

DIVISION 3 – CONCRETE

SECTION 02511 - HOT-MIXED ASPHALT PAVING

PART 1 - GENERAL

SUMMARY

This Section includes provisions for hot-mixed asphalt paving over prepared subbase.

Prepared subbase is shown on the drawings.

Proof rolling of prepared subbase is included in this Section.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

SITE CONDITIONS

Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg F (10 deg C) and when temperature has not been below 35 deg F (1 deg C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

Construct hot-mixed asphalt surface course when atmospheric temperature is above 40 deg F (4 deg C) and when base is dry. Base course may be placed when air temperature is above 30 deg F (minus 1 deg C) and rising.

Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

MATERIALS

General: Use locally available materials and gradations that exhibit a satisfactory record of previous installations.

Coarse Aggregate: Sound, angular crushed stone, crushed gravel.

Fine Aggregate: Sharp-edged natural sand or sand prepared from stone.

Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

Prime Coat: Cut-back asphalt type, ASTM D 2027; MC-30, MC-70 or MC-250.

Tack Coat: Emulsified asphalt; ASTM D 977.

Herbicide Treatment: Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

Ciba-Geigy Corp.
Dow Chemical U.S.A.
E.I. Du Pont de Nemours & Co., Inc.
FMC Corp.
Thompson-Hayward Chemical Co.
U.S. Borax and Chemical Corp.

ASPHALT-AGGREGATE MIXTURE

Provide plant-mixed Type C, hot-laid asphalt-aggregate mixture complying with ASTM D 3515.

PART 3 - EXECUTION

SURFACE PREPARATION

General: Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.

Proof-roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

Notify Architect of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and tested and are ready for paving.

Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

Prime Coat: Apply at rate of 0.20 to 0.50 gal. per sq. yd., over compacted subgrade. Apply material to penetrate and

seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into hot-mixed asphalt pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

Allow to dry until at proper condition to receive paving.

Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

PLACING MIX

General: Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 225 deg F (107 deg C). Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.

Paver Placing: Place in strips not less than 10 feet wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.

Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

ROLLING

General: Begin rolling when mixture will bear roller weight without excessive displacement.

Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.

Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.

Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained 95 percent laboratory density.

Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.

Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

Cleaning: Sweep and clean surface to eliminate loose material and dust.

FIELD QUALITY CONTROL

General: Testing in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory. Repair or remove and replace unacceptable paving as directed by Architect.

Thickness: In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:

Base Course: Plus or minus 1/2 inch.

Surface Course: Plus or minus 1/4 inch.

Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10-foot straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

Base Course Surface: 1/4 inch.

Wearing Course Surface: 3/16 inch.

SECTION 03300 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

SUMMARY

This Section specifies cast-in place concrete, including

formwork, reinforcing, mix design, placement procedures, and finishes.

Cast-in-place concrete includes the following:

Foundations and footings.

Slabs-on-grade including drives, paving, and curbs.

SUBMITTALS

General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

Laboratory test reports for concrete materials and mix design test.

QUALITY ASSURANCE

Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."

ACI 318, "Building Code Requirements for Reinforced Concrete."

Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing is required.

Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

PART 2 - PRODUCTS

FORM MATERIALS

Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

REINFORCING MATERIALS

Reinforcing Bars: ASTM A 615, Grade 60, deformed for #4 and larger. Grade 40 for #3 and smaller.

Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type I.

Use one brand of cement throughout Project unless otherwise acceptable to Architect.

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

For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

Water: Potable.

RELATED MATERIALS

Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal.

Provide material that has a maximum volatile organic compound (VOC) rating of 350 mg per liter.

Products: Subject to compliance with requirements, provide one of the following:

A-H 3 Way Sealer, Anti-Hydro Co., Inc.
Spartan-Cote, The Burke Co.
Conspec #1, Conspec Marketing & Mfg. Co.
Sealco 309, Cormix Construction Chemicals.
Day-Chem Cure and Seal, Dayton Superior Corp.
Eucocure, Euclid Chemical Co.
Horn Clear Seal, A.C. Horn, Inc.

Joint Sealants - Exterior paving joints "Allied 9020."

PROPORTIONING AND DESIGNING MIXES

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

Limit use of fly ash to not exceed 25 percent of cement content by weight.

Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

Design mixes for normal weight concrete as follows:

Interior Slabs, Foundations:

3000-psi, 28-day compressive strength; water-cement ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained).

Exterior Slabs and Curbs: 3,500 psi, 28-day compressive strength, water-cement ratio; 0.51 minimum (non-air entrained), 0.40 maximum (air entrained).

Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Exterior Paving: Not more than 4 inches.

Ramps, slabs, and sloping surfaces: Not more than 3 inches.

Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.

Water Cement Ratio; subject to freezing: W/C 0.45.

Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows:

Air Content: 3 to 5.5 percent for 1-1/2 inch maximum aggregate.

CONCRETE MIXING

Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

GENERAL

Coordinate the installation of joint materials, and other related materials with placement of forms and reinforcing steel.

FORMS

General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

PLACING REINFORCEMENT

General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

JOINTS

Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.

Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, walls, grade beams, and other locations, as indicated.

Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, unless otherwise indicated.

Contraction joints in floor slabs shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

If joint pattern is not shown, provide joints not exceeding 20 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

CONCRETE PLACEMENT

Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.

Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

Maintain reinforcing in proper position on chairs during concrete placement.

Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

MONOLITHIC SLAB FINISHES

Trowel Finish: Apply a trowel finish to monolithic slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E

1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete slabs, steps, and curbs, and to interior slabs at animal areas.

Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

CONCRETE CURING AND PROTECTION

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

******* END OF DIVISION 3 – CONCRETE *******