaced at his expense.

34. Protection of Concrete: The Contractor shall erect and maintain suitable barricades and employ watchmen, if required by the Engineer, to exclude traffic from the newly constructed pavement for the period of fourteen (14) days, but these barriers shall be so arranged as not in any way to interfere with or impede public traffic on any lane intended to be kept open and necessary signs and light shall be maintained by the Contractor clearly indicating the open lanes.

35. Excavated Material: The Owner shall have the right to remove any surface or roadway material from the streets. The Contractor will notify the Engineer when he expects to start excavation and if the City desires the excavated road material, the Contractor will, at his expense, load the material into City trucks, or stock pile it on abutting property as the Engineer directs. The balance of the excavated material will be disposed of under the instructions of the Engineer, the intent being that the Contractor either load the material into trucks furnished by the City or place the material on adjacent property if property owners so desire. Should the Owner or adjacent property owners have no need for the excavated material, it shall become the property of the Contractor and he will dispose of it by sale or otherwise as he sees fit.

36. Surface Finish Requirements: As soon as concrete has hardened sufficiently, the Contractor shall conduct tests as are necessary to determine whether the paved surface is within specification limits. The pavement surface will be tested with the Owner with an approved 10 foot rolling straightedge capable of marking the deficient areas by suitable means. The rolling straightedge shall be furnished by the Contractor and shall be calibrated and used in accordance with DOTD Designations: TR 603 and TR 618.

Surface tolerance measurements will be conducted for each lane. If surface deviations in a lane exceed 6.0 percent, paving operations shall be discontinued and shall not be resumed until satisfactory corrective action is taken by the Contractor.

All testing will be made longitudinally for the full length of each traffic lane. Each section will be tested as early as possible in a longitudinal direction in both wheel paths of each travel lane.

Pavement areas with surface deviations over ½ inch shall be satisfactorily removed and replaced by the Contractor at his expense with pavement meeting these specifications.

Pavement areas with surface deviations of ¼ to ½ inch will be isolated by the Engineer and shall be corrected by the Contractor at his expense by approved grinding methods to within a 1/8 inch deviation; except for ramps, turnouts and other irregular sections which shall be corrected by approved grinding methods to within a ¼ inch deviation. Pavement surfaces which have been corrected by grinding shall be textured consistent with adjacent pavement. Surface deviations of 1/8 to ¼ inch will be subject to the price adjustments given as follows:

	Payment (Percent of Contract Unit Price/Lane)			
	100	95	80	50 or Remove (1)
Surface Tolerance, Linear %	0 to 6.0	6.1 to 8.0	8.1 to 10.0	Over 10.0

(1) At the option of the Engineer.

PORTLAND CEMENT CONCRETE MIX DESIGN

PROJECT NO. ____-____-____ MATERIAL USE ___ P or S MATERIAL CODE ____ TYPE/CLASS ________

PLANT CODE C____ ________ MIX DESIGN NO. ____

Slip Form Paving ___ Yes / No Mixing Method: ___ 1 = Truck Mixer, 2 = Central Mixer, 3 = Shrink Mixed

F.A.P. ________ Project Name ________ Parish ________

MATERIALS

	Source Code	Company Name	Location*	Material Code	Alkali Reactive	Specific Gravity	Absorption Factor	Product Name
Cement					Yes / No			
Fly Ash						.		
Fine Aggregate						.	.	
Coarse Aggregate 1						.	.	
Coarse Aggregate 2						.	.	
Water Reducer			Normal Set ___ Yes / No			Set Retarder ___ Yes / No		
Air Entrainer								
Set Accelerator			Chloride ___ Yes / No			Non-Chloride ___ Yes / No		
Superplasticizer								
Special Additive A						.		
Special Additive B						.		
Special Additive C						.		

Mixing Water: Source of Supply ___ 1=City, 2=Well, 3=Other ________

Mix Proportions For One Cubic Yard of Concrete

	Amount		UNIT (lbs, gal, ozs)
Cement		lbs	
Fly Ash		lbs	
Fine Aggregate (SSD)		lbs	
Coarse Aggregate 1 (SSD)		lbs	
Coarse Aggregate 2 (SSD)		lbs	
Water	.	gal	
Water Reducer	.	ozs	
Air Entrainer	.	ozs	
Set Accelerator	.	ozs	
Superplasticizer	.	ozs	
Special Additive A	.		
Special Additive B	.		
Special Additive C	.		

Contractor ________

Submitted By ________

Date Submitted ____-____-____

Departmental Use

Yield	.	Cubic Feet
Cement Factor	.	Bags/Cubic Yard
Fly Ash		% By Weight
Water-Cement Ratio	.	Gallons/Bag
Water-Cement Ratio	.	By Weight
Cement with 0.6% or less Alkalies required		Yes / No

Received ________ Project Engineer ____ Code ____-____-____ Date

ACCEPTED ☐ REJECTED ☐

________ District Laboratory Engineer ____ Code ____-____-____ Date

Acceptance based on mix proposal meeting specification requirements for yield, cement factor, water-cement ratio, materials sources, cement type, fly ash type, admixture types, special additives and MATT Codes.

Remarks ________________________________

BATCH CERTIFICATION FOR PORTLAND CEMENT CONCRETE

PLANT DATA

Project No. _____ Time Batched _____ AM PM Date _____

Plant _____ Location _____ Mix Design No. _____

Concrete (Class/Type) _____ Truck No. _____ Batch No. _____ Batch Size _____ cu yd

Legal Load _____ lb/ _____ cu yd Ambient Air Temp. _____ ° F

Batch Weights

Cement _____ lb Fly Ash _____ lb Fine Agg. _____ lb Coarse Agg. _____ lb

Water Reducer _____ oz: NS ☐ SR ☐ Air Entrainment _____ oz

Maximum Allowable Water to be Added _____ gal Water Added _____ gal

Ice Added _____ gal Maximum Water That Can be Added at Jobsite _____ gal

Revolutions at Mixing Speed _____

_____
Batcher or Technician

JOB SITE DATA

Slump _____ in. Air Content _____ % Temperature of Concrete _____ ° F

Lot No. _____ Mix Use: ☐ Structural ☐ Major ☐ Minor Item No. _____

☐ Pavement Cu Yd This Lot _____

Time Truck Emptied _____ AM PM Allowed Elapsed Time ☐ 45 min Elapsed Time _____ min

☐ 90 min

Water Added _____ gal Total Water In Batch _____ gal Number of Water Additions _____

Revolutions at Mixing Speed _____ Total Revolutions at Mixing Speed _____

Temperature of Concrete _____ ° F Location Placed _____

Remarks: _____

_____

_____
DOTD Certified Inspector