

TABLE 02601-1

PHYSICAL REQUIREMENTS FOR FLEXIBLE BASE MATERIALS

GRADES				
TYPES	GRADE 1:	GRADE 2:	GRADE 3:	GRADE 4:
	(Triaxial Class 1 Min compressive strength, psi: 45 at 0 psi lateral pressure and 175 at 15 psi lateral pressure.	(Triaxial class 1 to 2.3) Min. compressive strength, psi: 35 at 0 psi lateral pressure and 175 at 15 psi lateral pressure.	(Unspecified Triaxial Class)	
TYPE A	Retained on Sq. Sieve %	Retained on Sq. Sieve %	Retained on Sq. Sieve %	
Crushed or Broken Aggregate (excluding gravel aggregate)	1-3/4"..... 0 7/8"..... 10-35 3/8"..... 30-50 No. 4 45-65 No. 40 70-85 Max LL 35 Max PI..... 10 Wet Ball Mill Max Amt..... 40 Max Increase in Passing No. 40 20	1-3/4".....0-10 No. 445-75 No. 4060-85 Max LL40 Max PI.....12 Wet Ball Mill Max. Amt.....50 Max Increase in Passing No. 4020	1-3/4" 0-10 No. 40 60-85 Max LL45 Max PI.....15 Wet Ball Mill Max. Amt.....55 Max. Increase in Passing No. 4020	As Shown On Plans
TYPE B	Retained on Sq. Sieve %	Retained on Sq. Sieve %	Retained on Sq. Sieve %	
Gravel Aggregate		1-3/4".....0-10 No. 430-75 No. 4070-85 Max LL35 Max PI.....12	1-3/4" 0-5 No. 4 30-75 No. 40 65-85 Max. LL35 Max. PI.....12	As Shown On Plans
TYPE C	Retained on Sq. Sieve %	Retained on Sq. Sieve %	Retained on Sq. Sieve %	
Iron Ore Topsoil		2-1/2".....0 No. 4050-85 Max. LL35 Max. PI.....12	2-3/4"0 No. 40 45-85 Max. LL35 Max. PI.....12	As Shown On Plans

TABLE 02601-1 CONT'D

TYPE D		Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	
Sand-Shell		1-3/4".....	0-10	1-3/4".....	0-10	
		No. 4	45-65	No. 40	45-65	As
		No. 40	50-70	Max. LL	35	Shown
		Max. LL	35	Max. PI.....	12	On
		Max. PI.....	12			Plans
TYPE E		Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	
Shell with		1-3/4".....	0	1-3/4".....	0	As
Sand and		No. 40	45-65	No. 40	45-65	Shown
Caliche		Max. LL	35	Max. LL	35	On
		Max. PI.....	10	Max. PI.....	12	Plans
TYPE F		Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	
Caliche		1-3/4".....	0	1-3/4".....	0	As
		No. 4	45-75	No. 40	50-85	Shown
		No. 40	50-85			On
		Max. LL	40	Max. LL	40	Plans
		Max. PI.....	12	Max. PI.....	12	
TYPE G						
Crushed						As
Blast						Shown
Furnace						On
Slag						Plans

G. The limits establishing reasonable close conformity with the specified gradation and plasticity index are defined by the following:

1. The ENGINEER may accept the material, providing not more than 2 of 10 consecutive gradation tests performed are outside the specified limits on any individual or combination of sieves by no more than 5% and where no two consecutive tests are outside the specified limits.
2. The ENGINEER may accept the material providing not more than 2 of 10 consecutive plasticity index samples tested are outside the specified limit by no more than two points and where no two consecutive tests are outside the specified limit.

2.05 STOCKPILING:

- A. When specified on the plans, the material shall be stockpiled prior to delivery on the road. The stockpile shall be not less than the height indicated and shall be made up of layers of material not to exceed the depth shown on the plans.
- B. After a sufficient stockpile has been constructed as specified on the plans, the CONTRACTOR may proceed with loading from the stock- pile for delivery to the road.
- C. In loading from the stockpile for delivery to the road, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.
- D. If the CONTRACTOR elects to produce the Type a material from more than one material or more than one source, each material shall be crushed separately and placed in separate stockpiles so that at least 75 percent of the material in the course aggregate stockpiles will be retained on the No. 4 sieve and at least 70 percent of the material in the fine aggregate stockpile will pass the No. 4 sieve.
- E. The materials shall be combined in a central mixing plant in the proportions determined by the ENGINEER to produce a uniform mixture which meets all of the requirements of the specification. In the event that combinations of the materials produced fail to meet all of the specification requirements, the CONTRACTOR will be required to secure other materials which will meet specifications requirements.
- F. The central mixing plant shall be either the batch or continuous flow type, and shall be equipped with feeding and metering devices which will add the materials into the mixer in the specified quantities.
- G. Mixing shall continue until a uniform mixture is obtained.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE:

- A. Type roadbed shall be excavated and shaped in conformity with the typical sections shown on the plans and to the lines and grades as established by the ENGINEER.
- B. All unstable or otherwise objectionable material shall be removed from the sub-grade and replaced with approved material.
- C. All holes, ruts and depressions shall be filled with approved material and, if required, the sub-grade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the sub-grade in an acceptable condition to receive the base material.
- D. The surface of the sub-grade shall be finished to line and grade as established and in conformity with the typical section shown on plans, and any deviation in

excess of 1/2 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and re-compacting by sprinkling and rolling.

- E. Sufficient sub-grade shall be prepared in advance to insure satisfactory prosecution of the work.
- F. Material excavated in the preparation of the sub-grade shall be utilized in the construction of adjacent shoulders and slopes or otherwise disposed on as directed, and any additional material required for the completion of the shoulders and slopes shall be secured from sources indicated on plans or as directed by the Engineer.

3.02 PLACEMENT OF FIRST COURSE - TYPE A, TYPE B, TYPE C, TYPE F, AND TYPE G MATERIAL:

- A. Immediately before placing the base material, the sub-grade shall be checked as to conformity with grade and section.
- B. The material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered in each 100- foot station.
- C. Material deposited upon the sub-grade shall be spread and shaped the same day.
- D. In the event inclement weather or other unforeseen circumstances render impractical the spreading of the material during the first 24-hour period, the materials shall be scarified and spread as directed by the Engineer.
- E. The material shall be sprinkled, if directed, and shall then be bladed, dragged and shaped to conform to typical sections as shown on plans.
- F. All areas and "nests" of segregated coarse or fine material shall be corrected to removed and replaced with well graded material, as directed by the ENGINEER.
- G. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and supplies in the amount directed by the ENGINEER. Such binder material shall be carefully and evenly incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods.
- H. The course shall be compacted by method of compaction hereinafter specified as the "Ordinary Compaction" method or the "Density Control" method of compaction as indicated on the plans, or as directed by the ENGINEER.
 - 1. When the "Ordinary Compaction" method is to be used, the following provisions shall apply:
 - a) The course shall be sprinkled as required and rolled as directed until a uniform compaction is secured. Throughout this entire operation,

the shape of the course shall be maintained by blading and the surface upon completion shall be smooth and in conformity with the typical sections shown on plans and to the established lines and grades.

- b) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and re-compacting by sprinkling and rolling.
- c) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and re-compacting by sprinkling and rolling.

2. When the "Density Control" method of compaction is to be used, the following provisions shall apply:

- a) The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as hereinafter specified under "Density".
- b) In addition to the requirement specified for density, the full depth of the flexible base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment.
- c) After each section of flexible base is completed, tests as necessary will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.
- d) Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to established lined and grades.
- e) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and re-compacting by sprinkling and rolling.
- f) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and re-compacting by sprinkling and rolling.

- I. Should the base course, due to any reason or cause, lose the required stability, density or finish before the surfacing is complete, it shall be re-compacted and refinished at the sole expense of the CONTRACTOR.

- J. Where Type C material is used, the material shall be scarified, thoroughly wetted, mixed, manipulated, and bladed so as to secure a uniformly wetted material, and pulled in over the sub-grade in courses and set under the action of blading and rolling. The work of mixing, blading, rolling, shaping, and subsequent maintenance shall be performed by the continuous use of sufficient number of satisfactory rollers and power maintainers with adequate scarifier attachments.

3.03 PLACEMENT OF FIRST COURSE - TYPE D MATERIAL:

- A. Immediately before placing the base material, the sub-grade shall be checked as to conformity with grade and section, and corrections made if necessary.
- B. All materials shall be delivered in approved vehicles of a uniform capacity.
- C. The required amount of shell shall be uniformly spread across the section and allowed to dry sufficiently to insure proper slaking and mixing of the binder material. Immediately upon completion of the drying period, as determined by the ENGINEER, the specified amount of sand admixture as required to produce a combined material meeting the requirements hereinbefore specified, shall be spread uniformly across the shell.
- D. The material shall then be sprinkled as required and thoroughly mixed by blading and harrowing, or other approved methods.
- E. Failure to proceed with the placing of sand admixture or mixing and placing operations will be grounds for the suspension of placing of shell.
- F. Under no conditions will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.
- G. The course shall be compacted by the method of compaction hereinafter specified as the "Ordinary Compaction" method or the "Density Control" method of compaction as indicated on the plans, or as directed by the ENGINEER.
1. When the plans indicate that the "Ordinary Compaction" method is to be used, the following provisions shall apply:
 - a) After mixing, all material shall be windrowed, and then spread over the section in layers.
 - b) The layer shall not exceed 2 inches in loose depth.
 - c) If necessary to prevent segregation, the material shall be wetted in the window prior to spreading.
 - d) After each lift is spread, it shall be sprinkled and rolled to secure maximum compaction as directed by the ENGINEER. Succeeding layers shall then be placed similarly until the course is completed.

- e) All areas and "nest of segregated coarse or fine material shall be corrected or removed and replaced with well graded material, as directed by the ENGINEER.
 - f) The course shall then be sprinkled as required and rolled as directed until a uniform compaction is secured.
 - g) Throughout this entire operation, the shape of the course shall be maintained by blading; and the surface, upon completion, shall be smooth and in conformity with the typical sections shown on plans, and to the established lines and grades.
 - h) In that area on which pavement is to be place, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and re-compacting by sprinkling and rolling.
 - i) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and re-compacting by sprinkling and rolling.
2. When the plans indicate that the "Density Control" method of compaction is to be used, the compaction method shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G material.
- H. When indicated on the plans or permitted by the ENGINEER, Type D material may be mixed in a central mixing plant and delivered to the road as a combined mixture. When this method is used, the combined mixture shall meet the requirements for type D material as hereinbefore specified and the placing and compaction requirement shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G material.

3.04 PLACEMENT OF FIRST COURSE - TYPE E MATERIAL:

- A. The construction methods for placing the first course of Type E material shall be the same as prescribed for Type D material except that after the shell and sand have been placed, the prescribed amount of caliche shall then be spread across the sand and shell.
- B. The composite mixture shall then be sprinkled as required and thoroughly mixed by blading and harrowing or other approved methods.
- C. Compaction of the first course of Type E material shall be the same as prescribed above for Type D material.
- D. Failure to proceed with placing the sand and caliche admixture or mixing and placing operations will be grounds for the suspension of placing of shell.

- E. Under no conditions will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.

3.05 PLACEMENT OF SUCCEEDING COURSES - ALL MATERIAL TYPES:

- A. Construction methods shall be the same as prescribed for the first course.
- B. Prior to placing the surfacing on the completed base, the base shall be "dry cured" to the extent directed by the ENGINEER.

3.06 DENSITY CONTROL:

- A. When the "Density Control" method of compaction is indicated on the plans, each course of flexible base shall be compacted to the percent density shown on the plans.
- B. The testing will be as outlined in Test Method Tex-114-E.
- C. It is the intent of this specification to provide in that part of the base included in the top 8 inches immediately below the finished surface of the roadway not less than 100 percent of the density as determined by the compaction ratio method.
- D. Field density determination shall be made in accordance with Test Method Tex-115-E.

3.07 TOLERANCES:

- A. When tolerances are permitted by the plans, the limits establishing reasonable close conformity with percent density specified are defined by the following:
 - 1. The ENGINEER may accept the work providing not more than 25 percent of the density tests performed each day are outside the specified density by no more than three pounds per cubic foot and where no two consecutive tests on continuous work are outside the specified limits.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Flexible base will be measure by the square yard of surface area of completed and accepted work based on the width of flexible base as shown on the plans.
 - 1. The flexible base shall be measured for depth by the units of 2000 square yards, with one measurement taken at a location selected by the ENGINEER.
 - 2. In that unit where flexible base is deficient by more than 1/2 inch in thickness, the deficiency shall be corrected by scarifying, adding material as required, reshaping and re-compacting by sprinkling and rolling.

3. No additional payment over the contract unit price will be made for any flexible base of a thickness exceeding that required by plans.
- B. The CONTRACTOR shall schedule his operations in such a manner as to facilitate the measurement of the pay item.
- C. The ENGINEER may accept the work provided no more than 2 out of 10 depth tests performed are deficient by not more 1/2 inch and where no two consecutive tests on continuous work are outside the specified depth.

4.02 PAYMENT:

- A. The accepted quantities of flexible base of the type, grade, and compaction method specified will be paid at the contract unit bid price per square yard, complete in place.
- B. Where "Ordinary Compaction" is used, all sprinkling, rolling, and manipulation required will not be paid for directly, but will be incidental to other bid items.
- C. The unit prices bid shall each be full compensation for shaping and fine grading the roadbed; for securing and furnishing all materials, including all royalty and freight involved; for furnishing scales and labor involved in weighing the material when required; for loosening, blasting, excavating, screening, crushing and temporary stockpiling when required; for loading all materials for all hauling and delivering on the road; for spreading, mixing, blading, dragging, shaping and finishing and for all manipulation, labor, tools and incidentals necessary to complete the work.

*** * * END OF SECTION * * ***

SECTION 02610

PRIME COAT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION:

- A. Prime coat shall consist of application of asphaltic materials on completed base course and/or other approved area, which shall be applied in accordance with these specifications, as shown on the plans, and as directed by the ENGINEER.

1.02 QUALITY ASSURANCE:

- A. Test and Certification of Bituminous Materials.
 - 1. Bituminous material is to be tested in accordance with the requirements of AASHTO M-82 and sampled in conformance with AASHTO T-40.
 - 2. Supply, at the time of delivery of each shipment of asphalt, two certified copies of test reports, from supplying vendor, to the ENGINEER.
 - 3. Test reports shall indicate name of vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and result of specified tests.

The test report, signed by an authorized representative of the vendor, shall certify that the product delivered conforms to the specifications for type and grade indicated.

Certified test reports and the testing required in the preparation of such report shall be at no cost to the COUNTY.

- 4. Final acceptance of bituminous materials shall be dependent on the determination by the ENGINEER that the material meets prescribed standards.

PART 2- PRODUCTS

2.01 MEDIUM CURING CUTBACK ASPHALT:

- A. Medium-curing liquid asphalt, designated by the letters MC, shall consist of an un-cracked petroleum base stock, produced by the processing of asphaltic or semi-asphaltic base crude petroleum, blended with a kerosene-type solvent. The base stock for all MC materials shall be straight run asphalt produced within the penetration range of 100 to 300, and the end point of the kerosene type solvent shall not exceed 525 degrees F. Medium curing liquid cutback asphalt shall be free from water and show no separation.
- B. Medium curing cutback asphalt shall consist of materials specified above and

conforming to the requirements set forth in Table 2610-1.

- C. Unless otherwise noted on the plans or directed by the ENGINEER, cutback asphalt Grade MC-30 shall be used.

2.02 BLOTTER MATERIAL:

- A. Supply blotter material consisting of native sand and/or sweepings from base course.
- B. Native sand shall be local material obtained from approved sources as approved by the ENGINEER.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. Unless otherwise specified on the plans or, required by the ENGINEER, only asphaltic material shall be used. Where required, a combination of asphaltic and blotter material shall be used.
- B. Application of Asphaltic Materials Only.
 - 1. Apply prime coat to prepared surface when ambient air temperature is above 40 degrees F. and is rising and shall not be applied when the ambient air temperature is below 50 degrees F. and falling.
 - 2. Apply prime coat to surfaces that have been cleaned by sweeping or other approved methods and where base is thoroughly dry and satisfactory for receiving prime coat.
 - 3. Apply prime coat to cleaned base, at a rate of 0.2 to 0.5 gallons per square yard of surface area, using an approved type of self-propelled pressure distributor so constructed and operated to distribute the material evenly and smoothly.
 - 4. Provide necessary facilities for the determination of temperature of asphaltic material in all heating equipment and distributors; and for determination of rate at which it is applied; and for securing uniformity at the junction of two distributor loads.
 - 5. Keep in clean and good working condition all storage tanks, piping, reports, booster tanks and distributors used in the storage and handling of asphaltic materials.
 - 6. Operate all associated equipment in a manner such that there is no contamination of asphaltic material with foreign material.
 - 7. Calibrate distributor and furnish ENGINEER with an accurate and satisfactory record of such calibrations.

TABLE 2610-1

Specification Designation	Test	AASHTO Test Method	ASTM MC Method	MC 30	Grade MC 70	MC 250	800	MC 3000
Flash Point (Open Cleve) oF, Min.		T 48	D 92	100	100	150	150	150
Viscosity 140oF, Kinematic, CS		T 201	D 2170	60	30 to 140	70 to 500	250 to 1600	800 to 6000
Furol Viscosity at 77 F. (Secs.)		T 72	D 88		75-150			
at 122 F. (Secs.)					60-120	300		
at 140 F. (Secs.)					125-250	to		
at 180 F. (Secs.)					100-200	600		
Distillation Distillate (% of Total Distillate to 680 F) to 437 F) to 500 F to 600 F		T 78	D 402		0-25 40-70 75-93	0-20 25-60 75-90	0-10 20-55 70-85	-0- 10-350-15 65-8050-75
Residue from Distillation to 680 F Volume % by Difference Min.				50	55	67	75	80
Tests on Residue From Distillation Penetration at 77 F		T 49	D 5	120 to 250	120 to 250	120 to 250	120 to 250	120 to 250
*Ductility 77 F cm., Min.		T 51	D 113	100	100	100	100	100
Solubility in CC1 4, % Min.		T44	NONE	99.5	99.5	99.5	99.5	99.5

Water, % Min.	T 55	D 95	0.2	0.2	0.2	0.2	0.2
Reaction to Spot Test	T 102**	-0-	-0-	-0-	-0-	-0-	-0-

* If penetration of residue is more than 200 and its ductility at 77 F is less than 100, the material will be acceptable if the ductility at 60 F is greater than 100.

** Using 85% Standard Naphtha and 15% Xylene.

NOTE: Viscosity tests may be made by either Kinematic or Furol test methods.

8. Recalibrates distributor, in a manner satisfactory to the ENGINEER, after the beginning of work, should the yield on the asphaltic material applied appear to be in error.
9. No traffic, hauling or placing of subsequent courses shall be permitted over freshly applied prime coat until authorized by the ENGINEER.
10. Apply asphaltic material at a temperature within 15 F of temperature of application selected by the ENGINEER based on temperature viscosity relationship noted in Table 2610-1.
11. Maintain surface until work is Blotter Material.

C. Application of Asphaltic and Blotter Material

1. Haul blotter material in vehicles of uniform capacity and placed on shoulders at spacings designated by the ENGINEER.
2. After application of asphaltic material as specified above, cover surface with blotter material as directed by the ENGINEER.
3. After application of blotter material, drag surface with approved drag broom, evenly and smoothly distributing the blotter material.
Brooming or dragging operation shall continue, as directed by the ENGINEER, until the course has properly cured under traffic.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PRIME COAT:

- A. Asphaltic material for prime coat will be measured for payment at point of delivery on the project in gallons at applied temperature. Payment will be paid at the unit bid price for "Prime Coat".
- B. When not listed as a separate contract pay item, prime coat shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all material, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

4.02 BLOTTER MATERIALS:

- A. Blotter mater will be considered incidental to asphaltic material for prime coat with no direct payment or payment therefor.

*** * * * END OF SECTION * * * ***

SECTION 02612

HOT MIX ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Hot mix asphalt concrete (HMAC) pavement shall consist of a binder course, a leveling up course, a surface course or a combination of the courses as shown on the plans, or as directed by the ENGINEER.
- B. HMAC pavement shall be composed of a compacted mixture of mineral aggregate and asphaltic material, constructed on previously completed and approved sub-grade, sub-base course, base course, or existing pavement.
- C. HMAC pavement shall be in accordance with the specifications herein and in conformity with the lines, grades, quantities and typical sections in the contract and/or as directed by the ENGINEER.

1.02 QUALITY CONTROL:

- A. HMAC pavement and its constituent part shall conform to the ASTM, AASHTO and/or Texas SDHPT test methods noted below.

PART 2 PRODUCTS

2.01 ASPHALTIC MATERIALS

- A. Asphalt cement binders shall be un-cracked petroleum asphalt and shall be carefully refined, by steam, vacuum, or solvent, from asphaltic or semi-asphaltic base crude petroleum at a temperature not to exceed 700 degrees F. Asphalt cements shall be free from thermal decomposition products and shall not be blended with any materials which have been subjected to cracking or produced from a crude petroleum source other than that of the original material. The asphalt cement shall not contain residues from non-asphaltic sources. Asphalt cement shall be homogeneous, free from water, and shall not foam when heated to 347 degrees F.
- B. Paving asphalt shall be classified by penetration or viscosity and shall conform to the requirements set forth in one of the following tables as designated by the ENGINEER. The CONTRACTOR may supply asphalt meeting the requirements of one of the following tables provided that he obtains prior approval of the ENGINEER and with the provision that once approval has been obtained, that the CONTRACTOR will remain with that grade throughout the project.

TABLE 02612-1

	AASHTO	ASTM	40	60	85	120	150	200
Specification	Test	Test	to	to	to	to	to	to
Designation	Method	Method	50	70	100	150	200	250
Flash Point (Open Cup Min.)	T48	D92		450	450	450	425	350
Penetration of Original Sample at 77 F	T49	D5	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Thin-Film Oven Loss Hours at 325 F, % Max	T179	D1754	0.7 5	0.7 5	0.7 5	0.7 5	1.0 0	1.0 0
Test of Residue from Thin-Film Oven Test % or Orig. Pen., Min.	T49	D5	52	50	50	50	50	50
Ductility at 77 F, cm. after Loss at 325 F, Min.	T51	D113	50	50	100	100	100	100
Solubility in CC1 4 Min.	T44*	None	99. 5	99. 5	99. 5	99. 5	99. 5	99. 5
Reaction to Spot Test	T102**	None	-0-	-0-	-0-	-0-	-0-	-0-

* Procedure No. 1 with CC1 4 substituted for CS2.

** Using 85% Standard Naphtha Solvent and 15% xylene,

TABLE 02612-2

	OA-30		OA-175*8		OA-400	
TYPE-GRADE	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Penetration at 32 F, 200g., 60 sec.	15	--	--	--	--	--
Penetration at 77 F, 100g., 5 sec.	25	35	150	200	--	--
Penetration at 115 F, 50g., 5 sec.	--	65	--	--	--	--
Ductility at 77 F, 5 Original OA	2	--	70	--	--	--
Flash Point C.O.C., F	450	--	425	--	425	--
Softening Point, R. & B., F	185	--	95	130	--	--
Thin Film Oven Test, 1/8 in. Film 50g., 5 hrs., 325 F, % Loss by Wt.	--	0.4	--	1.4	--	2.0
Penetration of Residue, at 77 F, 100g., 5 sec. % of Original Pen	--	--	40	--	--	--
Ductility of Residue at 77 F, 5 cm/min., cms	--	--	--	100	--	--
Solubility in Trichloroethylene, %	99.0	---	99.0	---	99.0	---
Spot Test on Original OA	Neg.		Neg.		Neg.	
Float Test at 122 F, sec.	--	--	--	--	120	150
Test on 85 to 115 Pen. Residue* Residue by Wt., %	--	--	--	--	--	75
Ductility, 77 F, 5 cm/min.: Original Res., cms.	--	--	--	--	100	---
Subjected to Thin Film Test, cms	--	--	--	--	100	--

* Determined by Vacuum Distillation (by evaporation if unable to reduce by vacuum).

** For use with Latex Additive only

TABLE 02612-3

PROPERTIES	AC-1.5		AC-3		AC-5		AC-10		AC-20		AC-20	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Viscosity, 140 F stokes...	150	50	300	100	500	100	1000	200	2000	400	4000	800
Viscosity, 275 F stokes.....	0.7	--	1.1	--	1.4	--	1.9	--	2.5	--	3.5	--
Penetration, 77 F 100 g, 5 sec	250	--	210	--	135	--	85	--	55	--	35	--
Flash Point, C.O.C., F...	425	--	425	--	425	--	450	--	450	--	450	--
Solubility in trichloroethylene percent.....	99.0	--	99.0	--	99.0	--	99.0	--	99.0	--	99.0	--
Test on residues from thin film oven test:												
Viscosity, 140 F stokes.....	--	450	--	900	1500	--	3000	--	6000	--	--	12000
Ductility, 77 F, 5 cms per min, cms	100	--	100	--	100	--	70	--	50	--	30	--
Spot Test.. . . .	Negative for all grades											

- C. A minimum of two percent, by weight, latex additive (solid basis) shall be added to the OA-175 Asphalt or to AC-5 Asphalt when specified in the contract. The latex additive shall be governed by the following specifications:

The latex is to be an anionic emulsion of butadiene-styrene low-temperature copolymer in water, stabilized with fatty-acid soap so as to have good storage stability, and possessing the following properties:

Monomer ration, B/S..... 70/30
 Minimum solids content..... 67%

Solids content per gal. @ 67%..... 5.3 lbs.
 Coagulum on 80-mesh screen..... 0.01% max.
 Type Anti-oxidant.....staining
 Mooney viscosity of Polymer(M/L 4@212F) 100 min.

PH of Latex	9.4 - 10.5
Surface tension	28 - 42 dynes/cm ²

The finished latex-asphalt blend shall meet the following requirements:

Viscosity at 140 F, stokes.	1500 max.
Ductility at 39.2 F. 1 cm. per., cm	100 min.

- D. Asphalt content shall be within the limits noted below:

HMAC Type	Percent of Mixture by Weight	Percent of Mixture by Volume
"A"	3.5 - 7.0	8.0 - 16.0
"B"	3.5 - 7.0	8.0 - 16.0
"C"	3.5 - 7.0	8.0 - 16.0
"D"	4.0 - 8.0	9.0 - 19.0
"F"	3.5 - 6.5	8.0 - 16.0

- E. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the purchaser certified copies of the test report which shall indicate the name of the vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, and results of the above-specified tests. The test report shall be certified and signed by an authorized representative of the vendor that the product delivered conforms to the specifications for the type and grade indicated.
- F. Until the certified test reports and samples of the material have been checked by the ENGINEER to determine their conformity with the prescribed requirements, the material to which such report relates in any work in which it may have been incorporated as an integral component will be only tentatively accepted by the COUNTY. Final acceptance will be dependent upon the determination of the ENGINEER that the material involved fulfills the requirements prescribed therefor. The certified test reports and the testing required in connection with the reports will be at the expense to the COUNTY.
- G. Unless otherwise specified in these specifications or in the Supplementary Specifications, the various grades of paving asphalt shall be applied at a temperature range of from 210 F, the exact temperature to be determined by the ENGINEER.
- H. Paving asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the paving asphalt during heating. The CONTRACTOR shall furnish and keep on the site, at all times, an accurate thermometer suitable for determining the temperature of the paving asphalt.
- I. HMAC asphalt shall be the grade having the highest penetration, within specified

limits, to produce a mix having a maximum stability of the compacted mixtures.

- J. Only one (1) grade of asphalt shall be required unless otherwise shown on the plans or as required by the ENGINEER.

2.02 AGGREGATES:

- A. HMAC aggregate will be tested in accordance with the following test:

AASHTO T-30	Mechanic Testing
AASHTO T-27	Passing No. 200 Sieve
AASHTO T-89	Liquid Limit
AASHTO T-96	Los Angeles Abrasion
AASHTO T-104	Soundness (Magnesium Sulfate)
ASTM C - 131	Resistance to Degradation
ASTM C - 136	Sieve Analysis
ASTM C -2419	Sand Equivalence Value
SDHPT Tex - 416 - E	Method of Calculating Plasticity Index of Solids
SDHPT Tex - 217 - F	(I & II) Determination of Deleterious Materials and Decantation Test
SDHPT Tex - 203 - F	Quality Test for Mineral Aggregates

- B. Aggregates shall have an abrasion of not more than 40 for all course except the non-skid surface course, which shall have an abrasion of not more than 35.
- C. When properly proportioned, HMAC aggregate shall produce a gradation which will conform to the limitations for classification for HMAC type shown below, or as directed by the ENGINEER.
- D. Course aggregate to be crushed limestone rock or crushed gravel with hydrated lime or limestone filler. (Crushed gravel shall be per Highway Department Specifications.)
- E. Binder aggregate to be composed of 15% crushed limestone screening or as directed by the ENGINEER.

1. Type "A" - Course Graded Base Course

Percent Aggregate by

Passing 2" sieve	100
Passing 1-3/4" sieve	95 to 100
Passing 1-3/4" sieve, retained on 7/8" sieve	16 to 42
Passing 7/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	10 to 26
Passing No. 40 sieve, retained on No. 10 sieve	5 to 21
Total retained on No. 10 sieve	68 to 84
Passing No. 10 sieve, retained on No. 40 sieve	5 to 21
Passing No. 40 sieve, retained on No. 80 sieve	3 to 16
Passing No. 80 sieve, retained on No. 200 sieve	2 to 16
Passing No. 200 sieve	1 to 8

2. Type "B" - Fine Graded or Leveling-Up Course

Percent Aggregate by
Weight or Volume

Passing 1" sieve	100
Passing 7/8" sieve	95 to 100
Passing 7/8" sieve	21 to 53
Passing 3/8" sieve, retained on 3/8" sieve	11 to 42
Passing No. 4 sieve, retained on NO. 10 sieve	5 to 26
Total retained on No. 10 sieve	58 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on NO. 80 sieve	4 to 21
Passing No. 80 sieve, retained on No. 200 sieve	3 to 21
Passing No. 200 sieve	1 to 8

3. Type "C" - Course Graded Surface Course

Percent Aggregate by
Weight or Volume

Passing 7/8" sieve	100
Passing 5/8" sieve, retained on 3/8" sieve	95 to 100
Passing 3/8" sieve, retained on No. 4 sieve	11 to 37
Passing No. 4 sieve, retained on No. 10 sieve	11 to 32
Total retained on No.10 sieve	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve	3 to 27
Passing No. 200 sieve	1 to 8

4. Type "D" - Fine Graded Surface Course

Percent Aggregate by
Weight or Volume

Passing 1/2" sieve	to 100
Passing 3/8" sieve	85 to 100
Passing 3/8" sieve, retained on No. 4 sieve	21 to 53
Passing No. 4 sieve, retained on No. 10 sieve	11 to 32
Total retained on No. 10 sieve.....	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve	3 to 27
Passing No. 200 sieve	1 to 8

5. Type "F" - Fine Graded Surface Course

Percent Aggregate by
Weight or Volume

Passing 3/8" sieve	100
Passing No. 4 sieve	95 to 100
Passing No. 4 sieve, retained on No.10 sieve	58 to 73
Passing No. 10 sieve, retained on No. 40 sieve	6 to 26
Passing No. 40 sieve, retained on No. 80 sieve	3 to 13
Passing No. 80 sieve, retained on No. 200 sieve	2 to 11
Passing No. 200 sieve	1 to 8

2.03 PRIME COAT:

- A. Prime coat, when specified on the plans, or as directed by the ENGINEER, shall be in accordance with Section 02610 - Prime Coat, and as specified herein.
- B. Prime coat shall be applied to surfaces of bases at least 12 hours prior to placing the HMAC unless otherwise directed by the ENGINEER.
- C. Asphalt prime shall be applied uniformly at the rate of 0.10 to 0.30 gallon per square yard or as directed by the ENGINEER. It shall be applied only when permitted by the ENGINEER and when the air temperature is not less than 40 F.
- D. In order to prevent lapping at the junction of two applications, the distributor shall be promptly shut off. A hand spray shall be used to touch up all spots unavoidably missed by the distributor.
- E. Immediately prior to application of the asphalt prime, an inspection will be made by the ENGINEER to verify that the base course has been constructed as specified. Also, all loose and foreign material shall be removed by light sweeping. Material so removed shall not be mixed with cover aggregate.

- F. The surface to be primed shall be in a smooth and well-compacted condition, true to grade and cross section, and free from ruts and inequalities.
- G. The pressure distributor used for applying prime coat material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the prime material in a uniform spray without atomization, in the amount and between the limits of temperature specified. It shall be equipped with a speed tachometer registering feet per minute and so located as to be visible to the truck driver to enable him to maintain the constant speed required for application at the specified rate.
- H. The pressure distributor shall be equipped with a tachometer registering the pump speed, pressure gauge, and a volume gauge. The rates of application shall not vary from the rates specified by the ENGINEER by more than 10%. Suitable means for accuracy indicating at all times the temperature of the prime material shall be provided. The thermometer well shall be so placed as not to be in contact with a heating tube.
- I. The distributor shall be so designed that the normal width of application shall not be less than 6 feet, with provisions for the application of lesser width when necessary. If provided with heating attachments, the distributor shall be so equipped and operated that the prime material shall be circulated or agitated through the entire heating process.
- J. The asphalt prime coat should preferably be entirely absorbed by the base course and, therefore, require no sand cover. If, however, it has not been completely absorbed prior to the start of placing the asphalt concrete mixture and in the meantime it is necessary to permit traffic thereon, just sufficient sand shall be spread over the surface to blot up the excess liquid asphalt and prevent picking it up under traffic. Also, sand shall be used in areas where traffic may pass over the prime coat. Prior to placing the asphalt concrete, loose or excess sand shall be swept from the base. If a sand cover is specified in the Supplementary Specifications or noted on the plans to cover asphalt prime, it shall be applied within 4 hours after the application of said prime coat, unless otherwise ordered by the ENGINEER.
- K. Liquid asphalt shall be prevented from spraying upon adjacent pavements, structures, guard rails, guide posts, culvert markers, trees, and shrubbery that are not to be removed; adjacent property and improvements; and other facilities or that portion of the traveled way being used by traffic.
- L. The CONTRACTOR shall protect the prime coat against all damage and markings, both from and other traffic. Barricades shall be placed where necessary to protect the prime coat. If, after prime coat has been applied to satisfaction of the ENGINEER and has been accepted by him, it is distributed by negligence on the part of the CONTRACTOR, it shall be restored at his expense to its condition at the time of acceptance. No material shall be placed until the prime coat is in a condition satisfactory to the ENGINEER.

2.04 TACK COAT:

- A. If the asphalt concrete pavement is being constructed directly upon an existing hard-surfaces pavement, a tack coat shall be evenly and uniformly applied to such existing pavement preceding the placing of the asphalt concrete. The surface shall be free of water, all foreign material, or dust when the tack coat is applied. No greater area shall be treated in any one day than will be covered by the asphalt concrete during the same day. Traffic will not be permitted over tack coating.
- B. Tack coat for HMAC shall consist of either rapid curing cut-back asphalt RC-2 diluted by addition of (not to exceed 15 percent by volume) an approved grade of gasoline and/or kerosene; emulsified asphalt, EA-11M diluted with 50 percent water, or a cut-back asphalt made by combining 50 to 70 percent of the asphaltic materials specified for the paving mixture with 30 to 50 percent gasoline and/or kerosene by volume.
- C. Tack coat shall conform to the requirements of Section 02620 - Tack Coat, or as specified herein.
- D. Application rate shall be 0.10 to 0.15 gallons per square yard as directed by the ENGINEER.
- E. A similar tack coat shall be applied to the surface of any course if, in the opinion of the ENGINEER, the surface is such that a satisfactory bond cannot be obtained between it and the succeeding course.
- F. When required, the contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like shall be painted with a tack coat immediately before the adjoining asphalt concrete is placed. Asphalt tack coat shall be applied in controlled amounts as shown on the plans or determined by the ENGINEER. Surfaces where a tack coat is required shall be cleaned to the satisfaction of the ENGINEER before the tack coat is applied.

2.05 MINERAL FILLER:

- A. Mineral filler, other than hydrated lime, shall consist of a thoroughly dry stone dust, portland cement or other mineral dust approved by the ENGINEER.
- B. The mineral filler shall be free from foreign or other deleterious matter.
- C. When tested by the method outlines in SDHPT Test Method Tex-200-F (Part 1 or 3), mineral filler shall meet the following gradations by weight:

Passing No. 30 Sieve	95 to 100%
Passing No. 80 Sieve	75%
Passing No. 200 Sieve	55%

- 2.06 Anti-Stripping compound, as required in the job mix formula, shall be furnished in the amounts calculated therein.

2.07 JOB MIX FORMULA:

- A. A job mix formula based on representative samples, including filler if required, shall be determined by the ENGINEER, or submitted by the CONTRACTOR for approval of the ENGINEER.
- B. The resultant job mix formula shall be within the master range for the specified type of HMAC.
- C. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, and a single percentage of bituminous material to be added to the aggregate and shall provide for 3 to 5% air voids in the resultant design mix. During the mix design process the ENGINEER will consider other factors, in addition to air voids and Marshall stability, such as durability, water resistance and asphalt film thickness when developing the mix design.
- D. After the job mix formula is established, mixtures for the project shall conform thereto within the following tolerances which may fall outside of the specified master range:

Passing 1-3/4" sieve, retained on 7/8" sieve	Plus or minus 5
Passing 7/8" sieve, retained on 3/8" sieve.....	Plus or minus 5
Passing 5/8" sieve, retained on 3/8" sieve.....	Plus or minus 5
Passing 3/8" sieve, retained on No. 4 sieve	Plus or minus 5
Passing No. 4 sieve, retained on No. 10 sieve	Plus or minus 5
Total retained on No. 10 sieve.....	Plus or minus 5
Passing No. 10 sieve, retained on No. 40 sieve	Plus or minus 3
Passing No. 40 sieve, retained on No. 80 sieve	Plus or minus 3
Passing No. 80 sieve, retained on No. 200 sieve	Plus or minus 3
Passing No. 200 sieve	Plus or minus 3

Asphaltic Material Plus or minus 0.05 by weight or 1.2 by volume

Mixing Temperature..... Plus or minus 20 F

- E. Asphaltic mixture shall be tested in accordance with SDHPT Test Method Tex-200-4 (Part I or Part III) and shall have the following laboratory values:

	<u>Surface Course</u>	<u>Base Course</u>
Density - Minimum	95%	95%
Maximum	99%	99%
Optimum	97%	97%

Stability - (Hveem)		
Minimum	30%	30%
Maximum	45%	45%
Stability (Marshall - 75 Blow Briquette)	1500 lbs.	1500 - lbs.
Voids	3 - 7%	4 - 7%
Voids Filled With Asphalt	75 - 85%	65 - 80%
Sand Equivalent	40	40

2.08 EQUIPMENT:

- A. All equipment for the handling of all material, mixing, and placing of HMAC shall be in accordance with the provisions of Texas SDHPT Item 340.

2.09 STOCKPILING, STORAGE, PROPORTIONING AND MIXING:

- A. Stockpiling, storage proportioning and mixing operations shall be in accordance with the Provisions of Texas SDHPT Item 340.

PART 3 - EXECUTION

3.01 WEATHER AND TEMPERATURE LIMITATIONS:

- A. Asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall not be placed when the air temperature is 50 F and falling, but may be placed when the air temperature is 40 F and rising.
- B. Asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is 60 F and falling, but may be placed when the air temperature is 50 F and rising.
- C. Mat thicknesses of 1" or less shall not be placed when the temperature on which the mat is to be laid is below 50 F.
- D. No tack coat or asphaltic mixture shall be placed when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the ENGINEER, are unsuitable.
- E. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture is 50 F or more below the temperature established by the ENGINEER, all or any part of the load may be rejected and payment will not be made for the rejected material.

3.02 EQUIPMENT

A. Hauling Equipment:

1. Trucks used for hauling asphaltic mixtures shall have tight, clean, smooth metal beds which have been thinly coated with a minimal amount of paraffin oil, lime slurry, lime solution or other approved material to prevent mixture adhesion to the bed.
2. The dispatching of hauling equipment shall be arranged so that all material delivered may be placed and all rolling completed during daylight hours, unless otherwise directed by the ENGINEER.
3. All trucks shall be equipped with a cover of canvas, or other suitable material to protect the mixture from weather or on hauls where the temperature of the mixture will fall below specified level. Use of covers will be as directed by the ENGINEER.

B. Rollers:

1. Pneumatic Tire Roller. This roller shall consist of not less than seven pneumatic tire wheels, running on axles in such manner that the rear group of tires shall cover the entire gap between adjacent tires of the forward group; mounted in a rigid frame; and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle. The tire shall afford surface contact pressures up to 90 pounds per square inch or more. The roller shall be so constructed as to operate in both a forward and a reverse direction with suitable provisions for moistening the surface of the tires while suitable provisions for moistening the surface of the tires while operating; and shall be approved by the ENGINEER.
2. Two Axle Tandem Roller. This roller shall be acceptable power-driven, steel-wheel, tandem roller weighing not less than eight tons. It must operate in forward and reverse directions; contain provision for moistening the surface of the wheels while in motion; and shall be approved by the ENGINEER.
3. Three Wheel Roller. This roller shall be an acceptable power-driven, all steel three wheel roller weighing not less than 10 tons. It must operate in forward and reverse directions; contain provisions for moistening the surface of the wheel while in motion; and shall be approved by the ENGINEER.
4. Vibratory Steel Wheel Roller. If approved for use by the OWNER, this roller shall have a minimum weight of six tons. The compactor shall be equipped with amplitude and frequency controls and shall be specifically designed to compact the material on which it is used. It shall be operated in accordance with the manufacturer's recommendations.

C. Straight Edges:

1. The CONTRACTOR shall provide an acceptable 16-foot straight-edges for surface testing. Satisfactory templates shall be provided as required by the ENGINEER.

D. Spreading and Finishing Machine:

1. Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or a strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans.
2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. Design will be such that no part of the truck weight will be supported by the paver.
3. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The screed shall be adjustable for both height and crown and shall be equipped with a controlled heating device.
4. The bituminous paver shall be equipped with an automatic leveling device controlled from an external guide. The initial pass for each course shall be made using a paver equipped with a 40-foot minimum external reference, except that this requirements will not apply when asphalt concrete is placed adjacent to portland cement concrete pavement. Subsequent passes may utilize the matching device of one foot minimum length riding on the adjacent lay.

3.03 CONSTRUCTION METHODS:

A. Spreading and Finishing:

1. The asphalt concrete mixture shall be laid on the approved surface, spread and struck off to the grade and elevation established. It shall be spread and compacted in layers as shown on the plans or as directed by the ENGINEER. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.
2. The ENGINEER will determine a minimum placement temperature, which is measured immediately behind the laydown machine, shall not vary more than 20 F.
3. A conventional paver or suitable equipment approved by the ENGINEER may be used to place asphalt concrete material on shoulders depressed from the traveled lanes in order to establish a uniform typical section. Approval of the equipment used will be based upon the results obtained.
4. The asphalt concrete may be dumped from the hauling vehicles directly into the paving machine or it may be dumped upon the surface being paved and subsequently loaded into the paving machine; however, no asphaltic concrete shall be dumped from the hauling vehicles at a distance greater than 250 feet in

front of the paving machine. When asphaltic concrete is dumped first upon the surface being paved, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphaltic concrete dumped shall be picked up and loaded into the paving machine.

5. To achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. Sufficient hauling equipment shall be available to insure continuous operation.
6. The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other indirectly either through controlling the transverse slope or alternately when directed, by controlling the elevation of each end independently, including any screed attachment used for widening, etc. Failure of the control system to function properly shall be cause for the suspension of the asphaltic concrete operations.
7. When dumping directly into the paving machine from trucks, care shall be taken to avoid jarring the machine or moving it out of alignment.
8. All courses of asphaltic concrete shall be placed and finished by means of self-propelled paving machines except under certain conditions or at certain locations where the ENGINEER deems the use of self-propelled paving machines impracticable.
9. Self-propelled paving machines shall spread the asphaltic concrete without segregation or tearing within the specified tolerances, true to the line, grade, and crown indicated on the plans. Pavers shall be equipped with hoppers and augers which will place the asphaltic concrete evenly in front of adjustable screeds without segregation. Screeds shall include any strike-off device operated by tamping or vibrating action which is effective without tearing, shoving or gouging the asphaltic concrete and which produces a finished surface of an even and uniform texture for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.
10. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, fluted and compacted with hand tools. For such areas the mixture shall be dumped, spread and screed to give the required compacted thickness.

B. Compaction:

1. Rolling with the 3-wheel and tandem roller shall start longitudinally at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels.
2. Alternate trips of the roller shall be slightly different in length.
3. Rolling with a pneumatic tired roller shall be as directed by the ENGINEER.
4. Rolling shall continue with no further compression can be obtained and all roller marks are eliminated
5. The motion of the roller shall be slow enough at all times to avoid displacement of asphaltic materials. If displacement occurs, it shall be

corrected immediately by use of rakes and fresh asphaltic mixtures, where required.

6. The roller shall not be allowed to stand on the surface course when it has not been fully compacted and allowed to cool.
7. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water; however, excess water shall not be allowed.
8. All precautions shall be taken to prevent dripping of gasoline, oil, grease, or other foreign substances on the surface or base courses during rolling operations or while rollers are standing.
9. With the approval of the ENGINEER, a vibratory steel wheeled roller may be substituted for the 3-wheel roller and tandem roller.
10. Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.
11. Any mixture that becomes loose, broken, mixed with dirt, segregated, or is in any way defective shall be removed and replaced with fresh hot bituminous mixture, which shall be compacted to conform with the surrounding area. Any area showing excess or deficiency of bituminous material shall be corrected immediately as directed by the ENGINEER.

C. In-Place Density:

1. In-place density shall be required for all mixtures except thin irregular depth leveling courses.
2. Each course, after final compaction, shall have a density of not less than 95 percent of the density developed in the laboratory test method outlines in Texas SDHPT Bulletin C-14.
3. Density shall be determined with a portable nuclear test device in conformity with ASTM D-2950.76.
4. Calibration of the portable nuclear device will be established by the ENGINEER from cut pavement samples tested in accordance with AASHTO T-166 (weight, volume method). The density readings of the cut pavement samples determined in accordance with AASHTO T-166 (weight, volume method), and the density readings of the pavement samples determined by the portable nuclear test device in conformity with ASTM D 2950 will be correlated by the ENGINEER.
5. Other methods of determining in-place density may be used as deemed necessary by the ENGINEER.
6. It is intended that acceptance density testing will be done while the bituminous mixture is hot enough to permit further compaction if necessary. If the density of an acceptance section does not meet the specified requirements, the CONTRACTOR shall continue the compaction effort until the optimum density is obtained, but rolling for any compactive effort will not be allowed when the temperature of the mix is below 175 F unless authorized in writing by the ENGINEER. Rerolling the paved surface after it has initially cooled will not be allowed.

7. If in-place density tests of the mixture produce a value lower than specified and in the opinion of the ENGINEER is not due to a change in the quality of the material, production may proceed with subsequent changes in the mix and/or construction procedures until in-place density equals or exceeds the specified density.
8. In-place density tests will be provided by the ENGINEER unless otherwise specified.

D. Joints:

1. Placing of the asphalt concrete shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the ENGINEER.
2. When plant mix bituminous pavement is placed over plant mix bituminous treated base or when plant mixed seal coat is placed over plant mix bituminous pavement, longitudinal joints shall be staggered at least 6 inches with relation to the longitudinal joints of the underlying course.
3. Transverse joints shall have two foot or 12:1 minimum taper. Longitudinal joints shall have a one foot or 6:1 minimum taper. All transverse tapers shall be cut and squared off prior to commencing new work. Tapered longitudinal joints from previous operations shall be cleaned and tack coated if directed by the ENGINEER. All joints shall be completely bonded. The surface of each course at all joints shall be smooth and shall not show any deviations in excess of 3/16 of an inch when tested with a 10-foot straightedge in any direction.
4. When paving under traffic the CONTRACTOR shall plan his daily surfacing operations on a schedule which will result in not more than one (1) day's operation of exposed longitudinal joints. The longitudinal joints shall not have a height greater than two (2) inches and shall not be left exposed longer than 24 hours.

E. Surface Tolerance:

1. Upon completion, the pavement shall be true to grade and cross section. Except at intersections or any changes of grade, when a 16 foot straight edge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straight edge more than 1/16-inch per foot. Areas that are not within this tolerance shall be brought to grade immediately following the initial rolling. After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective work and replacing with new material as directed by the ENGINEER at the expense of the CONTRACTOR.

F. Manholes and Valve Covers:

1. Manhole frames and valve covers shall be adjusted prior to placing the surface course.

G. Compacted Thickness of HMAC surface and Base Courses:

1. Surface Courses. The compacted thickness or depth of the asphaltic concrete surface course shall be as shown on the plans. Where the plans require a depth or thickness of the surface course greater than two inches compacted depth, same shall be placed in multiple courses of equal depth, each of which shall not exceed two inches compacted depth. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple courses, it shall be applied at the rate as directed.
2. Base Courses. The compacted thickness or depth of each base course shall be as shown on the plans. Where the plans require a depth or thickness of the course greater than 4 inches, same shall be accomplished by constructing multiple lifts of approximately equal depth, each of which shall not exceed these maximum compacted depths. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple lifts, it shall be applied as herein before specified and at the rate as directed.

H. Pavement Thickness Tests:

1. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the ENGINEER or his authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost for the initial pavement thickness test shall be at the expense of the ENGINEER. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR's expense. The cost for the additional coring test shall be at the same rate charged by commercial laboratories.

I. Price Adjustment for Roadway Density:

1. The pavement of the unit price will be adjusted for roadway density as outlined in the following table. The adjustment will be applied on a lot by lot basis for each lift. The adjustment will be based on the average of five density tests. The price adjustment will be applied to the entire asphalt concrete mix which includes the HMAC aggregate, the asphalt cement and anti-stripping compound, is used.

<u>Average Density</u> <u>% of Lab Density</u>	<u>Percent of Contract</u> <u>Price To Be Paid</u>
Above 95%	100%
94.0 to 94.99	96%
93.0 to 93.99	91%

92.0 to 92.99

85%

Less than 92.0

*

* This lot shall be removed and replaced to meet specification requirements as ordered by the ENGINEER. In lieu thereof, the CONTRACTOR and the ENGINEER may agree in writing that for practical purposes, the lot shall not be removed and will be paid for at 50% of the contract price.

PART 4 - MEASUREMENT AND PAYMENT

4.01 INCIDENTAL WORK:

- A. Prime coat, anti-stripping compound, where used and tack coat shall not be measured for direct payment, but shall be considered as subsidiary work pertaining to the placing of asphaltic mixtures of the contract price.

4.02 MEASUREMENT:

- A. Hot-mix asphalt concrete material shall be measured by the ton of 2,000 pounds or by the square yard of the type or types used in the completed and accepted work.
- B. Weight shall be determined by a certified scale approved by the OWNER and recorded serially numbered weight tickets, identifying the vehicle and presented to the ENGINEER's representative on the job.

4.03 PAYMENT:

- A. Work performed and materials furnished, as prescribed by this item, measured as provided herein, shall be paid at the unit bid price per ton or square yard for the type or types of hot mix asphalt concrete pavement shown on the proposal.
- B. Unit bid price shall be payment in full for quarrying; furnishing all materials; for all heating; mixing; hauling; cleaning existing base course or pavement; placing asphaltic mixtures; rolling and finishing; and for all labor, tools, equipment and incidentals necessary to complete the work, including the work and materials involved in the application of prime coat and tack coat.

***** END OF SECTION *****

SECTION 02620

TACK COAT

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Apply asphaltic materials on completed base course after curing of prime coat, on existing pavement, on bituminous surfaces, or on portland cement concrete surface.

1.02 QUALITY CONTROL:

- A. Asphaltic materials supplied for tack coat shall be tested in accordance with applicable ASTM or AASHTO designation noted below.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tack coat shall be composed of bituminous material of the type and grade specified in the plans or as specified by the ENGINEER.
- B. Unless otherwise specified, tack coat shall be one of the following grades:
 - 1. Penetrating Asphalt 85 - 100 or 120 - 150.
 - 2. EA-CSS-1 or EA-10S (SS-1) Emulsified Asphalt.
 - 3. AC-5 or AC-10 Asphalt.

2.02 ASPHALT CEMENT (GRADES RC AND PENETRATING ASPHALT):

- A. Asphalt cement binders shall be un-cracked petroleum asphalts and shall be carefully refined, by steam, vacuum, or solvent, from asphaltic or semi-asphaltic base crude petroleum at a temperature not to exceed 700 degrees F. Asphalt cements shall be free from thermal decomposition products and shall not be blended with any materials which have been subjected to cracking or produced from a crude petroleum sources other than that of the original material. The asphalt cement shall not contain residues from non-asphaltic sources. Asphalt cement shall be homogenous, free of water, and shall not foam when heated to 350 degrees F.
- B. Paving asphalt shall be classified by penetration or viscosity and shall conform to the requirements set forth in one of the following tables as designated by the ENGINEER. The CONTRACTOR may supply asphalt meeting the requirements of one of the following tables provided that he obtains prior approval of the ENGINEER and with the provision that once approval has been obtained, the CONTRACTOR will remain with that grade throughout the project.

TABLE 02620-1

Specification Designation	AASHTO Test Method	ASTM Test Method	85 to 100	120 to 100
Flash Point (Open Cup) Min.	T43	D92	450	450
Penetration of Original Sample at 77 degrees F.	T49	D5	85 to 100	120 to 150
Thin-Film Oven Loss, Hours at 325 degrees F. % Max.	T179	D1754	0.75	0.75
Test of Residue from Thin-Film Oven Test % of Orig. Pen., Min.	T49	D5	50	50
Ductility at 77 degrees F., cm. after Loss at 325 degrees F., Min.	T51	D113	100	100
Solubility in CCl ₄ Min	T44*	None	99.5	99.5
Reaction to Spot Test.	T102**	None	-0-	-0-

* Procedure No. 1 with CCl₄ substituted for CS₂.

** Using 85% Standard Naphtha Solvent and 15% Xylene.

TABLE 02620-2
REQUIREMENTS FOR SPECIFICATIONS FOR ASPHALT CEMENT
VISCOSITY GRADED AT 14 DEGREES F.

	VISCOSITY GRADE			
	AC-5		AC-10	
	Min.	Max.	Min.	Max
Viscosity, 60C (140F), poises	500	-100	1000	-200
Viscosity, 135C (275F), Cs	200	-	250	-
Penetration, 25C (77F), 100g, 5 sec.	140	-	80	-
Flash Point, COC, C (F)	177 (350)	-	219 (425)	-
Solubility in trichlorethylene,	99.0	-	99.0	-

**Tests on residue from Thin film
Oven Test:**

Loss on heating, percent	-	1.0	-	0.5
Viscosity, 60C (140F) poises	-	2000	-	2000
Ductility, 25C (77F), 5 cm per minute, cm	100	-	75	-

**Spot test (when and as specified)²
with:**

Standard naphtha solvent	Negative for all grades
Naphtha-Xylene solvent, % Xylene	Negative for all grades
Heptane-Xylene solvent, % Xylene	Negative for all grades

¹ If ductility is less than 100, material will be accepted if ductility at 15.5C (60F) is 100.

² The use of the spot test is optional, when it is specified, the ENGINEER shall indicate whether the standard naphtha solvent, or the heptane-xylene solvent will be used in determining compliance with the requirement, and also, in the case of xylene solvents, the percentage of xylene to be used.

2.03 EMULSIFIED ASPHALTS:

- A. Emulsified asphalts shall be composed of a paving asphalt base uniformly emulsified with water and an emulsifying or stabilizing agent. They shall be homogeneous throughout. Emulsified asphalt shall be classified as rapid-setting, medium-setting, or slow-setting type in either anionic or cationic emulsions.
- B. The emulsified asphalt shall conform to the requirements asphalt shall conform to the requirements set forth in the following tables:

**TABLE 02620-3
REQUIREMENTS FOR EMULSIFIED ASPHALT**

ANIONIC EMULSION

TYPE: SETTING TIME	RAPID				MEDIUM				SLOW			
	(RS-2) EA-HVRS		(RS-2H) EA-HVRS 90		(RS-2) EA-HVMS		(RS-2) EA-HVMS-90		(RS-2) EA-11M		(RS-2) EA-10S	
GRADE	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
FUROL VISCOSITY AT 77 F (25 C), SEC., C.	---	---	---	---	---	---	---	---	---	---	---	---
FUROL VISCOSITY AT 122 F (50 C)	100	300	100	300	100	300	100	300	---	---	---	---
RESIDUE BY DISTILLATION, %	63	---	63	---	63	---	63	---	60	---	60	---
OIL PORTION OF DISTILLATE, %	---	2.0	---	2.0	---	2.0	---	2.0	---	2.0	---	2.0
SIEVE TEST, %	---	0.1	---	0.1	---	0.1	---	0.1	---	0.1	---	0.1
MISCIBILITY (STANDARD TEST)	---	---	---	---	---	---	---	---	---	---	---	---
COATING	---	---	---	---	---	---	---	---	---	---	---	---
CEMENT MIXING, %	---	---	---	---	---	---	---	---	---	---	---	2.0
Demulsibility 50 cc OF N/10 CaCl ₂ , %	---	---	---	---	---	---	---	---	---	70	---	---
DEMULSIBILITY 33 CC OF N/50 CaCl ₂	60	---	60	---	---	30	---	30	---	---	---	---
SETTLEMENT, 5 DAYS, %	---	5.0	---	5.0	---	5.0	---	5.0	---	5.0	---	5.0
FREEZING TEST 3 CYCLE	---	---	---	---	---	---	---	---	---	---	---	---

TEST RESIDUE: PENETRATION AT 77 deg. F (25 C) 100 G, 5 SEC.	120	160	80	110	120	160	80	110	120	160	120	160
Solubility in Trichloroethylene, %	97.5	---	97.5	---	97.5	---	97.5	---	97.5	---	97.5	---
Ductility at 77 F (25 C) 5 cm/min., cms.	100	---	100	---	100	---	100	---	100	---	100	---

* Applies only when ENGINEER designates material for winter use.

* The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 days' time; or the Owner may require that the settlement test be run from the time the sample is received until it is used, if the elapse is less than 5 days.

** The 24-h (1-day) storage stability test may be used instead of the 5-day settlement test.

*** The demulsibility test shall be made within 30 days from date of shipment.

- C. Unless otherwise specified, the various grades of emulsified asphalt shall be applied at temperatures within the limits specified below, the exact temperature to be determined by the ENGINEER. Emulsified asphalt shall be reheated, if necessary, but at no time after loading into a tank, car or truck for transportation from the refinery to the purchaser shall the temperature of the emulsion be raised above 185 degrees F. During all reheating operations the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40 degrees F.

**TABLE 02620-5
APPLICATION TEMPERATURE
OF EMULSIFIED ASPHALT**

Grade	Mixing	Spraying
RS-1	Not used	70-140 deg. F.
A-HVRS, EA-CRS-2 CRS-1	Not used	125 - 185 deg. F.
EA-10S, EA-CSS-1	50 - 160 deg. F.	70 - 140 deg. F.
EA-CSS-1	50 - 160 deg. F.	70 - 140 deg. F.

- D. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the purchaser certified copies of the test report which shall indicated the name of the vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, and results of the above-specified tests. The test report shall be of the above-specified tests. The test report shall be certified and signed by an authorized representative of the vendor that the product delivered conforms to the specifications for the type and grade indicated.
- E. Until the certified test reports and samples of the material have been checked by the ENGINEER to determine their conformity with the prescribed requirements, the material to which such report related and any work in which it may have been incorporated as an integral component will be only tentatively accepted by the ENGINEER. Final acceptance will be dependant upon the determination of the ENGINEER that the material involved fulfills the requirements prescribed therefore. The certified test reports and the testing required in connection with the reports will be at the expense to the Contracting Agency.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACE TO BE TREATED:

- A. Surface to be tacked shall be patched, cleaned and free of dirt, surface moisture, vegetation and any other deleterious materials or irregularities to provide a smooth, uniform surface.
- B. Unstable corrugated areas shall be removed and replaced with suitable patching materials. Patching shall be completed at no cost to the COUNTY.
- C. The edges of existing pavements adjacent to new surface shall be cleaned to permit adhesion of tack coat.

3.02 WEATHER LIMITATIONS:

- A. Tack coat shall not be applied on a wet surface; during wet weather; after sunset; or when the ambient temperature is below 40 degrees F.

3.03 APPLICATION

- A. Apply tack coat uniformly with a self-propelled, pressure distributor at a rate of 0.02 to 0.15 gallons per square yard as directed by the ENGINEER.
- B. Roll tack coat with a self-propelled pneumatic tired roller weighing not less than 4 tons without ballast, to evenly distribute asphaltic material. Each tire shall have a contact pressure of not less than 90 pounds per square inch.
- C. Rolling will not be required for emulsified asphalt tack coat.
- D. Rolling shall be completed at no cost to the COUNTY
- E. Tack coat shall be applied in such a manner as to offer the least inconvenience to traffic and to permit one-way traffic without pickup or tracking.
- F. In no case shall the surface be tacked extend beyond what can be covered in the same day by surfacing courses.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Asphaltic material for tack coat will be measured at point of delivery on project in gallons at the applied temperature.

4.02 PAYMENT:

- A. Asphaltic material for tack coat will be measured at point of delivery on project in gallons at the applied temperature.

- B. When not listed as a separate contract item, tack coat shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

***** END OF SECTION *****

SECTION 02660

CONCRETE CURB AND GUTTER AND VALLEY GUTTER

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of the construction of concrete curb, concrete curb and gutter, concrete gutter or valley gutter, or combination thereof in compliance with these specifications, lines, grades, and details shown on the plans, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete and manufactured curb and gutter materials shall be subject to inspection and tests at plants and construction sites for compliance with quality requirements.
- B. Concrete curb and gutter or concrete valley gutter shall be constructed with concrete conforming to the provisions of Section 02614 - Portland Cement Concrete Paving, or Class "B" concrete conforming to the requirements of Section 03300 - Cast-In-Place Concrete.
- C. Preformed expansion Joint Filler shall conform to the requirements of AASHTO M-33 or M-153.
- D. Linseed Oil shall conform to the requirements of AASHTO D-260.
- E. Mineral Spirits shall conform to the requirements of AASHTO D-235.

2.02 FOUNDATION

- A. Concrete curb and gutter or concrete valley gutter shall be placed on an approved foundation conforming to the requirements of the following City Of McAllen Specifications:
 - 1. Section 02210 - Subgrade Preparation,
 - 2. Section 02601 - Flexible Base,
 - 3. Section 02230 - Roadway Excavation, Borrow, and Embankment.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. When required, excavation shall be made to the specified depth, and the base upon which the curb and gutter or valley gutter is to be placed shall be compacted to a firm, even surface conforming to the requirements of Subsection 2.02 above.
- B. All soft and unacceptable material shall be removed and replaced with material approved by the ENGINEER in conformance with the requirements of Subsection 2.02 above.

3.02 FORMS

- A. Forms shall be of wood or metal, straight, free from warp, and of such construction that there will be no interference to the inspection of grade or alignment.
- B. All forms shall extend for the entire depth of the curb and gutter and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placing of the concrete. Flexible forms shall be used in curved sections so that the top surface of the forms will form a smooth, continuous arc.

3.03 MIXING AND PLACING

- A. Concrete shall be proportioned, mixed, and placed in accordance with the requirements of Section 02614 and Section 03300.
- B. Compaction of the concrete placed in forms shall be by vibration or other acceptable methods.
- C. Unless otherwise provided, the exposed surfaces of curbs and gutters shall be finished by belting or with wooden floats. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without injury to the curb and gutter.

3.04 SECTIONS

- A. Curb and gutter shall be constructed in sections having a uniform length of 20 feet, unless otherwise directed by the ENGINEER. Sections shall be separate by open joints 1/8 inch wide except at expansion joints.

3.05 EXPANSION JOINTS

- A. Expansion joints shall be formed at the intervals shown on the plans using a performed expansion joints filler having a thickness of 3/4 inch.
- B. When the curb and gutter is constructed adjacent to or on concrete pavement, expansion joints, shall be located opposite or at expansion joints in the pavement.

3.06 CURING

- A. Immediately upon completion of the finishing, the curb and gutter shall be moistened and kept moist for 3 days, or the curb and gutter shall be cured by the use of membrane-forming material. The method and details of curing shall be subject to the approval of the ENGINEER.

3.07 SURFACE TREATMENT

- A. The surface of concrete curb and gutter or concrete valley gutter shall be treated with a solution of Linseed Oil and Mineral Spirits in accordance with the applicable requirements of Section 03300 - Cast-In-Place Concrete.

3.08 BACKFILLING

- A. After the concrete has set sufficiently, the spaces in front and back of the curb shall be refilled to the required elevation with material approved by the ENGINEER, and shall be thoroughly tamped in layers of not more than 6 inches.

3.09 SLIP-FORM CONCRETE CURB, CONCRETE CURB AND GUTTER OR CONCRETE VALLEY GUTTER

- A. Any concrete curb or concrete curb and gutter, except on structures, may be placed using a slip form machine provided that the finished concrete curb or concrete curb and gutter is true to line and grade and the concrete is dense and of the required surface texture.
- B. The concrete shall be of a consistency that it will maintain the shape of the concrete curb or concrete curb and gutter section without support after slip forming.
- C. The top and face of the finished concrete curb or concrete curb and gutter shall be true an straight and the top surface of the concrete curb or concrete curb and gutter shall be of uniform width and free from humps, sags, or other irregularities.
- D. The forming portion of the slip form machine shall be readily adjustable vertically during the forward motion of the slip from machine to provide a variable height of concrete curb or concrete curb and gutter grade when necessary. A grade line gauge or pointer shall be attached to the slip form machine in such a manner that a continual comparison can be made between the concrete curb or concrete curb and gutter grade as indicated by the offset guidelines.
- E. Concrete shall be fed to the slip form machine at a uniform rate. The slip form machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a wet brush. Finishing with a brush application of grout will not be permitted.

- F. Transverse weakened plane and expansion joints shall be constructed at right angles to the line of the concrete curb, concrete curb and gutter, or concrete valley gutter.
- G. Expansion joints may be constructed by sawing through the concrete curb or concrete curb and gutter section to its full depth. The width of the cut shall be such as to admit the joint filler with a snug fit.
- H. The operations of sawing and inserting the joint filler shall be completed before curing the concrete. At the conclusion of the curing period the filler in each joint shall be checked for tightness of fit. The loose filler in any joint shall be mortared in place and cured.
- I. Excavation shall be as per Subsection 2.02 above.
- J. All remaining provisions of Subsection 2.02 above also apply, unless otherwise specified.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Curb and gutter, curb, and valley gutter shall be measured by the linear foot.
 - 1. Curb shall be measured along the front face of the section at the finished grade elevation.
 - 2. Combination curb and gutter will be measured along the face of the curb at the flowline of the gutter.
 - 3. Valley gutter will be measured along the flowline of the gutter.
- B. A deduction in length shall be made for drainage structures, such as catch basins or inlets, in the curb, gutter, or combination thereof.
- C. There will be no direct measurement or payment of materials used to construct curb and gutter, curb or valley gutter.
- D. Excavation or construction of embankment for foundation of curb, valley gutter, or combination curb and gutter will not be measured for payment.

4.02 PAYMENT

- A. The accepted quantities of curb, valley gutter, and curb and gutter will be paid for at the contract unit bid price per linear foot for each kind and type specified complete in place.

- B. Foundation preparation by excavating or constructing embankment to the required sub-grade elevation is considered incidental to the completion of the work and no direct payment will be made thereof.
- C. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

***** END OF SECTION *****

SECTION 02780

FLAT WHEEL ROLLING

PART 1- GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of the compaction of subgrade, embankment, flexible base, surface treatments and asphalt surfaces by the operation of approved power roller as herein specified and as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 EQUIPMENT:

A. Embankments and Flexible Bases

- 1. Power rollers shall be of the 3-wheel, self-propelled type, weighing not less than 10 tons and shall provide a compression on the rear wheels of not less than 325 pounds per linear of wheel width. All wheels shall be flat.
- 2. The rear wheels shall have a diameter of not less than 48 inches and each shall have a wheel width of not less than 20 inches.

B. Surface Treatments and Pavements

- 1. Power rollers shall be the 3-wheel or tandem, self-propelled type, weighing not less than 3 tons nor more than 6 tons. All wheels shall be flat.
- 2. Rollers shall be equipped with an adequate scraping or cleaning device on each wheel.
- 3. Rollers used to compact asphalt mixture shall be equipped with a water system which will keep all tires uniformly wet.
- 4. In lieu of the rolling equipment specified, the CONTRACTOR may, upon written permission from the ENGINEER, operate other compacting in the same period of time as the specified equipment. If the substituted compaction within the same period of time as would be expected of the specified equipment, as determined by the ENGINEER, its use shall be discontinued.
- 5. Rollers shall be maintained in good repair and operating condition and shall be approved by the ENGINEER.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

A. Subgrades, Embankments and Flexible Base

1. The subgrade or embankment layer or the base course shall be sprinkled if directed and rolling with a power roller shall start longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the rear wheel of the power roller.
2. On super-elevated curves, rolling shall begin at the low sides and progress toward the high sides. Alternate trips of the roller shall be slightly different in length.
3. The rollers, unless otherwise directed, shall be operated at a speed between 2 and 3 miles per hour.

B. Surface Treatments and Pavements

1. Rolling shall be done to produce a satisfactory surface as called for in surface treatment and pavement items.
2. The sequence of work shall be as indicated for embankment layer or base course.
3. The operating speed shall be determined by the CONTRACTOR.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. No additional compensation will be made for materials, equipment or labor required by this item, but shall be considered incidental to the other items included in the contract.

***** END OF SECTION *****

PNEUMATIC TIRE ROLLING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of the compaction of embankment, flexible base, surface treatments or pavements by the operation of approved pneumatic tire rollers.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS:

- A. When used on seal coats, asphaltic surface treatments and bituminous mixture pavements, the roller shall be self propelled and equipped with smooth tread tires with 45 psi tire pressure.
- B. The roller shall be so constructed as to be capable of being operated in both a forward and a reverse direction.
- C. When used on bituminous mixture pavements, the roller shall have suitable provision for moistening the surface of the tires while operating.
- D. When turning is impractical or detrimental to the work and when specifically directed by the ENGINEER, the roller shall be of the self-propelled type.
- E. In lieu of the rolling equipment specified, the CONTRACTOR may operate other compacting equipment that will produce equivalent relative compaction in the same period of time as the specified equipment. If the substituted compaction equipment fails to produce the desired compaction within the same period of time, its use shall be discontinued.
- F. Rollers shall be maintained in good repair and operating condition and shall be approved by the ENGINEER.

2.02 LIGHT PNEUMATIC TIRE ROLLER:

- A. The light pneumatic tire roller shall consist of not less than 9 pneumatic tire wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group and mounted in a rigid frame and provided with a loading platform or body suitable for ballast loading.
- B. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle.

- C. The pneumatic tire roller under working conditions shall have an effective rolling width of approximately 60 inches and shall be so designed that by ballast loading the total load be varied uniformly from 9,000 pounds or less to 18,000 pounds or more.
- D. The roller shall be equipped with tires that will afford ground contact pressures to 45 pounds per square inch or more. The operating load and tire air pressure shall be within the range of the manufacturer's chart. The roller under working conditions shall provide a uniform compression under all wheels.
- E. Individual tire inflation pressures shall be within +5 psi of each other.
- F. The pneumatic tire roller shall be drawn by either a suitable crawler type tractor, a pneumatic tired tractor, a truck of adequate tractive effort or may be of the self-propelled type and the roller, when drawn or propelled by either type of equipment, shall be considered a light pneumatic tire roller unit.

2.03 MEDIUM PNEUMATIC TIRE ROLLER (TYPE A):

- A. The medium pneumatic tire roller (Type A) shall consist of not less than 7 pneumatic tired wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group and mounted in a rigid frame and provided with a loading platform or body suitable for ballast loading.
- B. The front axles shall be attached to the frame in such a manner that the roller may be turned within a minimum circle. The pneumatic tire roller, under working conditions, shall have an effective rolling width of approximately 84 inches and shall be so designed that, by ballast loading, the total load may be varied uniformly from 23,500 pounds or less to 50,000 pounds or more.
- C. The roller shall be equipped with tires that will afford ground contact pressures to 80 pounds per square inch or more. Individual tire inflation pressures shall be within +5 psi of each other.
- D. The operating load and tire air pressure shall be within the range of the manufacturer's chart.
- E. The pneumatic tire roller shall be drawn by either a suitable crawler type tractor, a pneumatic tired tractor, a truck of adequate tractive effort or may be of the self-propelled type.
- F. The roller, when drawn or propelled by any type of equipment, shall be considered a medium pneumatic tire roller unit.
- G. The power unit shall have adequate tractive effort to properly move the operating roller at variable uniform speeds up to approximately 5 miles per hour.

2.04 MEDIUM PNEUMATIC TIRE ROLLER (Type B):

- A. The medium pneumatic tire roller (Type B) shall conform to the requirements for Medium Pneumatic Tire Roller (Type A) as specified above, except that the roller shall be equipped with tires that will afford ground contact pressures to 90 psi or more.

PART 3 -EXECUTION

3.01 CONSTRUCTION METHODS:

- A. The embankment layer or the base course be sprinkled if directed and rolling with a pneumatic tire roller shall start longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 of width of the pneumatic tire roller.
- B. On super-elevated curves, rolling shall begin at the low sides and progress towards the high sides.
- C. Alternative trips of the roller shall be slightly different in length.
- D. The light pneumatic tire roller shall be operated at speeds between 2 and 6 miles per hour for asphalt surfacing work and all other work.
- E. The medium pneumatic tire roller shall be operated at speeds which produce a satisfactory product.
- F. Sufficient rollers shall be provided to compact the material in a satisfactory manner. When operations are so isolated from one another that 1 roller unit cannot perform the required compaction satisfactorily, additional roller units shall be provided.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. No additional compensation will be made for materials, equipment or labor required by this item, but shall be considered subsidiary to the various items of the contract.

*** * * END OF SECTION * * ***

SECTION 02786

PROOF ROLLING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION WORK:

- A. This work shall consist of furnishing and operating heavy pneumatic tired compaction equipment for testing the compaction of embankment, sub-grade or flexible base.
- B. Proof roll is to be used to locate unstable areas.

PART 2 - PRODUCTS

2.01 EQUIPMENT:

- A. The proof rolling equipment shall consist of not less than 4 pneumatic tired wheels, running on axles carrying not more than 2 wheels and mounted in a rigid frame and provided with loading platform or body suitable for ballast loading.
- B. All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces.
- C. The proof roller under working conditions shall have a rolling width of from 8 feet to 10 feet and shall be so designed that, by ballast loading, the gross load may be varied uniformly from 25 tons to 50 tons.
- D. The tires shall be capable of operating under the various loads with variable air pressure up to 150 pounds per square inch. The operating load and tire pressure shall be within the range of the manufacturer's chart as directed by the ENGINEER.
- E. The proof roller shall be drawn by a suitable crawler type tractor or rubber tire tractor of adequate tractive effort or may be of self-propelled type. There shall be a sufficient quantity of ballast available to load the equipment to a maximum gross weight of 50 tons.
- F. Rubber tired tractive equipment shall be used on base courses.
- G. Other type tractive equipment may be used on embankment sub-grade.
- H. The heavy pneumatic tire roller unit shall be capable of turning 180 degrees in the crown width.

- I. In lieu of the rolling equipment specified, the CONTRACTOR may, upon written permission from the ENGINEER, operate other equipment that will produce equivalent results as the specified equipment. If the substituted equipment fails to produce the desired results as would be expected of the specified equipment as determined by the ENGINEER, its use shall be discontinued.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. This work shall be done to proof all prepared sub-grades and flexible base courses or as directed by the ENGINEER.
- B. On embankment compaction, each layer will be placed to specified thickness at optimum moisture and compacted with conventional equipment to comply with the requirements of the governing embankment item.
- C. Prior to placing the overlaying course, the layer shall be proof rolled as directed by the ENGINEER.
- D. When the operation of the proof rolling unit shows an area to be unstable or non-uniform, such area shall be brought to satisfactory stability and uniformity by additional compaction, by removal of unsuitable materials or replacement with suitable materials and re-compaction.
- E. The surface tested shall then be checked for conformity with line and grade and any irregularities corrected.
- F. Roller shall be operated at speeds between 2 and 6 miles per hour or as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. No additional payment will be made for the materials, equipment or labor required by this item, but shall be considered subsidiary to the various items included in the contract.

***** END OF SECTION *****

SECTION 02790

HIGH PERFORMANCE (HP) POLYPROPYLENE STORM PIPE

1.0 SCOPE:

This specification includes materials and test methods for 12 to 60 inch diameter HP Polypropylene Pipe. The requirements of this specification are intended to provide pipe and fittings suitable for underground use in gravity-flow applications such as storm sewers, drainage and under-drains.

2.0 PIPE:

12 to 30 inch HP Polypropylene Pipe shall have a smooth interior and annular exterior corrugation and are required to meet or exceed ASTM F2736 and AASHTO M330. 36 to 60 inch pipe shall have a smooth interior and annular exterior corrugations and are required to meet or exceed ASTM F2881 and AASHTO M330. Pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects.

3.0 FITTINGS:

Fittings shall conform to ASTM F2736, ASTM F2881 and AASHTO M330, for the respective diameters. Bell & spigot connections shall utilize a spun-on, welded or integral bell and spigot with gaskets meeting ASTM F477. Bell & spigot fittings joint shall meet the watertight joint performance requirements of ASTM D3212. Corrugated couplings shall be split collar, engaging at least 2 full corrugations.

4.0 JOINTS:

HP Polypropylene Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2736 or F2881, for the respective diameters.

HP Polypropylene Pipe shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

HP Polypropylene Pipe shall have a reinforced bell with a polymer composite band installed by the manufacturer.

5.0 MATERIAL PROPERTIES:

Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2736, Section 4, ASTM F2881, Section 5 and AASHTO M330, Section 6.1, for the respective diameters.

6.0 INSTALLATION:

Installation shall be in accordance with ASTM D2321, manufacturers recommended installation guidelines and plan specifications.

7.0 PIPE DIMENSIONS:

Nominal Pipe I.D. in (mm)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Average Pipe I.D. In (mm)	12.1 (307)	14.9 (378)	18.0 (457)	24.1 (612)	30.1 (765)	35.7 (907)	41.8 (1062)	47.3 (1201)	59.3 (1506)
Average Pipe O.D. in (mm)	14.5 (368)	17.6 (447)	21.2 (538)	28.0 (711)	35.4 (899)	41.1 (1044)	47.2 (1199)	53.8 (1367)	66.5 (1689)
Minimum Pipe Stiffness * @ 5% Deflection* #/in./in. (kN/m²)	75 (520)	60 (411)	56 (385)	50 (343)	46 (320)	40 (275)	35 (240)	35 (240)	30 (205)

*** END OF SECTION ***

SECTION 03300

CAST-IN-PLACE-CONCRETE

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK COVERED:

- A. Mixing, placing, finishing and providing all related services necessary to construct all cast-in-place concrete work indicated on plans.

1.02 QUALITY ASSURANCE:

- A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes:
 - 1. ACI 315 - Manual of Standard Practice for Detailing.
 - 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 3. ACI 347 - Recommended Practice for Concrete Formwork.
 - 4. ASTM A36 - Structural Steel.
 - 5. ASTM C33 - Concrete Aggregates.
 - 6. ASTM C39 - Concrete Strength of Molded Concrete Cylinders.
 - 7. ASTM C94 - Ready-Mixed Concrete.
 - 8. ASTM C143 - Slump of Portland Cement Concrete.
 - 9. ASTM C150 - Portland Cement.
 - 10. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 11. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 12. ACI 301 - Specification for Structural Concrete for Building.
- B. Submit compliance submittals as specified in Division 1, including but not limited to the following: bar schedule, bar details, shop drawings including size and location of openings, water stops, joint systems and curing method.
- C. Submit proposed concrete mix proportions to ENGINEER prior to placing concrete.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT:

- A. Type I, Type II or Type III conforming to ASTM C150 as modified by Texas Department of Highways and Public Transportation, 1982 Standard Specifications.
- B. Type I or Type II cement may be used unless Type II is specified.
- C. Except when Type II specified, Type III may be used when the anticipated air temperature for the succeeding 12 hours will not exceed 60°F.

- D. Type III may be used in all precast pre-stressed concrete except in piling when Type II cement is required for substructure concrete.
- E. All cement used in a monolithic placement shall be of the same type.
- F. May be either bagged or bulk. Partially set or caked cement will be rejected.
- G. All types of cements shall be "low-alkali" cements.

2.02 WATER:

- A. Clear, fresh, free from injurious amounts of oil, alkaline, acid or organic matter or other deleterious substances and shall not contain more than 1000 parts per million of chlorides as CL nor more than 1000 parts per million of sulfates as SO_4 .
- B. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, un-coated grains and shall be essentially free from clay lumps, salt or alkali, and other foreign material.
- C. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	3.0%
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

An additional loss of 2% by decantation may be allowed, provided this new additional loss is material of the same quality as specified for fine aggregate or mineral filler.

- D. Gradation, percent of weight retained:

<u>Sieve Size</u>	<u>% Retained</u>
3/8 inch	0
No. 4	0 - 5
No. 8	0 - 20
No. 16	0 - 50
No. 30	0 - 75
No. 50	0 - 90
No. 100	0 - 100
No. 200	0 - 100

- E. Fineness Modulus: for Grade 1 only - 2.3 minimum, 3.1 maximum.
- F. Miner Filler:
1. May be added upon written authorization of ENGINEER.
 2. Shall be stone dust or clean crushed sand, or other approved inert material.
 3. Shall not exceed 5% of the fine aggregate.
 4. Shall meet the following requirements:

Passing No. 30 sieve	95 to 100%
Passing No. 100 sieve	70 to 100%

2.04 COARSE AGGREGATE:

- A. Crushed stone, gravel, crushed gravel, crushed blast furnace slag or a combination of these.
- B. Gravel and crushed gravel shall consist of clean, hard durable particles, free from adherent coating, thin or elongated pieces, soft or disintegrated particles, dirt, organic or deleterious substances, salt or alkali, and other foreign material.
- C. Crushed stone shall consist of the clean, dust free product resulting from crushing of stone. There shall be no adherent coatings, clay, loam organic or deleterious substance, salt or alkali, and other foreign material.
- D. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	1.0%
Shale, slate or other similar material	1.0%
Clay lumps	0.25%
Soft fragments	3.0%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.0%

- E. Course aggregates shall have a percent wear of not more than 45 when tested in accordance with Test Method Tex-410-A.
- F. Gradation, percent of weight retained on:

Grade No. 1 - Maximum Nominal Size 2 1/2 in. (63 MM)

<u>Sieve</u>	<u>Percentage Retained</u>
2 1/2 in.	0%
2 in.	0 - 20%
1 1/2 in.	15 - 50%
3/4 in.	60 - 80%
No. 4	95 - 100%

Grade No. 2 - Maximum Nominal Size 1 1/2 in. (37.5 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
2 in.	0%
1 1/2 in.	0 - 5%
3/4 in.	30 - 65%
3/8 in.	7 - 90%
No. 4	95 - 100%

Grade No. 4 - Maximum Nominal Size 3/8 in. (9.5mm)

<u>Sieve</u>	<u>Percentage Retained</u>
1/2 in.	0 - 5%
3/8	5 - 30%
No. 4	75 - 100%

- G. Gradation Requirements - maximum size of aggregate for structural concrete shall not exceed three inches, and shall be reduced in size to meet the following conditions:
1. One-sixth of the least dimension between forms of that part of the structure in which concrete is to be placed;
 2. Three-fourths of the clear space between reinforcement.
 3. The maximum size aggregate is defined as the clear space between the sides of the smallest square opening through which 95 percent of the weight of the aggregate can be passed.
 4. Unless otherwise noted or restricted by above Grade No. 2, gradation shall be used.

2.05 PIT-RUN AGGREGATE:

- A. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates, and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand.
- B. Pit-run aggregate shall be free from lumps of clay and injurious amounts of dust, shale, soft or flaky particles, salt and alkali.
- C. Pit-run aggregate shall not be used for high-strength concrete of 3000 psi and above.
- E. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

2.06 ADMIXTURES:

- A. Concrete admixtures shall comply with Section 03320.

2.07 REINFORCING STEEL:

- A. Reinforcing steel shall comply with Section 03320.

2.08 CURING MATERIALS:

- A. Liquid Membrane: white pigmented chlorinated rubber, ASTM C309.
- B. Liquid Membrane: resin base, clear compound, permitting application of paint, Serviced Products Corp. - Code 2802 or equal.
- C. Plastic Film: white pigmented, 0.00085" (minimum) thick.
- D. Burlap: jute fabric, lean, free of impurities.
- E. Surface Hardener: gray crystal, acidic fluosilicate base, slightly hygroscopic chemical surface hardener, SIKA Chemical Corp. or equal.

2.09 JOINT MATERIALS:

- A. Joint Sealer: hot poured, non-extruding, elastic, ASTM D1190.
- B. Preformed Expansion Joint Filler: non-extruding, bituminous fiber, ASTM D1751.

2.10 WATERSTOP:

- A. Polyvinyl chloride or rubber, center bulb.
- B. Size to suit joints, minimum 6".

2.11 FORM MATERIALS:

- A. Use plywood, metal, metal framed plywood faced or other acceptable panel-type material.
- B. Coat forms with non-bonding, non-staining commercial compounds.

2.12 MOISTURE BARRIER:

- A. Polyethylene sheet, minimum 8 mil., ASTM E154.

2.13 CONCRETE MIX DESIGN AND CONTROL:

- A. Submit not less than 10 days prior to the start of concreting operations, to the ENGINEER.
 - 1. Mix design, using a course aggregate factor acceptable to the Engineer.
 - 2. Sufficient samples of all materials to be incorporated into the mix for testing.
 - 3. Full description of the source of supply of each material component.
- B. Course aggregate factor:
 - 1. Not more than 0.82 when voids less than 48%.
 - 2. Not more than 0.85 when voids exceed 48%.

3. Not less than 0.68.

- C. No changes or deviations from proportions or sources of supply without approval of ENGINEER.
- D. No concrete may be placed on the job site until the mix design has been approved by ENGINEER in writing to the CONTRACTOR.

2.14 CONCRETE QUALITY:

- A. Consistency:
 - 1. Mortar shall cling to the coarse aggregate.
 - 2. The aggregate shall not segregate during transport.
 - 3. The concrete and mortar shall show no free water when removed from the mixer.
- B. The consistency should allow the completion of all finishing operations with the addition of water to the surface.
- C. The concrete shall be uniform, workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.
- D. Excessive bleeding shall be avoided.
- E. Slump requirements shall be as follows:

<u>Structural Concrete</u>	<u>Avg. Slump</u>	<u>Max. Slump</u>
(a) Cased Drilled Shafts and thin-walled Sections (9 inches or less)	4	5
(b) Slabs, Caps, Columns, Piers, Wall Sections Over 9 inches, etc.	3	4
(c) Slip Form Paving Underwater or seal concrete		2 1/2
(d) Rip-Rap, curb, Gutter and other Miscellaneous Concrete	As Specified	By Owner

Note: No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements shall be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

- F. The concrete shall comply with Table 1 below:

TABLE 1 - CLASSES OF CONCRETE

CLASS OF CONCRETE	MIN.-MAX. SX. CEMENT	MIN. BEAM STRENGTH 28-DAY PSI	MIN. BEAM STRENGTH 7-DAY PSI	MAX. WATER CEMENT RATIO ITEM 2.1.1.	COARSE NO.
A.	5.0	3000	500	6.5	2-3-4
B	4.0	2000	330	8.0	2-3-4
C*	6.0	3600	600	6.0	1-2-3-***
D	3.0	1500	250	11.0	2-3-4
E	6.0	3000	500	7.0	2-3
F	6.5	4200	700	5.5	2-3
H***	6.5-8.0	AS SPECIFIED ON PLANS	N/A	5.5	3

* Entrained Air:

** No. 1 course aggregate may be used in foundations only (except cased drilled shafts).

*** Pre-stressed Concrete.

**** ASTM C 293 (Center Point).

2.15 GROUT:

A. Non-Shrink:

1. Use pre-mix non-shrink, Embeco Premixed Grout or Embeco Pre Mixed Mortar by Master Builders Company or equal.
2. Keep water to a minimum for placing by the dry packing method.

B. Grout for Bonding:

1. 1 part cement to 1 1/2 parts sand by weight.
2. Keep water to a minimum.

PART 3 - EXECUTION

3.01 SUBGRADE:

- A. Insure sub-grade is true to line and grade and compacted as specified.

- B. Fill and re-compact any ruts or depressions.
- C. Check cross section with a template.
- D. Place moisture barrier or moisten sub-grade prior to placing of concrete. Method to be approved by the ENGINEER.

3.02 FORMS:

- A. Provide forms for all concrete work including footings and base slabs.
- B. Construct forms so that completed concrete will conform to shapes, lines, grades and dimensions indicated and required.
- C. Forms shall be true, plumb and level with reasonable tight joints. Adequately support and brace forms.
- D. Place anchors, inserts, bolts, sleeves and other device indicated or required for the various portions of all the work.
- E. Oil temporary forms with non-staining form oil before reinforcing steel is placed.
- F. Rough form finish as defined by ACI 301 permitted for concealed concrete.
- G. Smooth form finish as defined by ACI 301 permitted for concealed concrete.
- H. Provide 3/4 inch chamfer on exposed corners and edges, and 1-foot below ground level.

3.03 REMOVAL OF FORMS:

- A. Do not remove forms or supports until concrete has acquired sufficient strength to safely support its own weight and the superimposed loads.
- B. Mixing shall be done in a mixer of adequate size and type to produce uniform distribution of the material throughout the mass.
- C. The mixer shall have a plate affixed showing the manufacturer's recommended operating data and it shall be operated within the speed and capacity limits stated thereon.
- D. The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.
- E. The entire contents of the drum shall be discharged before any materials are placed.
- F. Improperly mixed concrete will not be placed.
- G. The mixing time shall be in accordance with the recommendations of the mixer manufacturer.

H. Transix Mix Concrete:

1. Sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation.
2. Satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppage or interruption.
3. Concrete shall not be placed on the job after a period of 1 hours after the cement has been placed in the mixer, with mixer turning; 30 minutes without mixer turning.

I. Continuous Volumetric Mix Concrete:

1. A mobile, continuous, Volumetric mixer of the rotating puddle type may be used for when approved by ENGINEER.
2. Mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mix them to the required consistency before discharging.
3. The mixers shall adequate water supply and metering devices.
4. Calibration of these mixers will be required.

3.04 PLACING CONCRETE:

- A. The minimum temperature of all concrete at the time of placement shall not be less than 50° F.
- B. Clean transporting equipment, reinforcing and embedded items before placing concrete.
- C. Batch trucks or paving equipment not permitted on prepared sub-grade unless authorized by the ENGINEER based on actual job conditions.
- D. Place no concrete until after inspection of forms by ENGINEER.
- E. The maximum time interval between the addition of cement to the batch, and the placing of concrete in the forms shall not exceed the following:

<u>AIR OR CONCRETE TEMPERATURE</u>	<u>NON-AGITATED CONCRETE</u>	<u>MAXIMUM TIME</u>
80 deg. F or Above	(26.6 deg. C)	15 minutes
35 deg. F or 79 deg. F	(1.6 to 26.1 deg. C)	30 minutes
<u>AGITATED CONCRETE</u>		
90 deg. F or Above	(32.2 deg. C)	45 minutes
75 deg F to 89 deg. F	(23.9 to 31.6 deg. C)	60 minutes
35 deg. F to 74 deg. F	(1.6 to 23.3 deg. C)	90 minutes

- F. Prevent segregation during placing.
- G. Consolidate flat work with one pass of mechanical vibrator moving parallel to centerline. Unusual sections and widths may be hand puddled and finished.
- H. Place concrete continuously so that each pour unit will be monolithic in construction and will terminate at expansion, contraction or construction joint. Permit not more than 30 minutes between depositing adjacent batches.
- I. Place slab concrete over membrane waterproofing before waterproofing has become damaged or dirty.
- J. Concrete placement will not be permitted when impending weather conditions will impair the quality of work.
- K. Slope horizontal surfaces of exterior concrete for drainage.
- L. Deposit concrete in forms in horizontal layers not deeper than 24 inches. Avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.
- M. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spreading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- N. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to penetrate placed layer of concrete and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. Limit vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

3.05 PLACING CONCRETE IN WATER:

- A. Concrete shall be deposited in water only when specified on the plans or with written permission of the ENGINEER.
- B. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is deposited.
- C. Pump will not be permitted during the concrete placing, nor until it has set for at least 36 hours.
- D. The concrete shall be placed with a tremie, closed bottom-dump bucket or other approved method.
- E. The concrete shall not be allowed to fall freely through the water nor shall it be

disturbed after it has been placed. Its surface shall be kept approximately level during placement.

- F. The tremie shall consist of a water tight tube 14 inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. The lower end of the tremie shall be submerged in the concrete at all times.
- G. Bottom-dump buckets used for underwater placing shall have a capacity of not less than one-half cubic yard. It shall be lowered gradually and carefully until it rests upon the concrete already gradually and carefully until it rests upon the concrete already placed and raised very slowly during the upward travel; the intent being to maintain still water at the point of discharge and to avoid agitating the mixture.
- H. The placing operations shall be continuous until the work is complete.
- I. Unless otherwise specified all concrete placed under water, except seal concrete, shall contain an additional sack of cement per cubic yard.

3.06 JOINTS:

A. CONTRACTOR:

- 1. Extend entirely across flat slabs at locations shown.
- 2. Location where not shown; maximum spacing is:
 - a. Driveways: 10'
 - b. Sidewalks: 4'
 - c. Other flat slabs: 20 times slab thickness.
- 3. Saw depth not less than 1/4 slab thickness.

B. Expansion:

- 1. Install where shown on the plans.
- 2. Locations where not shown: all structures and features which project through, into or against slab.
- 3. Install according to manufacturer's recommendations, set material securely before placing concrete.
- 4. Install 1 inch width unless shown otherwise.

C. Filling Joints:

- 1. Fill not later than 14 days after sawing.
- 2. Fill immediately following cleaning.
- 3. Fill to 1/8" of surface.
- 4. Remove excess while material is still pliable.
- 5. Refill low areas where necessary.
- 6. Omit filling sidewalk joints.

3.07 FINISHING EXTERIOR FLAT WORK:

- A. Strike off and float as required.
- B. Check surface with ten foot straight edge, maximum variance allowed - 1/8".
- C. Drag concrete surface longitudinally with double thickness burlap drag after completion of straight edging unless noted otherwise.
- D. Use edger on edges of slab.

3.08 CURING:

- A. CONTRACTOR shall inform the ENGINEER fully of the methods and procedures proposed for curing; shall provide proper equipment and material in adequate amounts; shall have approval of the proposed method, equipment and material prior to placing concrete.
- B. All concrete shall be cured for a period of 4 curing days except as noted herein.

EXCEPTIONS TO 4-DAY CURING

<u>Description</u>	<u>Required Curing</u>
Upper Surfaces of Bridge Roadway, Median and Sidewalk Slabs and Top Slabs of Direct Traffic Culverts	8 Curing Days

A curing day is defined as a calendar day when the ambient temperature, taken in the shade

*** END OF SECTION ***

CONCRETE ADMIXTURES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of furnishing materials for use as admixtures in concrete.

PART 2 - PRODUCTS

2.01 AIR ENTRAINING ADMIXTURE

- A. An "Air Entraining Admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will entrain uniformly dispersed microscopic air.
- B. This admixture shall conform to ASTM C 260, modified as follows:
1. The cement used in any series of tests shall be either the cement proposed for specific work or a reference" Type I cement from one mill.
 2. Unless otherwise indicated, the minimum relative durability factor shall be 80.
- C. The air entraining admixture used in the reference concrete shall be high quality neutralized Vinsol Resin.

2.02 WATER - REDUCING, RETARDING ADMIXTURE

- A. A "Water-reducing, Retarding Admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency and retard the initial set of the concrete.
- B. This mixture shall conform to ASTM C 494, Type A or D, modified as follows:
1. The water-reducing retarder shall retard the initial set of the plastic concrete a minimum of 2 hour and a maximum of 4 hours when the materials are at a temperature of 90 F, the dosage rate specified by the manufacturer.
 2. The cement used in any series of tests shall be either the cement proposed for specific work or a "reference" Type I cement for one mill.
 3. All concrete tested shall contain entrained air.

2.03 WATER-REDUCING ADMIXTURE

- A. "Water-reducing Admixture" is defined as a material which when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency and required strength.
- B. This admixture shall conform to ASTM C 494, Type A.

2.04 ACCELERATING ADMIXTURE

- A. In "Accelerating Admixture" is defined as an admixture that accelerates the setting time and the early strength development of concrete.
- B. This admixture shall conform to ASTM C 494, Type C, modified as follows:
 - 1. This accelerating admixture will contain no chlorides and shall be used in the liquid form only.

2.05 HIGH RANGE WATER REDUCING ADMIXTURES

- A. A "High-range Water Reducing Admixture," referred to as a super plasticizer, is defined as a synthetic polymer material which, when added to a low slump concrete mixture increases the slump without segregation, impermeability and durability of the mix.
- B. This admixture shall conform to ASTM C 494, Type F or G, modified as follows:
 - 1. It shall reduce the required water by a minimum of 15 percent.
 - 2. It shall increase the 7 day compressive strength of the concrete by a minimum of 25 percent.
- C. The admixture when added to the mix shall produce the following:
 - 1. Modify a low slump concrete, without the addition of water, to produce a slump which conforms to the range indicated.
 - 2. It shall prevent a temperature rise of the mix above 100 F during high ambient conditions.
 - 3. It shall not increase the chloride content of mix.

2.06 CERTIFICATION

- A. The CONTRACTOR shall submit the name of the admixture proposed and manufacturer's certification that products selected meet the requirements of this item and of ASTM C 260 and C 494 as required.

- B. If more than one admixture is proposed in the concrete mix, a statement of compatibility of components shall accompany certification.
- C. The ENGINEER may request additional information to be submitted such as infrared spectrophotometry scan, solids content, ph value, etc., for further identification.
- D. A change in formulation discovered by any of the tests prescribed herein or other means and not reported and re-tested, may be cause to permanently bar the manufacturer from furnishing admixtures for COUNTY work.
- E. The ENGINEER reserves the right to perform any or all of the tests required by ASTM C 260 and C 494 as a check on the tests reported by the manufacturer.
- F. In case of any variance, the ENGINEER tests will govern.

2.07 APPROVAL

- A. The ENGINEER shall approve all admixtures and dosage. Approval of admixtures shall be based on previous performance of the admixture.
- B. The dosage will be determined from the manufacturer's recommendations, trial mixes or current job approved mix designs, if it is shown that no substantial change in any of the proposed ingredients has been made.
- C. Should the CONTRACTOR desire to change the admixture or dosage approved during the progress of the work, the CONTRACTOR shall perform trial mixes at his own expense and submit the new mix design for approval.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

- A. No concrete shall be delivered to the project until the mix design is approved. All concrete delivered shall conform to the approved job mix formula. Unless otherwise indicated, all concrete shall be air entrained. All admixtures will be added at the Batch Plant. All admixtures shall be in the liquid state. No admixtures shall be dispensed on dry aggregates. Each admixture shall be dispensed separately, but at the same time as the mixing water.
- B. An approved job mix formula for normal hot weather concreting may not perform satisfactorily for extended retardation, in which case its use will not be permitted.
- C. The rotation of the mixer shall be sufficient to thoroughly mix the admixture into the concrete.
- D. Admixtures shall be agitated as required to prevent separation or sedimentation of solids. Air agitation of Neutralized Vinsol Resin will not be permitted.
- E. Normally air entraining agents shall be charged into the mixer at the beginning of

the batch and retarding or water reducing admixtures shall be charged into the mixer during the last part (approximately 1/3) of the batch when an air-entraining agent is used.

- F. Accelerating admixtures will not be used only on the written approval of ENGINEER. Accelerating admixtures will not be permitted in bridge decks, direct traffic culvert slabs at any time nor when Type II cement is specified.
- G. All admixtures shall be of the same brand from only one manufacturer for the entire project, unless otherwise approved by the ENGINEER.
- H. Accelerators will be used only to meet special project requirements and will require the approval of the ENGINEER.
- I. For individual placements of concrete of 25 cubic yards or more and for all ready-mix concrete, the admixture shall be measured and dispensed by a readily adjustable dispenser. When set to a predetermined volume, the dispenser shall fill to the preset amount and hold it positively without leakage until the operator releases the content into the mixing water by some positive means. Unless otherwise indicated, completely automatic dispensing will not be required, except for use with a full automatic plant.
- J. The calibrated container shall be a measuring reservoir of the type where the level of the admixture is visible at all times. A strip gauge with one ounce increments for air entraining admixtures, ten ounce increments for dispersing admixtures, shall be attached securely to the measuring apparatus. This strip shall be a material possessing weather resistant qualities. The accuracy equipment shall visibly show the total amount to be dispensed for ready check by the ENGINEER.
- K. When individual placements of less than 25 cubic yards and with the concrete batched on the job site, the ENGINEER may waive the requirements for mechanical dispensing equipment.
- L. When high range water reducing admixtures are indicated the following will be observed:
 - 1. Ready-mixed concrete shall be delivered in transit mixers and the capacity of the transit mixture shall be reduced for each batch by 25 percent of the rated capacity to assure proper mixing.
 - 2. If during the placement of concrete, a change in slump resulting in a slump loss in excess of 3 inches is noted, the remaining concrete shall be rejected.
 - 3. The addition of water will not be permitted at the job site.
 - 4. Only one liquid admixture shall be used to achieve the desired results, except where air entrainment is indicated, the air entrainment agent will be permitted.

5. The concrete design shall meet the following requirements:

<u>ITEM</u>	<u>TEST</u>	<u>VALUE</u>
Air entrainment	ASTM C 260	3 to 6 percent
High range water reducing Admixture	ASTM C 494 Type F or G	
Water cement ratio Gal/.Sack Max.		6.25
Minimum cement content in Sacks (94 lb. sack)		6.0
Coarse aggregate factor		6.5
Slump Maximum, inches		10
Flexural strength @ 7 days, psi		650
Maximum concrete temperature F		100

PART 4 - MEASUREMENT AND PAYMENT

- 4.01 No additional compensation will be made for the materials, equipment test or methods required by this item, but shall be considered subsidiary to various items included in the contract.

***** END OF SECTION *****

SECTION 03330

REINFORCING STEEL

PART 1 - GENERAL

- 1.01 This work shall consist of the furnishing and placing of reinforcing steel, deformed and smooth, of the size and quantity indicated and in accordance with these specifications.

PART 2 - PRODUCTS

2.01 BARS:

- A. Bar reinforcement shall be deformed and shall conform to ASTM A 615, A 616, Grades 40, 60, or 75 and shall be open-hearth, basic oxygen or electric furnace new billet steel, unless otherwise indicated. Large diameter new billet steel (Nos. 14 and 18), Grade 75, will be permitted for straight bars only.
- B. Where bending of bar sizes No. 14 or No. 18 of Grades 40 or 60 is required, bend testing shall be performed on representative specimens as described for smaller bars in the applicable ASTM specification. the required bend shall be 90 degrees at a minimum temperature of 60 F around a pin having a diameter of 10 times the nominal diameter of the bar and shall be free of cracking.
- C. Spiral reinforcement shall be either smooth or deformed bars or wire of the minimum diameter indicated. Bars for spiral reinforcement shall comply with ASTM A 675, A 615, or A 617. Wire shall comply with ASTM A 82. The minimum yield strength for spiral reinforcement shall be 40,000 psi.
- D. In cases where the provisions of this item are in conflict with the provisions of the ASTM Designation to which reference is made, the provisions of this item shall govern.
- E. Report of chemical analysis showing the percentages of carbon, manganese, phosphorus and sulfur will be required for all reinforcing steel when it is to be welded, except for drill shafts. No tack welding will be allowed. All welding shall conform to the requirements of AWS D-1-72.
- F. The nominal size and area and the theoretical weight (lbs.) of reinforcing steel bars covered by these specifications are as follows:

<u>BAR SIZE NUMBER</u>	<u>NOMINAL DIAMETER INCHES</u>	<u>NOMINAL AREA SQUARE INCHES</u>	<u>WEIGHT PER LINEAR FOOT</u>
2	0.250	0.05	0.167
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.65
18	2.257	4.00	13.60

- G. Smooth bars, larger than No. 4, may be steel conforming to the above or may be furnished in any steel that meets the physical requirements of ASTM A36.
- H. Smooth, round bars shall be designated by size number through No. 4. Smooth bars above No. 4 shall be designated by diameter in inches.

2.03 WELDED WIRE FABRIC:

- A. Wire for fabric reinforcement shall be cold-drawn from rods hot-rolled from open-hearth, basic oxygen or electric furnace billet. Wire shall conform to the requirements of the standard Specifications for Cold-Drawn Steel Wire for concrete Reinforcement, ASTM A82 or A496. Wire fabric, when used as reinforcement, shall conform to ASTM A 185 or A 497.
- B. When wire is ordered by size numbers, the following relations between size number, diameter in inches and area shall apply unless otherwise indicated.

<u>SIZE W NUMBER</u>	<u>NOMINAL DIAMETER (INCH)</u>	<u>NOMINAL AREA SQUARE INCHES</u>
31	0.628	0.310
30	0.618	0.300
28	0.597	0.280
26	0.75	0.260
24	0.553	0.240
22	0.529	0.220
20	0.505	0.200
18	0.479	0.180
16	0.451	1.160
14	0.391	0.140
12	0.391	0.120
10	0.357	0.100
8	0.319	0.080
7	0.299	0.070
6	0.276	0.060
5.5	0.265	0.055
5	0.252	0.050
4.5	0.239	0.045
4	0.226	0.040
3.5	0.211	0.035
3	0.195	0.030
2.5	0.178	0.025
2	0.160	0.020
1.5	0.138	0.015
1.2	0.124	0.012
1	0.113	0.010
0.5	0.080	0.005

- C. When deformed wire is required, the size number shall be preceded by D and for smooth wire the prefix shall be shown.

2.04 CHAIRS AND SUPPORTS:

- A. Chairs and Supports shall be steel, precast mortar or concrete blocks cast in molds meeting the approval of the ENGINEER of sufficient strength to position the reinforcement as indicated when supporting the dead load of the reinforcement, the weight of the workers placing concrete and the weight of the concrete bearing on the steel.
- B. Chairs shall be plastic coated when indicated.
- C. Chair types and uses shall be as follows:

Chair Types and Applicable Uses

Structural or Architectural Elements (columns, beams, walls, slabs) exposed to weather, and subject to sand blasting, water blasting or grinding.	Galvanized steel or steel chairs with plastic coated feet.
Structural or Architectural Elements exposed to weather and subject to sand blasting, water blasting or grinding.	Stainless steel
Structural or Architectural Elements not exposed to weather or corrosive condition.	Uncoated steel chairs.

Slabs and grade beams cast on grade. Steel chairs with a base with 9 inch² minimum area or sufficient area to prevent the chair from sinking into fill or sub-grade. Precast mortar or concrete blocks meeting the requirements of this item may be used.

2.05 BENDING:

- A. The reinforcement shall be bent cold, true to the shapes indicated. Bending shall preferable be done in the shop.
- B. Irregularities in bending shall be cause for rejection.
- C. Unless otherwise indicated, the inside diameter of bar bends, in terms of the nominal bar diameter (d), shall be as follows:

1. Bends of 90 degrees and greater in stirrups, ties and other secondary bars that enclose another bar in the bend.

<u>Bar Number</u>	<u>Grade 40</u>	<u>Grade 60</u>
3, 4, 5	3d	4d
6, 7, 8	4d	5d

2. All bends in main bars and in secondary bars not covered above:

<u>Bar Number</u>	<u>Grade 40</u>	<u>Grade 60</u>	<u>Grade 75</u>
3 thru 8	6d	6d	--
9, 10	8d	8d	--
11	8d	8d	8d
14, 18	10d	10d	--

2.06 STORAGE:

- A. Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports and shall be protected as far as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust.
- B. When placed in the work, reinforcement shall be free from dirt, paint, grease, oil or other foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations.
- C. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross sectional area and tensile properties of a hand wire brushed specimen meets the physical requirements for the size and grade of steel indicated.

2.07 SPLICES:

- A. No splicing of bars, except when indicated or specified herein, will be permitted without written approval of the ENGINEER.
- B. No substitution of bars will be allowed without the approval of the ENGINEER. Any splicing of substituted bars shall conform to Table 03330-1.
- C. Splices not indicated will be permitted in slabs no more than 15 inches in thickness, columns, walls and parapets, but not included for measurement, subject to the following:
 1. Splices will not be permitted in bars 30 feet or less in plan length.
 2. For bars exceeding 30 feet in plan length, the distance center to center of splices shall not be less than 30 feet minus 1 splice length, with no more than 1 individual bar length less than 10 feet.

3. Splices not indicated, but permitted hereby, shall conform to Table 03330-1. The specified concrete cover shall be maintained at such splices and the bars placed in contact and securely tied together.

TABLE 03330-1

Minimum Lap Requirements

<u>Bar Number</u>	<u>Grade 40</u>	<u>Grade 60</u>
3	1 foot 0 inches	1 foot 0 inches
4	1 foot 2 inches	1 foot 9 inches
5	1 foot 5 inches	2 feet 2 inches
6	1 foot 9 inches	2 feet 7 inches
7	2 feet 4 inches	3 feet 5 inches
No. 8	3 feet 0 inches	4 feet 6 inches
No. 9	3 feet 10 inches	5 feet 8 inches
No. 10	4 feet 10 inches	7 feet 3 inches
No. 11	5 feet 11 inches	8 feet 11 inches

- D. Spiral steel shall be lapped a minimum of 1 turn. Bar No. 14 and No. 18 may not be lapped.
- E. Welding of reinforcing bars may be used only where indicated or as permitted herein. All welding operations, processes, equipment, materials, workmanship and inspection shall conform to the requirements indicated. All splices shall be of such dimension and character as to develop the full strength of the bar being spliced.
- F. End preparation for butt welding reinforcing bars shall be done in the field, except Bar No. 6 and larger shall be done in the shop. Delivered bars shall be of sufficient length to permit this practice.
- G. For box culvert extensions with less than 1 foot of fill, the existing longitudinal bars shall have a lap with the new bars as shown in Table 03330-1.
- H. For box extensions with more than 1 foot of fill, a minimum lap of 6 inches will be required.
- I. Unless otherwise indicated, dowel bars transferring tensile stress shall have a minimum embedment equal to the minimum lap requirements shown in Table 03330-1.
- J. Shear transfer dowels shall have a minimum embedment of 12 inches.

PART 3 - EXECUTION

3.01 PLACING:

- A. Reinforcement shall be placed as near as possible in the position indicated. Unless otherwise indicated, dimensions shown for reinforcement are to the centers of the bars.
- B. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than $1/12$ of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than $1/4$ inch.
- C. Cover of concrete to the nearest surface of steel shall be as follows:

<u>ITEM</u>	<u>MINIMUM COVER INCHES</u>
1. Concrete cast against and permanently exposed to earth.	3
2. Concrete exposed to earth or weather: Bar No. 6 through 18 bars	2
Bar No. 5, W31 or D31 wire and smaller	1 1/2
3. Concrete not exposed to weather or in contact with ground:	
Slabs, walls, joists:	
Bar No. 14 and 18	1 1/2
Bar No. 11 and smaller	1
Beams, columns:	
Primary reinforcement, ties, stirrups, spirals	1 1/2
Shells, folded plate members:	
Bar No. 6 and larger	1
Bar No. 5, W31 or D31 wire, and smaller	1

- D. Vertical stirrups shall always pass around the main tension members and be attached securely thereto. The reinforcing steel shall be spaced its required distance from the form surface by means of approved galvanized metal spacers, metal spacers with plastic coated tips, stainless steel spacers, plastic spacers or approved precast mortar or concrete blocks. For approval of plastic spacers on a project, representative samples of the plastic shall show no visible indications of deterioration after immersion in a 5 percent solution of sodium hydroxide for 120 hours.

- E. All reinforcing steel shall be tied at all intersections, except that where spacing is less than 1 foot in each direction, alternate intersections only need be tied. For reinforcing steel cages for other structural members, the steel shall be tied at enough intersections to provide a rigid cage of steel. Mats of wire fabric shall overlap each other 1 full space as a minimum to maintain a uniform strength and shall be tied at the ends and edges.
- F. Where prefabricated deformed wire mats are specified or if the CONTRACTOR requests, welded wire fabric may be substituted for a comparable area of steel reinforcing bar plan, subject to the approval of the ENGINEER.
- G. A suitable tie wire shall be provided in each block, to be used for anchoring to the steel. Except in unusual cases and when specifically authorized by the ENGINEER, the size of the surface to be placed adjacent to the forms shall not exceed $2^{1/2}$ inches square or the equivalent thereof in cases where circular or rectangular areas are provided. Blocks shall be cast accurately the thickness required and the surface to be placed adjacent to the forms shall be a true plane, free of surface imperfections.
- H. Reinforcement shall be supported and tied in such a manner that sufficiently rigid cage of steel is provided. If the cage is not adequately supported to resist settlement or floating upward of the steel overturning of truss bars or movement in any direction during concrete placement, permission to continue concrete placement will be withheld until corrective measures are taken. Sufficient measurements shall be made during concrete placement to insure compliance with the above.
- I. No concrete shall be deposited until the ENGINEER has reviewed the placement of the reinforcing steel and all mortar, mud, dirt, etc, shall be cleaned from the reinforcement, forms, workers' boots and tools.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. The measurement of quantities of reinforcement furnished and placed will be based on the calculated weight of the steel actually placed as indicated, with no allowance made for added bar lengths for splices requested by the CONTRACTOR nor for extra steel used when bars larger than those indicated or with a higher grade of steel are substituted with the permission of the ENGINEER.
- B. Tie wires and supporting devices will not be included in the calculated weights.
- C. The calculated weight of bar reinforcement will be determined using the theoretical bar weight set forth in this item.
- D. Measurement required by a change in design will be computed as described above for the actual steel required to complete the work.

4.02 PAYMENT:

- A. The accepted quantities of reinforcing steel will be paid for at the contract unit bid price per pound complete in place.
- B. When not listed as a separate contract pay item, reinforcing steel shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work, will be for furnishing, bending, fabricating, welding and placing reinforcement, for all clips, blocks, metal spacers, ties, chairs, wire or other materials used for fastening reinforcement in place and for all tools, labor, equipment and incidentals necessary to complete the work.

***** END OF SECTION *****

SECTION 09100

CONSTRUCTION TRAFFIC CONTROL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This item shall consist of the construction, manipulation, maintenance and removal, if required, of detours of the length and to the lines, grades, and typical sections indicated and providing for installing, moving, replacing, maintaining, cleaning and removing upon completion of the work, as required, all detour markers, signs, barricades and other devices used in traffic control and handling at the construction site as indicated or as directed by the ENGINEER.
- B. This item shall also consist of providing, installing, moving, replacing, maintaining, cleaning and removing temporary or permanent street closure barricades, signs or other devices required to handle the traffic in conformance with the current edition of the Texas Manual of Uniform Traffic Control Devices for Street and Highways and as indicated or directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 CONSTRUCTION TRAFFIC CONTROL SIGNS:

- A. Construction traffic control signs shall conform to the provisions of Section 9000 except as noted in the plans or as directed by the ENGINEER.
- B. Construction traffic control signs used herein shall be fabricated using sheeting conforming to the requirements of Table 9000-3.
- C. The substrate for construction signs need only be sufficiently durable to last the life of the project and sufficiently rigid to hold the sheeting in a flat plane.

2.02 SIGN SUPPORTS:

- A. Supports for construction traffic control signs shall be grade #2 fir or yellow pine, pressure treated with pentachlorophenol.
- B. Supports shall have a minimum nominal size of 4-inches x 4-inches and conform to the details shown on the plans.

2.03 PORTABLE SIGN SUPPORT:

- A. Materials for portable sign supports shall comply with the details shown on the plans. Portable sign supports other than those shown on the plans shall be submitted to the Project Manager for approval prior to use.

2.04 BARRICADES:

- A. Barricades shall be classified as Type I, Type II, or Type III and shall comply with the details shown on the plans and the TMUTCD.
- B. Barricade rails shall be fabricated using S4S grade #2 fir or yellow pine and reflectorized sheeting conforming to the requirements shown in Table 9000-3.

2.05 VERTICAL PANELS:

- A. Materials for vertical panels shall conform to the details shown on the plans. Vertical panels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements of the TMUTCD and Table 9000-3.

2.06 CONSTRUCTION TRAFFIC MARKINGS:

- A. Construction traffic markings shall comply with Section 9990 and the details shown in the plans.

2.07 ABBREVIATED PAVEMENT MARKINGS FOR CONSTRUCTION:

- A. The pavement-marking material shall consist of an adhesive-backed reflective tape which can be applied to the pavement. Markings shall be of good appearance, have straight, unbroken edges and have a color that complies with all federal regulations.

1. COLOR

- a) The markings, as well as retroreflected light from the markings, shall be white or yellow as indicated.

2. VISIBILITY

- a) The pavement markings (during daylight hours) shall be distinctively visible for a minimum of 300 feet unless sight distance is restricted by geometric roadway features.
- b) The pavement markings (when illuminated by automobile low beam headlights at night) shall be distinctly visible for a minimum of 160 feet unless sight distance is restricted by geometric features.
- c) The above day and night visibility requirements shall be met when viewed from an automobile traveling on the roadway.

2.08 CHANNELIZATION DEVICES:

A. BARRELS

1. Barrels shall be of metal or nonmetal composition approved by the ENGINEER and of 30 to 55 gallon capacity. Only one size may be used on the project. The barrels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements of TMUTCD and Table 9000-3. The markings on the barrels shall be horizontal, circumferential, orange wide. There shall be a minimum of 55 alternating orange and white stripes on each barrel. Barrels shall also conform to the details shown on the plans.
2. Type "B" barrels shall be equipped with either Type "A" low intensity or Type "C" steady- burn warning lights complying with the provisions to TMUTCD and the ITE standard for flashing and steady-burn lights. The use warning lights shall be as directed by the ENGINEER.

B. TRAFFIC CONES

1. Traffic cones shall conform to the details shown on the plans.

C. TUBULAR TRAFFIC MARKERS

1. POST

- a) The post shall be of a thermoplastic or pliable elastomer composition meeting the manufacturer's requirements.
- b) Dimensions:

Outside Diameter..... 2.23 inches to 4 inches
Wall Thickness..... 0.125 inch minimum
Length..... 18 to 36 inches
Color..... Orange

2. BASE

- a) The base shall be of a thermoplastic or pliable elastomer composition meeting the manufacturer's requirements.
- b) Dimensions:

Height..... 1/2 to 2 inches
Outside Diameter 7 to 12 inches
Color..... black or same color as post

3. ASSEMBLY UNITS

- a) Assembly units which are inherent with the particular marker shall be as per manufacturer's recommendations.

4. ADHESIVES

- a) Adhesive shall be epoxy type (permanent installation or butyl type (temporary installation) as per manufacturer's recommendations.
- b) Other methods approved by the ENGINEER prior to initiating the work may be used; however, said approval does not abrogate the CONTRACTOR'S responsibility of effecting the temporary or permanent installation.

5. REFLECTORIZATION

- a) If used at night, tubular traffic markers shall have two 3-inch, circumferential reflective bands, no more than 2-inches from the top with no more than 6-inches separating the bands. Reflective material shall be SIA-250 or higher sheeting conforming to the provisions of Section 9000. The color of reflective material shall be as shown in the plans.

2.09 SEQUENTIAL ARROW DISPLAYS

- A. Sequential arrow displays shall be sequentially lighted and roof or trailer mounted. The minimum panel size shall be 30-inches high and 54-inches wide. The display shall have 22 hooded sealed beam amber lamps rated at a maximum intensity of 8800 candlepower.
- B. Light intensity shall be adjustable by dimmer switch. The operating modes shall be as follows:
 - 1. Pass Left. 3 chevrons of 5 lamps each sequence in right to left pattern 40 to 50 times per minute.
 - 2. Pass Right. 3 chevrons of 5 lamps each sequence in left to right pattern 40 to 50 times per minute.
 - 3. Pass Either Side. The two outermost chevrons on each end of the panel pointing like arrowheads and flashing 40 to 50 times per minute with crossing row of lamps burning continuously.
 - 4. Warning. 4 lamps, one at each corner of the panel, flashing 40 to 50 times per minute.

2.10 MATERIALS FOR CONSTRUCTION DETOURS

A. FLEXIBLE BASE

- 1. Flexible base shall conform to Section 2601.

B. ASPHALT TREATED BASE

1. Asphalt treated base shall conform to Section 2604.

C. PRIME COAT

1. Prime Coat shall conform to Section 2610.

D. TACK COAT

1. Tack Coat shall conform to Section 2620.

E. SEAL COAT

1. Seal Coat shall conform to Section 2617 or Section 2645.

F. HOT MIX ASPHALTIC CONCRETE PAVEMENT

1. Hot Mix shall be Type D conforming to Section 2612.

G. SEEDING

1. Seeding shall conform to Section 0000.

PART 3 - EXECUTION

3.01 CONSTRUCTION TRAFFIC CONTROL SIGNS AND SIGN SUPPORTS:

- A. Construction traffic control signs and sign supports shall be installed at locations noted on the plans in conformance with the TMUTCD or as directed by the ENGINEER.

3.02 PORTABLE SIGN SUPPORTS:

- A. Portable sign supports for traffic control devices for detours shall be furnished by the CONTRACTOR, shall be installed at the locations shown on the plans, unless otherwise shown on the plans, and shall remain the property of the CONTRACTOR.
- B. Unless otherwise specified, portable sign supports shall be of the dimensions shown on the plans.

3.03 BARRICADES:

- A. Barricades shall be installed in conformity with the details noted on the plans or as directed by the ENGINEER.

3.04 VERTICAL PANELS:

- A. Vertical panels shall be installed in conformity with the details noted on the plans or as directed by the ENGINEER.

3.05 CONSTRUCTION TRAFFIC MARKINGS:

- A. Construction traffic markings shall be installed in conformity with Section 9990 and the details shown on the plans or as directed by the ENGINEER.

3.06 ABBREVIATED PAVEMENT MARKING FOR CONSTRUCTION:

- A. Abbreviated markings meeting all specification requirements shall be in place on all roadways on which traffic is allowed and where suitable standard pavement marking is not in place. The transverse location of the line(s) formed by the markings shall be as determined by the ENGINEER.
- B. Unless otherwise indicated, the abbreviated markings shall be placed as follows:

<u>Condition</u>	<u>Spacing</u>	<u>Length of Stripe</u>
Straight	40 feet approximately	48 inch
Curve greater than 2 degrees	20 feet maximum	48 inch
Curve less than or equal 2 degrees	40 feet maximum	48 inch

- C. Pavement markings shall be a minimum of 3 7/8 inches wide. Length and spacing will be in accordance with these specifications.
- D. The spacing of stripes may be modified by the ENGINEER. However, the maximum spacing specified above shall not be exceeded in any case.
- E. The CONTRACTOR will be responsible for maintaining the abbreviated pavement markings until standard pavement markings are in place.
- F. Abbreviated pavement markings shall be removed after all permanent markings have been place.

3.07 CHANNELIZATION DEVICES:

A. TYPE "A" BARRELS

- 1. Type "A" barrels shall be used during daylight hours only and shall not be equipped with warning lights of any type.

B. TYPE "B" BARRELS

1. Type "B" barrels shall be equipped with warning lights. Type "B" barrels shall be used during nighttime hours only, unless otherwise shown on the plans or directed by the Project Manager.
2. The term "daylight hours" refers to those hours between dawn and dusk. The term "nighttime hours" refers to those hours between dusk and dawn.

C. TRAFFIC CONES

1. Traffic cones shall be installed in conformity with the plans and the TMUTCD or as directed by the ENGINEER.

D. TUBULAR TRAFFIC MARKERS

1. The metal, concrete, or bituminous surface where the tubular traffic markers are to be placed shall be thoroughly cleaned.
2. Metal and concrete surfaces shall be sandblasted or wire brushed. Bituminous surfaces shall be cleaned in accordance with manufacturer's recommendations.
3. All loose sand, dust and other deleterious debris from cleaned mounting surfaces shall be removed.
4. Tubular traffic markers shall be installed in conformity with details and at locations shown on the plans or as directed by the ENGINEER and in accordance with the manufacturer's recommendation.
5. In the event that removal of an installation (temporary or permanent) is effected and the metal, concrete, or bituminous surface is damaged the CONTRACTOR shall repair and otherwise restore said surface to its original condition at no additional cost to the County.
6. All defective post(s), base(s), assembly unit(s), adhesive(s), or reflective sheeting contributing to the detriment of the intended function of the tubular traffic markers shall be replaced by the CONTRACTOR at no additional cost to the COUNTY.

- E. Channelization devices shall be and installed in accordance with the details shown on the plans, except that barrels shall be as noted herein.

3.08 SEQUENTIAL ARROW DISPLAY:

- A. Sequential arrow displays shall be used according to the requirements shown on the plans and shown in TMUTCD.

3.09 CONSTRUCTION DETOURS:

- A. The detours shall be constructed at the locations and to the lines and grades indicated and it shall be the entire responsibility of the CONTRACTOR to provide for the passage of traffic in comfort and safety without creating a dust problem.

3.10 CONSTRUCTION METHODS:

- A. Prior to commencing construction, suitable "Construction Traffic Control" devices shall be installed to protect the workers and the public.
- B. The CONTRACTOR shall be responsible for installing all markers, signs and barricades conforming to The Texas Manual on Uniform Traffic Control Devices and/or as indicated. If, in the opinion of the ENGINEER, additional markers, signs or barricades are needed in the interest of safety, the CONTRACTOR will install such as are required or as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement of various items described in this specification complete in place will be made as follows:
 - 1. Construction traffic control sign assemblies, consisting of the applicable signage mounted on either sign supports or portable sign supports, shall be measured per each or lump sum.
 - 2. Barricades shall be measured by the type per each.
 - 3. Vertical panels shall be measured per each. Supports required for vertical panels will not be measured for payment but will be considered incidental to the completion of the work.
 - 4. Construction traffic markings shall be measured per linear foot.
 - 5. Abbreviated pavement markings for construction shall be measured per linear foot.
 - 6. Channelization devices shall be measured per each for the category and type shown.
 - 7. Sequential arrow display shall be measured per each.
 - 8. Construction detours shall be measured per each or considered incidental to completion of construction.
 - 9. Construction traffic control plan, consisting of any or all of the items described herein, shall be measured lump sum or incidental to completion of construction.

4.02 PAYMENT:

- A. The accepted quantities of construction traffic control devices shall be paid at the contract unit bid price per the unit of measurement noted above.
- B. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

*** * * END OF SECTION * * ***

SECTION ITEM 402

TRENCH EXCAVATION PROTECTION

402.1. Description. This Item shall govern for the excavation protection required for the trenches in excess of five (5) feet deep, including all additional excavation, backfill, pavement reconstruction and repair made necessary by the protection system, in accordance with this Item.

A trench shall be defined as a narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less (measured at the bottom of the excavation), the excavation is also considered to be a trench. In addition, "Trench Excavation Protection" will not be limited to these applications, but may be used wherever deemed expedient and proper to the ensuing work.

402.2. Construction Methods. Trench Excavation Protection shall be as required by the provisions of Part 1926, Subpart P-Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration's Standards and Interpretations.

402.3. Measurement. This Item will be measured by the linear foot along the centerline of trench where the depth of trench exceeds five (5) feet.

402.4. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Trench Excavation Protection". This price shall be full compensation for all excavation and backfill; for furnishing, placing and removing all shoring, sheeting, or bracing; for dewatering or diversion of water; for all jacking and jack removal; and for all other labor, materials, tools, equipment and incidentals necessary to complete the work.

No payment will be made for excavation protection made necessary due to the selection of an optional design or sequence of work that creates the need for the protection system.

*** END OF SECTION ***

SECTION 30040

BIAXIAL GEOGRID BX 1200 REINFORCEMENT SPECIFICATION

DESCRIPTION This item shall consist of furnishing, delivering and installing geogrid reinforcement.

MATERIALS The geogrid shall be a single layer grid structure formed by a regular network of integrally connected polymeric tensile elements with aperture designed to interlock with the surrounding fill material. The structure shall be capable of maintaining dimensional stability during placement and under normal construction traffic. The geogrid shall be resistant to damage during construction; including ultraviolet degradation and it shall have long term resistance to chemical and biological degradation caused by the material being reinforced.

The geogrid shall also conform to the properties specified below.

STRUCTURAL GEOGRID PROPERTIES

Index Properties	Test Method	Values
Aperture Dimensions	N/A	1.0 – 1.3 inches
Minimum Rib Thickness	N/A	0.05 inches
Tensile Strength @ 2% Strain	ASTM D6637-10 Method A	410 – 620 lb/ft
Tensile Strength @ 5% Strain	ASTM D6637-10 Method A	810 – 1,340 lb/ft
Ultimate Tensile Strength	ASTM D6637-10 Method A	1,310 – 1,970 lb/ft

Structural Integrity	Test Method	Values
Junction Efficiency	ASTM D7737-11	93%
Flexural Stiffness	ASTM D7748-12	750,000 mg-cm
Aperture Stability	GRI GG9	0.65 m-N/deg

Durability	Test Method	Values
Resistance to Installation Damage	ASTM D5818 (Sample) ASTM D6637 (Load Cap.)	95%SC / 93%SW / 90%GP
Resistance to Long Term Degradation	EPA 9090	100%
Resistance to UV Degradation	ASTM D4355-05	100%

.....

Alternate geogrid material will be considered. Such material must be pre-approved in writing by the Engineer prior to bid date. Alternate material packages must be submitted to the Engineer, a minimum of 15 calendar days prior to bid date. Submittal packages must include, as a minimum, the following:

- A. Full scale laboratory testing and in ground testing of pavement structures reinforced with the specific geogrid which quantifies the structural contribution of the geogrid to the pavement structure. The increase in structural layer coefficient of the base course must meet or exceed that of the design geogrid.

- B. Independent certified test results stating that the alternate geogrid has resistance to in-plane rotational movement measured by applying a 20 cm-kg (2 m-N) moment to the central junction of a 9 inch x 9 inch specimen restrained at its perimeter.
- C. A list of 5 comparable projects, in terms of size and applications, in the United States, where the results of the specific alternate geogrid's use can be verified after a minimal of 1 year service.
- D. A sample of the geogrid and certified specification sheets.

CONSTRUCTION METHODS Subgrade shall be prepared as indicated on the plans or as directed by the Engineer. The geogrid shall be installed in accordance with the lines and grades shown on the plans. The geogrid shall be oriented such that the roll lengths run parallel to the road direction. Geogrid sections shall be overlapped a minimum of one foot unless otherwise indicated on the plans or as directed by the Engineer. Care shall be taken to ensure the geogrid sections do not separate during construction; adjacent rolls shall be tied together every 30 feet using suitable plastic ties. Placement of geogrid around corners may require cutting and diagonal lapping. The geogrid shall be pinned, or held in place by other means, at the beginning of the backfill section but will be left free elsewhere to relieve wrinkles or folds in material during placement.

Fill material shall be placed in lift thicknesses and compacted as shown on the plans. Tracked construction equipment shall operate on the grid only with a minimum fill cover of four inches. Rubber tired equipment may operate directly on the grid at speeds less than 5 miles per hour if the underlying material is capable of supporting the loads. Sections of geogrid which are damaged by construction activity shall be repaired at the Contractor's expense.

MEASUREMENT This item will be measured by the square yard of surface area as shown on the plans. No measurement will be made for lapping of material.

PAYMENT The work performed and materials furnished, as prescribed by this item, measured as provided under "Measurement", will be paid for at the unit price bid for "Biaxial Geogrid BX 1200 Reinforcement", which shall be full compensation for furnishing all labor, materials, freight, tools, equipment and incidentals, and for doing all the work involved in placement of the geogrid, complete in place.

*** END OF SECTION ***

SECTION ITEM 420

CONCRETE STRUCTURES

420.1. Description. This Item shall govern for the construction of all types of structures involving the use of cast-in-place concrete. All structures shall be constructed in accordance with the details shown on the plans and this Item.

420.2. Materials.

(1) Concrete. All concrete shall conform to the provisions of Item 421, "Portland Cement Concrete".

The class of concrete for each type of structure or unit shall be as shown on the plans, or by pertinent governing specifications.

(2) Reinforcing Steel. All reinforcing steel shall conform to the provisions of Item 440, "Reinforcing Steel".

(3) Expansion Joint Material. The following materials shall conform to the requirements of Item 433, "Joint Sealants and Fillers".

(a) Preformed Fiber Material. Preformed fiber expansion joint material shall conform to the dimensions shown on the plans. Unless otherwise specified, "Preformed Bituminous Fiber Material" shall be used.

(b) Joint Sealing Material. Unless shown otherwise, the sealer shall be a "Low Modulus Silicone Sealant".

(c) Asphalt Board. Asphalt board shall conform to the dimensions shown on the plans.

(d) Rebonded Neoprene Filler. Rebonded neoprene filler shall conform to the dimensions shown on the plans.

(4) Waterstop.

(a) Rubber waterstop or polyvinyl chloride (PVC) waterstop shall be in conformance with Item 435, "Elastomeric Materials".

(b) Other types shall be as shown on the plans.

(5) Curing Materials.

(a) Membrane curing shall conform to Item 526, "Membrane Curing".

(b) Cotton mats shall consist of a filling material of cotton "bat" or "bats" (min. 12 oz. per sq. yd.); covered with un-sized cloth (min. six (6) oz. per sq. yd.); tufted or stitched to maintain stability; shall be free from tears; and shall be in good general condition.

(c) Polyethylene sheeting shall be four (4) mil. minimum thickness and free from visible defects. It shall be clear or opaque white except when the temperature during the curing period does not exceed 60 F or when applicable to control temperature during mass pours.

(d) Burlap-polyethylene mats shall be made from burlap impregnated on one side with a film of opaque white pigmented polyethylene and free from visible defects.

(e) Laminated mats shall have not less than one (1) layer of an impervious material such as polyethylene, vinyl plastic or other acceptable material (either as a solid sheet or impregnated into another fabric) and shall be free of visible defects.

(6) Admixtures. Concrete admixtures shall comply with the requirements of Item 437, "Concrete Admixtures".

(7) Epoxy. Unless otherwise specified, epoxy materials shall conform to Item 575, "Epoxy".

(8) Latex Emulsions. Latex emulsion used for latex based grout/mortar, latex adhesive grout/mortar or other purposes shall conform to Departmental Materials Specification D9-8110.

420.3. General Requirements. Before starting work, the Contractor shall inform the Engineer fully of the construction methods he proposes to use, the adequacy of which shall be subject to the approval of the Engineer.

Concurrence on the part of the Engineer of any proposed construction methods, approval of equipment, or of form and falsework plans does not relieve the Contractor of the responsibility for the safety or correctness of the methods, the adequacy of his equipment or from carrying out the work in full accordance with the contract.

Plans for forms and falsework for piers, superstructure spans over 20 feet long and for all bridge widening details shall be submitted to the Engineer for review. Similar plans shall be submitted for other units of the structure, if requested by the Engineer. The plans shall be prepared on standard 22 inch by 34 inch sheets and shall show all essential details of the proposed forms, falsework and bracing to permit a structural analysis. Four (4) sets of such plans will be required. One (1) set of design calculations shall accompany the submission of such plans. Plans, forms and falsework shall be designed, sealed, and signed by a professional engineer.

Forms or screed supports may be attached to I-beams or girders by welding, subject to the following requirements:

(1) Welds will not be permitted on tension flanges and in those areas shown on the plans or as directed by the Engineer.

(2) Welds shall be made in accordance with Item 448, "Structural Field Welding".

Unless otherwise shown on the plans, the time sequence in which construction operations may be carried on and in which completed structures may be opened to traffic shall be governed by the following:

- (1) Superstructure members, forms, falsework, or erection equipment shall not be placed on the substructure before the concrete therein has attained a flexural strength of 425 psi.
- (2) Storage of materials on completed portions of a structure will not be permitted until all curing requirements for those particular portions have been met.
- (3) A minimum flexural strength of 340 psi will be required for the following:
 - (a) Forms erected on concrete footings supported by piling or drilled shafts.
 - (b) Forms on individual drilled shafts.

Such work may begin on spread footings and culvert footings, after the concrete therein has aged at least two (2) curing days. Concrete may be placed as soon as the forms and reinforcing steel are approved.

(4) The support of tie beam and/or cap forms by falsework placed on previously placed tie beams will be permissible provided such beams have attained 425 psi flexural strength, curing requirements are completed, and the member is properly supported to eliminate stresses not provided for in the design.

(5) Bridges and direct traffic culverts shall not be opened to construction traffic or to the traveling public until authorized by the Engineer in accordance with the following:

After the last slab concrete has been in place at least 14 days, authorization may be given for construction traffic on structures not to exceed three-quarter ton vehicles.

After the last slab concrete has been in place at least 21 days, authorization may be given for other construction traffic, or for the traveling public when necessary. Vehicles exceeding the legal load limit will be allowed in accordance with Item 6, "Control of Materials".

(6) Box culverts in fills may be opened to backfilling and compaction equipment when the concrete in the top slab has attained 425 psi flexural strength, and may be opened to other traffic as soon as sufficient backfill and/or embankment has been placed over the top to protect the culverts against damage from heavy construction equipment. The Contractor shall repair, at his expense, any damage inflicted on the culvert by construction traffic.

420.4. Drains. Weep holes and roadway drains shall be installed and constructed as shown on the plans.

420.5. Expansion Joints. Joints and devices to provide for expansion and contraction shall be

constructed in accordance with plan details and the requirements of this Item.

The bearing area under the expansion ends of concrete slabs and slab and girder spans shall be given a steel trowel finish, and finished to the exact grades required.

Bridging of concrete or mortar around expansion joint material in bearings and expansion joints shall be prevented.

All open joints and joints to be filled with expansion joint material shall be constructed using forms adaptable to loosening or early removal. To avoid expansion or contraction damage to the adjacent concrete, these forms shall be loosened as soon as possible after final concrete set to permit free movement of the span without requiring full form removal.

When a "Type A" joint is shown on the plans, preformed fiber joint material shall be used in the vertical joints of the roadway slab, curb, median or sidewalk and the top one (1) inch thereof shall be filled with the joint sealing material shown herein or shown on the plans.

The sealer shall be installed in accordance with Item 438, "Cleaning and/or Sealing Joints and Cracks (Portland Cement Concrete)", and the manufacturer's recommendations.

Where preformed fiber joint material is used, it shall be anchored to the concrete on one (1) side of the joint by light wire or nails.

Finished joints shall conform to the plan details with the concrete sections completely separated by the specified opening or joint material.

Soon after form removal and again where necessary after surface finishing, all concrete shall be removed from within the joint opening to insure full effectiveness of the expansion joint.

420.6. Construction Joints. The joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set shall be deemed a construction joint. The term monolithic placement shall be interpreted to mean that the manner and sequence of concrete placing shall not create a construction joint.

Construction joints shall be of the type and at the locations shown on the plans. Construction joints other than those shown on the plans will not be permitted in bridge slabs. Additional joints in other members will not be permitted without written authorization from the Engineer. When additional joints are authorized, they shall have details equivalent to those shown on the plans for joints in similar locations.

Unless otherwise provided, construction joints shall be square and normal to the forms. Bulkheads shall be provided in the forms for all vertical joints.

Construction joints requiring the use of joint sealing material shall be as shown on the plans. A concrete placement terminating at a horizontal construction joint shall have the top surface roughened thoroughly as soon as practicable after initial set is attained.

The hardened concrete surface shall be thoroughly cleaned of all loose material, laitance, dirt or foreign matter and saturated with water. All freewater shall be removed and the surface shall be in a moist condition when concrete and/or bonding grout is placed against it.

Forms shall be drawn tight against the existing concrete to avoid mortar loss and offsets at joints.

When shown on the plans or in other specifications, the joint surface shall be coated with bonding mortar, grout, or other specified material.

When shown on the plans, Type V epoxy material shall be used for bonding fresh concrete to hardened concrete. The bonding epoxy shall be placed on a clean, dry surface and shall be tacky when the fresh concrete is placed.

420.7. Seal for Foundations. Concrete for foundation seals, unless otherwise specified, shall be in accordance with Item 400, "Excavation and Backfill for Structures".

420.8. Falsework. Falsework shall be designed and constructed to safely carry the maximum anticipated loads, including wind loads, and to provide the necessary rigidity. Details of falsework construction shall be subject to review and approval by the Engineer in accordance with the provisions of Article 420.3.

For evaluating the adequacy of job fabricated falsework, a weight of 150 pounds per cubic foot shall be assumed for concrete, and a live load allowance of 50 pounds per square foot of horizontal surface of the form work shall be included. The maximum stresses shall not exceed 125 percent of the allowable stresses used by the Department for the design of structures.

Commercially produced structural units used in falsework shall not exceed the manufacturer's maximum allowable working load for moment, and shear or end reaction. The maximum allowable working load shall include an allowance of 35 pounds per square foot of horizontal form surface and sufficient details and data shall be submitted to the Engineer for approval.

All timber used in falsework shall be sound, in good condition, and free from defects which would impair its strength.

When wedges are used to adjust falsework to desired elevations, the wedges shall be used in pairs to insure even bearing. The use of wedges to compensate for incorrectly cut bearing surfaces will not be permitted. Wedges shall be hardwood or metal.

Sills or grillages shall be large enough to support the superimposed load without settlement, and unless founded on solid rock, shale or other hard materials, precautions shall be taken to prevent yielding of the supporting material.

Falsework which cannot be founded on a satisfactory spread footing shall be placed on piling or drilled shafts having a bearing capacity sufficient to support the superimposed load without settlement. Falsework piling shall be driven to the required resistance determined by the

applicable formula given in Item 404, "Driving Piling". Drilled shafts for falsework shall be designed to carry the superimposed load using both skin friction and point bearing.

Welding, when used, shall conform to the requirements of Item 448, "Structural Field Welding". Each falsework bent shall be securely braced to provide the stiffness required with the bracing securely fastened to each pile or column it crosses.

The falsework shall be removed when no longer required. Falsework piling shall be pulled or cut off not less than six (6) inches below finished ground level. Falsework, piling or drilled shafts in a stream, lake, or bay shall be completely removed to a point specified by the Engineer to prevent any obstruction to the waterway.

420.9. Forms. All forms shall be constructed in accordance with the following:

(1) General. Except where otherwise specified, forms may be of either timber or metal.

Forms for round columns exposed to view shall be of steel, except that other materials will be allowed with written permission of the Engineer.

Studs, joists, wales or other devices used for form supports shall be of sufficient section and rigidity to withstand undue bulging or settling of the forms. Any device or method used for form support shall be subject to the approval of the Engineer.

Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete shall be taken into consideration in determining the depth of the equivalent liquid. Job fabricated forms shall be designed for an additional live load of 50 pounds per square foot of horizontal surface. The maximum unit stresses shall not exceed 125 percent of the allowable stresses used by the Department for the design of structures.

Commercially produced structural units used in form work shall not exceed the manufacturer's maximum allowable working load for moment, shear or end reaction. The maximum working load shall include a live load of 35 pounds per square foot of horizontal form surface and sufficient details and data shall be submitted to the Engineer for review.

Forms shall be practically mortar-tight, rigidly braced and strong enough to prevent bulging between supports and shall be maintained to the proper line and grade during concrete placement. Forms shall be maintained in a manner to prevent warping and shrinkage.

Offsets at form joints shall not exceed 1/16 inch. Form supports for slabs shall not be welded to the top flange of I-beams or girders except in accordance with the provisions of Article 420.3.

Deflections due to cast-in-place slab concrete and railing shown in the dead load deflection diagram shall be taken into account in the setting of slab forms.

All forms and footing areas shall be cleaned of any extraneous matter before placing concrete. Permission to place concrete will not be given until all preparatory work is complete to the

satisfaction of the Engineer.

If, at any stage of placement, the forms show signs of bulging or sagging, the portion of the concrete causing such condition shall be removed immediately, if necessary, and the forms shall be reset and securely braced against further movement.

(2) Timber Forms. Lumber for forms shall be properly seasoned, of good quality, and free from imperfections which would affect its strength or impair the finished surface of the concrete.

Forms or form lumber to be reused shall be maintained clean and in good condition. Any lumber which is split, warped, bulged, marred or has defects that will produce inferior work shall not be used and shall be promptly removed from the work.

Form lining will be required for all formed surfaces, except for the inside of culvert barrels, inlets, manholes and box girders; the bottom of bridge decks between beams or girders; surfaces that are subsequently covered by backfill material or are completely enclosed; and, any surface formed by a single finished board. Lining will not be required when plywood forms are used.

Form lining shall be of an approved type such as masonite or plywood. Thin membrane sheeting such as polyethylene sheets shall not be used for form lining.

Commercial form liners used to imprint a pattern or texture on the surface of the concrete shall be as shown on the plans and/or as approved by the Engineer.

Forms may be constructed of plywood not less than 1/2 inch in thickness. The grain of the face plies on plywood forms shall be placed parallel to the span between the supporting studs or joists.

Plywood used for forming surfaces which remain exposed shall be equal to that specified as B-B Plyform Class I or Class II Exterior of the U.S. Department of Commerce, National Institute of Standards and Technology, U.S. Product Standard, latest edition.

Studs and joists shall be spaced so that the facing form material remains in true alignment under the imposed loads.

Wales shall be spaced close enough to hold forms securely to the designated lines and scabbed at least four (4) feet on each side of joints to provide continuity. A row of wales shall be placed near the bottom of each placement.

Facing material shall be placed with parallel and square joints and securely fastened to supporting studs.

Forms for surfaces receiving only an ordinary finish and exposed to view shall be placed with the form panels symmetrical, i.e., long dimensions set in the same direction. Horizontal joints shall be continuous.

Molding for chamfer strips or other uses shall be made of materials of a grade that will not split

when nailed and which can be maintained to a true line without warping. Wood molding shall be mill cut and dressed on all faces. Unless otherwise provided herein or shown on the plans, forms shall be filleted at all sharp corners and edges with triangular chamfer strips measuring 3/4 inch on the sides.

Except at structures where railing is to be attached, culvert headwall heights shall be adjusted as necessary to provide a maximum projection of three (3) inches above the roadway slope unless otherwise directed by the Engineer. At the entrance of all box culverts, a three (3) inch chamfer shall be provided along the bottom edge of the top slab. Reinforcing steel shall be adjusted as necessary to provide a minimum 1 1/4 inch clear cover. No changes will be made in quantities and no additional compensation will be allowed for this work.

All forms shall be constructed to permit their removal without marring or damaging the concrete. The forms may be given a slight draft to permit ease of removal.

Metal form ties of an approved type or a satisfactory substitute shall be used to hold forms in place and shall be of a type that permits ease of removal of the metal as hereinafter specified.

All metal appliances used inside of forms for alignment purposes shall be removed to a depth of at least 1/2 inch from the concrete surface. The appliances shall be made so the metal may be removed without undue chipping or spalling of the concrete, and when removed, shall leave a smooth opening in the concrete surface. Burning off of rods, bolts or ties will not be permitted.

Any wire ties used shall be cut back at least 1/2 inch from the face of the concrete.

Devices holding metal ties in place shall be capable of developing the strength of the tie and adjustable to allow for proper alignment.

Metal and wooden spreaders which are separate from the forms shall be removed entirely as the concrete is being placed.

Adequate clean-out openings shall be provided for narrow walls and other locations where access to the bottom of the forms is not readily attainable.

The facing of all forms shall be treated with bond breaking coating of such composition that would not discolor or otherwise injuriously affect the concrete surface. Care shall be exercised to prevent coating of the reinforcing steel.

(3) Metal Forms. The foregoing requirements for timber forms regarding design, mortar-tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse and wetting shall also apply to metal forms, except that these will not require lining, unless specifically noted on the plans.

The thickness of form metal shall be as required to maintain the true shape without warping or bulging. All bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or which line up

improperly shall not be used. Metal shall be kept free from rust, grease or other foreign materials.

(4) Form Supports for Overhang Slabs. Form supports which transmit a horizontal force to a steel girder or beam, or to a pre-stressed concrete beam will be permitted, providing a satisfactory structural analysis has been made of the effect on the girder or beam and approval is granted by the Engineer.

When overhang brackets are used on pre-stressed concrete beam spans with slab overhangs not exceeding three (3) feet six (6) inches, bracing requirements shall conform to the details shown on the plans.

For spans in which the overhang exceeds three (3) feet six (6) inches, additional support will be required for the outside beams regardless of the type beam used. Details of the proposed support system shall be submitted by the Contractor for approval.

Holes in steel members for support of overhang brackets may be punched or drilled full size or may be torch cut to 1/4 inch under size and reamed full size. In no case shall the holes be burned full size. The hole shall be left open unless otherwise shown on the plans. The holes shall never be filled by welding.

420.10. Placing Reinforcement. Reinforcement shall be placed as provided in Item 440, "Reinforcing Steel". Reinforcing steel supports shall not be welded to I-beams or girders or to reinforcing steel except where shown on the plans to be permissible.

Post tensioning ducts shall be placed in accordance with the approved pre-stressing details, and in accordance with Item 426, "Pre-stressing". The Contractor shall maintain all ducts free of obstructions until all post tensioning operations are complete.

420.11. Placing Concrete-General. The Contractor shall give the Engineer sufficient advance notice before placing concrete in any unit of the structure to permit the inspection of forms, reinforcing steel placement and other preparations.

The sequence of placing concrete shall be as shown on the plans or as required herein.

Concrete placement will not be permitted when impending weather conditions would impair the quality of the finished work. If conditions of wind, humidity, and temperature are such that concrete cannot be placed without cracking, concrete placement shall be done in the early morning or at night. When concrete mixing, placing, and finishing is done in other than daylight hours, provisions shall be made to adequately light the entire placement site. The Engineer will approve the adequacy of such lighting before operations are begun.

Where work has been started and changes in weather conditions require protective measures, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall, or from freezing temperatures as outlined in Article 420.12. If necessary to continue operations during rainfall, the Contractor shall also provide protective coverings for the material stockpiles. Aggregate stockpiles need to be covered only to the extent necessary to control the moisture

conditions in the aggregates.

After concrete has achieved initial set, at least one (1) curing day shall elapse before placing strain on projecting reinforcement in order to prevent damage to the concrete.

(1) Placing Temperature. The temperature of all concrete at the time of placement shall be not less than 50 F.

The temperature of cast-in-place concrete in bridge slabs and top slabs of direct traffic structures shall not exceed 85 F when placed. Concrete diaframs, parapets, concrete portions of railing, curbs, and sidewalks, unless monolithically placed with the slab, will not be subject to the above maximum. Other portions of structures, when shown on the plans, shall require the temperature control specified.

For mass concrete placements, as defined in Subarticle 420.11 (10), the concrete temperature at the time of placement shall not exceed 75 F.

(2) Transporting Time. The maximum time interval between the addition of cement to the batch and the placing of concrete in the forms shall conform to the requirements in Table 1.

Table 1
Temperature-Time Requirements

Concrete Temp (at point of placement)	Max Time (No Retarding Agent) Minutes	Max Time(1) (With Retarding Agent) Minutes
Non-Agitated Concrete		
Above 80 F		30
80 F and Below	15 30	45
Agitated Concrete		
Above 90 F		75
Above 75 F thru 90 F	45	90
75 F and Below	60 90	120

(1) Normal dosage of retarder

(3) Transporting Equipment. The method and equipment used to transport concrete to the forms shall be capable of maintaining the rate of placement shown on the plans or required by the Engineer. Concrete may be transported by buckets, chutes, buggies, belt conveyors, pumps or

other methods.

When belt conveyors or pumps are used, sampling for testing should be done at the discharge end. When in the opinion of the Engineer, it is deemed impractical to sample at the discharge end, sampling may be done at the mixer provided that correlation testing is performed and documented to ensure specification requirements are met at the discharge end.

Concrete transported by conveyors shall be protected from sun and wind, if necessary, to prevent loss of slump and workability. Pipes through which concrete is pumped shall be shaded and/or wrapped with wet burlap, if necessary, to prevent loss of slump and workability. Concrete shall not be transported through aluminum pipes, tubes, or other aluminum equipment.

Pump lines shall conform to the following:

For Grade 2 coarse aggregate and smaller, the minimum size pump line shall be five (5) inches ID.

For Grade 1 coarse aggregate, the minimum size pump line shall be eight (8) inches ID.

Chutes, troughs, conveyors or pipes shall be arranged and used so that the concrete ingredients will not be separated. When necessary to prevent segregation, such equipment shall terminate in vertical down-spouts. Open troughs and chutes shall extend, if necessary, down inside the forms or through holes left in the forms.

All transporting equipment shall be kept clean and free from hardened concrete coatings. Water used for cleaning shall be discharged clear of the concrete.

(4) Forms. Openings in forms shall be provided, if needed, for the removal of laitance or foreign matter.

All forms, pre-stressed concrete panels, T-beams, and concrete box beams on which concrete is to be placed shall be wetted thoroughly prior to placing concrete thereon. Any remaining puddles of excess water shall be removed. The top of such members shall be in a moist surface dry condition when concrete is placed on them.

(5) Handling, Placing, and Consolidation. The method of handling, placing, and consolidation of concrete shall minimize segregation of the concrete and displacement of the reinforcement. A uniform dense compact mass shall be produced.

(a) Handling and Placing. Concrete shall not have a free fall of more than five (5) feet, except in the case of thin walls such as in culverts or as specified in other items. Any hardened concrete splatter ahead of the plastic concrete shall be removed.

Each part of the forms shall be filled by depositing concrete as near its final position as possible. Depositing large quantities at one point and running or working the concrete along the forms will not be allowed.

Concrete shall be deposited in the forms in layers of suitable depth but not more than 36 inches in thickness, unless otherwise directed by the Engineer.

Cold joints in a monolithic placement shall be avoided. The sequence of successive layers or adjacent portions of concrete shall be such that they can be vibrated into a homogeneous mass with the previously placed concrete. Not more than one (1) hour shall elapse between adjacent or successive placements of concrete, except as otherwise required by an approved placing procedure when revibration of the concrete is shown on the plans or specifications. This time requirement may be extended by 1/2 hour when the concrete contains not less than a normal dosage of retarding admixture.

An approved retarding agent shall be used to control stress cracks and/or cold joints in placements where differential settlement and/or setting time may induce stress cracking.

(b) Consolidation. All concrete shall be well consolidated and the mortar flushed to the form surfaces with immersion type vibrators. Vibrators which operate by attachment to forms or reinforcement will not be permitted, except on steel forms. At least one (1) stand-by vibrator shall be provided for emergency use in addition to those required for placement.

The concrete shall be vibrated immediately after deposit. A systematic spacing of the points of vibration shall be established to insure complete consolidation and thorough working of the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms. The vibrator may be inserted in a sloping or horizontal position in shallow slabs. The entire depth of each lift shall be vibrated, allowing the vibrator to penetrate several inches into the preceding lift. Concrete along construction joints shall be thoroughly consolidated by operating the vibrator along and close to but not against the joint surface. The vibration shall continue until thorough consolidation and complete embedment of reinforcement and fixtures is produced, but not long enough to cause segregation. Vibration may be supplemented by hand spading or rodding, if necessary, to insure the flushing of mortar to the surface of all forms.

(6) Slabs. Unless otherwise shown on the plans or other specifications, slab concrete shall be mixed in a plant located off the structure. Carting or wheeling concrete batches over completed slabs will not be permitted until the slabs have aged at least four (4) full curing days. For the remainder of the curing period, timber planking will be required for carting of the concrete. Carts shall be equipped with pneumatic tires. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

The storing of reinforcing or structural steel on completed roadway slabs generally shall be avoided and, when permitted, shall be limited to quantities and distribution that will not induce excessive stresses.

A longitudinal screed may be placed directly on previously placed concrete slabs for the purpose of checking and grading of an adjacent slab after the previously placed slab has aged not less than 24 hours. Actual screeding may be done after the previously placed slabs have aged at least 48 hours.

(7) Continuous Placements. For continuous placement of the deck on steel units, the initial set of the concrete shall be retarded sufficiently to insure that the concrete remains plastic in not less than three (3) spans immediately preceding the slab being placed. For simple spans, retardation shall be required only if necessary to complete finishing operations or as required by Article 420.13.

(8) Fogging and Interim Curing. From the time of initial strike off of the concrete until finishing is completed and required interim curing is in place, the unformed surfaces of slab concrete in bridge decks and top slabs of direct traffic culverts shall be fogged when necessary to replace water loss due to evaporation.

Fogging equipment shall be capable of applying water in a fine mist, not a spray. The fog shall be produced using equipment which pumps water or water and air under high pressure through a suitable atomizing nozzle. The equipment shall be hand operated and sufficiently portable for use in the direction of any prevailing wind. It shall be adaptable for intermittent use as directed by the Engineer to prevent excessive wetting of the concrete.

Interim curing will be required for slab concrete in bridge decks and top slabs of the direct traffic culverts immediately upon completion of final finish. Type 1-D membrane curing compound (Resin Base Only) will be required. Water curing will be required in accordance with Article 420.20 and shall be commenced as soon as possible without damaging the surface finish.

(9) Installation of Dowels and Anchor Bolts. Dowels and anchor bolts may be cast-in-place or installed by grouting with grout, epoxy or epoxy mortar. Holes for grouting may be formed or drilled.

(a) General. Holes for anchor bolts shall accommodate the bolt embedment required by the plans. Holes for dowels shall be a minimum of 12 inches deep unless otherwise shown on the plans. When grout or epoxy mortar is used, the diameter of the hole shall be not less than twice the dowel or bolt diameter nor more than the diameter plus 1 1/2 inches. When using epoxy, the hole diameter shall be 1/16 inch to 1/4 inch greater than the dowel or bolt diameter.

Holes shall be thoroughly cleaned of all loose material, oil, grease, or other bond breaking substance and blown clean with filtered compressed air. Holes shall be in a surface dry condition when epoxy type material is used. Holes shall be in a surface moist condition when portland cement grout is used. The Contractor shall develop and demonstrate a procedure for cleaning and preparing the holes for installation of the dowels and anchor bolts that is satisfactory to the Engineer. The void between the hole and dowel or bolt shall be completely filled with grouting material.

(b) Cast-in-Place or Grouted Systems. Portland cement grout, epoxy, epoxy mortar, or other prepackaged grouts as approved by the Engineer may be used.

Portland cement grout shall conform to the pertinent provisions of Item 421, "Portland

Cement Concrete". Epoxy (Type V) and Epoxy Mortar (Type VIII) shall conform to Item 575, "Epoxy". Grout, epoxy or epoxy mortar may be used as the binding agent unless otherwise indicated on the plans.

(c) Other Anchor Systems. These systems shall be in accordance with the plans and approved by the Engineer.

(10) Mass Placements. Unless otherwise shown on the plans, for monolithic mass placements having a least dimension greater than five (5) feet, the Contractor shall develop a plan to assure that during the heat dissipation period, the temperature differential between the central core of the placement and the exposed concrete surface does not exceed 35 F.

A detailed plan, along with an analysis of the associated heat generation and dissipation (heat flow analysis) shall be submitted to the Engineer for approval. No concrete shall be placed until this plan is approved.

This plan may include a combination of the following:

1. Selection of concrete ingredients to minimize heat of hydration.
2. Using ice or cooling concrete ingredients.
3. Controlling rate of concrete placement.
4. Using insulation to control heat loss.
5. Using supplemental heat to control heat loss.
6. Use of fly ash.

The Contractor shall furnish and install two (2) sets of strip chart temperature recording devices or approved equivalent at locations designated by the Engineer. These devices shall be accurate to within +/- 2 F within the range of 32 F to 212 F and shall be used to simultaneously measure the temperature of the concrete at the core and the surface.

420.12. Placing Concrete in Cold Weather. The Contractor is responsible for the protection of concrete placed under any and all weather conditions. Permission given by the Engineer for placing during cold weather will not relieve the Contractor of the responsibility for producing concrete equal in quality to that placed under normal conditions. Should concrete placed under such conditions prove unsatisfactory, it shall be removed and replaced.

Concrete may be placed only when the atmospheric temperature is greater than 35 F. Concrete shall not be placed in contact with any material coated with frost or having a temperature less than 32 F.

Aggregates shall be free from ice, frost and frozen lumps. When required, in order to produce the minimum specified concrete temperature, the aggregate and/or the water shall be heated uniformly, in accordance with the following:

The water temperature shall not exceed 180 F, nor shall the aggregate temperature exceed 150 F. The heating apparatus shall heat the mass of aggregate uniformly. The temperature

of the mixture of aggregates and water shall be between 50 F and 85 F before introduction of the cement.

The Contractor shall provide and install recording thermometer(s) or other suitable temperature measuring device(s) to verify that all concrete is effectively protected as follows:

(a) The temperature of all unformed surfaces of bridge decks and top slabs of direct traffic culverts shall be maintained at 50 F or above for a period of 72 hours from time of placement and above 40 F for an additional 72 hours.

(b) The temperature at the surface of all concrete in bents, piers, culvert walls, retaining walls, parapets, wingwalls, bottom of slabs, and other similar formed concrete shall be maintained at 40 F or above for a period of 72 hours from time of placement.

(c) The temperature of all concrete, including the bottom slabs (footings) of culverts placed on or in the ground, shall be maintained above 32 F for a period of 72 hours from time of placement.

Protection shall consist of providing additional covering, insulated forms or other means, and if necessary, supplementing such covering with artificial heating. Curing as specified under Article 420.20 shall be provided during this period until all requirements for curing have been satisfied.

When impending weather conditions indicate the possibility of the need for such temperature protection, all necessary heating and covering material shall be on hand and ready for use before permission is granted to begin placement.

Sufficient extra test specimens will be made and cured with the placement to ascertain the condition of the concrete as placed prior to form removal and acceptance.

420.13. Placing Concrete in Hot Weather. Unless otherwise directed by the Engineer, when the temperature of the air is above 85 F, an approved retarding agent will be required in all concrete used in superstructures and top slabs of direct traffic culverts.

420.14. Placing Concrete in Water. Concrete shall be deposited in water only when shown on the plans or with the written permission of the Engineer. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is being deposited. Pumping of water will not be permitted during the concrete placing, nor until it has set for at least 36 hours.

The concrete shall be placed with a tremie, or other approved method, and shall not be permitted to fall freely through the water nor shall the concrete be disturbed after being placed. The concrete surface shall be kept approximately level during placement.

The tremie shall consist of a water-tight tube of a diameter which will permit adequate placement of the concrete, but not greater than 14 inches. The tremie shall be constructed so that the bottom

can be sealed and opened after the tremie is in place and fully charged with concrete. The tremie shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. The lower end of the tremie shall be submerged in the concrete at all times.

The placing operations shall be continuous until the work is complete.

Unless otherwise specified, all classes of concrete placed under water, except Class E and Class SS, shall be redesigned to contain an additional sack of cement per cubic yard more than the mix design being used. Pilot beam tests may be waived by the Engineer for this redesign.

420.15. Placing Concrete in Superstructure. Unless otherwise shown on the plans, simple span bridge slabs shall be placed without transverse construction joints by using either a mechanical longitudinal screed or a self propelled transverse finishing machine. For small placements or for unusual conditions, the Engineer may waive the mechanical screed requirement and permit the use of manually operated screeding equipment. The screed shall be adequately supported on a header or rail system sufficiently stable to withstand the longitudinal or lateral thrust of the equipment. Unless otherwise shown on the plans, temporary intermediate headers will be permitted for placements exceeding 50 feet in length for the longitudinal screed, provided the rate of placement is rapid enough to prevent a cold joint and that these headers are designed for early removal to permit satisfactory consolidation and finish of the concrete at their locations.

Unless otherwise shown on the plans, slabs on continuous units shall be placed in one continuous operation without transverse construction joints using a mechanical longitudinal screed or a self propelled transverse finishing machine. For unusual conditions, such as widening, variable cross slopes or transitions, the Engineer may waive the mechanical screed requirement and permit the use of manually operated screeding equipment. Rails for transverse finishing machines which are supported from the beams or girders shall be installed so that the supports may be removed without damage to the slab. Bond between removable supports and the concrete shall be prevented in a manner acceptable to the Engineer. Rail support parts which remain embedded in the slab shall not project above the upper mat of reinforcing steel. Rail or screed supports attached to I-beams or girders shall be subject to the requirements of Article 420.3.

Unless otherwise shown on the plans, for transverse screeding, the minimum rate of concrete placement shall be 30 linear feet of bridge deck per hour. The Contractor shall furnish personnel and equipment capable of placing, finishing and curing the slab at an acceptable rate to insure compliance with the specifications.

The profile gradeline may require adjustment, due to variation in beam camber and other factors, to obtain the required cover over the slab reinforcement. Beams shall be set in a sufficient number of spans so that when adjustment is necessary, the profile gradeline can be adjusted over suitable increments and the revised gradeline will produce a smooth riding surface.

One (1) or more passes shall be made with the screed over the bridge deck segment prior to the placement of concrete thereon to insure proper operation and maintenance of grades and clearances.

Slab concrete shall be deposited between the exterior beam and the adjacent beam prior to placing concrete in the overhang portion of the slab.

For transverse screeding, concrete shall be placed in transverse strips. Additionally, on profile grades greater than 1 1/2 percent, placement shall begin at the lowest end.

For longitudinal screeding, concrete shall be placed in longitudinal strips starting at a point in the center of the segment adjacent to one side, except as provided herein, and the strip completed by placing uniformly in both directions toward the ends, except that for spans on a grade of 1 1/2 percent or more placing shall start at the lowest end.

The width of strips shall be such that the concrete therein will remain plastic until the adjacent strip is placed. Where monolithic curb construction is specified, the concrete shall be placed therein in proper sequence to be monolithic with the adjacent longitudinal strips of the slabs.

An approved system of checking shall be used to detect any vertical movement of the forms or falsework. Forms for the bottom surface of concrete slabs, girders and overhangs shall be maintained to the required vertical alignment during concrete placing.

Unless otherwise shown on the plans, girders, slab and curbs of slab and girder spans shall be placed monolithically. Concrete girder stems shall be filled first and the slab concrete placed within the time limits specified in Article 420.11.

Construction joints, when permitted for slab placements on steel and prestressed concrete beams, shall be as shown on the plans. Where plans permit segmental placing without specifying a particular order of placement, any logical placing sequence which will not result in the overstressing of any of the supporting members will be permitted subject to the approval of the Engineer.

Any falsework under steel girder or truss spans shall be released and the spans swung free on their permanent supports before placing any slab concrete thereon.

When the curb forms are filled, the top of curb and sidewalk section shall be brought to the correct camber and alignment and finished as described in Articles 420.18 and 420.23.

420.16. Placing Concrete in Box Culverts. Where the top slab and walls are placed monolithically in culverts more than four (4) feet in clear height, an interval of not less than one (1) nor more than two (2) hours shall elapse before placing the top slab to allow for settlement and shrinkage in the wall concrete.

The footing slab shall be accurately finished at the proper time to provide a smooth uniform surface. Top slabs which carry direct traffic shall be finished as specified in Article 420.19. Top slabs of fill type culverts shall be given a float finish.

420.17. Placing Concrete in Foundation and Substructure. Concrete shall not be placed in footings until the depth and character of the foundation has been inspected by the Engineer and permission has been given to proceed.

Placing of concrete footings upon seal concrete will be permitted after the cofferdams are free from water and the seal concrete cleaned. Any necessary pumping or bailing during the concreting operation shall be done from a suitable sump located outside the forms.

All temporary wales or braces inside cofferdams shall be constructed or adjusted as the work proceeds to prevent unauthorized construction joints.

When footings can be placed in a dry excavation without the use of cofferdams, forms may be omitted, if approved by the Engineer, and the entire excavation filled with concrete to the elevation of the top of footing. In this case, measurement for payment will be based on the footing dimensions shown on the plans.

Concrete in columns shall be placed monolithically between construction joints unless otherwise provided. Columns and caps and/or tie beams supported thereon may be placed in the same operation. To allow for settlement and shrinkage of the column concrete, it shall be placed to the lower level of the cap or tie beam and placement delayed for not less than one (1) hour nor more than two (2) before proceeding.

420.18. Treatment and Finishing of Horizontal Surfaces Except Roadway Slabs. All unformed upper surfaces shall be struck off to grade and finished. The use of mortar topping for surfaces under this classification will not be permitted.

After the concrete has been struck off, the surface shall be floated with a suitable float. Bridge sidewalks shall be given a wood float or broom finish or may be striped with a brush, as specified by the Engineer.

The tops of caps and piers between bearing areas shall be sloped slightly from the center toward the edge, and the tops of abutments and transition bents sloped from the backwall to the edge, as directed by the Engineer, so that the water drains from the surface. The concrete shall be given a smooth trowel finish. When shown on the plans, the top of caps and piers shall be coated with Type X epoxy material except for areas under shoes and bearing pads. Unless otherwise shown on the plans, the color shall be concrete gray. The color of the epoxy may be adjusted to concrete gray by the use of a black universal type tinting paste. Bearing areas for steel units shall be constructed in accordance with Item 441, "Steel Structures".

Bearing seat build-ups or pedestals for concrete units may be cast integrally with the cap or with a construction joint as follows:

The bearing seat build-ups shall be constructed of a latex based mortar or an epoxy mortar, mixed in accordance with the manufacturer's recommendation. Pedestals shall be constructed of Class "C" concrete, reinforced as shown on the plans.

Bearing areas under elastomeric pads or non-reinforced bearing seat build-ups shall be given a textured, wood float finish.

420.19. Finish of Roadway Slabs. In all roadway slab finishing operations, camber for specified vertical curvature and transverse slopes shall be provided.

For concrete slab or concrete slab girder spans cast in place on falsework, an additional amount of camber shall be provided to offset the initial and final deflections of the span. The additional amount of camber shall be determined from the dead load deflection diagram shown on the plans.

When dead load deflection is not shown on the plans, the additional amount of camber shall be 1/8 inch per ten foot of span length but not to exceed 1/2 inch. For pan girder spans the additional camber for initial and final deflections shall be approximately 1/2 inch for 30 foot spans and 5/8 inch for 40 foot spans unless otherwise directed by the Engineer.

Roadway slabs supported on pre-stressed concrete, steel beams or girders shall receive no additional camber, except that for slabs without vertical curvature, the longitudinal camber shall be approximately 1/4 inch.

Dead load deflection shall be taken into account in setting the grades of headers and rail systems.

Work bridges or other suitable facilities shall be provided by the Contractor from which to perform all finishing operations and check measurements for slab thickness and reinforcement cover.

As soon as the concrete has been placed and vibrated in a section of sufficient width to permit working, the surface shall be approximately leveled, struck off and screeded, carrying a slight excess of concrete ahead of the screed to insure filling of all low spots. The screed shall be rigid enough to hold true to shape and shall have sufficient adjustments to provide for the required camber or section. A vibrating screed may be used if heavy enough to prevent undue distortion. The screeds, except those of the roller drum type, shall be provided with metal cutting edges.

Longitudinal screeds shall be moved across the concrete with a saw-like motion while their ends rest on headers or templates set true to the roadway grade or on the adjacent finished slab.

The surface of the concrete shall be screeded a sufficient number of times and at such intervals to produce a uniform surface, true to grade and free of voids.

If necessary, the screeded surface shall be worked to a smooth finish with a long handled wood or metal float, or hand floated from bridges over the slab.

When required by the Engineer, the Contractor shall perform sufficient checks with a long handled 10 foot straightedge on the plastic concrete to insure that the final surface will be within the tolerances specified below. The check shall be made with the straightedge parallel to the centerline. Each pass thereof shall lap half of the preceding pass. All high spots shall be removed and all depressions over 1/16 inch in depth shall be filled with fresh concrete and floated. The checking and floating shall be continued until the surface is true to grade and free of depressions, high spots, voids or rough spots.

Rail support holes shall be filled with concrete and finished to match the top of the slab.

Unless otherwise shown on the plans, when no additional wearing course is to be placed, the bridge deck surface shall be given a grooved steel tine finish. The grooves shall be approximately 1/8 to 3/16 inch deep, approximately 1/8 inch wide. The tines shall be randomly spaced approximately 3/4 to one (1) inch apart. The grooves shall run perpendicular to the structure center line when a transverse screed is used and parallel to the structure centerline when a longitudinal screed is used. Areas which receive insufficient texture depth shall receive additional texturing, when directed by the Engineer, by saw grooving in accordance with the procedure given below.

At the option of the Contractor, or when shown on the plans, the surface shall be given its final texture by saw grooving to meet the above requirements. Saw grooving may be done a minimum of four (4) days after the slab concrete has been placed. If saw grooving is done prior to the completion of curing, the curing shall be continued after sawing to provide the minimum curing time required.

When shown on the plans that a concrete overlay is to be placed on the slab (new construction) or on pre-stressed concrete box beams or other precast elements, the slab or the top surface of shear key and diafram concrete shall be given a broom finish. The finish shall have an average texture depth of approximately 0.035 inches with any individual test, not falling below 0.020 inches unless otherwise shown on the plans, when tested in accordance with Test Method Tex-436-A. Should the texture depth fall below that intended, the finishing procedures shall be revised to produce the desired texture.

When the plans require that an asphaltic seal, with or without overlay, on the slab (new construction), on pre-stressed concrete box beams or other precast elements, the slab or top surface of shear key and diafram concrete shall be given a lightly textured broom finish having an average texture depth of approximately 0.025 inches when tested in accordance with Test Method Tex-436-A.

Straightedge requirements will be required on slabs (new construction) to be overlaid.

After the concrete slab has attained final set, the Engineer may require that the finished surface be tested with a standard 10 foot straightedge. The straightedge shall be used parallel to the centerline of the structure to bridge any depressions and touch high spots. Ordinates of the irregularities, measured from the face of the straightedge to the surface of the slab, should normally not exceed 1/8 of an inch, making proper allowances for camber, vertical curve and surface texture; however, occasional variations exceeding this will be acceptable if, in the opinion of the Engineer, the variations will not produce unacceptable riding qualities.

When directed by the Engineer, irregularities exceeding the above shall be corrected. Areas which are corrected to produce satisfactory riding qualities shall be provided with an acceptable surface texture in a manner approved by the Engineer.

420.20. Curing Concrete. The Contractor shall inform the Engineer of the methods proposed for curing; shall provide the proper equipment and material in adequate amounts; and shall have the proposed methods, equipment and material approved prior to placing concrete.

Unless otherwise noted herein or shown on the plans, the choice of curing methods shall be at the option of the Contractor, except that the Engineer may require the same curing methods for like portions of a single structure.

Inadequate curing and/or facilities shall be cause for the Engineer to delay all concrete placement on the job until remedial action is taken.

All concrete shall be cured for a period of four (4) curing days except as noted herein.

Table 2
EXCEPTIONS TO 4-DAY CURING

Description	Type of Cement	Required Curing Days
Upper surfaces of bridge slabs, top slab of direct traffic culverts, and concrete overlays	I or III	8
	II or I/II*	10
	All types with fly ash	10
Concrete Piling Build-ups	All	6

*Meets the requirements of both Type I and Type II.

When the air temperature is expected to drop below 40 F, the concrete shall be covered with polyethylene sheeting, burlap-polyethylene blankets, mats or other acceptable materials to provide the protection required by Article 420.12.

A curing day is defined as a calendar day when the temperature, taken in the shade away from artificial heat, is above 50 F for at least 19 hours, or on colder days if satisfactory provisions are made to maintain the temperature of all surfaces of the concrete above 40 F for the entire 24 hours. The required curing period shall begin when all concrete therein has attained its initial set.

The following methods are permitted for curing concrete subject to the requirements of Table 3 and the following additional requirements for each method of curing:

(1) **Form Curing.** When forms are left in contact with the concrete, other curing methods

will not be required except for exposed surfaces and for cold weather protection.

(2) Water Curing. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet the requirements for concrete mixing water as specified in Item 421, "Portland Cement Concrete". Sea water will not be permitted. Water which stains or leaves an unsightly residue shall not be used.

(a) Wet Mat Curing. This curing method shall consist of keeping the concrete continuously wet by maintaining wet cotton mats in direct contact with the concrete for the required curing time. Damp burlap blankets made from nine (9) ounce stock may be placed on the damp concrete surface for temporary protection prior to the application of cotton mats. The cotton mats may then be placed dry and wetted down immediately after they are placed. The mats shall be weighted down adequately to provide continuous contact with all concrete where possible.

Surfaces which cannot be cured by direct contact shall be covered with mats forming an enclosure well anchored to the forms or ground so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet. Wet mat curing will be required for Part A in Table 3 when the anticipated ambient temperature is expected to remain above 40 F for the first 72 hours of the curing period.

Polyethylene sheeting, burlap-polyethylene blankets, laminated mats or insulating curing mats placed in direct contact with the slab will be required when the air temperature is expected to drop below 40 F during the first 72 hours of the curing period. These curing materials shall be weighted down with dry mats to maintain direct contact with the concrete and to provide insulation against cold weather. Supplemental heating or insulation may be required in cold and/or wet weather if the insulating cotton mats become wet or if the concrete drops below the specified curing temperature.

(b) Water Spray. This curing method shall consist of overlapping sprays or sprinklers that keep all unformed surfaces continuously wet.

(c) Ponding. This curing method requires the covering of the surfaces with a minimum of two (2) inches of clean granular material, kept wet at all times, or a minimum of one (1) inch depth of water. Satisfactory provisions shall be made to provide a dam to retain the water or saturated granular material.

(3) Membrane Curing. Unless otherwise provided herein or shown on the plans, either Type 1-D or Type 2 membrane curing compound may be used where membrane curing is permitted except that Type 1-D (Resin Base Only) will be required for bridge slabs and top slabs of direct traffic culverts and all other surfaces which may require a higher grade of surface finish.

Table 3

CURING REQUIREMENTS

STRUCTURE UNIT DESCRIPTION	REQUIRED		PERMITTED	
	Water for Complete Curing	Membrane for Interim Curing	Water for Complete Curing	Membrane for Complete Curing
A. Upper surfaces of Bridge Roadway, Median and Sidewalk slabs, Top Slabs of Direct Traffic Culverts.	X	X (Resin Base)		
B. Top Surface of any Concrete Unit upon which Concrete is to be placed and bonded at a later interval (Stub Walls, Risers, etc.). Other Super structure Concrete (Curbs Wingwalls, Parapet Walls, etc.).	X			
C. All Substructure Concrete, Culverts, Box Sewers, Inlets, Manholes, Retaining Walls, Riprap, Railing			*X	*X
All other concrete	As specified in other items.			

*Polyethylene Sheeting, Burlap-Polyethylene Mats or Laminated Mats in close intimate contact with the concrete surfaces will be considered equivalent to water or membrane curing.

For substructure concrete only one (1) type of curing compound will be permitted on any one (1) structure. Material requirements and construction methods shall be as required by Item 526, "Membrane Curing", except as changed herein.

Membrane curing shall not be applied to dry surfaces, but shall be applied just after free moisture has disappeared. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane.

When membrane is used for complete curing, the film shall remain unbroken for the minimum

(3) **Measured in Place.** For those Items not measured for plan quantity payment, measurement will be made in place.

Table 4
PLAN QUANTITY PAYMENT
(Cubic Yard Measurement Only)

Culverts and Wingwalls	Slabs on Steel Spans
Headwalls for pipe	Slabs on Pre-stressed Spans
Retaining Walls	Pan Girder Spans
Inlets and Manholes	Pile Bent Caps
Slab Spans	Shear Key Concrete
Slab and Girder Spans	Abutments

Note: Other structure elements may be paid for as "plan quantity", including pier and bent concrete, when shown on the plans.

For those portions of structures not listed in Table 4, the concrete quantities, measured as provided in Subarticle 420.24.(1) will be paid for at the unit price bid per "Cubic Yard", per "Each", per "Square Foot", per "Square Yard", or per "Linear Foot", in place, for the various classifications of concrete shown.

420.25. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the various structure elements specified of the various classes of concrete. This price shall be full compensation for furnishing, hauling and mixing all concrete materials; for furnishing, bending, fabricating, splicing, welding and placing the required reinforcement; for all clips, blocks, metal spacers, ties, wire or other materials used for fastening reinforcement in place; for placing, finishing and curing all concrete; for all grouting and pointing; for furnishing and placing drains; for furnishing and placing metal flashing strips; for furnishing and placing expansion-joint material required by this Item; and for all forms and falsework, labor, tools, equipment and incidentals necessary to complete the work.

Concrete which fails to meet minimum strength requirements may be rejected or a structural review may be made by the Engineer. Such concrete which is proven structurally adequate may be accepted at an adjusted price based on the following formula:

$$A = .10Bp + .75(Sa/Ss)^2 Bp$$

A = Amount to be paid per unit of measure

Sa = Actual strength from beams or cores.

Ss = Minimum required strength (specified)

Bp = Unit bid price

* * * END OF SECTION * * *

SECTION ITEM 421

PORTLAND CEMENT CONCRETE

421.1. Description. This Item shall govern for portland cement concrete to be used in concrete pavement, concrete structures and other concrete construction.

421.2. Materials. The concrete shall be composed of portland cement, (with or without) fly ash, fine and coarse aggregates and water.

(1) Cement. Portland cement shall conform to Item 524, "Hydraulic Cement".

Unless otherwise shown on the plans or in the specifications, the cement shall be either Type I, IP, II or III portland cement except as follows:

a. Type III cement shall not be used when the anticipated air temperature for the succeeding 12 hours will exceed 60 F.

b. Type III cement may be used, regardless of air temperature, in all precast concrete.

All cement used in a monolithic placement shall be of the same type.

Type I/II cement may be considered as either Type I or Type II cement except as otherwise noted.

Type IP cement may be used in lieu of Type I or Type II cement except when otherwise required by the plans or specifications. When Type IP cement is used, additional fly ash will not be permitted.

(2) Fly Ash. Fly ash shall conform to the requirements of Departmental Materials Specification D-9-8900. Copies of Departmental Materials Specifications are available from the Texas Department of Transportation, Division of Materials and Tests, 125 East 11th Street, Austin, Texas 78701-2483.

When fly ash is used, "cement" shall be defined as "cement plus fly ash". "Cement plus fly ash" shall be composed of Type I, II or III portland cement and 20 to 35 percent fly ash by absolute volume, except that for classes of concrete which are specified to have less than five (5) sacks of portland cement per cubic yard, the fly ash replacement of cement shall not exceed 25 percent by absolute volume of the specified cement content. The Contractor has the option of using "cement plus fly ash" as defined herein for all classes of concrete except that Type B fly ash shall not be used when Type II cement is required, and no fly ash is permitted when a white portland cement is required.

(3) Mixing Water. Water for use in concrete and for curing shall be free from oils, acids, organic matter or other deleterious substances and shall not contain more than 1000 parts

per million of chlorides as Cl nor more than 1000 parts per million of sulfates as SO_4 .

Water from municipal supplies approved by the State Health Department will not require testing, but water from other sources will be sampled and tested before use in concrete. Tests shall be made in accordance with AASHTO T26. A sample of approximately one (1) gallon shall be submitted to the Texas Department of Transportation, Division of Materials and Tests, 3800 Jackson Ave., Bldg. No. 5, Austin, Texas 78731-6033.

Water used in white portland cement concrete shall be free from iron and other impurities which may cause staining or discoloration.

(4) Coarse Aggregate. Coarse aggregate shall be washed and shall consist of durable particles of gravel, crushed blast furnace slag, crushed stone, or combinations thereof and shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter, or other objectionable material either free or as an adherent coating. When white portland cement is specified, the coarse aggregates used in the concrete shall be light colored. Quality shall be reasonably uniform throughout. Coarse aggregate shall not contain more than 0.25 percent by weight of clay lumps, nor more than one (1.0) percent by weight of shale, nor more than five (5.0) percent by weight of laminated and/or friable particles when tested in accordance with Test Method Tex-413-A. Coarse aggregate from each source shall have a wear of not more than 40 percent when tested in accordance with Test Method Tex-410-A.

Unless otherwise shown on the plans, coarse aggregate from each source will be subjected to five (5) cycles of both the sodium sulfate and the magnesium sulfate soundness test in accordance with Test Method Tex-411-A. When the loss is greater than 12 percent with sodium sulfate and/or 18 percent with magnesium sulfate, further testing will be required prior to acceptance or rejection of the material. A satisfactory record under similar conditions of service and exposure will be considered in the evaluation of material failing to meet these requirements.

When tested in accordance with Test Method Tex-401-A, the coarse aggregate, including combinations of aggregates when used, shall conform to the gradation requirements shown in Table 1, except as provided in Subarticle 427.8.(3) for exposed aggregate finishes.

TABLE 1

COARSE AGGREGATE GRADATION CHART

Aggregate Grade No.	Nominal Size Inches	Percent Retained on Each Sieve								
		2-1/2 in.	2 in.	1-1/2 in.	1 in.	3/4 in.	1/2 in.	3/8 in.	No. 4	No. 8
1	2	0	0-20	15-50		60-80			95-100	
2 (467)*	1-1/2		0	0-5		30-65		70-90	95-100	
3	1-1/2		0	0-5		10-40	40-75		95-100	
4 (57)*	1			0	0-5		40-75		90-100	95-100
5 (67)*	3/4				0	0-10		45-80	90-100	95-100
6 (7)*	1/2					0	0-10	30-60	85-100	95-100
7	3/8						0	5-30	75-100	
8	3/8						0	0-5	35-80	90-100

*Numbers in parenthesis indicate that these gradations conform to corresponding ASTM gradation in ASTM C33.

The loss by decantation in accordance with Test Method Tex-406-A plus the allowable weight of clay lumps, shall not exceed one (1) percent, or the value shown on the plans, whichever is smaller. In the case of aggregates made primarily from the crushing of stone, if the material finer than the 200 sieve is definitely established to be the dust of fracture, essentially free from clay or shale, as established by Part III of Test Method Tex-406-A, the percent may be increased to 1.5.

(5) Fine Aggregate. Fine aggregate shall be washed and consist of clean, hard, durable and uncoated particles of natural or manufactured sand or a combination thereof, with or without a mineral filler. When white portland cement is specified the fine aggregate used in the concrete shall be light colored. It shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter or other objectionable material and it shall not contain more than 0.5 percent by weight of clay lumps. When the aggregate is subjected to the color test for organic impurities in accordance with Test Method Tex-408-A, the test result shall not show a color darker than standard.

Unless otherwise shown on the plans, the acid insoluble residue of fine aggregate used in concrete subject to direct traffic shall be not less than 60 percent by weight when tested in accordance with Test Method Tex-612-J.

When tested in accordance with Test Method Tex-401-A, the fine aggregate or combinations of aggregates, including mineral filler, shall conform to the gradation requirements shown in Table 2.

Table 2

FINE AGGREGATE GRADATION CHART

Aggregate Grade No.	Percent Retained on Each Sieve							
	3/8 in.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
1	0	0 to 5	0 to 20	15 to 50	35 to 75	65 to 90	90 to 100	97 to 100

Where manufactured sand is used in lieu of natural sand, the percent retained on the No. 200 sieve shall be 94 to 100.

Where the sand equivalent value is greater than 85, the retainage on the No. 50 sieve may be 65 to 94 percent.

Fine aggregate will be subjected to the Sand Equivalent Test (Test Method Tex-203-F). The sand equivalent shall not be less than 80 unless otherwise shown on the plans.

For all classes of concrete, except class K, the fineness modulus shall be between 2.30 and 3.10 as determined by Test Method Tex-402-A. The fineness modulus for class K shall be 2.6 to 2.8 unless otherwise shown on the plans.

(6) Mineral Filler. Mineral filler shall consist of stone dust, clean crushed sand, or other approved inert material. When tested in accordance with Test Method Tex-401-A, it shall conform to the following gradation:

Retained on No. 30 Sieve 0 percent

Retained on No. 200 Sieve 0-35 percent

(7) Admixtures. Admixtures and their use shall conform to the requirements of Item 437, "Concrete Admixtures". Calcium chloride will not be permitted.

(8) Mortar and Grout. Unless otherwise specified or approved by the Engineer, mortar and grout shall consist of one (1) part portland cement, two (2) parts finely graded sand and sufficient water to provide the desired consistency. Mortar may contain admixtures.

Post tensioning grout shall be in accordance with Item 426, "Prestressing".

Mortar shall have a consistency such that the mortar can be easily handled and spread by trowel.

Grout shall have a consistency such that the grout will flow into and completely fill all voids.

When required to prevent color difference, white cement shall be added to produce the color required. When shown on the plans or in the specifications, or when required by the Engineer, latex adhesive conforming to the requirements of Departmental Material Specification D-9-8110 shall be added to the mortar.

421.3. Storage of Materials.

(1) Cement, Fly Ash and Mineral Filler. All cement, fly ash and mineral filler shall be stored in well ventilated weatherproof buildings or approved bins, which will protect them from dampness or absorption of moisture. Each shipment of packaged cement shall be kept separated to provide easy access for identification and inspection.

The Engineer may permit small quantities of sacked cement to be stored in the open on a raised platform and under waterproof covering for a maximum of 48 hours.

(2) Aggregates. The method of handling and storing concrete aggregates shall prevent contamination with foreign materials. If the aggregates are stored on the ground, the sites for the stockpiles shall be clear of all vegetation and shall be level. The bottom six (6) inch layer of aggregate shall not be disturbed or used without re-cleaning.

When conditions require the use of two (2) or more sizes of aggregates, the aggregates shall be separated to prevent intermixing. Where space is limited, stockpiles shall be separated by physical barriers. Aggregates from different sources shall be stored in different stockpiles unless the aggregates are pre-blended as approved by the Engineer prior to stockpiling.

Methods of handling aggregates during stockpiling and their subsequent use shall be such that segregation will be minimized. The Engineer may require that stockpiles be remixed when segregation is apparent.

Unless otherwise authorized by the Engineer, all aggregate shall be stockpiled at least 24 hours to reduce the free moisture content. In order to control absorption, stockpiles shall be sprinkled when directed by the Engineer.

To assure uniform concrete, aggregate stockpiles shall be maintained at reasonably uniform moisture content.

(3) Admixtures. Admixtures shall be stored in accordance with Item 437, "Concrete Admixtures".

421.4. Measurement of Materials. Except as noted below, the measurement of materials used in batches of concrete shall be by weight.

Water may be measured by volume or by weight.

Cement and fly ash shall be weighed separately from other materials. Weighing of sacked cement will not be required. When sacked cement is used, the quantity of cement per batch shall be based upon using full bags of cement. Batches involving use of fractional bags will not be permitted except for small hand mixed batches of approximately five (5) cubic feet or less and when an approved method of volumetric measurement is used.

Where two (2) or more sizes or types of aggregates are used, each type and/or size shall be measured separately.

When determining aggregate batch weights, proper allowance shall be made for the water content in the aggregate (free water and/or absorption).

Admixtures shall be measured and dispensed in accordance with Item 437, "Concrete Admixtures".

Measuring materials by volumetric methods may be used where permitted by the specifications. When a mixer using volumetric batching of materials is used, an accurate method of measuring by volume shall be provided. Continuous volumetric mixers shall be calibrated to assure correct measurement of materials.

The amount of each ingredient in the batch shall be measured to within plus or minus one (1) percent of the required amount except that water shall be measured to within plus or minus one (1) gallon and admixture tolerances shall be in accordance with Item 437, "Concrete Admixtures".

421.5. Equipment.

(1) Weighing and Measuring Equipment. Weighing and measuring equipment shall conform to Item 520, "Weighing and Measuring Equipment".

(2) Mixing Equipment.

(a) General. All equipment, tools, and machinery used for hauling materials and performing any part of the work shall be maintained in such condition as to insure completion of the work under way without excessive delays for repairs or replacement.

The mixer shall be of an approved type and size that will produce uniform distribution of the material throughout the mass and shall be capable of producing concrete meeting the requirements of these specifications.

The mixing equipment shall be capable of producing the quantities of concrete necessary to comply with requirements shown on the plans or in these specifications.

For all mixers, an adequate water supply and an accurate method of measuring the water shall be provided.

Delivery of concrete to the worksite and the discharge from the hauling equipment,

agitating, or non-agitating, shall be in accordance with the requirements shown on the plans or in the governing specifications.

Specific requirements for batch plants, mixers and other equipment shall be in accordance with Item 522, "Portland Cement Concrete Plants", Item 360, "Concrete Pavement", or other specifications, except that continuous volumetric mixers shall conform to Subarticle 421.5(2)(b) of this Item.

(b) Continuous Volumetric Mixers. For all miscellaneous concrete placements, a mobile, continuous, volumetric mixer may be used.

When approved in writing by the Engineer or when specified for use in other Items, these mixers may be used for other types of concrete construction, including structural concrete, if the number of mixers furnished will supply the amount of concrete required for the particular operation in question.

These mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mix them to the required consistency before discharging.

(c) Portland Cement Concrete Plants. The use of ready-mixed concrete from a commercial source will be permitted for all structural concrete provided that the plant, truck mixers, and mixing equipment conform to the requirements of Item 522, "Portland Cement Concrete Plants". The use of ready-mix plants and ready-mix concrete for concrete pavement shall be in accordance with Item 360, "Concrete Pavement". The class of plant furnished shall conform to the requirements of Item 522, "Portland Cement Concrete Plants".

421.6. Mixing.

(1) General. Mixed concrete which does not conform to specification requirements shall not be placed. Mixing shall be in accordance with Item 522, "Portland Cement Concrete Plants", except that mixing with continuous volumetric mixers will be in accordance with Subarticle 421.6.(2) and except as set out in Subarticle 421.6.(3).

(2) Continuous Volumetric Mixers. Mixing shall be in accordance with mixer manufacturer's recommendations unless otherwise revised by the Engineer.

(3) Mixing of concrete by hand methods or by the use of a small motor driven mixer will be permitted for small placements of approximately two (2) cubic yards or less when authorized by the Engineer. Hand mixed batches shall not exceed a two (2) sack batch in volume. For such placements the mix may be proportioned by approved volumetric methods.

421.7. Placing, Curing and Finishing. The placing of concrete, including construction of forms and falsework, curing and finishing, shall be in accordance with Item 420, "Concrete Structures", Item 360, "Concrete Pavement", and Item 427, "Surface Finishes for Concrete".

421.8. Classification and Mix Design. The Contractor shall furnish the mix design, using a coarse aggregate factor acceptable to the Engineer, for the class(es) of concrete specified, to conform with the requirements contained herein and in accordance with Construction Bulletin C-11. The Contractor shall perform, at his entire expense, the work required to substantiate the design, except that casting and testing of strength specimens will be done by the Department. Complete concrete design data shall be submitted to the Engineer for approval.

The Contractor shall determine and measure the batch quantity of each ingredient, including all water, not only for batch designs but for all concrete produced for the project. The mixes shall conform to these specifications and other requirements shown on the plans.

For continuous volumetric mixers the materials delivered during a revolution of the driving mechanism, or in a selected time interval, will be considered a batch and the proportion of each ingredient will be calculated in the same manner as for a batch type plant.

The Contractor may accept a design from the Department; however, this acceptance will not relieve the Contractor of the responsibility of providing concrete meeting the requirements of these specifications.

Mix designs from previous or concurrent jobs may be used without trial batches if it is shown that no substantial change in any of the proposed ingredients has been made.

No charge will be made for existing designs furnished by the Engineer. The cost to the Department of preparing a new mix design will be charged to the Contractor and deducted from the payment for the work.

Trial batches shall be made and tested using all the proposed ingredients prior to the placing of concrete, and when the aggregate, and/or type, brand or source of cement, or admixture is changed. When the brand and/or source of cement only is changed, the Engineer may waive trial batch only if a prior record of satisfactory performance of the cement with the other ingredients has been established.

Trial batches generally shall be made in a mixer of adequate capacity to evaluate the design. The trial batches shall be made in a mixer representative of the mixers to be used. Batch size shall not be less than 50 percent of its rated mixing capacity.

Concrete for pneumatically placed concrete shall be in accordance with Item 431, "Pneumatically Placed Concrete".

The coarse aggregate factor shall be selected in accordance with Construction Bulletin C-11 based on grade of the coarse aggregate and the fineness modulus of the sand.

The Contractor shall have the option of using chemical admixtures with all classes of concrete in accordance with Item 437, "Concrete Admixtures", except where the use of specific admixtures is required or prohibited in this or other items.

When a retarding admixture is required for hot weather concreting, the amount to be used will be as required in Item 437, "Concrete Admixtures", subject to change by the Engineer when required.

When used for extended retardation, the amount to be used will be established by several trial batches with varying retarder content and simulating the placing conditions to be encountered and tested in accordance with Tex-440-A.

When entrained air is required, the concrete shall be designed to entrain five (5) percent air when Grade 1 or 2 coarse aggregate is used, six (6) percent when Grade 3 or 4 coarse aggregate is used, and seven (7) percent for Grades 5, 6 or 7 unless otherwise specified by the Engineer. Concrete as placed shall contain the proper amount of entrained air as required herein with a tolerance of plus or minus 1-1/2 percentage points. Acceptance of concrete with occasional variations between 1-1/2 and three (3) percentage points over the specified amount will be based on strength tests as required by the Engineer. Such concrete which fails to meet strength requirements may be accepted on the basis of structural reviews subject to the provisions of Article 420.25. When the quantity of entrained air is found to be more than three (3) percentage points over or two (2) percentage points under those values given herein, the concrete will be rejected.

Entrained air will be required for bridge slabs, top slabs of direct traffic culverts, concrete pavement, dense and regular concrete overlays, piers, bents, precast piling (nonprestressed), drilled shafts placed in water, bridge railing, concrete traffic barrier and for other items of work as may be specified, on the plans or in other specifications. Unless otherwise specified, entrained air will not be required when Class "H" concrete is used for precast traffic barrier or precast bridge repair.

**Table 3
SLUMP REQUIREMENTS**

Concrete Designation	Desired Slump Inches	Max Slump Inches
A. Structural Concrete		
(1) All drilled shafts	6	7
(2) Thin-Walled Section (9" or less)	4	5
(3) Slabs, Concrete Overlay, Caps, Column piers, Wall sections over 9", etc.	3	4
(4) Prestressed Concrete Members		
(5) Concrete traffic Barrier (cast-in-place or precast), Concrete Bridge Railing	4	5
	4	5

(6) Dense concrete overlay	3/4	1
(7) Concrete placed underwater	6	7
(8) Concrete with High Range Water Reducer	—	8
B. Concrete Pavement		
C. Riprap, curb, gutter, slip-formed and extruded concrete	1-1/2	3 max 1 min
As Approved by the Engineer		

Note: No concrete will be permitted with a slump in excess of the maximums shown.

When high range water reducing admixtures are used, the slump shall not exceed eight (8) inches.

421.9. Quality of Concrete. The concrete shall be uniform, workable and of a consistency acceptable to the Engineer. The cement content, maximum allowable water/cement ratio, the desired and maximum slump, the proper amount of entrained air and the strength requirement for all classes of concrete shall conform to the requirements of these specifications. It shall be the responsibility of the Contractor to provide concrete meeting these requirements.

During the progress of the work, the Engineer will cast test cylinders and/or beams, perform slump and entrained air tests and will make temperature checks, as required, to insure compliance with the specifications.

Unless otherwise shown on the plans the Contractor shall furnish and properly maintain all test molds. The test molds shall meet the requirements of Test Methods Tex-418-A and Tex-448-A and, in the opinion of the Engineer, must be satisfactory for use at the time of use. In addition, the Contractor shall be responsible for furnishing personnel to remove the test specimens from the molds and transport them to the proper curing location at the schedule designated by the Engineer and in accordance with the governing specification. For all concrete items the Contractor shall have a wheelbarrow, or other container acceptable to the Engineer, available to use in the sampling of the concrete. The Contractor is responsible for disposing of used, broken test specimens.

All labor and equipment furnished by the Contractor will be considered subsidiary to the various bid items and will not be paid for directly.

A strength test is defined as the average of the breaking strength of two (2) cylinders or two (2) beams as the case may be. Each specimen will be tested in accordance with Test Methods Tex-418-A or Tex-448-A.

Slump tests will be performed in accordance with Test Method Tex-415-A. Entrained air tests will be performed in accordance with Test Method Tex-416-A.

If the required strength or consistency of the class of concrete being produced cannot be secured with the minimum cement specified or without exceeding the maximum water/cement ratio, the Contractor will be required to furnish different aggregates, use a water reducing agent, an air entraining agent or increase the cement content in order to provide concrete meeting these specifications.

All test specimens, beams or cylinders, representing tests for removal of forms and/or falsework shall be cured using the same methods and under the same conditions as the concrete represented.

"Design Strength" beams and cylinders shall be cast and cured in accordance with Test Method Tex-447-A.

The Contractor shall provide, operate and maintain curing facilities as described in Test Method Tex-447-A, for the purpose of curing test specimens.

When the specified concrete strength is by 28 day compressive strength tests, job control testing will be by seven day compressive strength tests. The minimum strength requirement for seven (7) day tests will be 70 percent of the specified minimum 28 day compressive strength. If the required seven (7) day strength is not obtained with the quantity of cement specified in Table 4, changes in the batch design will be made as specified in this article. For an occasional failure of the seven day compressive test, the concrete may be tested at 28 days for final evaluation.

Strength test requirements for Type II cement will govern when Type I/II cement is used.

Table 4

CLASSES OF CONCRETE

Class of Conc.	Cement per C.Y. Min. (sacks)	Min. Comp. Sgth (f'c) 28 Day psi	Min.Flex. Sgth. 7 day psi	Max. Water Cement Ratio Gal/sk	Coarse Aggr. Grade No.	General Usage (information only)
A	5.0	3000	425 390 (c)	6.5	1-2-3-4-8 (a) (d)	Drilled Shafts; Culverts, except Top Slab of Direct Traffic Culverts; Inlets; Manholes, Headwalls; Appr. Slabs; Curb; Gutter; Curb & Gutter, Conc. Retards; Sidewalks; Driveways; Conc. Pavement; Back-up Walls; Anchors
B	4.0	2000	280	8.0	2-3-4-5-6-7	Riprap, Small Roadside Signs and Anchors
C	6.0	3600	510 470 (c)	6.0	1-2-3-4-5 (d)	Drilled Shafts; Bridge Substructure; Bridge Railing; Culverts, except Top Slab of Direct Traffic Culverts; Wing Walls; Approach Slab; Concrete Traffic Barrier (cast-in-place)

	Cement	Min.		Max. Water	Coarse	
--	--------	------	--	------------	--------	--

Class of Conc.	per C.Y. Min. (sacks)	Comp. Sgth (f'c) 28 Day psi	Min.Flex. Sgth. 7 day psi	Cement Ratio Gal/sk	Aggr. Grade No.	General Usage (information only)
D	3.0	1500	215	11.0	2-3-4-5-6-7	Riprap
E	6.0	3000	425	6.0	2-3-4-5	Seal Concrete
F	6.0 (8.0 Max)	As specified on plans	$\frac{.85 f'c}{6}$	5.5	2-3-4-5	Railroad structures; occasionally for Bridge Piers, Columns or Bents
H	6.0	As specified on plans	N.A.	5.5	3-4-5-6	Prestressed Concrete Beams, Boxes, Piling and Concrete Traffic Barrier (Precast)
S	6.5	4000	570 525(c)	5.0	2-3- 4-5	Bridge Slab; Top Slab of Direct Traffic Culvert; Bridge Substructure
P	5.0	N.A.	555(b)	6.25	2-3	Concrete Pavement
DC	8.75	5500	720	3.6	6	Dense Concrete Overlay
CO	7.0	4600	640	4.5	6	Concrete Overlay
SS	7.0	3600	510	5.5	3-4-5	Slurry Displacement Shafts, Underwater Drilled Shafts
K	Requirements as specified on the plans or in other Items.					

(a) Grade 8 aggregate for use in extruded curbs, unless a larger size is approved by the Engineer.

(b) Minimum running average for concrete pavement (in accordance with construction Bulletin C-II).

(c) When Type II or Type I/II cement is used.

(d) Unless otherwise permitted by the Engineer, Grade I coarse aggregate may be used only in massive foundations with four (4) inch minimum clear spacing between reinforcing steel bars. Grade I aggregate may not be used in drilled shafts.

421.10. Measurement and Payment. The work performed, materials furnished and all labor, tools, equipment and incidentals necessary to complete the work under this Item will not be measured or paid for directly, but will be considered subsidiary to the various bid items of the contract.

*** * * END OF SECTION * * ***

SECTION ITEM 464

REINFORCED CONCRETE PIPE

464.1. Description. This Item shall govern for furnishing and installing all concrete pipe and materials and for constructing precast concrete pipe culverts or precast concrete sewer mains, laterals, stubs and inlet leads. The pipes shall be of the sizes, strengths and dimensions shown on the plans and shall include all connections to new or existing pipes, sewers, manholes, inlets, headwalls and other appurtenances and jointing materials as may be required to complete the work.

464.2. Materials.

(1) General. Except as modified herein, precast reinforced concrete pipe shall conform to the design shown on the plans and to ASTM C76 or C655 for circular pipe; ASTM C506 for arch pipe or ASTM C507 for horizontal elliptical pipe.

All precast concrete pipe shall be machine made or cast by a process which will provide for uniform placement of the concrete in the form and compaction by mechanical devices which will assure a dense concrete. Concrete shall be mixed in a central batch plant or other approved batching facility from which the quality and uniformity of the concrete can be assured. Transit mixed concrete will not be acceptable for use in precast concrete pipe.

Unless otherwise shown on the plans, not more than two (2) holes may be placed in the top section of precast pipe for lifting and placing. The holes may be cast, cut, or drilled in the wall of the pipe. The holes shall not exceed three (3) inches in diameter at the inside surface of the pipe wall. Not more than one (1) longitudinal wire or two (2) circumferential wires may be cut per layer of reinforcing steel when locating lift holes in the pipe wall. After the pipe is in place, lift holes shall be filled with concrete or mortar or precast concrete plugs to the satisfaction of the Engineer.

The Contractor has the option of using portland cement or portland cement plus fly ash. When fly ash is used, then "cement" shall also be defined as "cement plus fly ash". "Cement plus fly ash" shall be composed of portland cement of the type specified and 20 to 35 percent fly ash by absolute volume. Type B fly ash shall not be used when Type II cement is shown on the plans. When portland cement is partially replaced, blended or otherwise modified by a pozzolan, the pozzolan is defined and limited to fly ash conforming to Department Materials Specification D-9-8900, "Fly Ash".

Copies of Departmental Materials Specifications are available from the Texas Department of Transportation, Division of Materials and Tests, 125 East 11th St., Austin, Texas 78701-2483.

(2) Design. Circular pipe shall be of the class or D-load shown on the plans. Regardless of the design shown, the Contractor may furnish pipe to either ASTM C76 or ASTM C655 specifications. Table C outlines the class and D-load equivalents. For concrete pipe arch or elliptical pipe, the minimum design shall conform to Table A or B.

TABLE A *			
Arch Pipe			
Design Size	Equiv. Dia. In.	Rise In.	Span In.
1	18	13	22
2	21	1/2	26
3	24	15	28 1/2
4	30	1/2	36 1/4
5	36	18	43 3/4
6	42	22	51 1/8
7	48	1/2	58 1/2
8	54	26	65
9	60	5/8	73
10	72	31	88
		5/16	
		36	
		40	
		45	
		54	

TABLE B *			
Horizontal Elliptical Pipe			
Design Size	Equiv. Dia. In.	Rise In.	Span In.
1	18	14	23
2	24	19	30
3	27	22	34
4	30	24	38
5	33	27	42
6	36	29	45
7	39	32	49
8	42	34	53
9	48	38	60
10	54	43	68

*Minimum height of cover required is one (1) foot.

*Maximum height of cover is eight (8) feet.

TABLE C
CIRCULAR PIPE
(CLASS, D-LOAD EQUIVALENTS)

Error! Bookmark not defined.C76	C655
CLASS I	800D-LOAD
CLASS II	1000D-LOAD
CLASS III	1350D-LOAD
CLASS IV	2000D-LOAD
CLASS V	3000D-LOAD

Reinforced concrete pipe for jacking, boring or tunneling shall meet the requirements of the pertinent ASTM specification with the following additional requirements:

The pipe shall have circular reinforcement and for 30 inch and larger diameters shall have an additional layer of Class III reinforcement, 12 inches long, extending into both the tongue and groove of the joint to within 3/4 inch of the end of the tongue and the groove. The minimum wall thickness shall be wall "B" for the diameter specified, unless special designs are required. The minimum concrete compressive strength for jacking and boring pipe shall be 5000 psi. Variations in the laying length of opposite sides shall not exceed 3/8 inch for pipe diameters 24 inches through 60 inches and 1/2 inch for pipe diameters 66 inches and larger.

The maximum joint taper shall be 7 degrees for tongue and groove pipe and 2 degrees for O-ring gasket pipe. Pipe manufactured to these additional requirements shall be marked to identify pipe for jacking and boring.

The plans will provide a summary indicating the locations and length for all pipe. In addition, the diameter, required D-load and/or class for full circle pipe, and/or the design size for pipe arch or elliptical pipe will also be shown.

(3) Physical Test Requirements. The acceptability of the pipe shall be determined by the results of the physical tests outlined herein; by appropriate material tests required in ASTM C76, C506, C507, or C655; by absorption tests on selected samples from the wall of the pipe; and by inspection of the finished pipe to determine its conformance with the required design and its freedom from defects. Three-Edge Bearing tests shall be performed on one (1) pipe for each 100 pipe or fraction thereof of each design or shape, size, class or D-load for the load to produce a 0.01 inch crack and, at the discretion of the Engineer, the pipe may be tested to ultimate load.

As an alternate to the Three-Edge Bearing test, concrete pipe 60 inches in diameter and larger may be accepted on the basis of compressive strength of cores cut from the wall of the pipe. The manufacturer shall furnish facilities and personnel for taking the cores and determining the compressive strength of the samples. Three-Edge Bearing tests and core tests shall be in accordance with ASTM C497.

The manufacturer shall plug and seal coreholes in the pipe wall, after testing, in a manner satisfactory to the Engineer.

(4) Marking. The following information shall be clearly marked on each section of pipe:

(a) The class or D-load of pipe.

(b) The date of manufacture.

(c) The name or trademark of the manufacturer.

(d) One end of each section of pipe with elliptical reinforcement shall be clearly marked during the process of manufacture or immediately thereafter on the inside and the outside of opposite walls to show the location of the "top" or "bottom" of the pipe as it should be installed, unless the external shape of the pipe is such that the correct position of the top and bottom is obvious. Marking shall be indented on the pipe

section or painted thereon with waterproof paint.

(e) Pipe for jacking and boring shall be identified for the intended use.

(5) Inspection. The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by the Engineer at the pipe manufacturing plant. In addition, the finished pipe shall be subject to further inspection by the Engineer at the project site prior to and during installation.

(6) Causes for Rejection. Pipe shall be subject to rejection for failure to conform to any of the specification requirements. Individual sections of pipe may be rejected because of any of the following:

(a) Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint.

(b) Defects that indicate imperfect proportioning, mixing and molding.

(c) Surface defects indicating honeycombed or open texture.

(d) Damaged ends, where such damage would prevent making a satisfactory joint.

(e) Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more, regardless of position in the wall of the pipe.

(7) Repairs. Pipe may be repaired if necessary, because of occasional imperfections in manufacture or accidental injury during handling and will be acceptable if, in the opinion of the Engineer, the repairs are sound, properly finished and cured, and the repaired pipe conforms to the requirements of the specifications.

(8) Rejections. All rejected pipe will be plainly marked by the Engineer by painting colored spots over the Division of Materials and Tests monogram on the inside wall of the pipe and on the top outside wall of the pipe. The painted spots shall be sufficient to identify the rejected pipe but no larger than four (4) inches in diameter. Rejected pipe shall not be defaced in any other manner. The Contractor shall remove the rejected pipe from the project and replace with pipe meeting the requirements of this Item.

(9) Jointing Materials. Unless otherwise specified on the plans the Contractor shall have the option of making the joints using any of the materials described herein. For all jointing materials except mortar, the Contractor shall furnish the Engineer the Manufacturer's Certificate of Compliance.

(a) **Mortar.** Mortar for joints shall be in accordance with the section, "Jointing", of this Item.

(b) **Cold Applied, Plastic Asphalt Sewer Joint Compound.** This material shall

consist of natural and/or processed asphalt base, suitable volatile solvents and inert filler. The consistency is to be such that the ends of the pipe can be coated with a layer of the compound up to one-half inch thick by means of a trowel. The joint compound shall cure to a firm, stiff plastic condition after application. The material shall be of a uniform mixture and any small separation occurring in the container shall be stirred to a uniform mix before use.

This material shall meet the following requirements when tested in accordance with Test Method Tex-526-C:

Asphalt Base, 100% - % Volatiles - % by weight	% Ash, 28-45
Volatiles, 212 F Evaporation, 24 h, % by weight	10-26
Mineral Matter, determined as Ash, % by weight	30-55
Consistency, Cone Penetration, 150 g, 5 sec, 77 F	150-275

(c) Rubber Gaskets. These gaskets shall conform to ASTM C361 or C443. The design of the joints and permissible variations in dimensions shall be in accordance with ASTM C443. The Contractor shall furnish the Engineer the Manufacturer's Certificate of Analysis.

(d) Cold Applied Preformed Plastic Gaskets. Preformed plastic gaskets shall be suitable for sealing joints of tongue and groove concrete pipe. The gasket sealing the joint shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes or obnoxious odors. The gasket joint sealer shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength, and shall be supplied in extruded rope-form of suitable cross-section. The size of the plastic gasket joint sealer shall be in accordance with the manufacturer's recommendations and be of sufficient size to properly seal the joint. The plastic gasket joint sealer shall be so constructed as to provide evidence of proper installation either by means of "squeeze-out" of the gasket material on the inside or outside around the complete pipe joint circumference or by means of tabs, projections or other such indicators placed at established intervals around the circumference of the pipe joint. Plastic gasket joint sealers shall be Type 1 or Type 2. Type 1 gaskets shall meet the "squeeze-out" requirements and Type 2 gaskets shall meet the requirements for tabs, projections or other indicators. The gasket joint sealer shall be protected by a suitable wrapper designed that when removed, the jointing material maintains integrity.

The chemical composition of the gasket joint sealing compound for Type 1 and 2, as shipped, shall meet the following requirements:

COMPOSITION	TEST METHOD	ANALYSIS
Bitumen, Petroleum Plastic Content, % by weight	ASTM D4	50-70
Ash-Inert Mineral Matter, % by weight	Tex-526-C	30-50
Volatile Matter, 325 F, % by weight	Tex-506-C	2.0 max.

The gasket joint sealing compound when immersed for 30 days at ambient room temperature separately in five (5) percent solution of caustic potash; a five (5) percent solution of hydrochloric acid; a five (5) percent solution of sulfuric acid; and a saturated H₂S solution, shall show no visible deterioration.

The physical properties of the gasket joint sealing compound as shipped shall meet the following requirements:

PROPERTY	TEST METHOD REQUIREMENT	
	Type 1	Type 2
Ductility @ 77 F (cm), min. Tex-503-C	5.0	5.0
Softening Point, F	275	275
Penetration 32 F (300g) 60 sec., min --	65	
Tex-502-C 77 F (150g) 5 sec	50-120	50-120
Tex-502-C 115 F (150g) 5 sec., max. Tex-502-C	-----	150

464.3. Construction Methods. The location of private driveway and side road pipe shall be constructed at locations shown on the plans or as directed by the Engineer.

Reinforced concrete pipe culverts and sewers shall be constructed in accordance with the plans and requirements of this Item.

(1) Excavation. All excavation shall be in accordance with the requirements of Item 400, "Excavation and Backfill for Structures", except where tunneling or jacking methods are shown on the plans or permitted by the Engineer.

(2) Shaping and Bedding. Shaping and bedding shall be in accordance with Item 400, "Excavation and Backfill for Structures".

(3) Laying Pipe. Unless otherwise authorized by the Engineer, the laying of pipe on the bedding shall be started at the outlet end with the spigot or tongue end pointing downstream

and shall proceed toward the inlet end with the abutting sections properly matched, true to the established lines and grades. Where bell and spigot pipe are used, cross trenches shall be cut in the foundation to allow the barrel of the pipe to rest firmly upon the bedding. These cross trenches shall be not more than two (2) inches larger than the bell ends of the pipe. Proper equipment shall be provided for hoisting and lowering the sections of pipe into the trench without disturbing the bedding and the sides of the trench. The ends of the pipe shall be carefully cleaned before the pipe is placed. As each length of pipe is laid, the mouth of the pipe shall be protected to prevent the entrance of earth or bedding material. The pipe shall be fitted and matched so that when laid in the bed the pipe shall form a smooth, uniform conduit. When elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, the pipe shall be laid in the trench in such position that the markings "Top" or "Bottom", shall not be more than five (5) degrees from the vertical plane through the longitudinal axis of the pipe.

Multiple installations of reinforced concrete pipe shall be laid with the center lines of individual barrels parallel. Unless otherwise shown on the plans, the following clear distances between outer surfaces of adjacent pipes shall be used.

Diameter	18"	24"	30"	36"	42"	48"	54"	60" to 84"
Clear Distance Between Pipes	0'-9"	0'-11"	1'-1"	1'-3"	1'-5"	1'-7"	1'-11"	2'-0"

(4) Jointing.

(a) Joints sealed with portland cement mortar shall be made as follows:

Mortar shall consist of one (1) part cement, two (2) parts sand and sufficient water to make a plastic mix. The pipe ends shall be cleaned and wetted before making the joint. The lower half of the bell or groove and the upper half of the tongue or spigot shall be plastered with mortar. After the pipes are tightly jointed, mortar shall be packed into the joint from both inside and outside the pipe. The inside shall be finished smooth and flush with adjacent joints of pipe. Over the joint outside the pipe, a bead shall be formed at least one (1) inch on either side of the joint and of semicircular cross section for tongue and groove joints, but for bell and spigot joints, the mortar shall form a 45° fillet between the outer edge of the bell and the spigot. Mortar joints shall be cured by keeping the joints wet for at least 48 hours or until the backfill has been completed, whichever comes first. No jointing shall be done when the atmospheric temperature is at or below 40 F. Mortared joints shall be protected against freezing by backfilling or other approved methods for at least 24 hours.

No mortar banding on the outside of pipe will be required for driveway culverts.

At the Contractor's option, and with the approval of the Engineer, pipes which are large

enough for a man to enter may be furnished with the groove not less than one-half of an inch and not more than three-fourths of an inch longer than the tongue. Such pipe may be laid and backfilled without mortar joints. Care shall be exercised to avoid displacing the joints during the backfilling operations. After the backfilling has been completed, the space between the end of the tongue and the groove on the interior of the pipe shall be cleaned of all foreign material, thoroughly wetted and filled with mortar around the entire circumference of the pipe and finished flush.

The Contractor shall make available for the use of the Engineer, an appropriate rolling device similar to an automobile mechanic's "Creeper" for conveyance through small size pipe structures.

Mortar joints will be required for irrigation wells, vents and similar vertical structures.

(b) Joints using Cold Applied, Plastic Asphalt Sewer Joint Compound shall be made as follows:

Both ends of the pipes shall be clean and dry. A one-half inch thick layer of the compound shall be troweled or otherwise placed in the groove end of the pipe covering not less than two-thirds of the joint face around the entire circumference. Next, the tongue end of the next pipe shall be shoved home with sufficient pressure to make a tight joint. After the joint is made any excess mastic projecting into the pipe shall be removed. Backfilling of pipe laid with asphalt mastic joints may proceed as soon as the joint has been inspected and approved by the Engineer. Special precautions shall be taken in placing and compacting backfill to avoid damage to the joints.

(c) Joints using Rubber Gaskets shall be made as follows:

Where rubber gasket pipe joints are required by the plans the joint assembly shall be made according to the recommendations of the gasket manufacturer. Water tight joints will be required when using rubber gaskets. Backfilling may begin when approved by the Engineer.

(d) Joints using Cold Applied Preformed Plastic Gaskets shall be made as follows:

Before laying the pipe in the trench, the plastic gasket shall be attached around the tongue or groove near the shoulder or hub of each joint in accordance with the gasket manufacturer's recommendations. The protective wrapper shall be removed and the gasket pressed firmly to the clean, dry surface of the pipe, as recommended by the manufacturer. The joint sealer must be placed in such a manner that no dirt or other deleterious materials will come in contact with the joint sealing material.

After the tongue is correctly aligned with the flare of the groove, the wrapper or wrappers on the gasket shall be removed and the pipe shall be pulled or pushed home with sufficient force to properly seal the joint. Any joint material pushed out into the interior of the pipe that would tend to obstruct the flow shall be removed. (Pipe shall be

pulled home in a straight line with all parts of the pipe on line and grade at all times.) Backfilling of pipe laid with plastic gasket joints may proceed as soon as the joint has been inspected and approved by the Engineer. Special precautions shall be taken in placing and compacting backfill to avoid damage to the joints.

When the atmospheric temperature is below 60 F, plastic joint seal gaskets shall either be stored in an area warmed to above 70 F, or artificially warmed to this temperature in a manner satisfactory to the Engineer. Gaskets shall then be applied to pipe joints immediately prior to placing pipe in trench, followed by connection to previously laid pipe.

(5) Connections and Stub Ends. Connections of concrete pipe to existing pipes, pipe sewers or sewer appurtenances shall be as shown on the plan.

The bottom of existing structures shall be mortared or concreted if necessary to eliminate any drainage pockets created by the connections. Any damage to the existing structure resulting from making the connection shall be repaired by the Contractor, to the satisfaction of the Engineer, at the Contractor's expense.

When concrete pipe is to be joined with existing aluminum pipe, portions of the aluminum pipe that are to be in contact with the concrete pipe, shall be insulated with a coating of bituminous material meeting the requirements of Article 460.7. The coating shall extend to a minimum distance of one (1) foot beyond the area of contact.

Unless otherwise shown in the plans, connections between concrete pipe and corrugated metal pipe shall be made with a suitable concrete collar having minimum thickness of four (4) inches.

Stub ends, for connections to future work not shown on the plans, shall be finished by installing watertight plugs into the free end of the pipe.

(6) Backfilling. After the pipe has been placed, bedded and jointed as specified, filling and/or backfilling shall be done in accordance with the applicable requirements of Item 400, "Excavation and Backfill for Structures". When mortar joints are specified, no fill or backfill shall be placed until the jointing material has been cured for at least six hours. Special precautions shall be taken in placing and compacting the backfill to avoid any movement of the pipe or damage to the joints. For all pipe structures where joints consist of materials other than mortar, immediate backfilling will be permitted.

(7) Reuse of Appurtenances. When existing appurtenances are specified on the plans for reuse, the portion to be reused shall be severed from the culvert and moved to the new position previously prepared by hoisting with a crane, rolling, or other approved methods. Connections shall conform to the requirements for joining sections of pipes, as designated herein or as shown on the plans. Any portion of the headwalls or pipe attached to the appurtenance damaged during the moving operations by the Contractor shall be restored to its original condition at the Contractor's expense. The Contractor may remove and dispose

of the existing appurtenances and construct new appurtenances at his expense in accordance with the pertinent specifications and design shown on the plans or as furnished by the Engineer.

(8) Protection of Pipe. Unless otherwise shown on the plans or permitted in writing by the Engineer, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of four (4) feet of permanent or temporary, compacted fill has been placed thereon. Pipe damaged by the Contractor's equipment shall be removed and replaced by the Contractor at the Contractor's expense.

464.4. Measurement. This Item will be measured by the linear foot. Such measurement will be made between the ends of the pipe barrel along the flow line, exclusive of safety end treatments. Safety end treatments shall be measured in accordance with Item 467, "Safety End Treatment". Where spurs or branches, or connections to existing pipe lines are involved, measurement of the spur or new connecting pipe will be made from the intersection of the flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, that length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length or width will be so included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels measured as prescribed above.

This is a plans quantity measurement Item and the quantity to be paid for will be that quantity shown in the proposal and on the "Estimate and Quantity" sheet of the contract plans, except as may be modified by Article 9.8. If no adjustment of quantities is required, additional measurements or calculations will not be required.

464.5. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Reinforced Concrete Pipe" and "Reinforced Concrete Pipe (Sewers)" of the size and D-load or class specified; and "Reinforced Concrete Pipe (Arch)", "Reinforced Concrete Pipe (Elliptical)", "Reinforced Concrete Pipe (Arch) (Sewer)", and "Reinforced Concrete Pipe (Elliptical) (Sewer)" of the design specified.

This price shall be full compensation for furnishing, hauling, placing and joining of pipes; for cutting of skews or slopes, for all connections to new or existing structures; for moving and reusing appurtenances where required; for removing and disposing of portions of existing structures as required; and for all labor, tools, equipment and incidentals necessary to complete the work.

Excavation, bedding and backfill will be paid for in accordance with Item 400, "Excavation and Backfill for Structures".

***** END OF SECTION *****

SECTION ITEM 506
TEMPORARY EROSION, SEDIMENTATION, AND
ENVIRONMENTAL CONTROLS

506.1. Description. Install, maintain, and remove erosion, sedimentation, and environmental control devices. Remove accumulated sediment and debris.

506.2. Materials.

A. Rock Filter Dams.

1. Aggregate. Furnish aggregate with hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding acceptable to the Engineer. Provide the following:

- **Types 1, 2, and 4 Rock Filter Dams.** Use 3 to 6 in. aggregate.
- **Type 3 Rock Filter Dams.** Use 4 to 8 in. aggregate.

2. Wire. Provide minimum 20 gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:

- a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 in. x 3-1/4 in.;
- minimum 0.0866 in. steel wire for netting;
- minimum 0.1063 in. steel wire for selvages and corners; and minimum 0.0866 in. for binding or tie wire.

3. Sandbag Material. Furnish sandbags meeting Section 506.2.1, "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

B. Temporary Pipe Slope Drains. Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved. Furnish concrete in accordance with Item 432, "Riprap."

C. Baled Hay. Provide hay bales weighing at least 50 lb., composed entirely of vegetable matter, measuring 30 in. or longer, and bound with wire, nylon, or polypropylene string.

D. Temporary Paved Flumes. Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.

E. Construction Exits. Provide materials that meet the details shown on the plans and this Section.

1. Rock Construction Exit. Provide crushed aggregate for long and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft, or flaky materials and organic and injurious matter. Use 4- to 8-in. aggregate for Type 1 and 2- to 4-in. aggregate for Type 3.

2. Timber Construction Exit. Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. For short-term exits, provide plywood or pressed wafer board at least 1/2 in. thick.

3. Foundation Course. Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.

F. Embankment for Erosion Control. Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.

G. Pipe. Provide pipe outlet material in accordance with Item 556, "Pipe Underdrains," and details shown on the plans.

H. Construction Perimeter Fence.

1. Posts. Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in. or use 2 x 4 boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 x 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.3 lb. per foot.

2. Fence. Provide orange construction fencing as approved by the Engineer.

3. Fence Wire. Provide 12-1/2 gauge or larger galvanized smooth or twisted wire. Provide 16 gauge or larger tie wire.

4. Flagging. Provide brightly-colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.

5. Staples. Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.

6. Used Materials. Previously used materials meeting the applicable requirements may be used if accepted by the Engineer.

I. Sandbags. Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be 24 to 30 in. long, 16 to 18 in. wide, and 6 to 8 in. thick.

Table 1 – Sand Gradation	
Sieve Number	Retained (% by Weight)
4	3%
100	80%
200	95%

J. Temporary Sediment Control Fence. Provide a net-reinforced fence using woven geotextile fabric. Logos visible to the traveling public will not be allowed.

1. Fabric. Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."

2. Posts. Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans.

Soft wood posts must be at least 3 in. in diameter or nominal 2 x 4 in. Hardwood posts must have a minimum cross-section of 1-1/2 x 1-1/2 in. T- or L-shaped steel posts must have a minimum weight of 1.3 lb. per foot.

3. Net Reinforcement. Provide net reinforcement of at least 12-1/2 gauge galvanized welded wire mesh, with a maximum opening size of 2 x 4 in., at least 24 in. wide, unless otherwise shown on the plans.

4. Staples. Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.

5. Used Materials. Use recycled material meeting the applicable requirements if accepted by the Engineer.

506.3. Equipment. Provide a backhoe, front end loader, blade, scraper, bulldozer, or other equipment as required when "Earthwork for Erosion Control" is specified on the plans as a bid item.

506.4. Construction.

A. Contractor Responsibilities. Implement the Department's Storm Water Pollution Prevention Plan (SWP3) for the project site in accordance with the specific or general storm water permit requirements. Develop and implement an SWP3 for project-specific material supply plants within and outside of the Department's right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.

B. General.

1. Phasing. Implement control measures in the area to be disturbed before beginning construction, or as directed. Limit the disturbance to the area shown on the plans or as directed. If, in the opinion of the Engineer, the Contractor cannot control soil erosion and sedimentation resulting from construction operations, the Engineer will limit the disturbed area to that which the Contractor is able to control. Minimize disturbance to vegetation.

2. Maintenance. Immediately correct ineffective control measures. Implement additional controls as directed. Remove excavated material within the time requirements specified in the applicable storm water permit.

3. Stabilization. Stabilize disturbed areas where construction activities will be temporarily stopped in accordance with the applicable storm water permit. Establish a uniform vegetative

cover. The project will not be accepted until a 70% density of existing adjacent undisturbed areas is obtained, unless otherwise shown on the plans. When shown on the plans, the Engineer may accept the project when adequate controls are in place that will control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

4. Finished Work. Upon acceptance of vegetative cover, remove and dispose of all temporary control measures, temporary embankments, bridges, matting, falsework, piling, debris, or other obstructions placed during construction that are not a part of the finished work, or as directed.

5. Restricted Activities. Do not locate disposal areas, stockpiles, or haul roads in any wetland, water body, or streambed. Do not install temporary construction crossings in or across any water body without the prior approval of the appropriate resource agency and the Engineer. Restrict construction operations in any water body to the necessary areas as shown on the plans or applicable permit, or as directed. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for stream crossings. Provide protected storage area for paints, chemicals, solvents, and fertilizers at an approved location. Keep paints, chemicals, solvents, and fertilizers off bare ground and provide shelter for stored chemicals.

C. Installation, Maintenance, and Removal Work. Perform work in accordance with the specific or general storm water permit. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until earthwork construction and permanent erosion control features are in place or the disturbed area has been

adequately stabilized as determined by the Engineer. If a device ceases to function as intended, repair or replace the device or portions thereof as necessary. Remove sediment, debris, and litter. When approved, sediments may be disposed of within embankments, or in the right of way in areas where the material will not contribute to further siltation. Dispose of removed material in accordance with federal, state, and local regulations. Remove devices upon approval or when directed. Upon removal, finish-grade and dress the area. Stabilize disturbed areas in accordance with the permit, and as shown on the plans or directed. The Contractor retains ownership of stockpiled material and must remove it from the project when new installations or replacements are no longer required.

1. Rock Filter Dams for Erosion Control. Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option. For Types 1, 2, 3, and 5, place the aggregate to the lines, height, and slopes specified, without undue voids. For Types 2 and 3, place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria, unless otherwise shown on the plans:

a. Type 1 (Non-reinforced).

(1) **Height.** At least 18 in. measured vertically from existing ground to top of filter dam.

(2) **Top Width.** At least 2 ft.

(3) **Slopes.** At most 2:1.

b. Type 2 (Reinforced).

(1) **Height.** At least 18 in. measured vertically from existing ground to top of filter dam.

(2) **Top Width.** At least 2 ft.

(3) **Slopes.** At most 2:1.

c. Type 3 (Reinforced).

(1) **Height.** At least 36 in. measured vertically from existing ground to top of filter dam.

(2) **Top Width.** At least 2 ft.

(3) **Slopes.** At most 2:1.

D. Type 4 (Sack Gabions). Unfold sack gabions and smooth out kinks and bends. For vertical filling, connect the sides by lacing in a single loop-double loop pattern on 4- to 5-in. spacing. At one end, pull the end lacing rod until tight, wrap around the end, and twist 4 times. At the filling end, fill with stone, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires 4 times. For horizontal filling, place sack flat in a filling trough, fill with stone, and connect sides and secure ends as described above. Lift and place without damaging the gabion. Shape sack gabions to existing contours.

E. Type 5. Provide rock filter dams as shown on the plans.

1. Temporary Pipe Slope Drains. Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe

at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of 10 ft. on center. Construct the energy dissipators or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, "Riprap," when designated on the plans.

2. Baled Hay for Erosion and Sedimentation Control. Install hay bales at locations shown on the plans by embedding in the soil at least 4 in. and, where possible, approximately 1/2 the height of the bale, or as directed. Fill gaps between bales with hay.

3. Temporary Paved Flumes. Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans, unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.

4. Construction Exits. When tracking conditions exist, prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits. Construct exits for either long or short-term use.

a. Long-Term. Place the exit over a foundation course, if necessary. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.

(1) Type 1. Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.

(2) Type 2. Construct using railroad ties and timbers as shown on the plans or as directed.

b. Short-Term.

(1) Type 3. Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.

(2) Type 4. Construct as shown on the plans or as directed.

6. Earthwork for Erosion Control. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.

a. Excavation and Embankment for Erosion Control Features. Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed. Where required, create a sediment basin providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.

b. Excavation of Sediment and Debris. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.

7. Construction Perimeter Fence. Construct, align, and locate fencing as shown on the plans or as directed.

a. Installation of Posts. Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8 to 10 ft.

b. Wire Attachment. Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.

c. Flag Attachment. Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long. Tie flagging to the wire using a square knot.

8. Sandbags for Erosion Control. Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.

9. Temporary Sediment-Control Fence. Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.

a. Installation of Posts. Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the run-off source.

b. Fabric Anchoring. Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 x 6 in. Place the fabric against the side of the trench and align approximately 2 in of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.

c. Fabric and Net Reinforcement Attachment. Unless otherwise shown under the plans, attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced. Sewn vertical pockets may be used to attached reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 in. or less.

d. Fabric and Net Splices. Locate splices at a fence post with a minimum lap of 6 in. attached in at least 6 places equally spaced, unless otherwise shown under the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment control fence include the following:

- fabric with minimal or no visible signs of biodegradation (weak fibers),
- fabric without excessive patching (more than 1 patch every 15 to 20 ft.),
- posts without bends, and
- backing without holes.

506.5. Measurement.

A. Rock Filter Dams. Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.

1. Linear Measurement. When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.

2. Volume Measurement. When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.

a. Installation. Measurement will be made in final position.

b. Removal. Measurement will be made at the point of removal.

B. Temporary Pipe Slope Drains. Temporary pipe slope drains will be measured by the foot.

C. Baled Hay. Baled hay will be measured by each bale.

D. Temporary Paved Flumes. Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.

E. Construction Exits. Construction exits will be measured by the square yard of surface area.

F. Earthwork for Erosion Control.

1. Equipment. Equipment use will be measured by the actual number of hours the equipment is operated.

2. Volume Measurement.

a. In Place.

(1) Excavation. Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.

(2) Embankment. Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:

- the original ground surfaces or the surface upon that the embankment is to be constructed for the feature and
- the lines, grades and slopes of the accepted embankment for the feature.

b. In Vehicles. Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicles)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.

G. Construction Perimeter Fence. Construction perimeter fence will be measured by the foot.

H. Sandbags for Erosion Control. Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.

I. Temporary Sediment-Control Fence. Temporary sediment-control fence will be measured by the foot.

506.6. Payment. The following will not be paid for directly but are subsidiary to pertinent items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);
- removal of litter;
- repair to devices and features damaged by Contractor operations;
- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;
- removal and reinstallation of devices and features needed for the convenience of the Contractor;

- finish grading and dressing upon removal of the device; and
- minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

The Contractor will be reimbursed in accordance with pertinent Items or Article 9.5, "Force Account," for maintenance, repair, or reinstallation of devices and features when the need for additional control measures cannot be attributed to the above, as determined by the Engineer. Stabilization of disturbed areas will be paid for under pertinent Items. Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly but is subsidiary to the excavation and embankment under this Item.

A. Rock Filter Dams. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

1. Installation. Installation will be paid for as "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

2. Removal. Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals. When the Engineer directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals

B. Temporary Pipe Slope Drains. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals. Removal of temporary pipe slope drains will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain. Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under Section 506.5.F, "Earthwork for Erosion and Sediment Control." Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, "Riprap."

C. Baled Hay. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Baled Hay." This price is full compensation for furnishing and placing bales, excavating trenches, removal and disposal, equipment, labor, tools, and incidentals. When the Engineer directs that the baled hay installation (or portions thereof) be replaced, payment will be made at the unit price bid for "Baled Hay," which is full compensation for removal and reinstallation of the baled hay.

D. Temporary Paved Flumes. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals. When the Engineer directs that the paved flume

installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals. Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under Section 506.5.F, "Earthwork for Erosion and Sediment Control."

E. Construction Exits. Contractor-required construction exits from offright of way locations or on-right of way PSLs will not be paid for directly but are subsidiary to pertinent Items. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right of way access to work areas required by the Department will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals. When the Engineer directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals. Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under Section 506.5.F, "Earthwork for Erosion and Sediment Control."

F. Earthwork for Erosion and Sediment Control. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Place)," "Earthwork (Erosion and Sediment Control, In Vehicles)," "Dragline Work (Erosion and Sediment Control)," "Backhoe Work (Erosion and Sediment Control)," "Excavator Work (Erosion and Sediment Control)," "Front End Loader Work (Erosion and Sediment Control)," "Blading Work (Erosion and Sediment Control)," "Scraper Work (Erosion and Sediment Control)," or "Bulldozer Work (Erosion and Sediment Control)." This price is full compensation for excavation including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion-control features; embankments including furnishing material from approved sources and construction of erosion-control features; sandbags; plywood; stage construction for curb inlets involved in curb-inlet sediment traps; and equipment, labor, tools, and incidentals. Earthwork needed to remove and obliterate of erosion-control features will not be paid for directly but is subsidiary to pertinent Items unless otherwise shown on the plans. Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

G. Construction Perimeter Fence. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals. Removal of construction perimeter fence will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

H. Sandbags for Erosion Control. Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals. Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

I. Temporary Sediment-Control Fence. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Sediment-Control Fence." This price is full compensation for furnishing and placing the fence; trenching, fence posts, fabric and backfill; removal and disposal; and equipment, labor, tools, and incidentals. Removal of temporary sediment-control fence will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the temporary sedimentation control fence installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Sediment-Control Fence," which is full compensation for the removal and reinstallation of the temporary sediment-control fence.

**** END OF SECTION ****



Determinataion of Asphalt Pavement and Caliche Thickness Report

Project Description: Sioux Rd. (I Rd. to Canal)

M.E.G. Report Number: 01-14-19240-1-1

Client: Hidalgo County Precinct No. 2

Date Tested: 11-19-14

Date Reported: 11-20-14

Location Tested: Sioux Rd.
(I Rd. to Canal)

Material Source: N/A

<u>Test Number</u>	<u>Location</u>	<u>Asphalt Depth / Thickness</u>	<u>Caliche Depth/Thickness</u>
1	Sioux Rd. .1 of a Mile West of Canal - West Bound Lane Reddish Brown Caliche	1 1/2"	10"
2	Sioux Rd. .5 of a Mile West of Canal - West Bound Lane Reddish Brown Caliche	1 5/8"	8"
3	Sioux Rd. .9 of a Mile West of Canal - West Bound Lane Reddish Brown Caliche	1 7/8"	8 3/4"
4	Sioux Rd. .3 of a Mile West of I Rd. - West Bound Lane Reddish Brown Caliche	2 5/8"	10"
5	Sioux Rd. .7 of a Mile West of I Rd. - West Bound Lane Reddish Brown Caliche	7/8"	9"

Remarks:

Raul Palma, Senior Materials Engineer



Atterberg Limits of Flexible Base Report

Project Name: Sioux Rd. (I Rd. to Canal)
Client: Hidalgo County Precinct No. 2

Report Number: 01-14-19240-3-1
Date Sampled: 06-16-2015
Date Reported: 06-24-2015
Material Description: Flexible Base
Sample Location: Sioux Rd.
STA 5+00 to 70+00

Procedure Utilized: ASTM D4318

Preparation Method: Wet

Material Identification	Test	Value	Specification Limits
East Bound Lane STA 5+00	Liquid Limit	26	N/A
	Plasticity Index	11	N/A
West Bound Lane STA 13+00	Liquid Limit	26	N/A
	Plasticity Index	10	N/A
East Bound Lane STA 20+00	Liquid Limit	29	N/A
	Plasticity Index	12	N/A
West Bound Lane STA 26+00	Liquid Limit	28	N/A
	Plasticity Index	12	N/A
East Bound Lane STA 32+00	Liquid Limit	25	N/A
	Plasticity Index	8	N/A
West Bound Lane STA 43+00	Liquid Limit	26	N/A
	Plasticity Index	9	N/A
East Bound Lane STA 51+00	Liquid Limit	30	N/A
	Plasticity Index	12	N/A
West Bound Lane STA 61+00	Liquid Limit	25	N/A
	Plasticity Index	9	N/A
East Bound Lane STA 70+00	Liquid Limit	30	N/A
	Plasticity Index	14	N/A

Remarks: Laboratory testing done in general accordance with ASTM D 4318.

The addition of 2.5 percent lime by dry weight is recommended for the salvage caliche base material.

Lime shall meet the requirements of TxDOT 2014 Specification Item 260. Lime treatment shall be in accordance with TxDOT 2014 Specification Item 260.

Andres Palma, Materials Engineer 15936





Moisture Content of Flexible Base Report

Project Description: Sioux Rd. (I Rd. to Canal)
Client: Hidalgo County Precinct No. 2

MEG Report Number: 01-14-19240-3-2
Date Sampled: 06-16-2015
Date Reported: 06-24-2015
Material Description: Reddish Brown Caliche
Sample Location: Sioux Rd.
STA 5+00 to 70+00

Procedure Utilized: Tex-103-E

Sample Identification	Moisture Content, %
STA 5+00, EBL	12.2
STA 12+00, WBL	13.9
STA 20+00, EBL	12.1
STA 26+00, WBL	13.9
STA 32+00, EBL	12.2
STA 43+00, WBL	11.6
STA 51+00, EBL	13.6
STA 61+00, WBL	12.2
STA 70+00, EBL	11.7

Remarks: Laboratory testing done in general accordance with Tex-103-E.

The addition of 2.5 percent lime by dry weight is recommended for the salvage caliche base material. Lime shall meet the requirements of TxDOT 2014 Specification Item 260. Lime treatment shall be in accordance with TxDOT 2014 Specification Item 260.

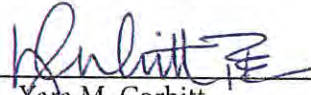
Andres Palma, Materials Engineer 15936



**Certification
Regarding Debarment, Suspension and Ineligibility**

As is required by the Federal Regulations Implementing Executive Order 12549, Debarment and Suspension, 45 CFR Part 76, Government-wide Debarment and Suspension, the applicant certifies, to the best of his or her knowledge and belief, that both it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency;
- b. Have not within a three-year period preceding this bid proposal and/or application been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction, violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a government entity with commission of any of the offenses enumerated herein; and
- d. Have not within a three-year period preceding this bid proposal and/or application had one or more public transactions terminated for cause or default.

Signature: 
Print Name: Yara M. Corbitt
Title: President
Telephone Number: (956) 627-6181
Date: 07/22/15

If the bidder is unable to certify to all of the statements in this Certification, such bidder should attach an explanation to this proposal.

**Request for Taxpayer
Identification Number and Certification**

Give form to the
requester. Do not
send to the IRS.

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)

Texas Cordia Construction, LLC

Business name, if different from above

Check appropriate box: ☐ Individual/
Sole proprietor

☐ Corporation

☒ Partnership

☐ Other ▶

☐ Exempt from backup
withholding

Address (number, street, and apt. or suite no.)

3149-A Center Pointe Drive

Requester's name and address (optional)

City, state, and ZIP code

Edinburg, TX 78539

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number

|| | | | | | |

or

Employer identification number

4 | 5 | 2 | 5 | 9 | 0 | 9 | 9 | 0

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. person (including a U.S. resident alien).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. (See the instructions on page 4.)

Sign
Here

Signature of
U.S. person ▶

Date ▶ 07/22/15

Purpose of Form

A person who is required to file an information return with the IRS, must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

U.S. person. Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee.

In 3 above, if applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

For federal tax purposes, you are considered a person if you are:

- An individual who is a citizen or resident of the United States,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States, or
- Any estate (other than a foreign estate) or trust. See Regulations sections 301.7701-6(a) and 7(a) for additional information.

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,

- The U.S. grantor or other owner of a grantor trust and not the trust, and
- The U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person, do not use Form W-9. Instead, use the appropriate Form W-8 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien.

Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the recipient has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity not subject to backup withholding, give the requester the appropriate completed Form W-8.

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 28% of such payments (after December 31, 2002). This is called "backup withholding." Payments that may be subject to backup withholding include interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the Part II instructions on page 4 for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See the instructions below and the separate Instructions for the Requester of Form W-9.

Also see *Special rules regarding partnerships* on page 1.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name

If you are an individual, you must generally enter the name shown on your income tax return. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

Sole proprietor. Enter your individual name as shown on your income tax return on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name" line.

Limited liability company (LLC). If you are a single-member LLC (including a foreign LLC with a domestic owner) that is disregarded as an entity separate from its owner under Treasury regulations section 301.7701-3, enter the owner's name on the "Name" line. Enter the LLC's name on the "Business name" line. Check the appropriate box for your filing status (sole proprietor, corporation, etc.), then check the box for "Other" and enter "LLC" in the space provided.

Other entities. Enter your business name as shown on required federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name" line.

Note. You are requested to check the appropriate box for your status (individual/sole proprietor, corporation, etc.).

Exempt From Backup Withholding

If you are exempt, enter your name as described above and check the appropriate box for your status, then check the "Exempt from backup withholding" box in the line following the business name, sign and date the form.

Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends.

Note. If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

Exempt payees. Backup withholding is not required on any payments made to the following payees:

1. An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2),
 2. The United States or any of its agencies or instrumentalities,
 3. A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities,
 4. A foreign government or any of its political subdivisions, agencies, or instrumentalities, or
 5. An international organization or any of its agencies or instrumentalities.
- Other payees that may be exempt from backup withholding include:
6. A corporation,
 7. A foreign central bank of issue,
 8. A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States,
 9. A futures commission merchant registered with the Commodity Futures Trading Commission,
 10. A real estate investment trust,
 11. An entity registered at all times during the tax year under the Investment Company Act of 1940,
 12. A common trust fund operated by a bank under section 584(a),
 13. A financial institution,
 14. A middleman known in the investment community as a nominee or custodian, or
 15. A trust exempt from tax under section 664 or described in section 4947.

The chart below shows types of payments that may be exempt from backup withholding. The chart applies to the exempt recipients listed above, 1 through 15.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt recipients except for 9
Broker transactions	Exempt recipients 1 through 13. Also, a person registered under the Investment Advisers Act of 1940 who regularly acts as a broker
Barter exchange transactions and patronage dividends	Exempt recipients 1 through 5
Payments over \$600 required to be reported and direct sales over \$5,000 ¹	Generally, exempt recipients 1 through 7 ²

¹ See Form 1099-MISC, Miscellaneous Income, and its instructions.

² However, the following payments made to a corporation (including gross proceeds paid to an attorney under section 6045(f), even if the attorney is a corporation) and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees; and payments for services paid by a federal executive agency.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-owner LLC that is disregarded as an entity separate from its owner (see *Limited liability company (LLC)* on page 2), enter your SSN (or EIN, if you have one). If the LLC is a corporation, partnership, etc., enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at www.socialsecurity.gov. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at www.irs.gov/businesses and clicking on Employer ID Numbers under Related Topics. You can get Forms W-7 and SS-4 from the IRS by visiting www.irs.gov or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Writing "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded domestic entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, and 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). Exempt recipients, see *Exempt From Backup Withholding* on page 2.

Signature requirements. Complete the certification as indicated in 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account ¹
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor ²
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee ¹
b. So-called trust account that is not a legal or valid trust under state law	The actual owner ¹
5. Sole proprietorship or single-owner LLC	The owner ³
For this type of account:	Give name and EIN of:
6. Sole proprietorship or single-owner LLC	The owner ³
7. A valid trust, estate, or pension trust	Legal entity ⁴
8. Corporate or LLC electing corporate status on Form 8832	The corporation
9. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
10. Partnership or multi-member LLC	The partnership
11. A broker or registered nominee	The broker or nominee
12. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity

¹ List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

² Circle the minor's name and furnish the minor's SSN.

³ You must show your individual name and you may also enter your business or "DBA" name on the second name line. You may use either your SSN or EIN (if you have one). If you are a sole proprietor, IRS encourages you to use your SSN.

⁴ List first and circle the name of the legal trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules regarding partnerships* on page 1.

Note. If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons who must file information returns with the IRS to report interest, dividends, and certain other income paid to you, mortgage interest you paid, the acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA, or Archer MSA or HSA. The IRS uses the numbers for identification purposes and to help verify the accuracy of your tax return. The IRS may also provide this information to the Department of Justice for civil and criminal litigation, and to cities, states, the District of Columbia, and U.S. possessions to carry out their tax laws. We may also disclose this information to other countries under a tax treaty, to federal and state agencies to enforce federal nontax criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism.

You must provide your TIN whether or not you are required to file a tax return. Payers must generally withhold 28% of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to a payer. Certain penalties may also apply.

HIDALGO COUNTY PURCHASING DEPARTMENT Bidder/Vendor Application

Complete in print or type. Please return this application to the Hidalgo County Purchasing Department
thru Facsimile: (956) 318-2629 or (956) 292-7612
in person or regular mail to: 2812 S. Business Hwy. 281, Edinburg, Texas 78539
or e-mail: purchasing@co.hidalgo.tx.us

Company Name: Texas Cordia Construction, LLC Telephone No. (956) 627-6181	
dba Name: Texas Cordia Construction, LLC	
Legal Name: Texas Cordia Construction, LLC	
Mailing Address : 3149-A Center Pointe Drive	Fax No. (956) 386-0289
Physical Address: 3149-A Center Pointe Drive	
City, State, Zip Edinburg, TX 78539	Tax I.D. No. 45-2590990
Remit to Address : 3149-A Center Pointe Drive	City, State, Zip Edinburg, TX 78539
E-Mail Address: yara@texascordia.com	
Representative(s) Name(s) & Title(s) Yara M. Corbitt, President / Isaac Heredia, Vice-President	
Type of Organization (check one): ☐ Individual ☐ Partnership ☐ Corporation ☐ Non-Profit	
☒ LLC ☐ Sole Proprietor ☐ Other, Specify	
State Identification No. 45-2590990 (Please attached completed W-9 form with this application)	
Federal Identification No. or (if individual) SS No.	
State of Incorporation: Texas Date: June 2011 Other:	
Type of Business (check one): ☐ Manufacturer ☐ Wholesaler ☐ Retailer ☐ Broker	
☐ Distributor ☐ Service Organization ☒ Other, Specify Heavy / Civil Construction	
Name & Title of Person(s) Authorized to Sign Bids, Proposals, and/or Contracts:	
Yara M. Corbitt, President / Isaac Heredia, Vice-President	
Small and/or Disadvantaged Business Information (check application criteria)	
Small Business: Disadvantaged Business (At Least 51% Ownership)	
Less than 125,000 annual gross receipt	Black American Native American
Less than 250,000 annual gross receipt	x Hispanic American x Women
Less than 499,000 annual gross receipt	Asian Pacific American Other
x More than 500,000 annual gross receipt	
Have you been certified as a HUB or an MBE/WBE source?: Yes x No	
Indicate Certification No.(s): or are Certificate(s) attached?: Yes x No	
What type of product(s) is/are solicited by your company?:	
Would you like to be provided with specifications for procurements of such products?: Yes x No	
To Be Completed by the County: Rec'd by (Purchasing): Date Rec'd by (Purchasing):	
Date Forwarded Information to Auditor's Office: Entry Date: Vendor No.:	

HISTORICALLY UNDERUTILIZED BUSINESS (HUB) DECLARATION

The primary objective of the Hidalgo County HUB Program is to ensure Historically Underutilized Businesses receive a fair and equal opportunity for participation in the County's procurement process. This fact holds true for Services (Professional & Non-Professional), Commodities, and Construction contracts and any subcontracts thereto. The program strongly encourages Prime Contractors to provide subcontracting opportunities to Certified Hub Contractors/Vendors. Our goal for HUB contractor/vendor participation, as well as HUB subcontractor participation is 30%. To be considered as a "Certified HUB Contractor/Vendor" the contractor/vendor must have been certified by, and hold a current and valid certification with any of the three agencies listed below.

Have you been Certified as a HUB or an MBE/WBE source?: Yes ☒ No

If yes, by whom?: Texas Building & Procurement Commission Other _____

Indicate Certification No(s): _____ or Are Certificate(s) Attached?: Yes No

LIST OF CERTIFIED HUB SUBCONTRACTORS

(Attach additional pages if necessary)

What percentage of the Bid, RFP, or RFQ is to be subcontracted with Certified HUB sources?: _____ %
(List HUB Subcontractor information below).

HUB Subcontractor Name: _____ HUB Status: _____
Certifying Agency (Check all applicable): Texas Building & Procurement Commission ☐ Other
Address: _____ City: _____ State: _____ Zip: _____
Contact Person: _____ Title: _____ Phone No.: ()
Subcontract Amount: \$ _____ Description of Work to be Performed: _____

HUB Subcontractor Name: _____ HUB Status: _____
Certifying Agency (Check all applicable): Texas Building & Procurement Commission ☐ Other
Address: _____ City: _____ State: _____ Zip: _____
Contact Person: _____ Title: _____ Phone No.: ()
Subcontract Amount: \$ _____ Description of Work to be Performed: _____

HUB Subcontractor Name: _____ HUB Status: _____
Certifying Agency (Check all applicable): Texas Building & Procurement Commission ☐ Other
Address: _____ City: _____ State: _____ Zip: _____
Contact Person: _____ Title: _____ Phone No.: ()
Subcontract Amount: \$ _____ Description of Work to be Performed: _____

DISCLOSURE OF CONFLICT OF INTEREST

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor, person, consultant or contractor considering doing business with Hidalgo County ("the County") to disclose in the Conflict of Interest Questionnaire (the "CIQ") attached as Exhibit D, the vendor, person, consultant or contractor's affiliation or business relationship that might cause a conflict of interest with the County. By law, the CIQ must be filed with the Hidalgo County Clerk's Office no later than the seventh business day after the date the person becomes aware of facts that require that statement to be filed. The disclosure requirement applies to a person or business who contracts or seeks to contract with Hidalgo County for the sale or purchase of property, goods or service. Any purchase order or contract resulting from this process shall be considered null and void if the successful bidder fails to comply with Texas Local Government Code Chapter 176. Vendors, consultants, contractors and others who desire to conduct business with Hidalgo County are encouraged to refer to Texas Local Government Code Chapter 176 for the details of this law. An offense under Texas Local Government Code Chapter 176 is a Class C Misdemeanor.

Please Submit completed forms to the Hidalgo County Clerk's Office located at 100 N. Closner, Edinburg, Texas 78539-Hidalgo County Courthouse

COMPLETION AND SUBMISSION OF FORM CIQ IS THE SOLE RESPONSIBILITY OF THE PROSPECTIVE BIDDER.

CONFLICT OF INTEREST QUESTIONNAIRE**FORM CIQ**

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 1491, 80th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code by a person who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the person meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. See Section 176.006, Local Government Code.

A person commits an offense if the person knowingly violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor.

OFFICE USE ONLY

Date Received

1 Name of person who has a business relationship with local governmental entity.

Texas Cordia Construction, LLC (Yara M. Corbitt)

2 ☐ Check this box if you are filing an update to a previously filed questionnaire.

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

3 Name of local government officer with whom filer has employment or business relationship.N/A

Name of Officer

This section (item 3 including subparts A, B, C & D) must be completed for each officer with whom the filer has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the filer of the questionnaire?

☐

Yes

☒

No

B. Is the filer of the questionnaire receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐

Yes

☒

No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

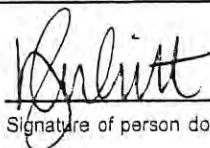
☐

Yes

☒

No

D. Describe each employment or business relationship with the local government officer named in this section.

4Yara M. Corbitt

Signature of person doing business with the governmental entity

11/22/2013

Date

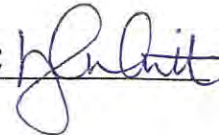
SALES TAX AND LOCAL SALES TAX EXEMPTION CERTIFICATE FOR CONTRACTORS

This Contract is to be performed for an exempt organization as defined by Article 20.04 (H) (4) of the Texas Limited Sales, Excise, and Use Tax Act and the undersigned hereby claims an exemption from payment of taxes under Chapter 20, title 122A, revised hereby claims an exemption from payment of taxes under Chapter 20, title 122A, revised civil statutes of Texas, and Article 1066 ©, entitle Local Sales and Use Tax, revised civil statutes of Texas.

The Contractor performing this Contract may purchase, rent, or lease all materials, supplies, equipment used for consumed in the performance of this Contract by issuing to his retailer an exemption certificate in lieu of the tax, said exemption certificate complying with State Comptroller's Ruling No 95-9.07. Any such exemption certificate issue by the Contractor in lieu of the tax shall be subject to the provisions of the State Comptroller's Ruling No. 95.0.09 as amended to be effective October 2, 1968.

EXECUTED this the 22nd day of July, 20 15.

Texas Cordia Construction, LLC
Contractor



character in the locality in which the work is performed; and

(2) not less than the general prevailing rate of per diem wages for legal holiday and overtime work.

(b) Subsection (a) does not apply to maintenance work.

(c) A worker is employed on a public work for the purposes of this section if the worker is employed by a contractor or subcontractor in the execution of a contract for the public work with the state, a political subdivision of the state, or any officer or public body of the state or a political subdivision of the state.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995. Amended by Acts 1997, 75th Leg., ch. 165, Sec. 18.01, eff. Sept. 1, 1997.

§Sec. 2258.022. DETERMINATION OF PREVAILING WAGE RATES.

(a) For a contract for a public work awarded by a political subdivision of the state, the public body shall determine the general prevailing rate of per diem wages in the locality in which the public work is to be performed for each craft or type of worker needed to execute the contract and the prevailing rate for legal holiday and overtime work by:

(1) conducting a survey of the wages received by classes of workers employed on projects of a character similar to the contract work in the political subdivision of the state in which the public work is to be performed; or

(2) using the prevailing wage rate as determined by the United States Department of Labor in accordance with the Davis-Bacon Act (40 U.S.C. Section 276a et seq.), and its subsequent amendments.

(b) This subsection applies only to a public work located in a county bordering the United Mexican States or in a county adjacent to a county bordering the United Mexican States. For a contract for a public work awarded by the state, the public body shall determine the general prevailing rate of per diem wages in the locality in which the public work is to be performed for each craft or type of worker needed to execute the contract and the prevailing rate for legal holiday and overtime work as follows. The public body shall conduct a survey of the wages received by classes of workers employed on projects of a character similar to the contract work both statewide and in the political subdivision of the state in which the public work is to be performed. The public body shall also consider the prevailing wage rate as determined by the United States Department of Labor in accordance with the Davis-Bacon Act (40 U.S.C. Section 276a et seq.), and its subsequent amendments, but only if the survey used to determine that rate was conducted within a three-year period preceding the date the public body calls for bids for the public work. The public body shall determine the general prevailing rate of per diem wages in the locality based on the higher of:

(1) the rate determined from the survey conducted in the political subdivision;

(2) the arithmetic mean between the rate determined from the survey conducted in the political subdivision and the rate determined from the statewide survey; and

(3) if applicable, the arithmetic mean between the rate determined from the survey conducted in the political subdivision and the rate determined by the United States Department of Labor.

(c) The public body shall determine the general prevailing rate of per diem wages as a sum certain, expressed in dollars and cents.

(d) A public body shall specify in the call for bids for the contract and in the contract itself the wage rates determined under this section.

(e) The public body's determination of the general prevailing rate of per diem wages is final.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995. Amended by Acts 1997, 75th Leg., ch. 165, Sec. 18.02, eff. Sept. 1, 1997; Acts 2001, 77th Leg., ch. 1422, Sec. 14.05, eff. Sept. 1, 2001.

Amended by: Acts 2007, 80th Leg., R.S., Ch. 728, Sec. 1, eff. September 1, 2007.

§Sec. 2258.023. PREVAILING WAGE RATES TO BE PAID BY CONTRACTOR AND SUBCONTRACTOR; PENALTY.

(a) The contractor who is awarded a contract by a public body or a subcontractor of the contractor shall pay not less than the rates determined under Section 2258.022 to a worker employed by it in the execution of the contract.

(b) A contractor or subcontractor who violates this section shall pay to the state or a political subdivision of the state on whose behalf the contract is made, \$60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contract. A public body awarding a contract shall specify this penalty in the contract.

(c) A contractor or subcontractor does not violate this section if a public body awarding a contract does not determine the prevailing wage rates and specify the rates in the contract as provided by Section 2258.022.

(d) The public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.

(e) A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than 10,000.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.024. RECORDS.

(a) A contractor and subcontractor shall keep a record showing:

(1) the name and occupation of each worker employed by the contractor or subcontractor in the construction of the public work; and

(2) the actual per diem wages paid to each worker.

(b) The record shall be open at all reasonable hours to inspection by the officers and agents of the public body.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.025. PAYMENT GREATER THAN PREVAILING RATE NOT PROHIBITED.

This chapter does not prohibit the payment to a worker employed on a public work an amount greater than the general prevailing rate of per diem wages.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.026. RELIANCE ON CERTIFICATE OF SUBCONTRACTOR. A contractor is entitled to rely on a certificate by a subcontractor regarding the payment of all sums due those working for the subcontractor until the contrary has been determined.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

SUBCHAPTER C. ENFORCEMENT; CIVIL AND CRIMINAL PENALTIES

§Sec. 2258.051. DUTY OF PUBLIC BODY TO HEAR COMPLAINTS AND WITHHOLD PAYMENT. A public body awarding a contract, and an agent or officer of the public body, shall:

(1) take cognizance of complaints of all violations of this chapter committed in the execution of the contract; and

(2) withhold money forfeited or required to be withheld under this chapter from the payments to the contractor under the contract, except that the public body may not withhold money from other than the final payment without a determination by the public body that there is good cause to believe that the contractor has violated this chapter.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.052. COMPLAINT; INITIAL DETERMINATION.

(a) On receipt of information, including a complaint by a worker, concerning an alleged violation of Section 2258.023 by a contractor or subcontractor, a public body shall make an initial determination as to whether good cause exists to believe that the violation occurred.

(b) A public body must make its determination under Subsection (a) before the 31st day after the date the public body receives the information.

(c) A public body shall notify in writing the contractor or subcontractor and any affected worker of its initial determination.

(d) A public body shall retain any amount due under the contract pending a final determination of the violation.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.053. ARBITRATION REQUIRED FOR UNRESOLVED ISSUE.

(a) An issue relating to an alleged violation of Section 2258.023, including a penalty owed to a public body or an affected worker, shall be submitted to binding arbitration in accordance with the Texas General Arbitration Act (Article 224 et seq., Revised Statutes) if the contractor or subcontractor and any affected worker do not resolve the issue by agreement before the 15th day after the date the public body makes its initial determination under Section 2258.052.

(b) If the persons required to arbitrate under this section do not agree on an arbitrator before the 11th day after the date that arbitration is required under Subsection (a), a district court shall appoint an arbitrator on the petition of any of the persons.

(c) A public body is not a party in the arbitration.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.054. ARBITRATION AWARD; COSTS. (a) If an arbitrator determines that Section 2258.023 has been violated, the arbitrator shall assess and award against the contractor or subcontractor:

- (1) penalties as provided by Section 2258.023 and this section; and
- (2) all amounts owed to the affected worker.

(b) An arbitrator shall assess and award all reasonable costs, including the arbitrator's fee, against the party who does not prevail. Costs may be assessed against the worker only if the arbitrator finds that the claim is frivolous. If the arbitrator does not find that the claim is frivolous and does not make an award to the worker, costs are shared equally by the parties.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.055. ARBITRATION DECISION AND AWARD FINAL. The decision and award of the arbitrator is final and binding on all parties and may be enforced in any court of competent jurisdiction.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.056. PAYMENT BY PUBLIC BODY TO WORKER; ACTION TO RECOVER PAYMENT.

(a) A public body shall use any amounts retained under this chapter to pay the worker the difference between the amount the worker received in wages for labor on the public work at the rate paid by the contractor or subcontractor and the amount the worker would have received at the general prevailing wage rate as provided in the arbitrator's award.

(b) The public body may adopt rules, orders, or ordinances relating to the manner in which a reimbursement is made.

(c) If the amounts retained by a public body under this chapter are not sufficient for the public body to pay the worker the full amount owed, the worker has a right of action against the contractor or subcontractor and the surety of the contractor or subcontractor to recover the amount owed, reasonable attorney's fees, and court costs.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.057. WITHHOLDING BY CONTRACTOR.

(a) A contractor may withhold from a subcontractor sufficient money to cover an amount withheld from the contractor by a public body because the subcontractor violated this chapter.

(b) If the contractor has made a payment to the subcontractor, the contractor may withhold money from any future payments owed to the subcontractor or sue the subcontractor or the subcontractor's surety for the amount withheld from the contractor by a public body because of the subcontractor's violation.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.058. CRIMINAL OFFENSE.

(a) An officer, agent, or representative of the state or of a political subdivision of the state commits an offense if the person wilfully violates or does not comply with a provision of this chapter.

(b) A contractor or subcontractor of a public work under this chapter, or an agent or representative of the contractor or subcontractor, commits an offense if the person violates Section 2258.024.

(c) An offense under this section is punishable by:

- (1) a fine not to exceed \$500;
- (2) confinement in jail for a term not to exceed six months; or
- (3) both a fine and confinement.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

**Prevailing Wage Rates
Certification Statement**

Date _____

Project Name _____

CSJ# _____

Contractor _____

Application# _____

I, _____ do hereby state:
(Name of Project Director)

1. That a payroll (form WH-347 or similar form) was submitted for contract work Performed for the period covered by the attached application.
2. That a statement of compliance(form WH-347 or similar form) was submitted with the payroll.
3. The certified payroll complies with the classifications and minimum wage rates Stipulated in the contract.
4. That a minimum of one interview was conducted with laborers using Form HUD-11 or similar.

Signature

General Decision Number: TX140008 01/03/2014 TX8

Superseded General Decision Number: TX20130008

State: Texas

Construction Types: Heavy and Highway

Counties: Cameron, Hidalgo and Webb Counties in Texas.

HEAVY & HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/03/2014

* SUTX2011-003 08/02/2011

	Rates	Fringes
CEMENT MASON/CONCRETE		
FINISHER (Paving & Structures)...	\$ 12.46	
FORM BUILDER/FORM SETTER		
(Structures).....	\$ 12.30	
FORM SETTER (Paving & Curb).....	\$ 12.16	
LABORER		
Asphalt Raker.....	\$ 10.61	
Flagger.....	\$ 9.10	
Laborer, Common.....	\$ 9.86	
Laborer, Utility.....	\$ 11.53	
Pipelayer.....	\$ 11.87	
Work Zone Barricade		
Servicer.....	\$ 12.88	
POWER EQUIPMENT OPERATOR:		
Asphalt Distributor.....	\$ 13.48	
Asphalt Paving Machine.....	\$ 12.25	
Broom or Sweeper.....	\$ 10.33	
Crane, Lattice Boom 80		
Tons or Less.....	\$ 14.39	
Crawler Tractor.....	\$ 16.63	
Excavator, 50,000 lbs or		
less.....	\$ 12.56	
Excavator, over 50,000 lbs..	\$ 15.23	
Foundation Drill, Truck		
Mounted.....	\$ 16.86	
Front End Loader Operator,		
Over 3 CY.....	\$ 13.69	
Front End Loader, 3 CY or		
less.....	\$ 13.49	
Loader/Backhoe.....	\$ 12.77	
Mechanic.....	\$ 15.47	
Milling Machine.....	\$ 14.64	
Motor Grader Operator,		

Rough.....\$ 14.62
Motor Grader, Fine Grade....\$ 16.52
Scraper.....\$ 11.07

Servicer.....\$ 12.34

Steel Worker (Reinforcing).....\$ 14.07

TRUCK DRIVER

Lowboy-Float.....\$ 13.63
Single Axle.....\$ 10.82
Single or Tandem Axle Dump..\$ 14.53
Tandem Axle Tractor with
Semi Trailer.....\$ 12.12

WELDER.....\$ 14.02

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

Unlisted classifications needed for work not included within
the scope of the classifications listed may be added after
award only as provided in the labor standards contract clauses
(29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification
and wage rates that have been found to be prevailing for the
cited type(s) of construction in the area covered by the wage
determination. The classifications are listed in alphabetical
order of "identifiers" that indicate whether the particular
rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with
characters other than "SU" denotes that the union
classification and rate have found to be prevailing for that
classification. Example: PLUM0198-005 07/01/2011. The first
four letters , PLUM, indicate the international union and the
four-digit number, 0198, that follows indicates the local union
number or district council number where applicable , i.e.,
Plumbers Local 0198. The next number, 005 in the example, is
an internal number used in processing the wage determination.
The date, 07/01/2011, following these characters is the
effective date of the most current negotiated rate/collective
bargaining agreement which would be July 1, 2011 in the above
example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION

CHANGE ORDER NUMBER ONE(1)

Project: _____

DATE OF ISSUANCE: _____ EFFECTIVE DATE: _____

OWNER: _____
OWNER'S CONTRACT NO: _____

CONTRACTOR: _____ ENGINEER: _____

You are directed to make the following changes in the Contract Documents.

Description: 1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Reason for Change Order: 1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Attachments:

CHANGE IN CONTRACT PRICE:		CHANGE IN CONTRACT TIME:	
Original Contract Price		Original Contract Time for	
\$ 0.00		Substantial Completion: 0	
		calendar days or dates	
Net Changes from previous Change Order		Net Change from previous Change Orders	
\$ 0.00		0	
		calendar days	
Contract Price prior to this Change Order		Contract Time prior to this Change Order	
\$ 0.00		Substantial Completion: 0	
		calendar days or dates	
Net Increase(decrease) of this Change Order		Net Increase(decrease) of this Change Order	
\$ 0.00		0	
		calendar days	
Contract Price with all approved Change Orders	Net % increase(decrease) from original contract price. #DIV/O! %	Contract Time with all approved Change Orders	
\$ 0.00		Substantial Completion: 0	
		calendar days or dates	

RECOMMENDED:

APPROVED:

ACCEPTED:

By: _____
Engineer (Authorized Signature)

By: _____
Owner (Authorized Signature)

By: _____
Contractor (Authorized Signature)

Date: _____

Date: _____

Date: _____

SAMPLE --APPLICATION FOR PAYMENT NO.

To: _____ (OWNER)
From: _____ (CONTRACTOR)
Contract: _____
Project: _____
Owner's Contract No. _____ Engineer's Project No. _____
For Work accomplished through the date of: _____

1. Original Contract Price: _____
2. Net change by Change Order and Written Agreements(+or-): _____
3. Current Contract Price (1 plus 2): _____
4. Total completed and stored to date: _____
5. Retainage (per Agreement):
 10% of completed Work: _____
 _____ of stored material _____
 Total Retainage: _____
6. Total completed and stored to date less retainage (4 minus 5) _____
7. Less previous Application for Payments: _____
8. AMOUNT DUE THIS APPLICATION (6 MINUS 7) _____

Accompanying Documentation: _____

CONTRACTOR'S Certification:

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied on account to discharge CONTRACTOR'S legitimate obligations incurred in connection with Work covered by prior Applications for Payment numbered 1 through 2 inclusive; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (3) all Work covered by this Application for Payments is in accordance with the Contract Documents and not defective.

Date _____

State of _____
County of _____
Subscribed and sworn to before me this _____
day of _____

CONTRACTOR

By: _____

Notary Public
My Commission expires: _____

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Date _____

ENGINEER

By: _____

Exhibit E-C

Estimate Quantity Update Worksheet

Colonias: Date: Contractor: Date Began: ?
Roadway: Contract Time: 120
Control: Project Price: 90
Project No: Work Done this Mo.: % Time Charged: 75.00%
County: Est. No: 1 #DIV/0!
Work Type: Paving & Drainage
Limits: From: To: % Time Used: 75.00%

		FIRST MONTH				SECOND MONTH				THIRD MONTH			
ITEM NO.	DESCRIPTION	UNIT	PROJECT QTY	Unit Price	Project Amount	MONTHLY QUANTITY	QTY to Date	Item Cost (Monthly)	MONTHLY QUANTITY	QTY to Date	Item Cost (Monthly)	MONTHLY QUANTITY	QTY to Date
(901) ADMINISTRATIVE													
(902) PRELIMINARY ENGINEERING													
(903) CONSTRUCTION ENGINEERING													
(904) RIGHT-OF-WAY													
(905) ROADWAY CONSTRUCTION													
100	PREP ROW	Sq. Yd.	1,100	\$1,800.00	\$1,980.00	1,000	1,000	\$0.00		0	\$0.00		0
110	BACKFILL (TY A)	Sq. Yd.	1,000	\$600.00	\$600.00	0	0	\$0.00		0	\$0.00		0
247	FLEX BASE (RDWY DEL)(TY D GR 6 CL 4)	CY	76,000	\$28.00	\$2,128.00	0	0	\$0.00		0	\$0.00		0
260	LIME (TY A SLURRY) OR (TY B)	TON	1036.000	\$2.00	\$2,072.00	0	0	\$0.00		0	\$0.00		0
260	LIME TREAT SUBGR (DC)(12")	SY	0.000	\$6,000.00	\$0.00	0	0	\$0.00		0	\$0.00		0
262	LIME (TY A SLURRY) OR (TY B)	TON	7,800	\$3,000.00	\$23,400.00	0	0	\$0.00		0	\$0.00		0
262	LME TRT FOR BS CRS (NEWEXT BS)(DC)(6")	SY	1277.800	\$6.00	\$7,666.80	0	0	\$0.00		0	\$0.00		0
310	ASPH MATRL (MC-30)	GAL	246.7	\$6.00	\$1,480.20	0	0	\$0.00		0	\$0.00		0
500	MOBILIZATION	LS	1,000	\$3,000.00	\$3,000.00	0	0	\$0.00		0	\$0.00		0
502	BARRICADES, SIGNS, AND TRAF HANDLE	MO	1,000	\$1,000.00	\$1,000.00	0	0	\$0.00		0	\$0.00		0
529	CONC CURB AND GUTTER (TY A)(BARRIER)	LF	600.000	\$7.50	\$4,500.00	0	0	\$0.00		0	\$0.00		0
644	SMALL RDSO SGN ASSM (TY A)	EA	2,000	\$300.00	\$600.00	0	0	\$0.00		0	\$0.00		0
644	SMALL RDSO SGN ASSM (TY F)	EA	2,000	\$500.00	\$1,000.00	0	0	\$0.00		0	\$0.00		0
658	DEL ASM TY A (D-ST)	EA	4,000	\$100.00	\$400.00	0	0	\$0.00		0	\$0.00		0
666	REFL PAV MKR TY I (Y)(SLD)(4")	LF	400.000	\$0.25	\$100.00	0	0	\$0.00		0	\$0.00		0
666	REFL PAV MKR TY I (Y)(BRK)(4")	LF	140.000	\$0.25	\$35.00	0	0	\$0.00		0	\$0.00		0
672	RAIS PAV MKR CL B (REFL)(TY II-A-A)	EA	24,000	\$3.50	\$84,000.00	0	0	\$0.00		0	\$0.00		0
3146	HOT MIX (TY D)	TON	105.5	\$34.00	\$3,587.00	0	0	\$0.00		0	\$0.00		0
5249	TEMP SEDMT CONT FENCE	LF	70.000	\$3.00	\$210.00	0	0	\$0.00		0	\$0.00		0
(906) DRAINAGE													
464	RC PIPE (CL III)(18")	LF	404.000	\$25.00	\$10,100.00	0.000	0	\$0.00		0	\$0.00		0
464	RC PIPE (CL III)(24")	LF	120.000	\$30.00	\$3,600.00	0.000	0	\$0.00		0	\$0.00		0
465	INLET (COMPL)(TY A)	EA	2,000	\$2,000.00	\$4,000.00	0.000	0	\$0.00		0	\$0.00		0
465	INLET (COMPL)(TY C)	EA	2,000	\$1,500.00	\$3,000.00	0.000	0	\$0.00		0	\$0.00		0
465	MANH (COMPL)(TYM)	EA	1,000	\$2,000.00	\$2,000.00	0.000	0	\$0.00		0	\$0.00		0
465	INLET EXT.	EA	2,000	\$700.00	\$1,400.00	0.000	0	\$0.00		0	\$0.00		0
467	SET (TY II)(18")(RCP)(1:6)	EA	4,000	\$550.00	\$2,200.00	0.000	0	\$0.00		0	\$0.00		0
467	SET (TY II)(24")(RCP)(1:6)	EA	1,000	\$650.00	\$650.00	0.000	0	\$0.00		0	\$0.00		0

Monthly Totals:	\$0.00	\$0.00	\$0.00
ADMINISTRATIVE (901)			
PRELIMINARY ENGINEERING (902)			
CONSTRUCTION ENGINEERING (903)			
RIGHT-OF-WAY (904)			
Roadway (905):	\$0.00	\$0.00	\$0.00
Drainage (906):	\$0.00	\$0.00	\$0.00

Total to Date Roadway (905): \$0.00
Drainage (906): \$0.00
Total \$0.00

Prepared and Checked By: Signature: Date:

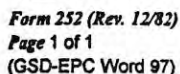
FEAR

Printed Name:

Contractor Name	
Starting Date	
Project Ending Date	
Retainage Percent	

Application No.: _____
 Application Date: _____
 Period To: _____
 Engineer Firm: _____

[illegible]



ESTIMATE NO. 0 CONTRACTOR _____

PROJECT NO. _____ COUNTY _____ DATE WORK BEGAN _____

TIME COMPUTED FROM _____ DATE WORK COMPLETED _____

[illegible]

RESIDENT ENGINEER

INSTRUCTIONS: PROJECT IDENTIFICATION SHOULD COVER CONTRACT, TIME CREDITED AND REASONS THEREFORE MUST CONFORM TO PROVISIONS OF CONTRACT. NO HOLIDAY CREDIT ALLOWED FOR DAYS PRECEDING OR FOLLOWING LEGAL HOLIDAYS. TIME SUSPENDED AND RESUMED MUST BE SUPPORTED BY COPY EACH OF LETTERS TO CONTRACTOR DATED ON OR BEFORE EFFECTIVE DATES. TIME EXTENSION MUST BE INDICATED AND REFERENCED TO RELATED PROVISION OF CONTRACT. SEE BOOKLET OF INSTRUCTIONS, CONSTRUCTION ESTIMATES DATED SEPTEMBER 1, 1956

(Company Letterhead)

(Date)

County of Hidalgo
Attn.: Mr. Raul E. Sesein, P.E.
1304 S. 25th St.
Edinburg, TX 78539

RE: Hidalgo County Precinct No. 2
Gearhart Drive Paving & Drainage Improvements
Contract No.: C-14-032-xx-xxx

Mr. Sesein:

The following is the list of suppliers used in the above mentioned projects as per the County's request:

Hidalgo County Pipe 2605 US Exp. 281 Edinburg, TX 78542 (956)318-2840

If you have any questions, please call me at (956) 607-0741

Best regards,

(name), Manger

PARTIAL/FINAL WAIVER OF LIEN

THE STATE OF TEXAS

COUNTY OF _____

The undersigned contracted with _____
_____ to furnish _____
in connection with certain improvements to real property located in _____
County, Texas, and owned by _____
Which improvements are described as follows:

In consideration of Pay Estimate No _____ in the amount of _____
DOLLAR(\$ _____) and other good and
valuable consideration, the receipt and sufficiency of which is hereby acknowledged and
confessed, the undersigned does hereby waive and release any mechanic's lien or materialmen's
lien or claims of lien that the undersigned has or hereafter has on the above mentioned real
property on account of any labor performed or materials furnished or to be furnished or labor
performed and materials furnished by the undersigned pursuant to the above-mentioned contract
or any constitutional lien that the undersigned may have.

Undersigned hereby guarantees that all bids for labor performed and/or materials furnished in the
erection and construction of such improvements on the Property have been fully paid and
satisfied and Undersigned does further guarantee that if for any reason a lien or liens are filed for
material or labor against said Property arising out of any bills for material or labor in connection
with the erection or construction of said improvements thereon, Undersigned will obtain a
settlement of such lien or liens and a proper release thereof shall be obtained.

SUPPLIER

BY: _____
TITLE

SWORN TO AND SUBSCRIBED BEFORE ME, on this the _____ day of _____, 20__ to
certify which witness my hand and seal of office.

NOTARY PUBLIC in and for the State of Texas
My Commission Expires: _____

**CONTRACTOR'S AFFIDAVIT OF
PAYMENTS OF DEBTS AND CLAIMS**

PROJECT:
OWNER:
CONTRACTOR:
ENGINEER:

PROJECT NO.

The Contractor in accordance with the Contract Documents, hereby certifies that, except as listed below, all obligations for all materials and equipment furnished, for all work labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or his property might in any way be held responsible have been paid in full or have otherwise been satisfied in full.

EXCEPTIONS: (If none, write "NONE". The Contractor shall furnish a bond acceptable to the Owner for each exception.)

CONTRACTOR

By

Title

Subscribed and sworn to before me this

day of

Notary Public:

My Commission Expires:

**Prevailing Wage Rates
Certification Statement**

Date _____

Project Name _____

CSJ# _____

Contractor _____

Application# _____

I, _____ do hereby state:
(Name of Project Director)

1. That a payroll (form WH-347 or similar form) was submitted for contract work Performed for the period covered by the attached application.
2. That a statement of compliance(form WH-347 or similar form) was submitted with the payroll.
3. The certified payroll complies with the classifications and minimum wage rates Stipulated in the contract.
4. That a minimum of one interview was conducted with laborers using Form HUD-11 or similar.

Signature

CERTIFICATE OF CONSTRUCTION COMPLETION

THIS IS TO CERTIFY THAT ON _____ DAY OF _____ A FINAL INSPECTION was made of the project herein described.

CONTRACT

CONTRACT DATE: _____
OWNER: _____
CONSTRUCTION CONTRACTOR: _____
OF THE CITY OF _____ STATE OF _____

PROJECT DESCRIPTION

CONSTRUCTION OF _____

CONTRACT NO: _____
Located in or near the City/Precinct Of _____

THIS IS TO CERTIFY"

1. That the work has been completed in accordance with the plans and specifications and all addenda, change orders, supplemental agreements thereto, and with the following exceptions:

2. That the sum of _____, deducted from the final payment of the Contractor is a fair and equitable settlement for the foregoing except work.
3. That the contractor has presented a "Certificate of Release" starting under oath, that all claims arising out of the performance of work have been fulfilled, and the Owner is released from all claims arising under or by virtue of said contract.
4. That the CONTRACTOR has presented in behalf of itself and its sureties, satisfactory evidence that it is bound to repair, replace, and make good any faulty workmanship and/or materials discovered in the work within a period of one year from this date, as provided in said contract.

5. Amount of Original Contract	_____
Present Amount of Contract	_____
Total Amount of earned to Date	_____
Less: previous payments	_____
Balance	_____
Authorized deductions	_____
AMOUNTY OF FINAL PAYMENT	_____

6. That the final payment in the amount of _____
_____ is now due and payable.

Engineer's Signature

CONCURRED BY:

Contractor's Name

By: _____

Title: _____

CONCURRED BY:

City/Precinct

By: _____

Title: _____

CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

PROJECT:

PROJECT NO.

OWNER:

CONTRACTOR:

ENGINEER:

The Contractor, in accordance with the Contract Documents, and in consideration for the full and final payment to the Contractor for all services in connection with the project, does hereby waive and release any and all liens, or any and all claims to liens which the Contractor may have on or affecting the project as a result of its contract(s) for the Project or for performing labor and/or furnishing materials in any way connected with the construction of any aspect of the project. The Contractor further certifies and warrants that all subcontractors of labor and/or materials for the Project, except as listed below, have been paid in full for all labor and/or materials supplied to, for through or at the direct or indirect request of the Contractor prior to, through and including the date of this affidavit.

EXCEPTIONS: (If none, write "NONE". The Contractor shall furnish a bond acceptable to the Owner for each exception.)

CONTRACTOR

By

Title

Subscribed and sworn to before me this

day of

Notary Public:

My Commission Expires:

Precinct Logo

Your Tax Dollars at Work

Hidalgo County Pct. 2

Eduardo "Eddie" Cantu

Sioux Road Improvements

(from I Road to 3,500 ft. East of Raul Longoria Road)

Hidalgo County Commissioner's Court

Ramon Garcia
A.C. Cuellar, Jr.
Eduardo "Eddie" Cantu
Joe M. Flores
Joseph Palacios

County Judge
Commissioner Pct #1
Commissioner Pct #2
Commissioner Pct #3
Commissioner Pct #4

Project Contractor: _____

Project Engineer: Raul E. Sesin, P.E.

CONSTRUCTION IDENTIFICATION SIGN:

Size, 4' – 0" X 8' – 0"

Letters to be brown with beige background

Construction Identification Signs To Be Erected Prior To Beginning of Actual Construction

Wood for Signs Shall Be $\frac{3}{4}$ " Waterproofing Resin Bonded Exterior Grade Plywood (Douglas Fir Plywood Association or Equal)

Payment for Furnishing, Erecting, Maintenance and Removing Construction Identification Signs Will Not Be made Directly. Such Costs Shall be Included in the Overall Bid Submitted.

To Be Erected as Indicated on title Sheet.