CONCRETE 3

SECTION 03051

CONCRETE COLOR ADDITIVE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements For Color Additive Used In:
   1. Portland cement concrete paving specified in Section 02751.

1.02 RELATED SECTIONS

A. Section 07900 - Joint Sealers: Colored sealants for joints.

1.03 REFERENCES

A. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2003.

B. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete; 2005.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's specifications and instructions for pigments and curing compounds.

C. Samples for Verification of Pigment Color: Sample chips of specified colors indicating pigment numbers and required dosage rates. Submittals are for general verification of color and may vary somewhat from concrete finished in field according to specifications.

1.05 QUALITY ASSURANCE

A. Mock-Up: Provide full-scale mock-up to demonstrate methods of obtaining consistent visual appearance.
   1. Paving: 4 feet by 4 feet.
   2. Locate mock-up on site.
   3. Retain samples of materials used in mock-up for comparison with materials used in remaining work.
   4. Accepted mock-up constitutes visual standard for work.
   5. Mock-up may remain if approved by Owner and Design Consultant.

1.06 PROJECT CONDITIONS

A. Plant-Mixed Concrete: Schedule delivery of concrete to provide consistent mix times from batching until discharge.

B. Concrete Paving: Schedule placement to minimize exposure to wind and hot sun before curing materials are applied. Avoid placing concrete if rain, snow or frost is forecast within 24 hours. Protect fresh concrete from moisture and freezing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer - Concrete Color Additives: Davis Colors; 7101 Muirkirk Road, Beltsville, MD 20705. ASD. Tel: (800) 800-6856 or (301) 210 3400. Fax: (301) 210-4967. or 3700 E. Olympic Boulevard, Los Angeles, CA 90023. ASD. Tel: (800) 800 6856 or (323) 269-7311. Fax: (323) 269-1053. e-mail: www.daviscolors.com

B. Substitutions: See Section 01600 - Product Requirements.

2.02 COLORS

A. Concrete Colors: Provide cement, aggregate, and pigment as required to produce consistent colors using the materials specified.

B. Exterior Walls:
   1. Cement: Gray or White.
   2. Color Additive: Color to be selected by Design Consultant from Davis Colors subtle, standard, and premium color lines.
      a. Allow for ___ different pigment colors.

C. Concrete Floors:
   1. Cement: Gray or white.
   2. Color Additive: Color to be selected by Design Consultant from Davis Colors subtle, standard, and premium color lines.
      a. Allow for # different pigment colors.
      b. Allow for up to # percent dosage for each color.

2.03 MATERIALS

A. Colored Concrete Additive: Pure, concentrated mineral pigments especially processed for mixing into concrete and complying with ASTM C 979.
   1. Base dosage rates on weight of portland cement, fly ash, silica fume, lime and other cementitious materials but not aggregate or sand.
   2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured Mix-Ready disintegrating bags to minimize job site waste.

B. Admixtures: Do not use calcium chloride admixtures.

C. Curing Compound for Colored Concrete: Davis Colors W-1000 Clear Cure & Seal; complying with ASTM C 309.

D. Form Facing Material: Smooth, non-porous surface; steel, plastic, or high-density overlaid plywood, as permitted by applicable specification; with watertight joints, sealed to prevent leakage.

2.04 MIXES

A. Concrete Mix: Mix pigments in accordance with manufacturer's instructions, until pigments are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.

PART 3 EXECUTION

3.01 FORMED SURFACES

A. Stripping: Leave forms in place as long as practical. Remove forms when concrete has reached a consistent age to maintain uniformity of curing conditions throughout Project.

B. Sandblasted Finish: Allow concrete to cure to sufficient strength that it will not be damaged by blasting but not less than seven days.

3.02 FLOORS AND PAVING

A. Broomed Finish: Do not dampen brooms.

B. Trowel Finish (sand blast final finish): Do not over-trowel or start troweling late.

3.03 PATCHING CONCRETE

A. Fill holes and defects in concrete surface within 48 hours of form removal.

B. Use the same patching materials and techniques that were approved on mock-up.

C. Make patches with a stiff mortar made with materials from the same sources as the concrete. Adjust mortar mix proportions so dry patch matches dry adjacent concrete. Add white cement to mortar mix if necessary to lighten it.

D. Exposed Aggregate Finish: Add aggregate to mortar mix so patches will have the same texture and appearance as adjacent concrete.

3.04 CURING CONCRETE

A. Maintain concrete between 65 and 85 F degrees during curing.

B. Cure concrete using curing compound; apply curing compound in accordance with manufacturer's instructions.

3.05 TOLERANCES

A. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of unpigmented concrete, are acceptable.

END OF SECTION

SECTION 03052

CONCRETE COLOR STAIN

PART 1 GENERAL

1.01 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's specifications and instructions for pigment stains.

C. Samples for Pigment Color Selection: Pigment manufacturer's color chart or sample chip set; indicate pigment number and required dosage rate.

PART 2 PRODUCTS

2.01 CHEMICAL STAIN

A. Color Chemical Stain: Lithochrome Chemical Stain manufactured by L.M. Schofield Company, 713/859-3987 or approved equal. Color to be selected by Design Consultant from manufacturer's standard colors.

PART 3 EXECUTION

3.01 FLOORS AND PAVING

A. Concrete paving shall be power washed to provide surface free from oil, grease and any foreign matter which would prevent necessary penetration and subsequent reaction of the stain solution with the concrete surface.

B. apply chemical stain material per the manufacturer's recommendations.

C. Apply stain with broom-type, medium stiff bristle brush to provide a consistent color over the area involved.

D. Apply a second coat and subsequent coats if required at least 8 hours after the previous application. After last coat of strain has dried, remove all residue and salts by wet scrubbing and flushing with clean water. Control run-off of flushing water to prevent damage to the surrounding area.

3.02 TOLERANCES

A. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of unpigmented concrete, are acceptable.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Concrete footings.

C. Concrete curb wall and retaining wall.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Abrasive blast finish.

G. Concrete curing.

1.02 RELATED SECTIONS

A. Section 02751 - Portland Cement Concrete Paving: Sidewalks.

B. Section 07900 - Joint Sealers.

1.03 REFERENCES

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.

G. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001.

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2005.

I. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2004b.

J. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.

K. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2004a.

L. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2004a.

M. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2003.

N. ASTM C 150 - Standard Specification for Portland Cement; 2004a.

O. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the

Volumetric Method; 2001.

P. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2001.

Q. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2003.

R. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2004.

S. ASTM C 685/C 685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2001.

T. ASTM C 881/C 881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2002.

U. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999.

V. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2002.

W. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 1998 (Reapproved 2003).

X. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Facing for Exposed Finish Concrete: Steel; Steel. Fiberglass; MDO plywood; or _____.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   4. Form Ties: Removable type, outside of formwork, which will not mar finish of concrete.

2.02 REINFORCEMENT

A. ASTM A 615/A 615M Grade 60 (420).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Joint Dowel Bars:
   1. Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Water: Clean and not detrimental to concrete.

2.04 CHEMICAL ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260.

B. Air Entrainment Admixture: ASTM C 260.

C. Chemical Admixtures: ASTM C 494, Type A - Water Reducing.
1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 ACCESSORY MATERIALS

A. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.

B. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type. _____

C. Epoxy Bonding System: ASTM C 881, type as required by project conditions.

D. Non-Shrink Grout: ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours: 2,400 psi.
2. Minimum Compressive Strength at 28 Days: 7,000 psi.

E. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

F. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.06 BONDING AND JOINTING PRODUCTS

A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, 1/2 inch thick and full depth of slab less 1/2 inch; tongue and groove profile.

B. Sealant and Primer: As specified in Section 07900.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Design Consultant for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3000 psi.
2. Cement Content: Minimum of 480 pounds of cement per cubic yard. of concrete.
3. Water-Cement Ratio: Maximum 50 percent by weight.
4. Total Air Content: 4 percent, determined in accordance with ASTM C 173/C 173M.

5. Maximum Slump: 51/2 inches.
6. Maximum Aggregate Size: 1-1/2 inch.

2.08 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C 94, except as may be modified by the following:
   1. Delete references for allowing additional water to be added to batch for material with slump. Addition of water to the batch will not be permitted.
   2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
   3. When air temperature is in between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Provide chamfer strips on all exposed external corners and edges.

3.03 INSTALLING REINFORCEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Notify Design Consultant not less than 24 hours prior to commencement of placement operations.

C. Ensure reinforcement; inserts; embedded parts; formed construction joint devices will not be disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with joint filler.

E. Place joint filler in slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

F. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.

G. Install joint devices in accordance with manufacturer's instructions.

H. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

I. Apply sealants in joint devices in accordance with Section 07900.

J. Place concrete continuously between predetermined expansion, control, and construction joints.

K. Do not interrupt successive placement; do not permit cold joints to occur.

L. Place slabs in saw cut pattern indicated.

M. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

N. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.05 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/16 inch or more in height. Provide finish as follows:

D. Exposed Aggregate Finish of curb wall and retaining wall:
   1. Sand blast concrete finish to surface of curb wall and retaining wall shall be light abrasive blast to expose fine aggregate with exposure of course aggregate (maximum 1/16" reveal). Sand blasting shall not affect the color of the finished surface.
   2. Prepare a mock-up of no less than 10 square feet separate from the proposed work.
      a. Match existing sandblast finish of concrete paving at _____.
   3. Abrasive shall be graded blasting sand or abrasive and shall be of gradation, size and sharpness to produce an acceptable finish on the field condition mock-up.
   4. Contractor shall have on hand for the blasting of the mock-up, several various abrasives, which shall include sharp type abrasive of medium and fine gradation.
   5. Apply finish in presence of the Owner and Design Consultant. Receive approval prior to applying finish to any concrete work. Maintain continuity of finish throughout the job.
   6. Perform abrasive blasting after not less than seven (7) days of curing and before 30 days of curing time has elapsed.
      a. Ensure the surfaces to be blast finished are blasted at the same age for uniform results.
      b. Blast prior to sealing joints.
   7. Protect adjacent materials during blasting operations. Maintain control of concrete chips, dust and debris.
      a. Clean up and remove such material at completion of each day of operation.
      b. Prevent migration of airborne materials with containing devices.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
   2. High early strength concrete: Not less than 4 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   2. Begin final curing after initial curing but before surface is dry.
      a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
      b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01400.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design to testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 75 cu yd or less of concrete placed.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.

3.08 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Design Consultant and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Design Consultant. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Design Consultant for each individual area.

END OF SECTION

SECTION 02741

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

C. Surface sealer.

1.02 RELATED SECTIONS

A. Section 02310 - Grading: Preparation of site for paving and base.

B. Section 02316 - Fill and Backfill: Compacted subgrade for paving.

C. Section 02751-Portland Concrete Paving: concrete.

1.03 UNIT PRICES

A. See Section 01270 - Unit Prices for requirements applicable to this section. Measurement and payment will be as follows:

B. Asphalt Pavement Mix (Base Course): By the ton; cubic yard; square yard. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

C. Asphalt Pavement Mix (Binder Course): By the ton; cubic yard; square yard. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

D. Asphalt Pavement Mix (Wearing Course): By the ton; cubic yard; square yard. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

E. Seal Coat: By the square yard. Includes preparing surfaces and applying.

1.04 REFERENCES

A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1994, Sixth Edition.

B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Third Edition.

C. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 1982 (Reapproved 1999).

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the City of San Antonio Public Works standard's.

B. Obtain materials from same source throughout.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 60 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for Base Course: In accordance with the City of San Antonio, Texas Public Works, Standard Specifications for Public Work Construction, latest revision, Item 200 Flexible Base.

B. Prime Coat: In accordance with the City of San Antonio, Texas Public Works Construction, latest revision, Item 202 Prime Coat Public Work's standards..

C. Tack Coat: In accordance with the City of San Antonio Public Works standards Construction, latest revision, Item 203 Tack Coat.

D. Seal Coat: AI MS-19, sand; fog; or slurry type. In accordance with the City of San Antonio, Texas Public Works Standard Specifications for Public Work Construction latest revision, Item 207 single course Bituminous Slurry Seal.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Provide plant mixed, hot-laid, hot-mix asphalt-aggregate mixture complying with ASTM D 3515 and in accordance with TxDOT Specification No. 340.

B. Use dry material to avoid foaming. Mix uniformly.

C. Wearing Course: In accordance with the City of San Antonio, Texas Public Works Standard Speicificaitons for Public Works Construction, latest revision, Item 205, Hot Mix Asphaltic Concrete pavement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

A. Place and compact base course in accordance with the City of San Antonio Public Works Standards.

3.03 PREPARATION - PRIMER

A. Apply primer in accordance with the City of San Antonio Public Works Standards.

B. Apply primer to contact surfaces of curbs, gutters.

C. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with the City of San Antonio Public Works Standards.

B. Apply tack coat to contact surfaces of curbs and gutters to be in contact with asphalt pavement.

C. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with City of San Antonio Public Works Standard Specifications for Public Works Construction, latest revision, Item 204 Surface Treatments.

B. Place to 2 inch compacted thickness.

C. Install gutter drainage grilles and frames and manhole frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 SEAL COAT

A. Apply seal coat to surface course in accordance with Item 207 the City of San Antonio Public Works standards.

3.07 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch; 1/4 inch.

D. No ponding/bird baths.

3.08 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.09 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 02751

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas, roads, and sloped transition at decomposed granite trail.

1.02 RELATED SECTIONS

A. Section 02310 - Grading: Preparation of site for paving and base.

B. Section 02316 - Fill and Backfill: Compacted subbase for paving.

C. Section 02741 - Bituminous Concrete Paving: Asphalt wearing course.

D. Section 02781 - Brick Pavers.

E. Section 02783 - Concrete Pavers.

F. Section 02785 - Stone Pavers.

G. Section 03051 - Concrete Color Additive.

H. Section 03052 - Concrete Color Stain.

I. Section 03300 - Cast-in-Place Concrete.

J. Section 07900 - Joint Sealers: Sealant for joints.

K. Section 09900 - Paints and Coatings: Pavement markings.

1.03 UNIT PRICES

A. See Section 01270 - Unit Prices, for additional unit price requirements.

B. Concrete Placed: By the square yd per specified inch thickness. Includes preparing base, placing, floating and finishing, testing.

1.04 REFERENCES

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.

F. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2004b.

G. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.

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E. Section 02783 - Concrete Pavers.

F. Section 02785 - Stone Pavers.

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H. Section 03052 - Concrete Color Stain.

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B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.

F. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2004b.

G. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.

H. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2004a.

I. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2004a.

J. ASTM C 150 - Standard Specification for Portland Cement; 2004a.

K. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2001.

L. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2001.

M. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2003.

N. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2004.

O. ASTM C 685/C 685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2001.

P. ASTM C 1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete; 1991.

Q. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types); 2004.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

C. Samples: Provide sample panel a minimum 5' X 5' X 4" thick indicating concrete finish and other detailing for approval by *Design Consultant*. Provide number of samples as required until acceptable. Approved sample is to be maintained for duration of project. Remove sample(s) after completion of concrete paving work. Sample may be portion of sidewalk to be constructed pending acceptance of Owner.

D. Color Hardener Samples.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain cementitious materials from same source throughout.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Wood or Steel form material, profiled to suit conditions.

C. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751).
   1. Thickness: 1/2 inch.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280); deformed billet steel bars; unfinished finish.

B. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60; unfinished finish. Cut bars true to length with ends square and free of burrs.

2.03 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03300.

B. Cement: ASTM C 150 Normal - Type I Portland type, grey color.

C. Cement: ASTM C150 Normal- Type 1 Portland type, color to match existing concrete sidewalks.

D. Use one brand of cement throughout project, unless otherwise acceptable to Landscape Architect.

E. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

F. For exterior exposed surfaces, do not use fine or course aggregates containing spalling- causing deleterious substances.

G. Course Aggregate: Crushed rock or washed gravel with minimum size between 3/4 inch and 1 1/2 inch, and with a maximum size number 4.

H. Fine Aggregate: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8 inch screen, of which at least 12% shall pass a 50- mesh screen.

I. Exposed Aggregate: Quartz; Marble; Limestone; Gravel; or _____ washed natural mineral aggregate, ____ inch minimum and ____ inch maximum size, _____ color, from a single source.

J. Water: Clean, and not detrimental to concrete.

K. Fiber Reinforcement: Alkali-resistant glass fibers; or Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture 1/4 inch; 1/2 inch; 3/4 inch; __ inch length. Provide Fibermesh InForce e3 manufactured by Nycon, Inc. or approved equal 1-800-456-9266.

L. Air Entrainment Admixture: ASTM C 260.

M. Chemical Admixtures: ASTM C 494/C 494M, Type A - Water Reducing.

2.04 ACCESSORIES

A. Acid Etch Solution: Muriatic type mixed to a ____ percent solution.

B. Curing Compound: ASTM C 309, Type 1;1-D, or 2, Class A.

C. Joint Sealer: Type as specified in Section 07900.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Design Consultant for preparing and reporting proposed mix designs.
   2. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

E. Concrete Properties:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3000 psi. As scheduled; or As indicated on drawings.
      a. General Pedestrian Paving: 3000 psi.
      b. Skate Park Slab: 6000 psi.
   2. Cement Content: Minimum 480 lb per cubic yard.
   3. Water-Cement Ratio: Maximum 40 percent by weight.
   4. Total Air Content: 4 percent, determined in accordance with ASTM C 173/C 173M.
   5. Maximum Slump: 5 inches.
   6. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows with a tolerance of plus or minus 1 1/2 percent.
      a. Air Content: 5.5 percent for 1 1/2 inch maximum aggregate.
      b. Air Content: 6.0 percent for 1 inch maximum aggregate.
      c. Air Content: 6.00 percent for 3/4 inch maximum aggregate.
   7. Mix adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.
   8. Maximum Aggregate Size: 1 1/2 inch. Minimum size between 3/4 inch and 1 1/2 inch and with a maximum size number 4.

2.06 MIXING

A. Transit Mixers: Comply with ASTM C 94, except as may be modified by the following:
   1. Delete references for allowing additional water to be added to batch for material with slump. Addition of water to the batch will not be permitted.
   2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
   3. When air temperature is in between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. See Section 02721 for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole; catch basin; and imbedded items manholes and catch basin frames with oil to prevent bond with concrete pavement.

C. Notify Design Consultant minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at expansion joints.

C. Place dowels; or reinforcement to achieve pavement alignment as detailed.

D. Provide doweled joints 24 inch on center at transverse joints; interruptions of concrete;with one end of dowel set in capped sleeve to allow longitudinal movement.

3.06 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during placement of concrete.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

D. Place concrete to pattern indicated.

E. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

3.07 JOINTS

A. Align sidewalk joints.

B. Place 1/2 inch wide expansion joints at 20 foot; 40 foot maximum intervals and to separate paving from vertical surfaces and other components and in pattern indicated; or None - N/A.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored or sawn joints:
   1. At intervals equal in width to pavement unless indicated otherwise.

D. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.08 EXPOSED AGGREGATE

A. Wash scheduled concrete surfaces with acid etch solution exposing aggregate.

B. Wash concrete surfaces to which surface retarder has been applied with clean water, and scrub with stiff bristle brush or water blast exposing aggregate to match sample panel.

C. Sand blast concrete surfaces to achieve aggregate exposure of (specify %) percent of unit aggregate surface.

D. Include broadcast spreading of aggregate into plastic concrete.

3.09 FINISHING

A. Area; or Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel; Light broom, texture parallel to direction of travel; Wood float; Exposed aggregate; or with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction; texture perpendicular to pavement direction.

3.05 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at expansion joints.

C. Place dowels; or reinforcement to achieve pavement alignment as detailed.

D. Provide doweled joints 24 inch on center at transverse joints; interruptions of concrete;with one end of dowel set in capped sleeve to allow longitudinal movement.

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C. Curbs and Gutters: Light broom, texture parallel to pavement direction; texture perpendicular to pavement direction.

D. Direction of Texturing: Transverse to pavement direction or as indicated.

E. Pedestrian Ramps: Medium Broomed perpendicular to slope.

F. Inclined Vehicular Ramps: Medium Broomed perpendicular to slope.

G. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions .

3.10 JOINT SEALING

A. See Section 07900 for joint sealer requirements.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.
   2. Submit proposed mix design of each class of concrete testing firm for review prior to commencement of concrete operations.
   3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 75 cu yd or less of each class of concrete placed.
   1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
   2. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.13 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement until 75 percent design strength of concrete has been achieved.

3.14 SCHEDULES

A. Parking Area and Drive Pavement: 4,000 psi 28 day concrete, 6 inches thick, #4 rebar at 12 inch on center each way reinforcement, wood float finish.

B. Pedestrian Walk: 3000 psi 28 day concrete, 5 inches thick, #4 rebar at 18 inch on center each way reinforcement, wood float finish.

END OF SECTION

SECTION 02783

CONCRETE PAVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interlocking concrete paver units and detectable warning pavers.

B. Non-interlocking concrete paver units and detectable warning pavers

C. Open grid concrete paver units.

D. Sand setting bed.

E. Sand joint filler.

F. Topsoil filler.

G. Edge restraints.

1.02 RELATED SECTIONS

A. Section 02310 - Grading: Preparation of subsoil for pavers.

B. Section 02316 - Fill and Backfill: Compacted fill for pavers.

1.03 UNIT PRICE - MEASUREMENT AND PAYMENT

A. See Section 01270 - Unit Prices, for additional unit price requirements.

B. Pavers on Sand Bed: By the square foot. Includes preparation of substrate, sand setting bed, pavers, sand jointing, finishing.

1.04 REFERENCES

A. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.

B. ASTM C 936 - Standard Specification for Solid Concrete Interlocking Paving Units; 2001.

C. ASTM C 1319 - Standard Specification for Concrete Grid Paving Units; 2001.

D. ASTM D 5268 - Standard Specification for Topsoil Used for Landscaping Purposes; 2002.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two samples of each paver type, illustrating style, size, color range and surface texture of units being provided.

1.06 MOCK-UP

A. Provide paver mockup, 4 feet long by 4 feet wide, which includes setting bed, pavers, curbs, joints, and edging.

B. Locate where directed.

C. Mockup may remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interlocking Concrete Pavers: The design is based on the following product: _____. Also acceptable, subject to compliance with specified requirements:

1. Alamo Concrete Pavers; San Antonio, Texas (210) 534-8821.
2. Pavestone Stone Co.; Grape Vine, Texas (817) 481-5802.
3. Pavex Concrete Pavers, Inc. Round Rock, Texas (512) 244-7788.

B. Open Grid Concrete Pavers: The design is based on the following product: _____. Also acceptable, subject to compliance with specified requirements:
1. Alamo Concrete Pavers; San Antonio, Texas (210) 534-8821.
2. Pavestone Stone Co.; Grape Vine, Texas (817) 481-5802.
3. Pavex Concrete Pavers, Inc. Round Rock, Texas (512) 244-7788.

2.02 MATERIALS

A. Interlocking Concrete Pavers: Hydraulically pressed concrete, configured for interlocking with adjacent units and complying with ASTM C 936.

B. Non-interlocking Pavers: Precast concrete.

C. Open Grid Pavers: Precast concrete units complying with ASTM C 1319.

D. Detectable Warning Pavers: Cast concrete with truncated domes, _____ color.

E. Sand for Setting Bed: Clean washed natural sand or crushed stone complying with gradation requirements of ASTM C 33 for fine aggregates.

F. Sand for Joints: Fine washed sand with 100 percent passing No. 16 sieve and not more than 10 percent passing No. 200 sieve.

G. Aggregate Fill: Open-graded aggregate for filling voids and joints in open grid paver units, conforming to requirements of ASTM C 33 for No. 8 crushed stone.

H. Topsoil Fill: For filling voids and joints, provide topsoil conforming to ASTM D 5268.

I. Edging: Concrete curb, as detailed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this Section.

B. Verify gradients and elevations of substrate are correct.

3.02 PREPARATION

A. Treat soil with herbicide to retard plant growth.

3.03 INSTALLATION OF SOLID PAVER UNITS

A. Spread sand evenly over prepared substrate surface to a maximum thickness of 1-1/2 inch.

B. Dampen and roller compact sand to level and even surface.

C. Screed and scarify top 1/2 inch of sand.

D. Place paver units in pattern indicated on the drawings.

E. Cut paver units at edges with masonry saw. HAMMER CUTTING IS NOT ACCEPTABLE.

F. Place half units; special shaped units; or edging; at edge and interruptions. Maintain tight; or evenly spaced joints.

G. Sprinkle sand over surface and sweep into joints. Moisten joints and recover with additional sand until firm joints are achieved. Remove excess sand.

H. Place topsoil over paver surface and sweep into joints between pavers. Moisten joints and recover with additional soil until firm placement is achieved. Remove excess soil.

I. Tamp and level paver units with mechanical vibrator until units are firmly bedded, level, and to correct elevation and gradients. Do not tamp unrestrained edges.

3.04 INSTALLATION OF OPEN GRID PAVER UNITS

A. Spread sand evenly over prepared substrate course and screed to a uniform thickness of 1-1/2 inch.

B. Place paver units in pattern indicated on the drawings.

C. Maintain uniform joints between paver units not more than 1/8 inch wide.

D. Cut paver units at edges with masonry saw. HAMMER CUTTING IS NOT ACCEPTABLE.

E. Compact and seat paver units into screeded setting bed using low amplitude plate compactor capable of at least 5,000 lb centrifugal compaction force.

F. Vibrate and compact pavers again while sweeping aggregate fill or topsoil into joints and openings in pavers, stopping when fill material is within 1/2 inch from top surface of units. Do not compact within 3 ft of unrestrained paver edges.

G. Completely fill voids in pavers with aggregate fill. Remove excess material.

END OF SECTION