ADOT 2008

ARIZONA

DEPARTMENT OF TRANSPORTATION

STANDARD SPECIFICATIONS

for

ROAD AND BRIDGE CONSTRUCTION

2008

Backfill material shall be compacted to at least 95 percent of the maximum density determined in accordance with the requirements of the applicable test methods of the ADOT Materials Testing Manual, as directed and approved by the Engineer.

Jetting shall not be used to compact pipe backfill, trench backfill or any material placed more than one foot above the top of the pipe.

Ponding will not be allowed in any case.

If trench backfill or pipe backfill is placed as an aggregate slurry, the contractor shall excavate holes in the compacted slurry to the depths and at the locations designated by the Engineer. These holes shall be of such size as to allow the required density tests to be performed in a safe manner. Upon completion of the tests, the contractor shall refill the excavated areas and compact the material to the required density in a manner satisfactory to the Engineer.

Cement-treated slurry bedding material for pipe backfill shall not require additional compaction after placement up to an elevation one foot above the top of pipe if it meets the material requirements of Subsection 501-3.02(A) and is placed and compacted as outlined in Subsection 501-3.04(B) and (C). No density tests will be required in the cement-treated slurry bedding material when it is utilized for pipe backfill to an elevation one foot above the top of pipe.

Cement-treated slurry bedding material used for trench backfill shall meet the requirements listed above for pipe backfill up to the elevation which it is placed.

501-3.05 Filter Material:

When shown on the project plans or specified in the Special Provisions, filter material shall be carefully placed around perforated pipe.

Filter material shall conform to the grading requirements for fine aggregate in Section 1006 and shall be placed in accordance with the details shown on the project plans.

501-3.06 Encasement of Pipe:

When shown on the project plans, pipe shall be encased in Class B concrete. Portland cement concrete shall conform to the requirements of Section 1006.

501-3.07 Nonreinforced, Cast-In-Place Concrete Pipe:

(A) General Requirements:

The contractor shall have previously installed cast-in-place pipe similar to the pipe specified in this contract. The Engineer may require the

contractor to submit a list of names of the contractor's key personnel with their cast-in-place pipe experience. When required, the list shall include the foreman and equipment operators.

When the project plans include cast-in-place concrete pipe as an alternate, the contractor shall review the geotechnical investigation report. The report will be available at Contracts and Specifications Section, 1651 W. Jackson, Phoenix, Arizona 85007, phone (602) 712-7221. The contractor shall be responsible to determine if the in-place soil conditions will allow the specified trench to be constructed.

The contractor shall provide a quality control administrator who shall be responsible for cast-in-place pipe quality. The administrator shall be a full time employee of the contractor or a consultant engaged by the contractor. The contractor shall provide documentation to the Engineer which demonstrates the quality control administrator's experience in the manufacture and placement of cast-in-place pipe. The administrator shall have the authority to control all activities necessary to ensure a product of acceptable quality, including strength, alignment, thickness, and grade.

The contractor's quality control administrator shall inspect the pipe construction and complete a daily observation form, supplied by the Engineer. The form shall be completed and submitted to the Engineer no later than 9:00 a.m. on the first working day following each day work is being performed on the pipe installation.

Nonreinforced, cast-in-place concrete pipe shall be cast monolithically in a prepared trench at the locations and in accordance with the details shown on the project plans and the requirements of these specifications.

The pipe shall be constructed with equipment specifically designed for constructing cast-in-place, monolithic concrete pipe. The equipment shall be approved by the Engineer prior to use, and the contractor may be required to furnish evidence of successful operation of the equipment on similar work. If, in the opinion of the Engineer, the equipment furnished is not suitable to produce the quality of work specified, its use will not be permitted for the work.

Pipe shall be constructed in trenches which have been excavated in either native soil or compacted fill. The trench walls shall be stable so that the planned shape of the trench is maintained.

The minimum inside diameter of the pipe, measured in any direction, shall be at least 98 percent of the nominal pipe size. The minimum wall thickness will be as specified on the project plans for each pipe size.

(B) Excavation:

The trench shall be excavated to the lines and grades shown on the project plans. Laser guided alignment instruments shall be used to

control the grade and alignment of the trench. Departure from and return to the established grade for the finished trench shall not exceed one inch per ten linear feet, with a total departure not to exceed 1.5 inches. Departure from and return to specified alignment for the trench shall not exceed two inches per ten linear feet, with a total departure not to exceed four inches. The bottom of the trench shall be shaped in accordance with the details shown on the project plans and prepared to provide full, firm and uniform support over the bottom 210 degrees of the pipe to be constructed.

The length of trench permitted to remain open at any one time shall not exceed 1,600 linear feet, unless otherwise specified in the Special Provisions or as may be permitted by the Engineer.

The bottom of the trench must consist of either undisturbed native soil or compacted backfill.

When, in the opinion of the Engineer, soft, spongy or other unsuitable material is encountered in the bottom of the trench, such unsuitable material shall be removed to the depth and width directed by the Engineer. The resulting area shall be backfilled with material conforming to the requirements of Subsection 501-3.04(A)(1). The backfill shall be compacted in accordance with the requirements of Subsection 501-3.04(C). The trench shall then be excavated as specified above.

When boulders, bedrock, or rock ledges are encountered in the bottom or side walls of the trench, such material shall be removed to a distance of at least six inches from the nearest surface of the pipe, and the space then backfilled, compacted, and reshaped as required above for unsuitable material.

The trench walls, from a point one foot above the top of the pipe to the top of the trench, may be sloped as required by soil conditions to provide more stability in the trench and safer working conditions in accordance with the provisions of Subsection 107.07. The steepness of the side slopes shall be limited to the degree of stability considered necessary for safety, unless an approved shoring system is used. Side slopes shall conform to current OSHA regulations and be approved by the Engineer.

(C) Concrete Placement:

At the time of concrete placement, all surfaces in the trench which will be in contact with the pipe shall be thoroughly moistened so that moisture will not be drawn from the freshly placed concrete; however, the trench shall be free of standing water, mud and debris.

The concrete shall be placed around the full circumference of the pipe in one operation. When metal forms are used, they shall be of sufficient strength to withstand vibrating and tamping of the concrete.

The concrete shall be vibrated, rammed, tamped or worked with suitable devices until the concrete has been thoroughly consolidated and completely fills the formed space.

Laser guided alignment instruments shall be used to control the grade and alignment of the pipe. Departure from and return to the established grade for the invert of the installed pipe shall not exceed one inch per ten linear feet, with a total departure not to exceed 1.5 inches. The surface of the invert shall not vary by more than 0.10 feet when tested with a ten foot straight edge. Departures from and return to specified alignment for the pipe shall not exceed two inches per ten linear feet, with a total departure not to exceed four inches.

When placing operations stop for such a time that initial set of the concrete is likely to occur before placement resumes, a construction joint shall be made by leaving the end of the pipe rough with a slope of approximately 45 degrees and inserting 24-inch No. 4 dowels one foot into the center of the pipe wall at approximately 18-inch intervals.

Collars may be used in lieu of doweled joints. An excavation shall be made along the sides and bottom of the construction joint to permit casting of a concrete collar around the outside of the joint. The collar shall have a minimum thickness 1.25 times the pipe wall thickness and shall lap the entire joint by at least two times the wall thickness.

Immediately before resuming concrete placement, the joint shall be cleaned of all laitance, loose or defective concrete, coatings and other deleterious materials, and thoroughly wetted.

Construction joints used for connections to another pipe or at junction structures shall be made by squaring off the end of the pipe. An excavation along the sides and bottom of the pipe to permit casting of the concrete collar shall be made as previously specified.

After the removal of forms, the inside of the pipe will be inspected for rock pockets, voids, form indentation, and excessive form lap. Any necessary repairs shall be made within 24 hours and to the satisfaction of the Engineer. Cracks shall be repaired in accordance with Subsection 501-3.07(G).

(D) Finishing:

The interior surface and exterior top surface of the pipe shall be as smooth as a wood-float finish and shall be essentially free of fractures, cracks and roughness.

(E) Curing:

Within 15 minutes after the pipe is cast, the concrete forming the exposed top portion of the pipe shall be cured as follows:

The pipe shall be covered with a polyethylene film conforming to the requirements of AASHTO M 171 except that the nominal thickness shall be 0.0015 inches. The film shall be white opaque or clear and shall be held in place with loose soil to assure continuous contact. The loose soil shall not be greater than six inches in depth at any point, and shall conform to the requirements herein before specified under pipe backfill. This curing method shall be used when the ambient temperature exceeds 100 degrees F.

For ambient air temperatures equal to or less than 100 degrees F, the pipe may be sprayed with a liquid membrane-forming compound conforming to the requirements of Subsection 1006-6(C). If the contractor elects to spray the pipe with a liquid membrane, such procedure shall be completed within 30 minutes.

During the curing period, the inside of the pipeline shall be kept in a humid condition for at least seven days following placement of the concrete. To prevent air drafts from drying the fresh concrete, openings in the pipeline shall be covered during the seven day period, except at locations where work on the pipe is required and only during the time that such work is actually in progress.

(F) Backfilling:

Backfilling shall not start until the concrete has developed a compressive strength of at least 2,500 pounds per square inch.

The type of backfill material, the placement of pipe and trench backfill material, and compaction shall conform to the requirements of Subsection 501-3.04.

(G) Pipe Repair:

The contractor shall perform all interior crack repairs only after backfilling.

Transverse cracks 0.05 inches or more in width shall be cleaned and filled with an elastomeric compound approved by the Engineer. The elastomeric compound shall penetrate into the crack at least 0.38 inches.

A longitudinal crack shall be defined as one which is generally oriented within 30 degrees of the alignment of the pipe.

Longitudinal cracks will be a cause for rejection under any of the following conditions.

(1) A crack which has caused a surface fault within the pipe with a displacement greater than 0.08 inches.

(2) A crack width greater than that determined by the formula 0.0005 x O.D. and that can be penetrated by a standard machinist gauge leaf designated in AASHTO T 280.

(3) A crack width greater than 0.05 inches and that can be penetrated by a standard machinist gauge leaf designated in AASHTO T 280.

Longitudinally cracked pipes meeting any of the three rejection criteria above may be allowed to remain in place if approved by the Engineer. If the Engineer allows such rejectable pipe to remain, all longitudinal cracks meeting any of the three criteria above shall be repaired by full depth epoxy grouting.

Any section of pipe rejected by the Engineer shall be removed and replaced at no additional cost to the Department.

(H) Pipe Wall Thickness:

The contractor shall measure the thickness at the invert and crown by probing at 25-foot intervals during the placement of concrete. The probe shall be a 3/8-inch round bar at least two inches longer than the wall thickness to be measured. The measurements shall be reported on the daily observation form.

The wall thickness will be measured for acceptance. One hole each shall be drilled at the invert and on each side of the springline, within 200-foot intervals. The drill locations will be determined by the Engineer. The Engineer may require additional holes on curves or in areas which appear to be defective. All holes shall have a minimum diameter of 3/4 inch. If the wall thickness is less than the specified minimum thickness, a core shall be drilled adjacent to the drilled hole.

All cores shall have a minimum diameter of three inches.

The length of the core will be determined in accordance with the requirements of AASHTO T 148.

If the length of the drilled core is deficient, additional cores shall be taken at intervals not to exceed ten feet in each direction from the deficient core until one core which is not deficient is obtained in each direction. The pipe between these two acceptable cores will be rejected. The rejected pipe section shall be removed and replaced with pipe of the specified thickness at no additional cost to the Department.

At all locations where drilled holes or cores have been made, the resulting holes shall be filled with concrete in a manner satisfactory to the Engineer.

501-4 Method of Measurement:

Pipe will be measured by the linear foot parallel to the central axis of the pipeline, and shall include the length of fittings.

Tees, wyes and other branches will be measured as pipe along the central axis of the pipes to the point of intersection of said central axes. Pipe reducers will be measured as pipe of the larger diameter along the central axis.

The end of pipe in closed structures will be considered to be at the intersection of the central axis and the inside face of the wall and for masonry and concrete headwalls it will be considered to be at the intersection of the central axis and the face of the headwall.

End sections will be measured by the number of units installed.

501-5 Basis of Payment:

The accepted quantities of pipe, measured as provided above, will be paid for at the contract unit price complete in place.

Except as hereinafter specified, no separate measurement or payment will be made for excavating trenches and for furnishing, placing and compacting bedding and backfill material as described and specified herein and on the project plans, the cost thereof being considered as included in the contract unit price per foot of pipe.

Payment for the removal of rock, hard pan, other unyielding material, or soft, spongy or other unstable soil below the vertical limits as shown on the plans, and the backfilling of these over-excavated areas, as specified herein and as directed by the Engineer, will be paid for in accordance with the requirements of Subsection 104.02.

When an embankment is constructed prior to the digging of a trench and the installation of a pipe, payment for the construction of the embankment will be made under the appropriate item, such as Roadway Excavation or Borrow. Removal of rock, hard pan, other unyielding material, or soft, spongy or other unstable material from the trench within the embankment will not be considered for payment.

The repairing of the damage to existing pipe ends to which new pipe is to be joined and which cannot be seen in order to be assessed and the removal of any portion of a damaged existing pipe, as specified under Subsection 501-3.03(B) will be paid for in accordance with the provisions of Subsection 104.02.

No measurement or direct payment will be made for furnishing and placing filter material, plating material, fittings, collars, bands and the joining of new and existing pipes.

For cast-in-place pipe, no separate measurement or payment will be made for the excavation or preparation of the trench; for furnishing,

placing and compacting backfill material; for pipe repair, when authorized by the Engineer; or for quality control activities; the cost being considered as included in the unit price per foot of pipe.

End sections, measured as provided above, will be paid for at the contract unit price complete in place.

SECTION 502 STRUCTURAL PLATE PIPE, PIPE-ARCHES, AND ARCHES:

502-1 Description:

The work under this section shall consist of furnishing and erecting structural plate pipe, pipe-arches, and arches of the sizes, thicknesses, and dimensions shown on the project plans. They shall be installed at the locations specified on the project plans or as directed by the Engineer in reasonably close conformity to the lines and grades shown on the project plans or as established by the Engineer and the requirements of these specifications.

502-2 Materials:

Materials shall conform to the requirements of Section 1010, unless otherwise specified.

Plates shall be fabricated in accordance with the requirements of either AASHTO M 167, AASHTO M 219 or Federal Specification WW-P-405.

Concrete shall conform to the requirements of Section 1006 for the class and strength shown on the project plans.

Reinforcing steel shall conform to the requirements of Section 1003.

502-3 Construction Requirements:

Excavating bedding and backfilling for the structural plate pipe, pipe-arches, and arches shall be performed as specified under Section 501 and as specified herein and on the project plans. Excavating and backfilling for the concrete footings shall be performed as specified under Subsection 203-5. Placement of reinforcing steel and structural concrete shall conform to the requirements of Sections 605 and 601, respectively.

When backfill material is placed around and over arches before headwalls are in place, the material shall first be placed midway between the ends of the arch, forming as narrow a ramp as possible, until the top of the arch is reached. The ramp shall be constructed evenly from both sides and the material shall be compacted as it is placed. After the two ramps have been constructed to the top of the arch, the remainder of the material shall be placed from the top of the