SECTION 03310 – FAST SETTING CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the contract, including the General Provisions for Construction Projects (2016), Special Provisions, and General Requirements of the Specifications, apply to the work specified in this Section.

1.02 SUMMARY

A. Section includes the furnishing of all labor, materials, equipment and any other related miscellaneous items necessary to completely construct all Fast Setting Concrete as shown on the plans. In the specification, fast-setting concrete and Hybrid Polymer Concrete (HPC) are used and refer to the same material. HPC shall be used for the Second Level Roadway sections in front of the turn-around area on the Ewa and Diamond Head Concourse.

B. HPC shall be 100% Solids, thermosetting hybrid-polymer concrete, and composed of the following three components: two-component reactive hybrid polymer resin binder and blend of specified aggregates.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. General:

1. Prior to the start of this work, provide the following submittals in one complete set for acceptance. Indicate clearly the name of the product and its manufacturer on pertinent submittals. No work that is related to these submittals shall be performed until written acceptance has been received.

C. Detailed step by step procedures for all aspects of the work including determining surface profiles and compressive strengths, cleaning and roughening substrata, placement (handling, mixing, consolidating, finishing, curing, and texturing) of HPC, and testing for delaminations. The procedure shall include the method and materials used to contain, collect and dispose of the concrete debris generated by the scarifying process, including provisions for protecting adjacent traffic from flying debris.

D. The HPC mix design and the estimated curing time based on the anticipated temperatures.

E. Certificates of compliance and test reports for all materials used in the HPC mix.

F. The name of the manufacturer of the HPC materials including the name and phone number of the Manufacturer's Technical Representative.

G. Information on the HPC including shelf life, working times, and placement rates.

H. Detailed information on the HPC on all equipment and materials that will be used for all aspects of the work including but not limited to determining surface profiles and compressive strength, quality control (QC) plan, placing (handling, mixing consolidating, finishing, curing, and texturing) of HPC, and testing for delaminations.

I. Detailed plans and procedures including complying to noise variances, and controlling the work to appropriately minimize dust and air borne debris from cleaning and roughening the substrata, mixing and placing concrete, and cleaning operations and to prevent water runoffs following Section 01560 – ENVIORNMENTAL CONTROLS, Section 01561 – CONSTRUCTION SITE RUNOFF CONTROL PROGRAM, and Section 01562 – MANAGEMENT OF CONTAMINATED MEDIAS.

J. Planned actions to maintain adherence to limitations and requirements of the following variables with regards to HPC work:

1. Equipment and traffic control near or on work areas during placement and curing operations.

2. Rain

K. Test reports of compressive strengths, tensile strengths, bond strengths, and maturity readings during the progress of the work.

1.04 QUALITY CONTROL

A. Pre-Activity Meeting:

1. Schedule a meeting with the Contractor, and supplier's representatives involved in construction operation for the HPC and DOT-A, at a mutually agreed time, to discuss and verify the methods of accomplishing all phases of the HPC operations, contingency planning, and standards of workmanship for the completed items of work. Include the Contractor's superintendents, foremen, subcontractors, and supplier's technical representatives, and all key personnel involved with the HPC work as attendees of the pre-operation conference. Do not begin placement of HPC before DOT-A accepts the pre-activity meeting as completed.

B. Trial Pour:

1. The contractor shall place a trial pour of HPC using the equipment selected by the Contractor and the production mix and procedure as approved by DOT-A. The Contractor shall notify DOT-A of the time and location of the trial pour at least seven calendar days prior to the scheduled trial pour. Attendance of the trial pour is mandatory for all personnel who will perform the work contained in this section.

2. The trial pour shall be placed on a previously cast and cured concrete pad at a location selected by the Contractor and as approved by DOT-A. The trial pour of HPC shall be 4 feet minimum in width by 4 feet minimum in length.

3. The contractor shall clean the concrete pad surface and prepare the concrete substrate similar to the conditions in the field. Contractor shall mix, place, finish, and cure the HPC. The HPC is to be placed using the same equipment at the production work and replicate the field conditions for the production work. The Contractor is to demonstrate to DOT-A the suitability of the proposed means and methods.

4. The Contractor shall not begin construction operations at the site receiving the HPC until receiving approval of the completed trial pour.

5. After receiving approval of the completed trial pour, the concrete pad and trial pour shall become the Contractor's property and shall be removed and disposed of in accordance with all applicable local, state and federal laws, rules and ordinances.

1.05 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered in their original containers bearing the manufacturer's label, specifying date of manufacturing, batch number, trade name, and quantity. Each shipment of resin binder shall be accompanied by a Safety Data Sheet (SDS).

B. The material shall be stored to prevent damage by the elements and to ensure the preservation of their quality and fitness for the work. The storage space shall be kept clean and dry.

C. Stored materials shall be inspected prior to their use, and shall meet the requirements of this Specification at the time of use.

D. Any material which is rejected because of failure to meet the required tests or that has been damaged so as to cause rejection shall be immediately replaced at no additional expense to DOT-A.

E. Sufficient material to perform the entire HPC application shall be in storage at the site prior to any field application, so that there shall be no delay in procuring the material for each day's application.

F. The contractor shall arrange to have the material supplier furnish technical service related to application of material and health and safety training for personnel who are to handle the HPC.

PART 2 – PRODUCTS

2.01 TWO COMPONENT RESIN BINDER

A. The resin binder shall be solvent-free, moisture-insensitive, two-component reactive thermoset polymer binder conforming to the following requirements in Table 1:

Table 1. Physical Requirements for HPC Resin Binder

Quality Characteristic	Test Method	Requirement
Viscosity (RV2 @ 20 RPM)	ASTM C881	1000 – 1500 cP
Flash Point	ASTM D3278	>250°F
VOC Content	ASTM D2369 (Method E, 55-60 mil thickness)	<10 g/L
Gel Time	C881	10 minutes minimum
Tensile Strength (7 days)	ASTM D638, Type I Specimen	1500 – 2500 psi
Tensile Elongation	ASTM D638	50% minimum at 7 days
Water Absorption (24 hrs.)	ASTM D570	0.5% maximum
Type D Hardness	ASTM D2240	60 – 80
Thermal Compatibility	ASTM C884	PASS
Chloride Ion Permeability	ASTM C 1202	<10.0 Coulombs
-No volatile chemical odors -No explosive catalysts or ingredients allowed -Material must be MADE IN THE USA		

2.02 AGGREGATES

A. The aggregate for the HPC shall conform to this section and shall be provided by the HPC supplier and conform to the following:

1. Gradation following Table 2:

Table 2. Aggregate Gradation

Sieve Size	Percent Passing
1/2"	100
3/8”	98-100
No. 4	77-100
No. 8	60-82
No. 16	34-56
No. 30	5-25
No. 50	0-15
No. 100	0-7
No. 200	0-3

2. The aggregate absorption shall not exceed 1.5% as determined by ASTM C 127 or as otherwise approved by DOT-A.

3. At the time of mixing with the resin, the moisture content of the aggregate, as determined by ASTM C 566, shall not exceed on half of the aggregate absorption.

4. The aggregate temperature shall be between 45 deg. F and 100 deg. F at the time of mixing.

PART 3 – EXECUTION

3.01 GENERAL

A. The HPC Manufacturer shall have a representative on the job site for the startup of the project scope involving HPC on both the Ewa and Diamond Head Concourse who, upon consultation with the DOT-A, may suspend any item of work that is suspect and does not meet the requirements of this specification. Resumption of work will occur only after the manufacturer’s representative and DOT-A are satisfied that appropriate remedial action has been taken by the Contractor. No work shall proceed and materials will not be accepted if manufacturer’s technical representative is not on site for the startup of the project.

B. During surface preparation and application, precaution shall be taken to assure that traffic is protected from rebound, dust and construction activities. Appropriate shielding shall be provided as required and as directed by DOT-A at no additional cost. The Contractor shall provide suitable protection as needed to protect all exposed areas not to receive HPC such as parapets, drains, etc. All damage and defacement resulting from the application shall be cleaned and, or repaired to DOT-A’s satisfaction at no additional cost.

3.02 EQUIPMENT

A. Use a continuous automated volumetric mixer. Mechanically operated mixers or hand mixing may only be used as a backup during repairs, or for applications less than a cubic yard. Follow manufacturer's recommendations.

B. When mixing and applying manually, mix only the amount of material that can be used within its pot life. Proportion each liquid component carefully into a clean pail or drum. Mix thoroughly for 3 minutes with a Jiffy mixer on low speed (400-600 rpm). To prepare a repair mortar, slowly add 200-250 pounds of the engineered aggregate to every 4-gal of mixed polymer. Mix only until all aggregate is wetted out. Manufacturer's representative shall be present during hand mixing operations.

3.03 SURFACE PREPARATION

A. Use the procedures of ICRI (International Concrete Repair Institute) Guideline No. 03730 "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcement Steel Corrosion", ICRI Guideline 03732 "Selecting and Specifying Concrete Surface, Surface Preparation for Sealers, Coatings and Polymer Overlays" sections of ACI 546.1R-80 (Reapproved 1997) "Guide for Repair of Concrete Bridge Superstructures". The Contractor shall be responsible for any falsework requirements, debris, noise and pollution control on and below the repair area

B. The concrete surface shall be prepared by removing all material which may act as a bond breaker between the surface and the HPC.

C. The textured or scarified pavement preparation method shall remove all dirt, oil and other foreign materials, as well as any unsound concrete or laitance from the surface and edges against which new HPC is to be placed. The concrete surface may require retexturing where penetration of foreign material is evident. No contamination of the retextured or scarified concrete surface shall be permitted.

D. Surface preparation shall meet the following requirements:

1. Existing Pavement or Elevated Deck. On existing concrete, the surface shall be prepared by shot blasting or approved equal. Pneumatic tools weighing 15 pounds or less may be used for areas where the Contractor is unable to shot blast upon approval of DOT-A. Produce a concrete substrate surface with a minimum roughness of approximately 1/8-inch amplitude or an ICRI concrete surface profile (CSP) of 7. The preparation method shall not produce a polish or slick surface.

3.04 TRAFFIC AND EQUIPMENT CONTROL ON ROADWAY

A. Construction vehicles shall not exceed a 5-mph speed limit within 200 feet of the placement area in both directions during HPC placement and curing.

B. Equipment, vehicles, and personnel, etc. shall not contaminate the prepared deck surface.

C. Equipment shall not be located on bays undergoing deck HPC unless approved by DOT-A.

D. The Contractor shall not permit compressors or other equipment that produce vibrations on the bay undergoing deck HPC work.

E. The roadway shall not be used as a storage area for equipment or for stockpiling materials. Follow construction documents for proper storage locations and weight limitations.

3.05 PLACEMENT OF HPC

A. Time for placement of the HPC shall be in accordance with the recommendation of the manufacturer and within the contract work hours. After surface preparation concrete surfaces shall be structurally sound, clean, free of dirt, powdered concrete, loose mortar particles, paint, film, protective coatings, efflorescence, laitance, and other matter detrimental to proper adhesion of the new HPC. Contractor shall use methods such as pressure washing or approved equal to ensure proper cleanliness. Work surfaces must be free of ridges, fins or sharp projections. All reinforcing bars in the repair area shall be made free of all scale and loose rust by using either powered rotary wire bristle brush or abrasive blasting. Needle gunning may be used as preliminary step for removal of loose rust. Do not overly vibrate the reinforcing bars.

B. Expansion joints, drains and grates shall be adequately isolated prior to placing the HPC as approved. HPC shall not affect the design and function of the expansion joints, drains, and grates. Do not place HPC within 6 feet of another area where the deck surface is being prepared with pneumatic tools.

C. The HPC discharged from the mixer shall be uniform in composition and consistency. Mixing capability shall be such that initial and final finishing operations can proceed at a steady pace.

D. The hybrid polymer resin binder in the HPC shall be 12-15 percent by weight of the dry aggregate. The contractor shall determine the exact percentage as approved by DOT-A.

E. Any falsework and formwork required shall be considered incidental to this work.

3.06 HOT WEATHER CONCRETING

A. Do not place concrete where temperature is above 90 degrees F unless design mix and placement method conform to ACI 305 R-91 Hot Weather Concreting. When ambient temperature is above 90 degrees F, cool reinforcing steel, forms, and other surfaces to below 90 degrees F with water spray or other acceptable methods before placing of concrete.

3.07 FINISHING HPC

A. Finishing equipment shall be capable of consolidating the HPC and striking off the HPC to the final grade, thickness and cross-sections as shown in the contract documents.

B. For repairs or placements of less than 2 cubic yards or areas inaccessible to self-propelled finishing equipment, finish while the HPC is plastic and workable using a roller screed or air screed approved by DOT-A. Contractor has the option of using other methods of finishing HPC as long as the selected method leaves a uniform, level finish, free of slick or puddled resin areas. DOT-A must approve methods prior to constructing trial overlay. Finish the concrete to meet the requirements of Paragraph 3.10 – Surface Testing.

3.08 CURING

A. Traffic and construction equipment shall not be permitted on the HPC for at least 3 hours and until the HPC surface is tack free. Refer to HPC technical data sheet curing schedule for estimated cure times.

3.09 CONSTRUCTION JOINTS

A. Use construction joints only with the acceptance of DOT-A and in accordance with the Contract documents.

3.10 SURFACE TESTING

A. The finished HPC shall conform to the following requirements when tested by the Contractor in the presence of DOT-A within 14 days following the placement of concrete:

1. Surface Flatness. The surface of the HPC shall not vary more than 1/8 inch under a 10-foot straightedge placed parallel to the traffic lanes.

2. Surface Condition. The surface of the HPC shall be sound and free from delaminations and cracks greater than 0.01 inch in width.

3.11 HPC SAMPLING AND TESTING

A. Perform QC concrete sampling and testing in accordance with the QC plan and following requirements:

1. QC tests shall include temperature and preparing compressive strength cubes for testing. Perform HPC tests on the initial delivery for each mix each day. Ensure that QC technicians are certified, and the materials testing laboratory are accredited in the test method being used. Ensure all technician that are performing the sampling and performing the testing are certified in the test placement operation at each placement site and the testing is done in an accredited material testing laboratory. A LOT shall be one day's production, once every maximum of 20 cubic yards of HPC. Cast a set of cubes representing the LOT from the same sample of HPC.

2. Maintain a logbook with records of relevant details of all tests. Provide a copy of new entries at the end of each work day. Make available for inspection by the Engineer during the normal working hours of construction. At the end of the project, deliver the original logbook to the Engineer. The original logbook will become property of the Engineer.

B. Compressive strength shall be in accordance with ASTM C 579 Standard Test Methods for Compressive Strength of Chemical-375 Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes. The compressive strength shall be at least 3000 psi prior to opening to traffic.

3.12 ACCEPTANCE

A. The completed HPC must be uniform in texture and appearance. HPC shall meet the compressive strength and bond strength requirements. Contractor shall repair all HPC that does not meet the approval of DOT-A at no additional cost. Repair HPC according to the manufacturer's recommendations.

3.13 VERIFICATION AND INDEPENDENT ASSURANCE

A. DOT-A may perform Verification sampling and testing for its own use for internal assurance and acceptance testing. Furnish sufficient quantities of each mix for verification and independent assurance sampling and testing as required by DOT-A. When DOT-A performs verification, the Contractor may perform the same tests on the HPC at the same time.

PART 4 – MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

No measurement shall be made for the items in this Section.

4.02 BASIS OF PAYMENT

Fast-setting concrete work involving the Roadway Deck Replacement in front of the turn around area at the Second level Ewa Concourse Roadway, and the Second level Diamond Head Concourse Roadway, shall be paid for at the contract Lump Sum prices for the Ewa Concourse Second Level Roadway Deck Replacement Near Turn Around and for the Diamond Head Concourse Second Level Roadway Deck Replacement Near Turn Around. The contract prices paid shall be full compensation for all labor, tools, equipment, and all other incidentals necessary to complete the work.

Item No.	Description	Unit
03310.1	Ewa Concourse Second Level Roadway Deck Replacement Near Turn Around	Lump Sum
03310.2	DH Concourse Second Level Roadway Deck Replacement Near Turn Around	Lump Sum

All other structural concrete work specified in this section shall be considered incidental to and included in the bid prices for the various items of work in the project.

END OF SECTION