

Santa Rosa & Corral Storm Drainage  
Improvement Project  
Additional Specifications

SECTION 02050  
DEMOLITION

PART 1 GENERAL

1.01 Existing Conditions

- a. Owner assumes no responsibility for actual condition of structures to be demolished. Existing conditions at the time of inspection for bidding purposes will be remain unchanged by the Owner insofar as practicable.
- b. Minimize interference with adjacent facilities or areas of usage. Do not obstruct existing ways of traffic circulation, vehicular or pedestrian.
- c. Provide and maintain temporary fences, coverings barriers and/or safety devices required to protect damage to any persons or property.
- d. Maintain egress, access and exits at all times, unless obstruction is approved forty-eight (48) hours in advance by the Owner.
- e. Protect existing structures and surfaces scheduled to remain. Promptly repair damaged structures and surfaces at no additional cost.
- f. Maintain existing utilities and protect from damage for duration of operations. Interruption of services to be only with Owner approval forty-eight (48) hours in advance of interruption. When so required by the Owner, provide temporary services for duration of utilities interruption.
- g. Where demolition operations require the removal of an item or structure which will compromise the security of the existing facility, provide temporary closures or barrier until new material acquisition for such work so that such situations are minimized and provide Owner forty-eight (48) hours advance notice prior to commencement.

1.02 Pollution Control

- a. Use water sprinkling, temporary enclosures or other suitable methods to limit dust and dirt to a condition of "lowest possible emissions." Clean adjacent structures and improvements and return adjacent areas to condition existing prior to start of work.
- b. Conform to applicable requirements of the ~~Texas Air Control Board~~ <sup>TCEQ</sup>, EPA, OSHA, and any other regulatory authority having jurisdiction over this work. Provide monitoring and other evidence of compliance as required to statute or safe-work practice, at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 Material Disposition

- a. Unless indicated otherwise, all demolished material is to be removed from the site and properly disposed of. Items of salvageable value to the Contractor but not indicated for reuse or turning over to the Owner, shall be removed as the work progresses in a timely manner. Storage (or sale) of these items on site will not be permitted.
- b. Reused items: Certain items may be indicated on the Drawings or in the Specifications to be salvaged and/or reused. Where items are so identified, Contractor shall store and protect said items for duration of the project.

PART 3 EXECUTION

3.01 Preparation

- a. Prevent movement or settlement of adjacent structures. Provide all necessary shoring and bracing. Protect existing landscaping materials, areas, surfaces, and structures that are to be demolished. Disconnect, remove and cap utility lines within demolition areas.

3.02 Execution

- a. Perform all demolition required to effect the requirements of this project in an orderly and careful manner. Remove all items scheduled to reuse or to be turned over to the Owner in such a manner as to minimize damage.
- b. Construct and maintain dust partitions to confine dirt, dust, fumes and other forms of air pollution to the construction area. Partitions to have perimeters sealed. Protect HVAC system from intake and/or distribution of such contaminates.
- c. Cease operations and notify Engineer immediately if adjacent structures appear to be endangered. Do not resume operations until corrective measures have been taken. Repair damage to adjacent structures caused by demolition operations.
- d. Remove demolished materials not scheduled for reuse or turning over to Owner from the site in a timely fashion. Broom clean demolished areas at end of each day's work.

- e. Store and protect items scheduled for reuse. Prior to reinstallation, clean said items and prepare for reuse and, where applicable, refinishing.
- f. Notify the Owner at such time when items scheduled to be submitted to the Owner are available. Unless otherwise indicated, the Owner will pick up these materials at the project site. The Contractor shall obtain a written receipt from the Owner for same.
- g. Demolished materials shall not be sold on site or to Owner's employees.
- h. Do not burn or bury demolished materials on site.
- i. Backfill open pits and holes caused as a result of demolition.
- j. Rough grade and compact areas affected by demolition to maintain site grades and contours.
- k. Replace or restore to Engineer 's satisfaction existing structures, finishes or items damaged by demolition operations. Replace or restore to Engineer's satisfaction all landscaping materials, including turf, damaged by demolition operations.

SECTION 02070  
GEO-GRID REINFORCEMENT

PART 1 GENERAL

1.01 Description

- a. This item shall consist of furnishing and installing geogrid reinforcement in accordance with the lines and grades shown on the plans.

1.02 Related Work

- a. Section 02310: Earthwork for Pavements

1.03 Measurement and Payment

- a. 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.
- b. The work performed and materials furnished, as prescribed by this item, will be paid for at the unit price bid for "Geogrid Reinforcement", which shall be full compensation for furnishing all labor, material freight, tools, equipment and incidentals, and for doing all the work involved in placement of the geogrid, complete in place.

1.04 Submittals

- a. Contractor shall submit manufacturer technical data of all material for engineer approval.

PART 2 PRODUCTS

2.01 Material

- a. The geogrid shall be a single layer grid structure formed by a regular network of integrally connected polymetric tensile elements with apertures designed to interlock with the surrounding fill material. The fabric 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. Tensar BX-1100 or approved equal.

- b. The geogrid shall also conform to the properties specified below.

Property	Test Method	Requirement
Aperture Size	I.D. Calipered	0.75 – 1.5 inches
Open Area	COE Method CW-02215	70%, min.
Rib Thickness	ASTM D 1777	0.025 inches, nom.
Junction Thickness	ASTM D 1777	0.06 inches, nom.
Secant Aperture Stability Modulus @ 20 cm-kg	In-Plane-Rotation Test Kinney, Univ. of Alaska	3.2 cm-kg/deg., min.
Flexural Rigidity both directions	ASTM D 1388 64	250,000 mg-cm, min.
Tensile Modulus	GRI –GG1-87	14,000 lb/ft, min.
Junction Strength	GRI-GGI-87	765 lb/ft., min.
Junction Efficiency	GRI-GG-2 87	90%, min.

- c. 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 days prior to bid date. Submittal packages must include, as a minimum, the following:
1. Full-scale laboratory testing and in-ground testing of pavement structures reinforced with the specific geogrid that 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.
  2. Independent certified test results stating that the alternate geogrid has a secant aperture stability modulus at 20 cm-kg, when tested in accordance with the "Grid Aperture Stability by In-Place-Rotation" test of 3.2 or greater.
  3. 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 minimum of 1 year service.
  4. A sample of the geogrid and certified specification sheets.

### PART 3 EXECUTION

- a. Subgrade shall be prepared as specified and as indicated on the plans.
- b. 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.
- c. Care shall be taken to ensure the geogrid sections do not separate during construction; adjacent rolls may be tied together every 30 feet using suitable plastic ties. Placement of geogrid around corners may require cutting and diagonal lapping. The geogrid may 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.
- d. Should the geogrid be ripped or torn during installation, the damaged area shall be uncovered to determine full extent of the damage. New geogrid section shall overlap all torn or damaged geogrid a minimum of three feet in all directions.
- e. Fill material shall be placed in lift thickness and compacted as shown on the plans. Tracked construction equipment shall operate on the grid only when a minimum of four-inch cover is provided. Rubber-tired equipment may operate directly on the grid at speeds less than five miles per hour if the underlying material is capable of supporting the loads. Sections of geogrid that are damaged by construction activity shall be repaired at the Contractor's expense.

PART 1 GENERAL

1.01 Related Work

- A. Section 02070: Geo-grid Reinforcement
- B. Section 02310: Earthwork for Pavement
- C. Section 02320: Lime Stabilized Soils
- D. Section 02510: PVC Water Pipe System
- E. Section 02550: PVC Sanitary Sewer System
- F. Section 02600: Storm Drain System
- G. Section 03300: Cast-in-Place Concrete
- H. Section 03400: Precast Concrete

1.02 Job Conditions

- A. The contractor shall examine the site prior to bidding and shall be held to have knowledge of existing grades, topography, obstructions, and other visible site related conditions.
- B. Maintain all benchmarks and other necessary reference points throughout construction. Replace if disturbed or destroyed.
- C. Keep all excavations free from water at all times furnishing such pumps, equipment and power as may be required. Maintain surface drainage during construction.
- D. Existing Utilities: Locate by hand excavation and protect from damage. Stake and identify locations and maintain same. Coordinate with Owner and utility companies to maintain services. Do not disrupt service without providing temporary means of service acceptable to the Owner. Repair any damages to utilities as promptly as possible, at no expense to the Owner.
- E. Protection: Protect structures, sidewalks, pavement, and other facilities on the site. Stake and identify locations of active utilities to remain and protect same. Barricade open excavations and provide means of warning as required. Provide necessary bracing and shoring at excavations to maintain the integrity of the excavation prior to backfilling. Comply with all governing safety regulations.
- F. Use of explosives will not be permitted. Burning of removed materials will not be permitted.
- G. Perform all work with experienced personnel and appropriate equipment to insure first class workmanship in a timely fashion.
- H. Excavation and backfill required by any trade or subcontractor shall be performed by the affected parties in the manner described hereafter.

1.03 Warranty

- A. Contractor shall for a period of one (1) year from acceptance correct any area exhibiting settlement, ponding or otherwise improper conditions at no expense to the Owner.

1.04 Geotechnical Testing and Quality Control

- A. A recognized Independent Testing Laboratory will be selected by the Owner to perform field and lab testing services. The expense of these tests and re-tests shall be borne by the Contractor. These services will include proctors, in-place densities, Atterberg limits, and any other testing procedures deemed appropriate by the Owner. These services will be identified to the Contractor for his use in coordinating with the Testing Laboratory. The scope of testing services may be adjusted at the Owner's discretion prior to or at any point during the project.
- B. All inspections and tests shall be performed in accordance with applicable ASTM Standards. Standard proctors to be in accordance with ASTM D698. Atterberg limits to be in accordance with ASTM D4318.
- C. The Contractor will be responsible for notifying the Testing Laboratory at appropriate points of progress so that the identified scope of testing can be effected. Such notification to be made in a timely fashion. The Contractor shall cooperate with the Testing Laboratory so that the functions of the laboratory may be properly performed.
- D. Should test results indicate that materials or placement do not conform to the requirements of these specifications, non-conforming work in-place shall be removed, replaced or reworked or any combination thereof until such work, after re-testing, conforms to these requirements. All expenses of re-testing to be born by the Contractor. Scope of re-testing to be as determined by Engineer.
- E. Testing of materials described herein in no way relieves the Contractor of his obligation to provide materials and construction in full compliance with the requirements of the Contract Documents.

## PART 2 PRODUCTS

- A. All fill materials for the project site to obtain grades and conditions indicated on the drawings. Natural excavated fill may be reused as common fill if so approved by the Engineer.
- B. All select fill to be new material. Stripped topsoil may be reused for topsoil.
- C. Additional fill materials from Contractor's source shall be supplied by the Contractor as needed at no additional expense to the Owner.
- D. All fill materials shall be clean and free from deleterious matter.
- E. Sand Bedding for envelopes around utility lines shown on the drawings shall meet the following requirements.

Passing 1/2" Sieve	100% by weight
Passing 3/8" Sieve	90% to 100% by weight
Passing No. 4 Sieve	80% to 100% by weight
Passing No. 200	maximum 20% by weight
Plasticity Index	non-plastic 8 maximum
Liquid Limit	30 maximum
- F. Select fill shall be placed under all concrete work on grade, thickness as indicated on the drawings. Select fill shall be natural uniform mixture of light tan sand and clay (maximum P.I. of 12). Common caliche meeting the P.I. requirement may also be utilized under concrete slabs on grade. Material to be free from debris and organic material.
- G. Select fill under sidewalks, curbs and gutters, and other site related structures to be 2" thickness minimum, unless noted otherwise on the drawings.
- H. Common fill shall be placed at all locations requiring fill material, except at areas under concrete work on grade and under concrete or asphalt paving flexible base. Common fill to be natural excavated soil or a mixture of soil and clay. All common fill to be free from debris, organic matter and lumps or clods in excess of 2" in any dimension. Provide common fill to elevations necessary to bring the covering topsoil material to required finish elevations.
- I. Topsoil shall be placed at a minimum 4" layer over all areas to receive turf or planting or where shown on the plans for topsoil. Topsoil to be fertile agricultural topsoil capable of sustaining healthy plant growth.

## PART 3 EXECUTION

### 3.01 Delivery, Storage and Handling

- A. Handle and neatly stockpile materials both new and excavated (suitable for reuse) with a minimum of interference with traffic, existing site facilities, and other trades as approved by the Engineer.
- B. Stockpile different soil types separately.
- C. Prevent dirt and dust from blowing or otherwise becoming a nuisance to the occupants of adjacent facilities, to the public or to the procedure of this work.

### 3.02 Excavation

- A. Perform all excavations for the completion of the entire project. Remove and dispose of material required to obtain subgrade elevations, including existing paving and visible obstructions; also underground structures and utilities indicated to be removed.
- B. Excavate to elevations and dimensions indicated, plus sufficient space for forms, erections, shoring and removal.
- C. Keep excavations clean and free of loose materials. Keep excavations free of water. Remove water and reshape excavations prior to placing concrete. Provide and maintain all pumps, piping and equipment required to properly dewater excavation.
- D. All excavations to be inspected and approved by the Engineer prior to pouring concrete, backfilling, or otherwise covering.
- E. Contractor to bear cost of extra work and materials caused by excavations beyond dimensions and grades required.

### 3.03 Trenches

- A. Provide excavation for trenches required by piping, conduits and work of all trades including mechanical and electrical work. Trenches to be depths and dimensions required for finished installation.
- B. All trenches shall meet or exceed the latest requirements of OSHA.
- C. Shape trenches as required to prevent sides from caving by back sloping vertical sides. Contractor shall be solely responsible for back-slope used. Provide bracing and/or shoring as required to protect existing structures as well as workers. Remove bracing/shoring in a timely fashion as backfill occurs.

SECTION 02310  
EARTHWORK FOR PAVEMENTS

PART 1 GENERAL

1.01 Description

- A. This specification shall govern for the excavation and placement of earthwork and subgrades.

1.02 Related Work

- A. Section 02070: Geo-grid Reinforcement
- B. Section 02300: Earthwork
- C. Section 02320: Lime Stabilized Soils
- D. Section 02500: Caliche Base
- E. Section 02505: Limestone Base

1.03 Submittals

- A. Contractor shall provide technical data and/or samples for each of the following material items.
- 1. Common Fill, only when source is offsite
  - 2. 5-gallon sample of Caliche on-site and Geotechnical Lab report.
  - 3. Geotechnical Soil and Density Field reports.

1.04 Geotechnical Testing and Quality Control

- A. A recognized Independent Testing Laboratory will be selected by the Owner to perform field and lab testing services. The expense of these tests and re-tests shall be borne by the Contractor. These services will include proctors, in-place densities, Atterberg limits, and any other testing procedures deemed appropriate by the Owner. These services will be identified to the Contractor for his use in coordinating with the Testing Laboratory. The scope of testing services may be adjusted at the Owner's discretion prior to or at any point during the project.
- B. All inspections and tests shall be performed in accordance with applicable ASTM Standards. Standard proctors to be in accordance with ASTM D698. Atterberg limits to be in accordance with ASTM D4318.
- C. The Contractor will be responsible for notifying the Testing Laboratory at appropriate points of progress so that the identified scope of testing can be effected. Such notification to be made in a timely fashion. The Contractor shall cooperate with the Testing Laboratory so that the functions of the laboratory may be properly performed.
- D. Should test results indicate that materials or placement do not conform to the requirements of these specifications, non-conforming work in-place shall be removed, replaced or reworked or any combination thereof until such work, after re-testing, conforms to these requirements. All expenses of re-testing to be born by the Contractor. Scope of re-testing to be as determined by Engineer.
- E. Testing of materials described herein in no way relieves the Contractor of his obligation to provide materials and construction in full compliance with the requirements of the Contract Documents.

PART 2 PRODUCTS

- A. Backfill is a specified material used in refilling a cut, trench, or other excavation, placed at a specified degree of compaction.
- B. Compaction is the process of mechanically stabilizing a material by increasing its density at a controlled moisture condition.
- C. Degree of Compaction is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 698, 1991 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Hammer and 12-in. (304.8-mm) Drop, for general soil types abbreviated in this specification as a percentage of maximum density (ASTM D 698).
- D. Embankment is "fill" having a top that is higher than adjoining ground.
- E. Excavation is the removal of soil, rock, or hard material to obtain a specified depth or elevation.
- F. Fill is a specified material placed at a specified degree of compaction to obtain an indicated grade or elevation.
- G. In-Situ Soil is existing in-place soil.
- H. Lift is a layer (or course) of soil placed on top of a previously prepared or placed soil.
- I. Soil is the surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material.

- J. Subgrade is the material in excavation (cuts) and fills (embankments) immediately below any subbase, base, pavement, or other improvement. Also, as a secondary definition, the level below which work above is referenced.
- K. Topsoil is a natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material.
- L. Unsatisfactory Material is existing, in-situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability.

### PART 3 EXECUTION

#### 3.01 Application

- A. Materials and workmanship specified herein with reference to State Department of Highways and Public Transportation, SDHPT, shall be in accordance with the referenced articles, sections and paragraphs of the standard except that contractual and payment provisions do not apply.
- B. Deliver and store materials in a manner to prevent contamination or segregation.

#### 3.02 Weather Limitation

- A. Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course.
- B. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising.
- C. Do not construct fill and backfill in the rain or on saturated subgrades.
- D. If weather conditions, in the opinion of the engineer are not suitable for construction, the work shall be scheduled for a later time, approved by the engineer.
- E. The Contractor shall furnish equipment to add moisture to the fill or backfill during and after placement.

#### 3.03 Compaction

- A. Compact each layer or lift of material specified so that the in-place density tested is not less than 95 percent of the maximum density of the standard proctor (ASTM D 698).
- B. Subgrade shall be tested at a rate of one proctor and atterberg limits per type of soil and one field density per 300 square yards of subgrade surface area.

#### 3.04 Site Grading

- A. Grade to finished grades indicated within 0.10 foot.
- B. Grade areas to drain water away from structures and to provide suitable surfaces for mowing machines.
- C. Existing grades, which are to remain but are disturbed by the Contractor's operations, shall be restored to the original condition.

#### 3.05 Finishing Subgrades

- A. Finish surface of top lift of fill or top of subgrade to the elevation and cross section indicated.
- B. Finished surface shall be smooth and of uniform texture.
- C. Lightly scarify or blade the finished surface to bring the finished surface to within 0.05-foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment.
- D. Surface shall show no deviations in excess of 1/2-inch when tested with a 10-foot straightedge.

#### 3.06 Disposition of Surplus Material

- A. Surplus or other soil material that is not required or suitable for filling or backfilling shall be stock piled at a location within the owner's premises.

#### 3.07 Protection of Surfaces

- A. Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes prior to acceptance of work.

SECTION 02320  
LIME STABILIZED SOILS

PART 1 GENERAL

1.01 Description

- a. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to lime stabilize the soils as shown on the drawings and as specified herein.
- b. Lime stabilization shall be used only for soils having a plasticity index greater than 12.

1.02 Related Work

- a. Section 02300: Earthwork
- b. Section 02310: Earthwork for Pavements
- c. Section 02500: Caliche Base
- d. Section 02705: Asphalt Pavement Repair
- e. Section 03305: Concrete Paving, Curbs, and Sidewalks

1.03 References: The publications listed below form a part of this specification to the extent referenced.

- a. American Association of State Highway and Transportation (AASHTO)
- b. AASHTO M216: 1984 Lime for Soil Stabilization
- c. American Society for Testing and Materials (ASTM)
- d. ASTM D 698: 1978 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb Rammer and 12-inch Drop
- e. National Lime Association (NLA) NLA Bulletin 326: 1987 Lime Stabilization Construction Manual

1.04 Submittals

- a. When the quantity of lime required for stabilization is being determined by laboratory testing, the laboratory shall submit design data to the Engineer for review and approval.
- b. Ten days prior to the construction, the Contractor shall submit a list of equipment to be used and their relation to method of mixing proportioning, spreading, pulverizing and compacting subgrade, and slurry application
- c. Geotechnical reports shall be submitted directly to the Engineer's office. Test reports shall include Field Sample of Optimum Moisture-Maximum Density of Lime Stabilized Soil and Field In-Place Moisture and Density of Lime Stabilized Soil
- d. Contractor shall submit to the Engineer a Certificate of Compliance for the Lime.

PART 2 PRODUCTS

- a. Hydrated lime shall be Type I, AASHTO M216 Grade A.
- b. Water utilized for the lime process shall be potable.

PART 3 EXECUTION

3.01 Weather Limitations

- a. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials.
- b. Do not apply lime unless the air temperature is at least 40 degrees F in the shade and rising.
- c. Do not apply lime to soils that are frozen or contain frost. If the air temperature falls below 35 degrees F in the shade, protect completed lime-treated areas by approved methods against the detrimental effects of freezing.
- d. Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

3.02 Application

- a. Site Preparation shall be performed where shown on the drawings and as required by Section 02300 Earthwork. Clean debris from area to be stabilized. Remove rocks larger than 2 inches. Inspect original ground for adequacy for the forthcoming compactive effort of lime treatment work.
- b. When stabilized course is to be constructed to meet a fixed grade, provide adequate line and grade stakes for control. Finished and completed stabilized areas shall conform to the lines, grades, cross section, and dimensions indicated.
- c. Locate grade stakes in lanes parallel to centerline of areas under construction, and suitably placed for string lining. The Contractor shall be responsible for maintaining line and grade. After the subgrade has been brought

- to line and grade as shown on the typical sections, the subgrade should be scarified to the specified depth and width of stabilization and then partially pulverized. All deleterious materials like stumps, roots, turf, etc., and aggregate larger than 2-inches should be removed.
- d. Lime treatment and sequence of construction shall comply with NLA BUL326 and sequence of construction operations, unless specified otherwise hereinafter.
  - e. The Engineer shall approve the lime slurry preparation facilities. Provisions shall be made for agitation in the distributor truck to prevent settling of lime solids. The hydrate slurry may be prepared either in a central mixing tank or tank trucks, with agitation provided for mixing. Prepare quicklime slurry using a portable batch-slaking unit. Accurately weigh or meter lime and water. Standard water or asphalt trucks, properly cleaned, with or without pressure distributors, may be used to apply lime treatment.
  - f. After site preparation, scarify subgrade and spread lime. Blend lime into subgrade to depth of 6-inches. Apply lime and water only to those areas where mixing operations can be completed during the same working day. Accomplish application and mixing of lime by the slurry method.
  - g. Hydrated lime shall be uniformly spread at a rate of 5-percent by weight. A typical lime slurry ration is 1 ton lime to 500 gallons of water. Maintain the water content at 5 percent above optimum during application to lime-subgrade mixture. Distribute lime in successive passes over subgrade material until proper amount of lime has been spread to the proper depth. Continually agitate slurry to keep mixture uniform. Keep pumps, distribution spray bars, slurry injection equipment and other equipment clean of excessive lime slurry. The Contractor's laboratory shall verify the specified amount and rate of application of lime for the various materials encountered.
  - h. The lime-subgrade shall be thoroughly rotary mixed throughout the proper depth and width of the subgrade and pulverized to a minus 2-inch. Water shall be added to raise the moisture of the subgrade-lime mixture at least 5-percent above optimum moisture content. The soil-lime shall be rotary mixed. The mixer shall continue making passes until it has produced a homogeneous, uniform mixture of lime, subgrade, and water. Continue mixing or re-mixing operations, until material is free of streaks or pockets of lime and mixture is uniform.
  - i. After initial mixing, the lime-treated layer should be shaped and sealed to the approximate section and compacted lightly for curing and to minimize evaporation loss, lime carbonation, or to prevent excessive wetting from possible heavy rain. Moisture cure lime-subgrade mixture up to 48 hours until adhesive quality of clay is reduced to almost normal subgrade consistency. Heavy clays may require up to 7 days of curing.
  - j. During curing, the surface shall be maintained in a moist condition by light sprinkling and rolling. Heavy traffic loads shall be kept off, and the surface shall be maintained in a smooth condition by rolling as required.
  - k. Re-scarify, mix, and pulverization of the lime-soil shall continue until all of the clods are broken down to pass a 1-inch screen and at least 60-percent pass a No-4 sieve. Additional water may be required to raise the mixture approximately 2-percent above optimum moisture content prior to compaction.
  - l. Compact the lime-soil material to 95-percent of the density (Standard Proctor). The density value shall be based on a representative field sample of the lime-subgrade mixture, not the untreated (raw) subgrade. Compaction should begin immediately after final mixing, but in no case should any delay exceed five days. The surface of the lime-treated soil shall be graded after compaction to achieve the finish grades shown on the drawings.
  - m. Finish completed section by rolling with a pneumatic roller or other suitable light roller that will sufficiently compact and prevent hairline cracking. Keep the compacted lime treated surface moist until covered by a subsequent layer. When a bituminous wearing course is schedule for application, the surface shall be broom cleaned and dampened.
  - n. Temporary joints shall be made at the end of each working day, prepare a temporary joint in fully compacted material normal to paved surface centerline. Construct a longitudinal temporary joint for partial width sections against which future material is to be placed.
  - o. Remove temporary joints during next work period by trimming 3 inches into treated material for continuity. Trimmed material shall be incorporated in subsequent work. Temporary joints shall not coincide with any longitudinal or transverse temporary joint location of previous or subsequent construction. Re-mixing 4-inches into the previous day's work may be substituted for joints providing the method and equipment is acceptable to the Engineer.
  - p. The Contractor shall provide warning signs and barricades so that traffic will not travel over freshly treated surfaces. Do not permit equipment or traffic on lime-treated material until subgrade stability is assured.
  - q. Maintain the finished surface until work has been completed. The Contractor shall provide drainage during entire period of construction to prevent water from collecting or standing on area to be stabilized.

### 3.03 Equipment and Limitations

- a. The type of equipment to be used for each category of work shall conform to the NLA Bulletin 326 unless specified otherwise. Maintain equipment in satisfactory and safe operating condition.
- b. Spreading hydrated lime by aggregate spreaders, dump trucks, end-dumping or tailgate control methods, or agricultural spreaders is not allowed.

- c. Motor graders will not be allowed to mix lime with clays. Deep-lift rotary mixers may be used and may facilitate changes in specified depths of operation, providing equipment and method of operation sustains uniform distribution of lime with required compacted density throughout the deeper layer, with approval of engineer.
- d. Unauthorized equipment such as hauling or transportation vehicles will not be allowed for compaction purposes.

#### 3.04 Safety Requirements

- a. The Contractor shall insure the prevention of employee eye or skin contact with quicklime during transport or application. Provide and require employees to use protective clothing, high top boots, gauntlet-type gloves, protective headwear, splash-proof safety goggles and face shields, and protective cream.

#### 3.05 Testing

- a. A recognized Independent Testing Laboratory will be approved by the Owner to perform field and lab testing services. These services may include proctors, in-place densities, Atterberg limits, and any other testing procedures deemed appropriate by the Owner. All geotechnical testing and retesting shall be paid for by the Contractor without additional charge to the Owner.
- b. The Contractor shall coordinate the scope and frequency of testing with the Geotechnical Testing Laboratory. The scope of testing services may be adjusted at the Owner's discretion prior to or at any point during the project.
- c. Frequency of sampling and testing of materials for conformance and quality control shall be as specified herein and shall be performed at such other times as necessary to document contract compliance. The laboratory shall certify all test reports.
- d. Geotechnical testing shall be performed as follows in accordance with ASTM D 698.
- e. Lime Sample Optimum Moisture-Maximum Density: One per type of material.
- f. Lime Field In-Place Density: One per 300 square yards.
- g. Thickness of final lime treated subgrade and base course shall be not less than thickness shown on the drawings. Final grade smoothness shall not deviate by more than 3/8 inch, when tested with a 10-foot straightedge.

SECTION 02500  
CALICHE BASE

PART 1 GENERAL

1.01 Description

- A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install a caliche base course in accordance with the drawings and as specified herein.

1.02 Related Work

- A. Section 02070: Geogrid Reinforcement
- B. Section 02310: Earthwork for Pavements
- C. Section 02320: Lime Stabilized Soils
- D. Section 02700: Asphalt Surface Treatment
- E. Section 02705: Asphalt Pavement Repair
- F. Section 02710: Hot Mix Asphaltic Concrete
- G. Section 03305: Concrete Paving, Curb, and Sidewalks

1.03 Submittals: Contractor shall submit technical data and certification as follow:

- A. Laboratory Test reports for the Calliche:
- 1. Standard Proctor
  - 2. Atterberg Limits
  - 3. Optimum Moisture and Compaction
  - 4. Wet Ball Mill
  - 5. Field Densities

1.03 Field Quality Control

- A. A recognized Independent Testing Laboratory, selected by the Owner, shall perform all testing.
- B. The Contractor shall cooperate and coordinate all tests with the Lab, Engineer, and Owner.
- C. Contractor shall pay for all testing and retesting of failures.
- D. Caliche Base Course Testing
  - 1. Raw Sample Optimum Moisture-Maximum Density of Limed Soil: One per type of material
  - 2. Raw Sample Standard Proctor: One per type of material
  - 3. Raw Sample Wet Ball Mill: One per type of material
  - 4. Raw Sample Atterburg Limits and Gradation: One per type of material
  - 5. Field In-Place Densities: One per 300 square yards
- E. When lime stabilization is required refer to the "Lime Stabilized Soils" specification for additional testing. Test in accordance with ASTM D 698, Method D.

PART 2 MATERIALS

2.01 Caliche Base Material

- A. The material shall be from a source approved by the Engineer. The material shall conform to TxDOT Item 247, Type D, Grade 6, and shall consist of argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, or sand and shall be free of vegetation.
- B. All materials shall be screened, and the oversize shall be crushed and returned to the screened materials again in such a manner that a uniform product will be produced, and will meet the following requirements of the current TxDOT Standard Specifications for Construction of Highways, Streets and Bridges.

2.02 Caliche Gradation	<u>Sieve Size</u>	<u>Percent Retained</u>
	2-1/2"	0
	1-3/4"	0-10
	No. 4"	45-75
	No. 40	60-85

2.03 Caliche Physical Properties

- A. The untreated caliche material passing the 40 mesh, "Soil Binder", shall have the following properties:
  - Liquid Limit (LL) 40 maximum
  - Plasticity Index (PI) 5 to 16
  - Wet Ball Mill Mix Amount 50 (TEX 116E)
- B. The soil binder shall be tested to determine the gradation, LL, PI, Wet Ball Mill, and standard proctor moisture-density relation.

## PART 3 EXECUTION

### 3.01 Placement of Caliche Base Course

- A. Caliche base course shall be of compacted thickness and at locations indicated.
- B. Spread base course uniformly and compact to 98 percent of maximum laboratory density as determined in accordance with ASTM D 698, Method D.
- C. When compacted, finished surface of base course shall not vary more than 3/8-inch when tested with a ten-foot straightedge.
- D. Finished thickness of base course shall not vary more than one-half inch from the required thickness at any point.
- E. Areas not meeting the specified requirements will be rejected until corrected by the Contractor.

SECTION 02505  
LIMESTONE BASE

PART 1 GENERAL

1.01 Description

- A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install a limestone base course in accordance with the drawings and as specified herein.

1.02 Related Work

- A. Section 02070: Geogrid Reinforcement
- B. Section 02310: Earthwork for Pavements
- C. Section 02320: Lime Stabilized Soils
- D. Section 02700: Asphalt Surface Treatment
- E. Section 02705: Asphalt Pavement Repair
- F. Section 02710: Hot Mix Asphaltic Concrete
- G. Section 03305: Concrete Paving, Curb, and Sidewalks

1.03 Submittals: Contractor shall submit technical data and certification as follow:

- A. Laboratory Test reports for the Limestone:
- 1. Standard Proctor
  - 2. Atterberg Limits (ASTM D698)
  - 4. Wet Ball Mill

1.03 Field Quality Control

- A. A recognized Independent Testing Laboratory, selected by the Owner, shall perform all testing.
- B. The Contractor shall cooperate and coordinate all tests with the Lab, Engineer, and Owner.
- C. Contractor shall pay for all testing and retesting of failures.
- D. Limestone Base Course Testing
  - 1. Wet Ball Mill
  - 2. Atterburg Limits and Gradation
  - 3. Field In-Place Densities with moisture control, one per 300 square yards

PART 2 MATERIALS

2.01 Limestone Base Material

- A. The material shall be from a source approved by the Engineer. The material shall conform to TxDOT Item 247, Type A, Grade 6, and shall be free of vegetation.
- B. All materials shall be screened, and the oversize shall be crushed and returned to the screened materials again in such a manner that a uniform product will be produced, and will meet the following requirements of the current TxDOT Standard Specifications for Construction of Highways, Streets and Bridges.

2.02 Limestone Gradation	<u>Sieve Size</u>	<u>Percent Retained</u>
	2-1/2"	0
	1-3/4"	0-10
	No. 4"	45-75
	No. 40	60-85

2.03 Limestone Physical Properties

- A. The limestone material passing the 40 mesh, "Soil Binder", shall have the following properties:
  - Liquid Limit (LL) 40 maximum
  - Plasticity Index (PI) 5 to 12
  - Wet Ball Mill 45 Max. (TEX 116E)
- B. The soil binder shall be tested to determine the Liquid Limit and Plasticity Index.

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PART 3 EXECUTION

3.01 Placement of Limestone Base Course

- A. Limestone base course shall be of compacted thickness and at locations indicated.
- B. Spread base course uniformly and compact to 98 percent of maximum laboratory dry density as determined in accordance with ASTM D 698, Method C and within 1.5-percent of the optimum moisture content.
- C. When compacted, finished surface of base course shall not vary more than 3/8-inch when tested with a ten-foot straightedge.
- D. Finished thickness of base course shall not vary more than one-half inch from the required thickness at any point.
- E. Areas not meeting the specified requirements will be rejected until corrected by the Contractor.

SECTION 02510  
PVC WATER PIPE SYSTEM

PART 1 GENERAL

1.01 Related Work

- A. Section 02300: Earthwork
- B. Section 02525: Valves, Fittings, and Hydrants

1.02 Description

- A. This specification shall govern for furnishing of all equipment, materials, labor, and performance of all operations required to provide and install all pressure pipes, valve and fittings shown on the drawings and as specified herein.
- B. Installation of PVC pressure pipe complying with AWWA C900 for 4-12 inch diameter and C905 for 14-36 inch diameter including all labor, equipment and material, not specifically provide for by others, necessary to complete the work as stipulated in this specification and other contact documents.
- C. Remove pavement or other improved surfaces, excavated the trenches and pits to the required dimensions, provided for the maintenance of traffic and other utilities, support the adjoining ground or structures where necessary, and handle all drainage or ground water.
- D. Replace all damaged utilities, drains, sewers or other structures, backfill the trench and pits, remove surplus excavated material and clean the site of all debris.
- E. Test the completed pipeline for pressure and leakage requirements and disinfect the completed pipeline.
- F. Restore the pavements and other improved surfaces over the trenches.

1.03 Submittals

- A. Contractor shall submit manufacturer technical data for engineer's approval as follows for
  - Pipe
  - Fittings and Joint Restraints
  - Valves and boxes
  - Hydrants

1.04 Warranty

- A. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

PART 2 PRODUCTS

2.01 Pipe

- A. Pipes 4-inches in diameter and larger shall be PVC C900 and shall comply with the AWWA C900, pressure class 150, and a dimension ratio 18.
- B. Pipes 2-inches in diameter and smaller shall be PVC, schedule 40, pipe shall be type 1, bell end, PR-120, PVC 1120, ATSM D-2241, SDR-21.

2.02 Fittings

- A. 2-inch pipe fittings and smaller shall be polyvinyl chloride (PVC) plastic fittings and shall conform to ASTM D2466, PVC schedule 40.
- B. 2-inch gate valves and smaller shall be class 200 with all bronze body, non-rising stem, and solid disc. The disc shall clear the port area completely in open position.
- C. 4-inch pipe fittings and larger shall be mechanical joint type. The fittings shall be lined with enameled cement mortar in accordance with AWWA C104. Fittings shall have a pressure rating of 250 P.S.I.
- D. 4-inch gate valves and larger shall conform to the latest revision of AWWA standards C-509 covering resilient seated gate valves and be approved by UFLM. The valves shall be non-rising stem, opening by turning stem left or right and provided with 2" square operating nut. Prior to shipment from factory, each valve shall be tested by hydrostatic pressure equal to requirements for both AWWA (twice the specified working pressure) and 400 PSI UFLM requirements.
- E. All fittings shall utilize joint restraints, Uni-flange or Meg-a-Lug, AWWA C111, as shown on the plans.

## PART 3 EXECUTION

### 3.01 Handling and Storage

- A. The pipe, valves, fittings, and accessories shall at all times be handled with care to avoid damage.
- B. The contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work until it has been incorporated in the completed project.
- C. The interior all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

### 3.02 Alignment and Grade

- A. All pipes shall be laid to and maintained at the required lines and grades.
- B. Fittings, valves, air vents and hydrants shall be installed at the required locations with valve and hydrant stems plumb. No deviation shall be made from the required line or grade without approval in writing from the engineer or his representative.
- C. Deviations Occasioned by Other Structures: Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers and other structures encountered in the progress of the work shall be furnished by the contractor at his own expense. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the contractor in cooperation with the owners of such utility structures.
- D. All pipes shall be laid to the depth of cover shown on the contract drawings.

### 3.03 Excavation and Preparation of Trench

- A. The trench shall be dug in accordance with section 02300, Earthwork, to the required alignment and depth shown on the drawings.
- B. Trench Width: The minimum clear width of the trench measured at the horizontal diameter of the pipe shall be 18 inches or 1 foot greater than the outside diameter of the barrel of the pipe, whichever is greater. The maximum clear width of the trench at the top of the pipe shall not be more than the outside barrel of the pipe plus two feet.
- C. Preparation of Trench Bottom: The trench bottom shall be constructed to provide a firm, stable and uniform support for the full length of the pipe. Bell holes at each joint shall be provided to permit the joint to be made properly.
- D. Stockpiling of Excavated Material: All excavated material shall be stockpiled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural watercourses shall not be obstructed.

### 3.04 Lowering Pipe and Accessories into Trench

- A. All pipe, fittings, valves, hydrants and accessories shall be carefully lowered into the trench using suitable equipment in such manner as to prevent damage to pipe and fittings. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench.
- B. The pipe and accessories shall be inspected for defects prior to lowering into trench. Any defective damaged or unsound material shall be repaired or replaced.
- C. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean after laying.
- D. The sealing surface of the pipe, the bell to be joined and the elastomeric gaskets shall be cleaned immediately before assembly, and assembly shall be made as recommended by the manufacturer. When pipe laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line.
- E. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and the bedding restored. No pipe shall be laid when the trench conditions or the weather are unsuitable for proper installation as determined by the engineer.
- F. The pipe shall be cut in a neat and workmanlike manner without damage to the pipe so as to have a smooth end at right angles to the axis of the pipe.

### 3.05 Joining PVC Pipe to Fitting and Accessories

- A. General: Valves, hydrants or fittings connected to PVC plastic pipes shall be equipped with bells having a profile that permits a seal to be made directly between the pipe end and the bell of the fitting with an elastomeric gasket. The elastomeric gasket shall be supplied by the fitting or accessory manufacturer.
- B. Pipe ends shall be cut square, deburred and beveled in accordance with pipe manufacturer's recommendations.
- C. The push on joint is an elastomeric gasketed joint. It is assembled by positioning the elastomeric gasket(s) in the annular groove(s) of the bell or coupler and inserting the spigot end of the pipe into the bell or coupler after approved lubricant has been applied as recommended by the manufacturer. The spigot end of the pipe compresses the gasket radially to form a positive seal. The gasket and annular groove are designed, sized and shaped so that the gasket will resist displacement. Care shall be taken so that only the correct elastomeric gasket, compatible with the angular groove(s) of the bell or coupler is used. Insertion of the elastomeric gasket in the annular groove must be in accordance with the manufacturer's recommendations.
- D. The mechanical joint is a bolted joint of the stuffing box type. Each joint shall consist of:
  - 1. A bell provided with an exterior gland having bolt holes or slots and a socket with an annular recess for the sealing gasket;
  - 2. A sealing gasket;
  - 3. A follower gland with bolt holes matching those in the fitting;
  - 4. Tee bolts and hexagonal nuts. Installation recommendations from the manufacturer should be followed.
- E. Install mechanical joint restraints on all fittings and on pipes according to the scheduled shown on the plans.

### 3.06 Setting of Hydrants, Valves and Fittings

- A. Hydrants, valves and fittings shall be provided and installed as shown on the drawings. They shall be inspected and cleaned prior to installation.
- B. Thrust blocking shall be provided at each hydrant, value, bend, tee and at reducers or fittings where changes in pipe diameters or directions occur. Anchorage may also be made to the water main pipe with rods and clamps. The size and shape of the thrust blocking is as shown on the drawings.
- C. Plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of accessories, fittings and plain ends of plastic pipe shall be capped. Thrust blocking shall be provided at all dead ends of pipe that are capped or plugged.

### 3.07 Pressure and Leakage Tests

- A. Sufficient backfill shall be placed prior to filling with water and field testing to prevent lifting of the pipe. Where conditions permit, it is recommended that joints be left uncovered to allow any leaks that occur to be easily located. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed, but before placement of permanent surface. In all cases, sufficient backfill shall be placed to confine the pipe system during testing.
- B. Each section of the pipeline shall be slowly filled with water and all air expelled by means of taps at high points. The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the engineer. The test pressure shall be maintained by additional pumping if necessary for the specified time during which, the system and all exposed pipe, fittings, valves and hydrants shall be carefully examined for leakage. All defective elements shall be repaired or removed and replaced and the test repeated until all visible leakage has been stopped and the allowable leakage requirements have been met.
- C. The contractor shall furnish the gauges and measuring device for the leakage test, pump, pipe, connections and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of each leakage test shall be two hours. The new pipe system shall be tested at twice the system operating pressure but not less than 100-psi. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within after the pipe has been filled with water and the air in the pipeline has been expelled. A pressure variation of five psi from the specified test pressure is allowable during test duration. However, determination of actual leakage shall be made after line has been returned to specified test pressure at the end of test duration.

D. No installation will be accepted if the leakage is greater than that determined by the formula:

$$L = N \times D \times P \div 7400$$

L is the allowable leakage, in gallons per hour.

N is the number of joints in the length of pipeline tested.

D is the nominal diameter of the pipe, in inches.

P is the average test pressure during the leakage test, in pounds per square inch.

### 3.08 Backfilling

- A. Pipe bedded in sand to four-inch minimum above the pipe.
- B. After the bedded material has been placed, the balance of the backfill shall be machine placed as required but shall contain no large stones or rocks or frozen debris. Unless otherwise specified, trenches under pavements, sidewalks or roads shall be backfilled and compacted to 90 percent density per ASTM D698.
- C. Additional backfill material shall be supplied if needed to completely backfill the trenches, or to fill depressions caused by subsequent settlement.

### 3.09 Restoration of Surfaces and-or Structures

- A. The contractor shall restore and/or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surface or structure to a condition equal to that before the work began and to the satisfaction of the engineer and shall furnish all labor and material incidental thereto.

### 3.10 Cleaning Up

- A. The contractor shall remove and dispose surplus material, pipe, and temporary structures. All dirt, rubbish and excess earth from excavations shall be disposed of by the contractor in compliance with applicable laws and ordinances. The construction site shall be left clean, to the satisfaction of the engineer.

### 3.11 Disinfection

- A. Before being placed in service, the new pipeline and all exposed sections of existing pipelines shall be disinfected in accordance with AWWA Standard C651, "Disinfection of Water Mains."

SECTION 02600  
REINFORCED CONCRETE PIPE STORM DRAIN SYSTEM

1.0 GENERAL

1.1 Related Work

- A. Section 02050: Demolition
- B. Section 02200: Earthwork
- C. Section 03300: Cast-in-Place Concrete

1.2 Description

- A. This specification shall govern all equipment, plant, materials, labor and performance of all operation required to provide and performance of all operation required to provide and install all Storm Drain system as shown on the drawings and as specified herein.
- B. This specification is for the proper installation of a reinforced concrete pipe (RCP) system for storm drain applications.

1.3 Submittals

Contractor shall provide three sets of manufacturers' technical data for each of the following material items.

- A. Pipe
- B. Joint material
- C. Sand Bedding material (5-gallon bucket)

2.0 MATERIALS

- A. Concrete structures shall be constructed as shown on the plans and as specified in Sections 03300.
- B. Reinforced concrete pipe shall comply with the requirements of ASTM C76, Class III, tongue and groove pipe.
- C. Joint material shall be asphalt mastic or "ram-nek" or approved equal.

3.0 EXECUTION

3.1 Delivery, Storage, and Handling

- A. Upon arrival at the jobsite, the pipe shall be inspected for quantity and shipping damage.
- B. The pipe shall not be dropped. Tie down straps shall not be removed until the pipe is secured from rolling or from being dropped.
- C. Store pipe as close as possible in an organized manner. Pipe shall be stored on level ground. Blocking should be provided to prevent rolling.
- D. Protective covers on joint material shall remain on the pipe until it is ready for installation.
- E. Any damaged pipe should be removed and replaced with new pipe.

3.2 Installation

- A. Install pipe to the proper line and grade shown on the plans and per manufacturer recommendations.
- B. Trench shall be excavated on line, the pipe bedding shall be placed to the proper thickness. The top of the bedding must be adjusted to allow for the difference between the invert (flowline) and pipe profile wall thickness. Refer to manufacturer data for wall thickness.
- C. Trench shall be excavated to the width shown on the plans and as specified. When excavation depths or soil conditions require shoring or use of a trench box, the bottom of the shoring or trench box should be placed no lower than the top of the pipe.
- D. Joints shall be installed according the manufacturer recommendations. The ends of the pipe should be clean and free of debris just prior to placing the joint sealant material. The joint is designed to prevent infiltration of soil and exfiltration of storm water.

PART 1 GENERAL

1.01 Related Work

- A. Section 02310: Earthwork for Pavements
- B. Section 02500: Caliche Base
- C. Section 02700: Asphalt Surface Treatment
- D. Section 02710: Hot Mix Asphalt Pavement
- E. Section 03305: Concrete Paving, Curbs & Sidewalks

1.02 Quality Assurance

- A. Work in this area shall be done by a paving contractor approved by the Engineer and by personnel experienced in asphalt paving.
- B. This work shall be coordinated with other related work and conform to the applicable regulatory standards.

1.03 Guarantee

- A. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

PART 2 PRODUCTS

2.01 Materials

- A. Subgrade shall be compacted existing subgrade, compacted to 95% standard AASHTO.
- B. Flexible base shall consist of a 8" minimum thickness caliche base conforming to Texas Department of Transportation Item 247, Type "D", Grade 3. It shall be compacted to 95% Proctor (standard).
- C. Asphalt Paving shall consist of a 2-inch layer of conforming to Texas Department of Transportation, Item 340, Hot Mix Asphaltic Concrete Pavement, Type D. It shall be compacted to 98% of optimum density.
- D. Prime Coat shall be Medium Curing Cutback asphalt, MC-30, per ASTM D-2027.
- E. Tack coat shall be Asphalt Emulsion, SS-1, per ASTM D-977.
- F. Herbicide shall be commercial chemical for weed control, acceptable to and approved by EPA and authorities having jurisdiction.
- G. Pavement Marking paint shall be Alkyd-Resin, ready-mixed AASHTO M248, Type 1; yellow.

PART 3 EXECUTION

3.01 Performance

- A. After the completion of all general site grading in areas to receive asphalt pavement repair, backfill and compact subgrade to within 10-inches of finished grade. Compact as specified.
- B. Apply herbicide in strict accordance with manufacturers' requirements and recommendations for performance and safety.
- C. After successful testing of the subgrade, apply the specified flexible base (maximum lift of 8" per lift). Fine grade and compact as specified.
- D. After successful testing of flexible base, apply tack coat and 2-inch layer of hot mix asphalt in accordance with specified standards.
- E. The joint between existing paving and new asphalt work shall be in a straight uniform line, all in a smooth grade. Prime all surfaces as required.
- F. When applicable, apply striping, directional markings and other graphics indicated using specified coating system and as specified.

SECTION 02710  
HOT MIX ASPHALTIC CONCRETE (HMAC) PAVEMENT

PART 1 GENERAL

1.01 Summary

- A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install the bituminous asphaltic concrete pavement in accordance with the drawings and as specified herein.

1.02 Related Work

- A. Section 02500: Caliche Base
- B. Section 02720: Prime Coat
- C. Section 02725: Tack Coat
- D. Section 02740: Pavement Marks and Stripes
- E. Section 03300: Cast-in-Place Concrete
- F. Section 03400: Precast Concrete

1.04 Quality Control and Warranty

- A. Contractor shall submit a certificate from the manufacturer that the material supplied meets or exceeds the requirements of this specification.
- B. Finished surface shall not vary more than 1/8-inch when tested with a 10-foot straightedge.
- C. Areas not meeting the above requirements will be rejected until corrected by the Contractor.
- D. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

PART 2 MATERIALS

2.01 Hot Mix Asphaltic Concrete

- A. The hot mix asphaltic concrete (HMAC) shall be produced, transported, and applied in accordance with the latest edition of the Texas Department of Transportation (TxDOT), Standard Specifications for Construction of Highways, Streets and Bridges.
- B. The Contractor shall submit a one-year recent plant mix design certifying the hot mix asphaltic concrete design complies with the TxDOT specifications for engineer approval at least one-week prior to installation.
- C. The contractor shall attain a laboratory specimen of the design mix prepared in accordance with MIL-STD-620, Method 100, at the contractor's expense.
- D. The hot mix asphaltic concrete shall be TxDOT Item 340, Type "D". Hot mix-cold laid asphaltic concrete pavement, TxDOT Item 334, may be used for asphalt repair and level-up courses upon engineer approval.
- E. The HMAC shall be placed to the compacted thickness indicated on the drawings.

PART 3 EXECUTION

3.01 Placement

- A. The surface to receive the HMAC shall be prepared and approved before placing the HMAC.
- B. Apply tack coat to surface, when requested by the engineer, as specified in Section 02744.
- C. Spread wearing course with a bituminous spreader at a temperature of not less than 250 degrees F nor more than 300 degrees F.
- D. When compacted, the finished surface shall be smooth, uniform in texture and density, and conform to the cross sections and surface tests.
- E. Placement of the asphaltic mixture shall be done without tearing, shoving, gouging, or segregating the mixture and without producing streaks.
- F. The asphaltic concrete shall be rolled while hot. The first roller shall be a steel-wheel roller weighing not less than 10 tons.
- G. In areas where the use of machine-spreading is impractical, spread the mixture by hand. Spread mixture with hot rakes in a uniformly loose layer of a thickness that when compacted will conform to the required grade and thickness. During hand spreading carefully place each shovelful of mixture by turning the shovel over in a manner that will prevent segregation.
- H. Do not dump the loads any faster than can be properly handled by the shovelers and rakers.
- I. Geotechnical testing on core samples shall be performed at intervals of 500-square yards at locations requested by the Engineer. Compaction of each layer shall be 98% of maximum laboratory density.

SECTION 02715  
HOT MIX (HMAC) OVERLAY

PART 1 GENERAL

1.01 Summary

- A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install the asphalt hot-mix (HMAC) overlay in accordance with the drawings and as specified herein.

1.02 Related Work

- A. Section 02310: Earthwork for Pavement
- B. Section 02500: Caliche Base
- C. Section 02710: Hot Mix Asphaltic Pavement
- D. Section 02725: Tack Coat
- E. Section 02740: Pavement Marks and Stripes
- F. Section 03300: Cast-in-Place Concrete

1.03 Quality Control and Warranty

- A. Contractor shall submit a certificate from the manufacturer that the material supplied meets or exceeds the requirements of this specification.
- B. The Contractor shall submit a one-year recent plant mix design certifying the hot mix asphaltic concrete design complies with the TxDOT specifications for engineer approval at least one-week prior to installation.
- C. The HMAC shall be placed to the compacted thickness indicated on the drawings and not less than 1.5-inches in thickness.
- D. Finished surface shall not vary more than 1/8-inch when tested with a 10-foot straightedge.
- E. Areas not meeting the above requirements will be rejected until corrected by the Contractor.
- F. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

PART 2 MATERIALS

2.01 Hot Mix Asphaltic Concrete

- A. The hot mix asphaltic concrete (HMAC) shall be produced, transported, and applied in accordance with the latest edition of the Texas Department of Transportation (TxDOT), Standard Specifications for Construction of Highways, Streets and Bridges.
- B. The hot mix asphaltic concrete shall be TxDOT Item 340, Type "D".
- C. The Tack Coat material shall be as specified elsewhere.

PART 3 EXECUTION

3.01 Placement

- A. The asphalt material and tack coat shall be placed only when weather conditions, in the opinion of the engineer, are suitable.
- B. The existing pavement surface shall be cleaned and swept of all grass, weed, dirt, and other deleterious material. Weed and grass herbicide shall be applied according to manufacturer instructions.
- C. All existing potholes, ruts, and any other weak section of the existing pavement shall be cut out and repaired with hot-mix level-up.
- D. Tack coat shall be as specified but not in excess of 0.05 gallons per square yard.
- E. The hot-mix overlay shall be spread on a prepared and approved surface so that it will receive initial rolling during daylight. The hot-mix material shall be spread with an approved paving-finishing machine in such a manner that when properly compacted, the finished pavement will be smooth and of uniform density.
- F. Compaction shall be 98-percent of maximum laboratory density.
- G. Geotechnical testing on core samples shall be performed at intervals of 500-square yards at locations requested by the Engineer.

SECTION 02720  
PRIME COAT

PART 1 GENERAL

1.01 Summary

- A. This specification shall govern for furnishing all plant, labor, equipment, supplies, materials, and in performing all operations required to apply a prime coat of asphaltic material on an approved base course completed in accordance with the applicable section of this specifications.

1.02 Related Work

- A. Section 02500: Caliche Base
- B. Section 02710: Hot Mix Asphaltic Concrete
- C. Section 02725: Tack Coat

1.03 Submittal

- A. Contractor shall submit a letter of certification from the asphaltic material supplier for engineer approval.

PART 2 PRODUCTS

- A. The asphaltic materials used for prime coat shall be MC-30, ASTM D2027, Medium-Curing Cutback Asphalt, or RC-30 or RC-70, ASTM D2028, Rapid Curing Cutback asphalt.
- B. Attention is directed to the fact that the flash point for cutback asphalt is approximately 80-F.
- C. Care shall be taken to prevent open flames from coming in contact with cutback asphalt or gases of the cutback asphalt.
- D. The Contractor shall be responsible for any fires or accidents, which may result from heating the cutback asphalt.

PART 3 EXECUTION

- A. Before the application of the prime coat the surface shall be cleaned by sweeping or other approve methods and all loose materials compacted.
- B. If found necessary by the engineer the surface shall be lightly sprinkled just prior to application of the asphaltic materials.
- C. The asphaltic materials shall be applied on the clean surface by an approve type of self-propelled pressure distributor so operated as to distribute the material in the quantity specified, evenly and smoothly under a pressure necessary for proper distribution.
- D. The contractor shall provide all necessary facilities for determining the temperature of the asphaltic material in all the heating equipment and in the distributor and for determining the rate at which it is applied.
- E. The prime coat shall be applied at 60-F.
- F. The asphaltic material shall be applied at the rate not more than 0.4 and not less than 0.3 gallons per square yard, the exact rate to be determined by the engineer.
- G. Prime coat shall not be applied when the air temperature is below 60-F and falling, but it may be applied when the air temperature is above 50-F and is rising.
- H. Asphaltic materials shall not be piace when general weather conditions, in the opinion of the engineer, are not suitable.
- I. No traffic or hauling will be permitted over the freshly applied prime coat until authorized by the engineer.

SECTION 02725  
TACK COAT

PART 1 GENERAL

1.01 Summary

- A. This specification shall govern for furnishing all plant, labor, equipment, supplies, materials, and in performing all operations required to apply a tack coat of asphaltic material on an approved surface.

1.02 Related Work

- A. Section 02500: Caliche Base
- B. Section 02710: Hot Mix Asphaltic Concrete
- C. Section 02715: Hot Mix Overlay
- D. Section 02720: Prime Coat

1.03 Submittals

- A. The Contractor shall submit a manufacturer statement certifying the material meets or exceeds the requirements of this specification.

PART 2 MATERIALS

- A. The asphaltic materials used for tack coat shall be either Cutback Asphalt or Asphalt Emulsion. Cutback Asphalt shall be RC-70 or RC-250, ASTM D2028, Rapid Curing Cutback asphalt.
- B. Asphalt emulsion shall be SS-1, ASTM D 977. Asphalt Emulsion may be diluted with not more than 50 percent water.
- C. Care shall be taken to prevent open flames from coming in contact with cutback asphalt or gases of the cutback asphalt.
- D. The Contractor shall be responsible for any fires or accidents, which may result from heating the cutback asphalt.

PART 3 EXECUTION

- A. Before the application of the tack coat, the surface shall be cleaned by sweeping or other approve methods and all loose materials compacted.
- B. The asphaltic materials shall be applied on the clean surface by an approve type of self-propelled pressure distributor so operated as to distribute the material in the quantity specified, evenly and smoothly under a pressure necessary for proper distribution.
- C. The contractor shall provide all necessary facilities for determining the temperature of the asphaltic material in all the heating equipment and in the distributor and for determining the rate at which it is applied.
- D. The temperature of the tack coat material shall be 60-F during application.
- E. The asphaltic material shall be applied at the rate not more than 0.12 and not less than 0.08 gallons per square yard, the exact rate to be determined by the engineer.
- F. Tack coat shall not be applied when the air temperature is below 60-F and falling, but it may be applied when the air temperature is above 50-F and is rising.
- G. Asphaltic materials shall not be place when general weather conditions, in the opinion of the engineer, are not suitable.
- H. No traffic or hauling will be permitted over the freshly applied tack coat.

SECTION 03100  
CONCRETE FORMWORK

PART 1 GENERAL

1.01 Related Work

- a. Section 03200: Concrete Reinforcement
- b. Section 03300: Cast In Place Concrete
- c. Section 03400: Precast Concrete

1.02 Quality Assurance

- a. All concrete formwork, including forms, shores, reshores, and required braces to be the responsibility of the Contractor, who shall be responsible for the design, engineering and constructing of the formwork as required to meet construction loading requirements and applicable code requirements. Forms to be provided so that resultant concrete conforms to required lines, shapes and dimensions. Design formwork to be readily removed without impact, shock or damage to the in-place concrete surfaces and adjacent finishes.
- b. Formwork to be in compliance with ACI "Recommended Practice for Concrete Formwork" and with applicable sections of ACI 301.

1.03 Design

- a. Contractor shall be responsible for designing, erecting, shoring, bracing and maintaining formwork required to place concrete and to safely transmit all vertical and lateral loads that might be applied to the structure and formwork until the reinforced concrete has attained sufficient strength to safely accommodate such loads. Form design shall include considerations of live load, dead load, weight of equipment, weight of materials, impact loads, vibrator frequencies, ambient temperatures, foundation pressures, stress and any other factor affecting the safety of the structure during construction.
- b. Provide supports, reshores and bracing in such a manner as to provide a means of field adjustment of forms due to shift and/or settlement during placement procedures.
- c. Design formwork to minimize joints. Design formwork assemblies to facilitate form removal and to allow forms to be stripped without removal of shoring and bracing that may be required to remain in place. Forms to be readily removable with a minimum of impact to concrete structure.

PART 2 PRODUCTS

2.01 Form Materials, Accessories, and Ties

- a. Plywood: Douglas fir conforming to PS-1 for Construction and Industrial grade plywood.
- b. Lumber: Douglas fir; structural grade with grade stamp clearly visible.
- c. Form Release Agent: Commercial formulation that will not bond with, stain or adversely affect concrete surfaces. Agent shall not impair subsequent treatment of concrete surfaces requiring bond or adhesion.
- d. Form Ties: Factory fabricated, adjustable length, removable or snap-off metal ties designed to prevent form deflection and to prevent spalling of concrete surfaces upon removal. Provide ties so that portion remaining within concrete is at least 1-1/2" from outer surfaces. Provide face disk not larger than 1" in diameter with water seal feature.
- e. Chamfers: Wood or PVC strips, 3/4" x 3/4"; unless indicated otherwise on the Plans; maximum lengths as practical.
- f. Anchorage: Provide nails, lag bolts and other anchorage items as required of sufficient size, strength and character to maintain formwork in place while placing concrete.
- g. Waterstops: Refer Section 03300.

PART 3 EXECUTION

3.01 Inspection and Installation

- a. Verify lines, levels, elevations and measurements before proceeding with the formwork. Inspect formwork construction before any concrete is placed to insure adequate bracing and shoring to meet loading requirements.
- b. Construct forms in accordance with ACI 301 to exact sizes, shapes, elevations and dimensions required. Provide for openings, offsets, keyways and recesses as required. Provide all shoring and bracing required to ensure stability of formwork during and after placement. Support form-facing materials by structural members spaced sufficiently to prevent deflection. Provide extra studs and/or girts at intersecting planes to maintain true, square intersections. Seal all openings and joints to prevent leakage and "fins".
- c. Provide openings in forms to accommodate the work of other trades, including mechanical and electrical work.

- d. Set and build into formwork anchorage such devices, accessories and other embedded items required for other work that is attached or supported by cast in place concrete. Use setting drawings and instructions provided by manufacturer of such items. Ensure that items are installed level and plumb and that they are not disturbed during concrete placement operations.
- e. Provide temporary openings where interior areas of formwork are inaccessible for cleanout, inspection and/or concrete placement. Brace openings and set tightly to forms. Provide openings at bottom of forms to allow water to drain. Close all temporary openings with tight fitting panels, flush with inside face of forms.
- f. Forms for Exposed Concrete: Drill forms to suit ties utilized and to prevent concrete leakage. Provide chamfer strips at all sight-exposed external corners. Provide all other form-moulding shapes, recesses and projections with smooth finish materials and install in forms with sealed joints to prevent displacement.
- g. Edge Forms and Screed Strips for Slabs: Set edge forms and intermediate screed strips for slabs to obtain required elevations in the finish slab surface. Provide and secure units required to support screeds.
- h. Construction Joints: Locate construction joints not shown on the Drawings so as not to impair the strength and appearance of the structure, as approved by the Engineer. Provide keyways for slabs and all other construction joints in walls and beams. Place construction joints perpendicular to the main reinforcement with the reinforcement continued across the joint, unless otherwise indicated.

### 3.02 Form Releases, Form Removal, and Form Reuse

- a. Coat form surfaces with form release agent. Apply in strict accordance with manufacturer's printed instructions. Apply prior to placement of reinforcing steel, inserts, anchor devices and other embedded items.
- b. Forms shall be left in place until concrete has attained sufficient strength to support its own weight and construction and design loads, which may be imposed upon it. Reshore structural members as required by construction conditions to permit successive construction; such reshoring being the sole responsibility of the Contractor.
- c. Remove forms progressively so that no unbalanced loads are imposed on the structure. Do not damage concrete surfaces during removal of the forms.
- d. Clean and repair forms to be reused. Patching of voids will not be permitted at exposed faces of concrete.
- e. Store forms to prevent damage until reuse.
- f. Reapplication of form release agent is required prior to each reuse of forms.

SECTION 03200  
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 Related Work

- a. Section 03100: Concrete Formwork
- b. Section 03300: Cast In Place Concrete

1.02 Quality Assurance

- a. Comply with CRSE "Manual of Standard Practice for Detailing Reinforced Concrete Structures" and Documents 63 and 65.
- b. Conform to ACI 301 Specifications for Structural Concrete for Building and 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures.

1.03 Submittals

- a. Shop Drawings: If requested by Engineer, submit shop drawings indicating fabrication, bending and placement of reinforcing steel. Show locations and quantities of steel sizes, spacing, bending and cutting requirements, splicing, stirrup spacing, support and spacing devices.
- b. Certificates: If requested by the Engineer, submit 4 copies of steel mill test certificates for supplied concrete reinforcing. Indicate physical and chemical analysis.
- c. Foreign Manufactured Reinforcing Steel: Test supplied steel for compliance to ASTM requirements by an independent testing laboratory located in the United States, approved by the Owner. All costs for testing to be borne by the Contractor.

PART 2 PRODUCTS

2.01 Materials

- a. Reinforcing steel: ASTM A615, 60 ksi yield billet-steel deformed bars: No. 3 bars and less, and No. 4 bars used as stirrups or ties - Grade 40; all others - Grade 60; uncoated finish.
- b. Welded Wire Fabric: ASTM A185. Sizes and gauges as indicated on the Drawings. Provide in flat sheets (rolled sheets are unacceptable).
- c. Tie Wire: 16 gauge annealed.
- d. Chairs, Bolsters, and Supports: Plastic-coated type, of proper size, type, and spacing required to support reinforcing steel and to maintain required clearances prior to and during placing procedures. Provide flat "tins" welded to feet of bolsters to be placed over insulation, void forms or other otherwise unstable surfaces.

2.02 Fabrication

- a. Fabricate reinforcing steel to required shapes and sizes with fabrication tolerances in accordance with ACI 315.
- b. Do not re-bend or straighten reinforcing in a manner, which will damage or weaken the material.
- c. Splices: Locate splices for scheduled reinforcing. Splices for unscheduled reinforcing to be minimized. Where splices area required, stagger splices in adjacent bars.

PART 3 EXECUTION

3.01 Delivery, Storage, Handling, and Preparation

- a. Deliver reinforcing steel to the project site bundled with weather resistant tags and marks. Store at site in such a manner as to prevent damage and accumulation of dirt, mud and excessive rust.
- b. Contractor shall, prior to placement of any reinforcing steel, secure Engineer's approval for placement, tying and supporting procedures. Required interpretations shall be obtained prior to initiation of placement.

3.02 Installation

- a. Comply with specified standards for details and methods of reinforcement placement and support.
- b. Clean reinforcement to remove loose rust and scale and any other materials which will reduce bond between reinforcing and concrete.
- c. Place reinforcement to obtain required coverage. Provide chairs, bolsters and bar supports in sufficient types, quantities and locations to carry reinforcement. Arrange, space and securely tie bars and bar supports together with tie wire to hold reinforcement accurately in position. Set wire ties so the ends are directed away from exposed concrete surfaces.

- d. Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations.
- e. Where required, install wire fabric in as long lengths as practical. Lap adjoining pieces at least one full mesh and lace together with wire. Do not make end laps between supporting beams or directly over beams of continuous structures. Offset end laps with adjacent widths to prevent continuous laps.
- f. Splices: Unless otherwise shown all laps and splices shall be equal to 30 bar diameters, but in no case less than 12". This also applies to temperature reinforcing.

### 3.03 Inspections

- a. Notify Engineer 24 hours in advance of concrete placement operations to permit inspection of reinforcing steel and preparatory work and to allow necessary corrections to be made before such operations are commenced.

SECTION 03300  
CAST IN PLACE CONCRETE

PART 1 GENERAL

1.01 Related Work

- a. Section 03100: Concrete Formwork
- b. Section 03200: Concrete Reinforcement
- c. Section 03400: Precast Concrete

1.02 Quality Assurance

- a. Perform work in accordance with ACI 301 - Specifications for Structural Concrete for Buildings and ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- b. Obtain materials from same source throughout the work.
- c. All concrete work included in other sections of these Specifications that is NOT specifically described therein shall comply with the requirements of this Section.

PART 2 PRODUCTS

2.01 Concrete Materials

- a. Cement: ASTM C-150; normal - Type 1 Portland cement; gray color. Concrete for the various members of the structure to a minimum compression strength in pounds per square inch within 28 days as indicated on the Drawings.
- b. Fine and coarse aggregates: ASTM C-33; maximum aggregate size to be 1-1/2", unless noted otherwise.
- c. Water: Clean, potable and free from oil, acid, alkalines, salts and other deleterious materials.

2.02 Admixtures and Accessories

- a. Except for air-entrainment averaging 3% but not exceeding 5% no other admixtures to be used with Engineer's approval. Air-entrainment admixture to conform to ASTM C-260.
- b. Bonding Agent: Polymer resin emulsion or latex emulsion.
- c. Curing Compound: ASTM C-309, Type 1, curing compound shall not effect finishes to be installed nor adhesives used to install them. Sonneborn Kure-N-Seal or equal.
- d. Waterstop: Volclay "Waterstop-Rx" or equal.
- e. Expansion Joint Filler: performed, non-extruded resilient, ASTM D-994.

PART 3 EXECUTION

3.01 Inspections and Job Conditions

- a. Verify inserts, pipes, sleeves, conduits, anchors, plates, reinforcement and other items to be cast into concrete are accurately placed, securely position and will not obstruct placement of concrete.
- b. Conform to ACI recommendations for hot-weather (ACI 305) and for cold-weather (ACI 306) concrete mixing and placement.
- c. Perform no concrete operations when temperature is below 40 degrees F. or is expected to fall below 40 degrees F. within the ensuing 24 hours. Temperature of mixed concrete shall not exceed 90 degrees F. nor be less than 60 degrees F.

3.02 Concrete Design and Mixing

- a. Mix concrete in accordance with ACI 613. Volumetric proportioning not allowed. Measurement of materials to be by weight only by methods that will permit proportions to be accurately controlled.
- b. Concrete may be proportioned and mixed on the job, dry batched for mixing on the job or procured from a "transit mixed" concrete. If transit-mixed, mixing and transporting operation to conform with ASTM C-94. Mixing water shall not be added after a truck has left the plant except by permission of Engineer or his representative. No concrete shall be used in the work, which has been held longer than 1-1/2 hours in a mixer truck. If dry-batched to job site, the batching plant operations to conform with ASTM C-94. Transportation of dry materials shall be performed in such a manner as to prevent loss, segregation or contamination of ingredients. If job-proportioned and mixed, aggregates must be stock piled separately and handled in such a manner as to prevent inclusion of any foreign materials. Except for emergency hand-mixing under approved condition, all concrete to be machine mixed in an approved type mixer for a minimum period of 1-1/2 minutes in a drum rotating at a peripheral speed of about 200 feet per minute. All equipment to be clean.

- c. Aggregates to be proportioned by weight. Use of fractional sacks of cement will not be permitted unless the cement is proportioned by weight. Water to be measured by an accurate measuring device, which can be adjusted to compensate for variations in free moisture content or aggregates. Re-tempering of partially hardened concrete or mortar will not be permitted. Concrete to be proportioned so as to include the minimum amount of water to obtain a workable mix in accordance with the limits prescribed.
- d. The determination of the proportions of cement, aggregate and water to attain the required strengths shall be established by tests which shall be made in advance of the beginning of operations using the consistencies suitable for the work and in accordance with the "Standard Method of Making Compression Tests of Concrete", ASTM C-39.
- e. Unless noted otherwise on the Drawings, all concrete shall be 3000-psi minimum compression strength at 28 days.

### 3.03 Placement

- a. No concrete to be placed at anytime without the Engineer's direct presence, unless approved by the Engineer.
- b. Notify the Engineer 24 hours prior to commencement of placement operations. Placement of concrete will not be allowed until inspection and approval of reinforcement, formwork and other conditions of placement has been done by the Engineer.
- c. Maintain concrete coverage around reinforcing as shown on the Drawings. In no case shall coverage be less than 1-1/2", unless noted otherwise.
- d. All concrete placement to be in strict accordance with ACI 301. For standard concrete, elapsed time between proportioning of materials and placing of concrete shall not exceed 1-1/2 hours. Delivery of concrete to be scheduled so that continuity of a pouring operation is not interrupted for more than 15 minutes between trucks.
- e. Before depositing concrete, remove debris and water from spaces to receive concrete. Wet forms and abutting concrete surfaces as directed.
- f. When depositing new concrete against old, wire brush clean and thoroughly wet old surfaces and cover with bonding agent in accordance with manufacturer's recommendations.
- g. Convey concrete from mixer to forms immediately by means of approved equipment that will avoid segregation upon placement. Deposit continuously and in layers of such thickness so that no concrete will be deposited on concrete that has hardened. Consolidate concrete to insure avoidance of excessive voids and honeycombs using mechanical vibrators, supplemented by hand-rodging and tamping where required. Do not vibrate to the point that segregation occurs. Vibration to conform to ASTM C-309.
- h. After placement, screed concrete to required lines and levels working with horizontal and vertical strokes. Use bull-float or darbies to smooth surface and to raise fills to surface. Check for humps, depressions or other surface irregularities and correct. Float surface to 1/4" in 10'-0" tolerance. Finish in accordance with Paragraph 3.4, Finishing.
- i. Construction loads on in-place construction shall at no time exceed the live load for which the in-place structure was designed. Contractor to obtain same from Engineer and Engineer prior to loading structure.
- j. If, for any reason, it shall become necessary to stop placing of concrete at places other than those indicated on the Drawings, such places and the manner of making the joint, shall require the approval of the Engineer. Adequate provisions shall be made against shear by means of keys or added reinforcement or as otherwise directed. Before depositing new concrete against old, forms to be retightened and hardened surfaces cleaned and covered with a coating of mortar and neat cement grout.
- k. Where shown on the Drawings and wherever else concrete cannot be placed continuously, provide construction joints made and located in accordance with methods which, will least impair the strength of the structure. Where waterstops are indicated, install in strict accordance with manufacturer's recommendations. Place concrete continuously between construction joints. Unless indicated otherwise, continue reinforcing across joints and provide 1-1/2" keyways. Prior to pouring, clean previously-poured concrete and apply bonding agent throughout joint area. Do not break or otherwise interrupt successive pours such that cold joints occur.

### 3.02 Finishing

- a. Concrete surfaces to be left exposed to be smooth rubbed finish. Wet surfaces while concrete is green and rub with a carborundum brick until uniform color and texture are produced. Remove, burrs, fins and other surface irregularities.
- b. Concrete slabs to be steel-troweled finished unless indicated otherwise. Machine troweling is acceptable, subject to Engineer's approval. Concrete floor areas NOT scheduled to receive floor finish shall be hand troweled after machine troweling and light broomed.
- c. Curing: Apply one coat of Super Rez Seal, by Euclid Chemical Co. to entire slab surface in strict accordance with manufacturer's recommendations. Apply second coat a minimum of twenty-one (21) days later to all areas to have exposed, sealed, concrete floor.
- d. Slope slabs to drain as indicated on the Drawings.

- e. Patch all surface defects immediately upon removal of forms. Defects include, but are not limited to, cracks in excess of .01", honeycombs, rock pockets, spalls and any surface voids or cracks extending back to reinforcing. Patch all tie holes full and solid. Patching material to be 1 part cement to 2-1/2 parts sand. Color to match concrete surrounding defective area by use of appropriate volumes of white cement. Mix with water to stiffest consistency allowing handling and placing. Dampen area to be patched and an area 6" around. Coat with bonding agent. Patch, thoroughly consolidating mortar into patched area. Keep patched area damp cured for 7 days.
- f. Remove and replace all concrete not conforming to lines, levels, details and elevations required by the Drawings. Slabs to be level to 1/4" in 10'-0" tolerance. Grind all slabs, where required.

### 3.03 Testing

- a. Contractor shall coordinate with testing laboratory and shall notify same to insure laboratory representation at all required pours.
- b. A recognized Independent Testing Laboratory will be selected by the Owner to perform the following field and laboratory testing services at the expense of the Owner:
  - 1) Inspect and test all concrete materials, except those items such as domestic cement and domestic reinforcing steel covered by mill certificates, which need not be tested by the Laboratory.
  - 2) Make and test concrete cylinders at the frequency of one set of four specimens per 50 cubic yards of concrete for each class placed or fraction thereof per day's pour.
- c. The scope of testing services may be adjusted at the Owner's discretion prior to or at any time during the project.
- d. All inspections and tests to be performed in accordance with applicable ASTM Standards. Slump tests to be in accordance with ASTM C-43. Compression tests to be in accordance with ASTM C-31. In the event the Laboratory determines deviations from the Specifications, the Engineer and Contractor shall be notified immediately. Written reports covering all inspection and testing operation to be furnished promptly to the Engineer and Contractor.
- e. In addition to the foregoing function, the Testing Laboratory shall be considered available to consult with the Contractor and his sub-contractor in respect to the design, proportioning and mixing of concrete. The Contractor will be responsible for notifying the Testing Laboratory at appropriate points of progress so that the identified scope of testing can be reflected. Such notification to be made in a timely fashion. The Contractor shall cooperate with the Testing Laboratory so that the functions of the laboratory may be properly performed.
- f. Should cylinder breaks indicate that below-specified strength tests shall be made on those areas so affected. The method of loading shall conform to the ACI 318. Such tests to be made by the Independent Testing Laboratory and at the expense of the Contractor. Any area or member found to be inadequate by the above test shall be removed and replaced to the satisfaction of the Engineer.
- g. The testing of materials described herein in no way relieves the Contractor of his obligation to provide materials and construction in full compliance with the requirements of the Contract Documents.

### 3.04 Protection and Cleanup

- a. Immediately after placement, protect concrete from premature drying and excessively hot or cold temperatures.
- b. Maintain concrete with minimum moisture loss at uniform temperature for sufficient time to insure hydration of cement. Perform curing of all concrete by applying curing compound to horizontal concrete surfaces in two coats, with second coat at right angles to first. Apply curing compound in strict accordance with manufacturer's recommendations. Moist-curing or moisture-retaining coverage methods are acceptable, but will require approval prior to concrete placement.
- c. Immediately after completion of concrete operations, remove all debris from site. Immediately prior to final inspection, wash, clean and mop all exposed all exposed concrete floors.

SECTION 03305  
CONCRETE PAVING, CURB, and SIDEWALKS

PART 1 GENERAL

1.01 Related Work

- A. Section 02310: Earthwork for Pavement
- B. Section 03200: Concrete Reinforcing
- C. Section 03300: Cast In Place Concrete
- D. Section 03310: Joint Sealant

1.02 Quality Assurance, Job Conditions, and Warranty

- A. All work done in this area to be paid by personnel experienced in concrete finishing work.
- B. Perform no concrete operations when temperature is below 40 degrees F or is expected to fall below 40 degrees F within the ensuing 24 hours.
- C. Temperature of mixed concrete shall not exceed 90 degrees F nor be less than 60 degrees F.
- D. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

PART 2 PRODUCTS

- A. Concrete shall be of material composition as specified Section 03300; 3000 P.S.I. at 28 days. Maximum aggregate size to be 1-1/2".
- B. Expansion Joint Material (Wood): 3/4" B or better redwood.
- C. Expansion Joint Material (Sealant) shall be as specified in Section 02760.
- D. Curing compound to be resin base ASTM C309, Type I.
- E. Reinforcing Steel shall be as shown on the drawings and as specified Section 03200.
- F. Dowels, except as otherwise detailed, shall be No. 4 reinforcing bars 18" long at 24" on center with one side wrapped with plastic tubing to form a slip joint.
- G. Subgrade and Base materials to be placed as shown on the drawings and as specified elsewhere.

PART 3 EXECUTION

3.01 Performance

- A. Excavate earthwork as required to obtain required finish grades, allowing for required thickness of fill material and concrete. Compact earthwork true to line and grade. Earthwork shall be free from soft spots and loose materials. Fill areas to receive concrete with select fill. Level and compact as specified elsewhere.
- B. Forms to be straight, durable and have a depth equal to the required depth. The forms to be securely staked to line and grade in such a manner that there shall be no movement when the concrete is placed. Wet down subgrade before placing concrete.
- C. Reinforcing steel and expansion joints with dowels to be located and accomplished in accordance with the Drawings. Expansion joints and transverse markings to be square with the form-work. Transverse markings to be 1/5 depth of concrete thickness and to be located between expansion joints at a distance not to exceed 10-foot intervals.
- D. Concrete shall be placed in such a manner so that segregation does not occur. Concrete shall be thoroughly tamped with a "jitterbug" or other approved tool. All pours shall begin and end at expansion joints; no cold joints allowed.
- E. Immediately after the finishing has been completed, curing compound shall be evenly applied in strict accordance with manufacturer's recommendations. Forms shall be carefully removed so that the concrete work is not damaged. All "honeycombs" shall be plastered before backfilling is accomplished. Protect work for duration of project. Replace portions of work that become damaged prior to acceptance of building by Owner.

3.02 Finishes

- A. All joints and edges shall be tooled and surface of sidewalks and paving shall receive a medium broom finish unless otherwise indicated. Broom marks shall be uniform and even. The marks shall break the surface to prevent surface from becoming slick when wet. Run broom marks across the width of the forms. Concrete curbs shall have a rubbed and grout coat finish.
- B. Non-slip finish, if required, shall be installed as per manufacturer's recommendations.
- C. Where washed aggregate surface is called for on the plans, aggregate size shall not exceed 3/4".

SECTION 03310  
JOINT SEALANT

PART 1 GENERAL

- A. This section shall govern for sealing control, expansion, and/or construction joints in concrete to create a continuous diaphragm to prevent fluid migration and accumulation of debris.

1.01 Related Work

- A. Section 03300: Cast In Place Concrete
- B. Section 03305: Concrete Paving, Curb, and Sidewalk
- C. Section 03400: Precast Concrete

1.02 References

- A. American Society for Testing Materials (ASTM)

1.03 Submittal

- A. Contractor shall submit manufacturer technical data for engineer approval.

PART 2 PRODUCTS

2.01 Materials

- A. Dow Corning 888 Silicone Joint Sealant over wood expansion material or approved equal.

PART 3 EXECUTION

3.01 Installation for Silicone Sealant

- A. Clean and blowout joint of contaminants and impurities to a minimum 1/2-inch depth. Joint must be properly recessed immediately after installation.
- B. Apply sealant in a continuous operation to properly fill the joint. The sealant shall only be applied when temperature is above 40 F.
- C. Excess sealant shall be cleaned off with an appropriate solvent.