STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

AIRPORTS DIVISION

SPECIFICATIONS AND PROPOSAL

FOR

REPAIR OF CEMENT CONCRETE PAVEMENT

AT

DANIEL K. INOUYE INTERNATIONAL AIRPORT

STATE PROJECT NO. BO1649-73

HONOLULU, OAHU, HAWAII

FY2027

NOTICE TO BIDDERS
Hawaii Revised Statutes (HRS),
Chapter 103D

The receiving of bids for **REPAIR OF CEMENT CONCRETE PAVEMENT AT DANIEL K. INOUYE INTERNATIONAL AIRPORT, HONOLULU, OAHU, HAWAII, PROJECT NO. BO1649-73,** will begin as of the HIePRO Release Date. Bidders shall register and submit complete bids through HIePRO only. Refer to the following HIePRO link for important information on Vendor Registration: https://hiepro.ehawaii.gov/welcome.html.

The solicitation, specifications, proposal, and additional documents designated or incorporated by reference shall be available in HIePRO.

HIePRO OFFER DUE DATE & TIME is **January 6, 2027, at 2:00 p.m., Hawaii Standard Time (HST). Bidders shall submit and upload the complete proposal to HIePRO prior to the offer due date and time. Proposals received after said due date and time shall not be considered. Any additional support documents explicitly designated as confidential and/or proprietary shall be uploaded as a separate file to HIePRO. Bidders shall not include confidential and/or proprietary documents as part of their proposal. The record of each bidder and their respective proposal shall be open to public inspection. FAILURE TO UPLOAD THE PROPOSAL TO HIePRO SHALL BE GROUNDS FOR REJECTION.**

The scope of work consists of airfield concrete pavement repairs performed at Daniel K. Inouye International Airport on an open end, "as-needed" basis.

To be eligible for award, bidders shall possess a valid State of Hawaii license General Engineering Contractor "A" license, license **at the time of bidding.**

The Hawaii Department of Transportation, Air and Water Transportation Facilities Division, 2016 GENERAL PROVISIONS FOR CONSTRUCTION PROJECTS, applicable to this project are available on the internet at: http://hidot.hawaii.gov/administration/con/.

A pre-bid conference is scheduled for **December 3, 2026, at 9:00 a.m., HST** at the Terminal 2 – Office Tower, 5th Floor, Daniel K. Inouye International Airport, Honolulu, Hawaii. Persons needing special accommodations at the pre-bid conference due to disability may contact Gary Kam, State Project Manager, directly at gary.yt.kam@hawaii.gov no less than five working days prior to the scheduled pre-bid conference. All prospective bidders and/or their respective representatives are encouraged to attend; however, attendance is not mandatory. All information presented at the pre-bid conference shall be provided for clarification and information only. Any amendments to the solicitation shall be made by formal addendum and posted in HIePRO.

All Request for Information (RFI) questions and Substitution Requests shall be submitted in HIePRO **no later than December 11, 2026, at 2:00 p.m., HST.** RFI questions received after the stated deadline shall not be addressed. Substitution Requests received after the stated deadline shall not be considered. Verbal RFI(s) shall not receive a response. All responses to RFI questions shall be provided for clarification and information only and issued by formal addendum. Any amendments to the solicitation shall be made by formal addendum and posted in HIePRO.

If there is a conflict between the solicitation and information stated in the pre-bid conference, the meeting minutes, and/or the responses to RFI questions, the solicitation shall govern and control, unless as amended by formal addendum.

Apprenticeship Preference. A five percent bid adjustment for bidders that are party to apprenticeship agreements pursuant to HRS § 103-55.6 is applicable to this project.

Employment of State Residents on Construction Procurement Contracts. Compliance with HRS § 103B-3 is a requirement for this project whereby a minimum of 80 percent of the bidder's work force on this project shall consist of Hawaii residents.

Campaign contributions by State and County Contractors. Contractors are hereby notified of the applicability of HRS § 11-355 which states that campaign contributions are prohibited from specified State or County government contractors during the term of the contract if the contractors are paid with funds appropriated by a legislative body. For more information, contact the Campaign Spending Commission at (808) 586-0285.

Protests. Any protest of this solicitation shall be submitted in writing to the Director of Transportation, in accordance with HRS § 103D-701 and Hawaii Administrative Rules § 3-126.

Bidders are hereby notified that the Department of Transportation shall affirmatively ensure that contracts entered into pursuant to this advertisement are awarded to the lowest responsible bidder without discrimination on the basis of race, color, national origin, sex, age, disability, or any other protected status recognized under applicable State and federal law.

For additional information, contact Gary Kam, State Project Manager, by phone at (808) 834-6091, or by email at gary.yt.kam@hawaii.gov.

The State reserves the right to reject any or all proposals and to waive any defects in said proposals in the best interest of the public.

CURT T. OTAGURO
Deputy Director of Transportation for Airports

HIePRO RELEASE DATE: November 18, 2026

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Contract

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INSTRUCTIONS FOR CONTRACTOR'S LICENSING

"A" general engineering contractors and "B" general building contractors are reminded that due to the Hawaii Supreme Court's January 28, 2002 decision in Okada Trucking Co., Ltd. v. Board of Water Supply, et al., 97 Haw. 450 (2002), they are prohibited from undertaking any work, solely or as part of a larger project, which would require the general contractor to act as a specialty contractor in any area where the general contractor has no license. Although the "A" and "B" contractor may still bid on and act as the "prime" contractor on an "A" or "B" project *(See, HRS § 444-7 for the definitions of an "A" and "B" project.)*, respectively, the "A" and "B" contractor may only perform work in the areas in which they have the appropriate contractor's license *(An "A" or "B" contractor obtains "C" specialty contractor's licenses either on its own, or automatically under HAR § 16-77-32.)*. The remaining work must be performed by appropriately licensed entities. It is the sole responsibility of the contractor to review the requirements of this project and determine the appropriate licenses that are required to complete the project.

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

AIRPORTS DIVISION

SPECIAL PROVISIONS

SPECIAL PROVISIONS

The following additional amendments to the General Provisions are applicable to this project:

1.3 DEFINITIONS is amended as follows:

The definition for Subcontractor is deleted in its entirety and replaced with the following:

Subcontractor – An individual, partnership, firm, corporation, joint venture or other legal entity, as licensed or required to be licensed under Chapter 444, Hawaii Revised Statutes, as amended, which enters into an agreement with the Contractor to perform a portion of the work.

The following definitions shall be added:

AASHTO - The American Association of State Highway and Transportation Officials.

Access Road - The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.

Air Operations Area (AOA) - The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

Apron - Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.

ASTM International (ASTM) - Formerly known as the American Society for Testing and Materials (ASTM).

Bid - The offer of a Bidder, on the prescribed HDOT form, to perform the work and to furnish the labor and materials at the prices quoted.

Building Area - An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

Certificate of Analysis (COA) - The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.

Certificate of Compliance (COC) - The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.

Contractors Quality Control (QC) Facilities - The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).

Contractor Quality Control Program (CQCP) - Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.

Control Strip - A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.

Drainage System - The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

Extra Work - An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Owner's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.

FAA - The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.

Force Account – a) Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis. b) Owner Force Account - Work performed for the project by the Owner's employees.

HAWAII ePROCUREMENT SYSTEM (HIePRO) - The State of Hawaii eProcurement System for issuing solicitations, receiving proposals and responses, and issuing notices of award.

Intention of Terms - Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Owner. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

Lighting - A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

Major and Minor Contract Items - A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

Owner - The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only. The Owner for this project is the State of Hawaii, Department of Transportation, Airports Division.

Pavement Structure - The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.

Payment Bond - The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

Performance Bond - The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

Project - The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

Proposal Guaranty - The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Owner.

Quality Assurance (QA) - Owner's responsibility to assure that construction work completed complies with specifications for payment.

Quality Control - Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.

Quality Assurance (QA) Inspector - An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

Quality Assurance (QA) Laboratory - The official quality assurance testing laboratories of the Owner or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Owner's, or QA Laboratory.

Resident Project Representative (RPR) - The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor and acting directly or through an authorized representative.

Runway - The area on the airport prepared for the landing and takeoff of aircraft.

Runway Safety Area (RSA) - A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.

Subgrade - The soil that forms the pavement foundation.

Supplemental Agreement - A written agreement between the Contractor and the Owner that establishes the basis of payment and contract time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%: (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3) work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.

Taxilane - A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.

Taxiway - The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

Taxiway/Taxilane Safety Area (TSA) - A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.

2.7 REQUEST FOR SUBSTITUTION OF SPECIFIED MATERIALS AND EQUIPMENT BEFORE BIG OPENING is amended as follows:

1. The last sentence in the first paragraph (line 147 to 152) shall be replaced with the following:

"Where a bidder intends to use a material or equipment of an unspecified brand, make, or model, the bidder must submit a request to the Department for review and approval at the earliest date possible. As specified in the Notice to Bidders, all requests shall be posted as a question in HIePRO under the "Question and Answer" tab. Supporting documents for specific request shall be emailed to the Project Manager specified in the Notice to Bidders. Request must be posted in HIePRO and supporting documents received by the Project Manager via email no later than the RFI deadline in the Notice to Bidders."

2. The first sentence in the second paragraph (line 154 to 156) shall be replaced with the following:

"It shall be the responsibility of the bidder to submit sufficient evidence based upon which a determination can be made by the Department that the alternate brand is a qualified equivalent."

2.8 PREPARATION AND DELIVERY OF BID is amended as follows: Last Paragraph (line 189 to 192) shall be replaced with the following:

"**Bidders shall submit and upload the complete proposal to HIePRO prior to the bid opening date and time. Proposals received after said due date and time shall not be considered. Any additional support documents explicitly designated as confidential and/or proprietary shall be uploaded as a separate file to HIePRO. Do not include confidential and/or proprietary documents with the proposal.** The record of each bidder and respective bid shall be open to public inspection. Original (wet ink, hard copy) proposal documents are not required to be submitted. **Contract award shall be based on evaluation of proposals submitted and uploaded to HIePRO.**

FAILURE TO UPLOAD THE COMPLETE PROPOSAL TO HIePRO SHALL BE GROUNDS FOR REJECTION OF THE BID.

If there is a conflict between the specification document and the HIePRO solicitation, the specifications shall govern and control, unless otherwise specified."

2.11 BID SECURITY - delete Section 2.11(a) in its entirety and replace it with the following:

"(a) Unless directed otherwise in the invitation for bids, each bid shall be accompanied by bid security which is intended to protect the Department against failure or refusal of a bidder to execute the contract for the work bid or to supply the required performance and payment bonds. Bid security shall be in an amount equal to at least five percent of the base bid and additive alternates.

Bid security shall be one of the following forms:

1. A deposit of legal tender,

2. A valid surety bid bond, underwritten by a company licensed to issue bonds in the State of Hawaii, in the form and composed, substantially, with the same language as provided herewith and signed by both parties, or

3. A certificate of deposit; credit union share certificate; or cashier's, treasurer's, teller's' or official check drawn by or a certified check accepted by a bank, savings institution, or credit union insured by the Federal Deposit Insurance Corporation (FDIC) or the National Credit Union Administration (NCUA) and payable at sight or unconditionally assigned to the Department. These instruments may be utilized only to a maximum of one hundred thousand dollars ($100,000.00). If the required amount totals over one hundred thousand dollars ($100,000.00), more than one instrument not exceeding one hundred thousand dollars ($100,000.00) each and issued by different financial institutions shall be accepted.

If bidder elects options (1) or (3) above for its bid security, said bid security shall be in its <u>original form</u> and shall be <u>submitted before the bid deadline</u> to the Contract Office, Department of Transportation, Aliiaimoku Hale, 869 Punchbowl Street, Room 103, Honolulu, Hawaii 96813. Original surety bid bonds do <u>not</u> need to be submitted to the Contracts Office. Bidders are reminded that a copy of its surety bid bond shall be <u>included with its bid</u> submitted and uploaded to HIePRO."

<u>2.12 PRE-OPENING MODIFICATION OR WITHDRAWAL OF BIDS</u> is amended by deleting 2.12 Pre-Opening Modification or Withdrawal of Bids in its entirety and replace with the following:

"2.12 PRE-OPENING MODIFICATION OR WITHDRAWAL OF BIDS. Bids may be modified or withdrawn prior to the bid opening date and time. Withdrawal or revision of proposal shall be completed, submitted and uploaded to HIePRO prior to the bid opening date and time."

<u>2.14 PUBLIC OPENING OF BIDS</u> is amended by deleting 2.14 Public Opening of bids in its entirety

<u>2.20 BID EVALUATION AND AWARD</u> is amended as follows: Paragraph (a) shall be replaced with the following:

"(a) The award shall be made to the lowest, responsive, responsible bidder within ninety (90) days after bid opening and shall be based on the criteria set forth in the invitation for bids. The Department may request the bidders to allow the Department to consider the bids for the issuance of an award beyond the 90 day period. Agreement to such an extension must be made by a bidder in writing. Only bidders who have agreed to such an extension will be eligible for the award. No response to request shall mean the bidder shall no longer be eligible for award."

<u>2.24 REQUIREMENTS OF CONTRACT BONDS</u> is amended by deleting 2.24(c) in its entirety and replacing with the following:

"(c) Prior to execution of the contract, the successful bidder shall file a good and sufficient performance bond and payment bond on the forms furnished by the Department. In as much as the contract to be executed is a price-term, open end, or requirements contract under which the contract price, or total amount to be paid the Contractor cannot be determined at the time the contract is executed, the performance and payment bond amounts required shall be as follows:

Performance Bond.....$1,000,000.00

Payment Bond.....$1,000,000.00

The Contractor shall submit the required contract bond(s) together with the signed contract in accordance with Section 2.25 Execution of Contract.

The above amounts represent the performance and payment bond amounts required for the initial term of the contract. If work orders issued during the initial contract term exceed the original bond requirements, the procurement officer shall require additional performance and payment bonds to cover said work orders.

If the contract is extended beyond the initial term, the State shall require new bonds for each subsequent term. Such performance and payment bonds for each subsequent term, may be extensions of the original bond(s) by endorsements thereto, provided that, as to any claims which may have arisen or may arise while said bonds were in effect, said bonds shall remain in full force and effect.

The performance and payment bond amounts may be reduced upon written determination by the head of the purchasing agency, if it is deemed to be in the best interest of the State."

2.25 EXECUTION OF CONTRACT is amended by deleting 2.25 Execution of Contract in its entirety and replacing it with the following:

"2.25 Execution of Contract. The contract, contract performance and payment bonds, and HRS Chapter 104 Compliance Certificate, shall be executed by the successful bidder and returned within ten (10) days or within such further time as the Department may allow after the bidder has received the contract for execution. The contract shall not bind the State in any way unless said contract has been fully and properly executed by all the parties thereto, the Comptroller has endorsed thereon its certificate that there is available an unexpended appropriation over and above all outstanding contracts, sufficient to cover the amount required by the contract, and the fully executed contract is received by the Contractor. If the Contractor fails to execute the contract and file acceptable bond(s) within ten (10) days, or within such further time as the Department may allow, the Department may cancel the award and award the contract to the next lowest, responsive and responsible bidder. The Department may recover its damages against the bid security as described in Subsection 2.11(c) herein."

4.12 UTILITIES AND SERVICES - is amended as follows:

Add the following after the last paragraph:

"(e)Repairs and Outages.

(1) The Contractor shall have available on 24-hour call sufficient specialty contractors, such as electrical and plumbing contractors, to repair any damage to existing facilities that might occur as a result of construction operations regardless of when the damage might occur.

(2) Outage: Written requests for power outage, communication changes, and water and sewer connection outages shall be submitted to the Engineer at least seven (7) days in advance or as specified in other sections of these specifications. Outages will be restricted to non-peak operational hours between midnight and 6:00 a.m."

7.21 PUBLIC CONVENIENCE AND SAFETY - is hereby added to the General Provisions:

"It shall be especially noted by the Contractor that the area directly adjacent to the existing in use runways and taxiways, is an extremely hazardous area and that very strict controls will apply throughout the entire period required to complete all work within 500 feet from the edge of an in use runway and 180 feet from the edge of an in use taxiway.

The Contractor shall familiarize himself with the Airport Certification Manual available for review at the Airport Manager's Office and shall comply with its requirements.

The Contractor is responsible for the security of access points to the Airport Operational Area that are located within the limits of construction and will be fined $1,000 per incident for any breach of security at these locations. All gates leading into the AOA shall be kept locked and if required to be open, the Contractor shall provide professional security guards to attend gates. The guards must be approved by the Director and shall be required to attend a training session conducted by the Airport Manager prior to gate assignment."

8.20 LIMITATION OF OPERATIONS: is hereby added to the General Provisions:

"The following limitations shall be observed by the Contractor when operating within 75 feet from the edge of any taxiway.

General - The Contractor shall schedule his operations to minimize interference with the movement of aircraft or passengers as may be required by the Engineer. The Contractor shall be responsible to alert all of his personnel to the location of power and signal cables installed for the operation of the airport. The Contractor shall control his operations in a manner to preclude any possible damage to those cables. Utility companies shall be notified by the Contractor one week before commencement of work. The Contractor shall give notice to the Engineer in writing, at least 168 hours before operating within 75 feet from the edge of any taxiway and the Engineer will assure himself that the Airport Management personnel are notified in sufficient time to publish the warning (NOTAM). The Contractor shall immediately repair any damages to the existing perimeter fence to prevent inadvertent entry to the Airport Operation Area (AOA).

Work in Vicinity of Runways and Taxiways in Use - Under the terms of this contract, it is intended that work shall be completed without disturbing the paved surface of existing runways and taxiways, unless shown otherwise on the plans.

Aircraft traffic shall not be interrupted. The Contractor shall schedule to work within 75 feet of the taxiway as directed by the Airport Management. No ruts, holes, or open trenches of 3 inches or more in depth and no objects or material 3 inches or more in height shall be permitted within the safety area when the airfield is in operation in conformance to Federal Aviation Regulation Part 139. The Contractor is also informed that Airport Zoning Regulations dictate that a 'clear zone' be maintained 500 feet on each side of an active runway, to be known as a hazardous area. The Contractor shall comply with all regulations governing ground operations within hazardous areas. The following FAA Advisory Circulars ·or later versions and FAA Regulations specify these requirements.

AC 150/5210-5D Painting, Marking, and Lighting Vehicles Used on an Airport, dated April 2010

AC 150/5340-lM Standards for Airport Markings, dated May 2019

AC 150/5370-2G Operational Safety on Airports During Construction, dated December 2017

FAA Regulations Objects Affecting Navigable Airspace Part 77

The Contractor shall keep all personnel and equipment off the areas not specifically designated for work under this Contract. At all times when the Contractor's equipment is not in use, the equipment shall

be moved outside the hazardous areas to an area designated by the Engineer. Under no condition shall equipment be parked, or material stored within the hazardous areas.

Failure on the part of the Contractor to abide by the above will result in suspension of work.

Authority of Control Tower Personnel - With the exception of actual construction methods, the airport control tower personnel will have full authority to control the Contractor's movements within the existing taxiway. When required, the Contractor shall maintain a constant radio vigil within all work areas and in addition shall keep at least one flagman on duty with the radio man. When notified by the control tower to temporarily halt operations, it shall be the duty of the flagman, through the use of appropriate methods (lighted flares shall not be used under any circumstances), to notify all operators of equipment and other personnel to cease work and move men and equipment off of hazardous areas. Contractor shall provide, at his own expense, the necessary radio and equipment including a radio equipped mobile vehicle to maintain contact with control tower personnel at all times during job performance. A transceiver operating at a frequency designated by the Engineer to communicate with the Control Tower.

Marking of Hazardous Areas - The Engineer will designate areas that are hazardous for aircraft. The Contractor shall provide red blinker lights spaced not more than 50 feet apart around all hazardous areas and areas of work within 75 feet of any taxiway. Such systems shall be subject to approval by the Engineer. The Contractor shall have personnel on call 24 hours per day for the emergency maintenance of hazard markings.

The Contractor shall provide red flags not less than 20 inches square in addition to the red blinker lights. When danger flags are made of fabric, a wire stiffener shall be used to hold the flags in an extended position. Flags shall be so mounted that they do not produce a hazard. The red danger flags shall be spaced not more than 50 feet apart around all areas of work within 75 feet of any taxiway.

All systems proposed by the Contractor for lighting and barricading shall be submitted to the Engineer for review prior to installation. The Contractor shall install all flags, lighting and barricades as required by the Engineer. Such systems shall be subject to approval by the Engineer.

Storage of Equipment and Materials - At the end of each working shift, all of the Contractor's equipment shall be withdrawn to an area designated by the Engineer. The Contractor shall park all equipment in an orderly fashion and place a sufficient number of red flasher lights to identify these areas. Materials stored within the airport shall be so placed and the work shall, at all times, be so conducted as to cause no greater obstruction to the air and ground traffic than is considered necessary by the Engineer. No runways, taxiways or roadways shall be closed or opened, except by permission of the Engineer.

Utilities - The Contractor shall provide for the protection of all utilities from damages in areas to be traversed by his vehicles and equipment. If required, buried cables and utility lines shall be protected by mounding earth over the cables or by any other method approved by the Engineer.

The Contractor shall notify representatives of the owner, agencies, and other affected organizations at least 48 hours prior to working in any area containing the facilities of these organizations.

Failure to notify the owning organization will prevent authorization to work in a specific area.

Archaeological Features - Any archaeological features such as petroglyphs, burial sites, and artifacts discovered or unearthed during the performance of the work shall immediately be brought to the attention of the Engineer and all work that would damage or destroy these features shall be discontinued. The Engineer will decide, after proper investigation, to salvage or abandon such artifacts."

8.21 OPERATION OF CONTRACTOR'S MOTOR VEHICLE AND PERSONNEL IN RESTRICTED AIR OPERATIONS AND MOVEMENT_AREAS is hereby added to the General Provisions:

"The contractor shall conform with the all sections of the "State of Hawaii, Department of Transportation,

Airports Division, Contractor's Training Guide" pertaining to access and operation in the Airport Operation Area (AOA) hereinafter described as follows:

A. Motor Vehicles in Airport Operation Area
for safety reasons, the operation of motor vehicles in the AOA must conform with all applicable State Airport rules and regulations.

B. Motor Vehicle Access Permit

Each motor vehicle operated in the AOA is required to:

1. Meet all State licensing registration and safety requirements and be specifically licensed for operation in the AOA.

2. Meet all insurance requirements.

3. Be restricted to operation by those persons qualified to drive the vehicle and in possession of a current Ramp Driver's License and applicable Motor Vehicle Operator's License.

C. The operators of motor vehicles in the AOA shall be responsible for meeting the following insurance requirements.

1. Licensed Vehicles

As a condition for authorization to enter the AOA, the Contractor shall provide evidence of vehicle liability insurance in the form of a Certificate of Insurance issued by an authorized insurance carrier. Automobile Liability and general Liability (combined single limit, Bodily Injury and Property Damage, per occurrence) shall be required in the applicable minimum limits specified below:

a. Daniel K. Inouye International Airport

(1) Standard AOA clearance.... $5,000,000

(2) Limited AOA clearance .....$1,000,000 Limited AOA clearance is defined as operations restricted to Diamond head and Ewa Concourses second level roadways and connecting third level main terminal roadway only, with entry and exit via Security Access Point "C" (Primary) and Access Point "A" (Secondary)

b. Other Airports

Standard AOA clearance.....$1,000,000
Standard AOA clearance is defined as any portion of a public Airport from which the public is restricted by fences or appropriate signs and no leased or demised to anyone for exclusive use and shall include runways, taxiways, all ramp and apron areas, aircraft parking and storage areas, fuel storage areas, maintenance areas, and any other area of a public Airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft or used for embarkation or debarkation of passengers.

2. Unlicensed Vehicles

Airport Liability (or General Liability) shall be required in the applicable minimum limits specified below:

a. Daniel K. Inouye International Airport, Kahului Airport and Ellison Onizuka Kona International Airport at Keahole

AOA clearance.....$5,000,000

b. All other Airports

AOA clearance.....$1,000,000

3. Specifically name the State of Hawaii as additionally insured.

4. Indicate that the Airport Engineer will be provided with a 30-day written prior notice of policy cancellation or material change in coverage or conditions.

D. Operator's Permit

1. No person shall operate a motor vehicle on the AOA unless he holds and carries on his person a current Airport Motor Vehicle operator's permit issued by the State of Hawaii, Department of Transportation, Airports Division.

2. Operator's permits will only be issued to persons who apply through the Airport District Security Office and pass a written exam covering those portions of the Airport Rules and Regulation relating to the operation of vehicles in Airport Operations Areas.

E. Authorized Vehicles

1. Only vehicles considered operationally safe and necessary for the performance of this contract may be allowed to operate in the AOA.

2. All motor vehicles must be painted in such a manner so as to be easily identifiable and must carry the Contractor's name on each side. These signs may be of a temporary nature applied to the side windows or doors.

The lettering shall be in bold characters of a minimum of four (4) inches in height and one and one-half (1-1/2) inches in widths, the height of logos should be a minimum of six (6) inches.

3. The Contractor's operations on, over, across, and/or immediately adjacent to any runway and/or taxiway at a towered airport shall require the use of two-way radio communication. The Contractor shall obtain the necessary equipment at his own expense.

4. No person shall operate a motor vehicle on the AOA unless he holds and carries on his person a current Motor Vehicle Operator's Permit issued by the Airport Manager.

a. The Motor Vehicle Operator's Permit will be issued only to persons who apply through the Airport Security Section and pass a written exam covering those portions of the Airport Rules and Regulations relating to the operation of vehicles in the AOA.

b. Permits issued may be suspended or revoked for cause at any time by the Airports Division.

F. Airport Operation Area Construction Pass

1. Issuance of Airport Operation Area (AOA) Construction Passes shall be limited to contractors, subcontractors, companies, organizations, individuals engaged in authorized and approved construction activity which requires a continuing need for entry into the AOA or Airfield Movement Areas Request letters for such passes must be made to the Airport District Manager's Office in

accordance with the Contractors Training Guide or applicable District requirements.

2. As a condition for security area clearance, applicants must comply with Transportation Security Regulation 1542 which requires a ten-year background Criminal History Records Check for those individuals employed under this contract.

G. Access to Movement Areas

1. Movement areas shall mean all of the runways and taxiways of the Airport which are utilized for taxiing, takeoff, and landing of aircraft.

   a. Any vehicle which requires access to the movement area shall be equipped with operational radio equipment capable of positive two-way contact with Tower/Ground Control.

   b. Operators of vehicles in movement areas must possess knowledge and familiarity with restricted and airfield movement areas, operational rules, regulations, and procedures, or be under direct escort by individuals meeting all of the above requirements.

2. Vehicle Operations on Movement Areas

   a. No vehicle shall proceed across any runway unless specifically cleared by Tower/Ground Control.

   b. The operator of a vehicle in the movement area shall not leave his vehicle unless continuous radio contact is maintained with the Tower/Ground Control while he is away from his vehicle.

   c. Any vehicle proceeding onto the movement area between the hours of sunset and sunrise shall be equipped with an overhead flashing light which is visible for one (1) mile, unless such vehicle is being escorted by another vehicle so equipped.

   d. All vehicles operated on the movement area between sunrise and sunset except those being escorted, shall operate an overhead amber or red flashing beacon visible for at least one (1) mile; or display a flag at least three (3) feet square with orange and white checkered squares of not less than one (1) foot on each side.

H. Runway and Taxiway Closure

1. Requests for runway or taxiway closures, or for any work which affects operational conditions at the airport must be made in writing through the Airport Manager.

2. Temporarily closed runways require placement of a lighted “X” runway closure marker on top of the runway identification numerals at both ends of the closed runway.

3. Taxiway closures require placement of barricades with alternate orange and white markings at each end of the closed taxiway segment. Barricades must be supplemented with flashing red lights. The intensity of the lights and spacing for barricades, and lights must adequately define and delineate the hazardous area.

I. Gate Guards Furnished by Contractors

1. If a contractor is permitted by the airport to maintain operational control of an AOA Access Gate, entry through such gate shall be controlled by the posting of a gate guard.

   a. Written instruction will be provided, outlining the guard's duties to enforce those requirements and provisions prescribed by the airport's security program to include all personnel and vehicle entry and access requirements.

   b. Procedures will be established to identify the actions which will be undertaken by the guard in calling for assistance.

   c. An approved emergency communications procedure will be established.

J. Compliance

1. The contractor shall comply with all regulations and rules governing the Air Operations Areas during construction, as specified in the following or later versions:

   a. Hawaii Revised Statutes, Title 19, Administrative Rules for Public Airports.

   b. Federal Aviation Administration Advisory Circular AC 150/5340-l, Standards for Airport Markings; AC 150/5370-2, Operational Safety on Airports During Constructions.

K. Enforcement Authorization

Act 21, Section 1, Section 261-17(a), HRS; Federal Aviation Administration Regulations, Part 139, Part 107.

L. Right of Rejection or Revocation

The State of Hawaii, Airports Division, reserves the right to withhold, deny or revoke any airport security clearance, licenses or permits to any individual or organization who fails to meet the prescribed or required access area clearance criteria to include background investigation information, or fails to observe or comply with established rules, regulations, and directives.

It should be clearly understood that such denial or revocation is based solely on airport security or safety considerations and does not in any way constitute a determination by the State with regard to private employment by any individual or organization."

--------END OF SECTION------

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

AIRPORTS DIVISION

SPECIFICATIONS

PART I

GENERAL PROVISIONS

The Hawaii Department of Transportation AIR and WATER Transportation Facilities Division General Provisions for Construction Projects dated 2016 is not physically included in these specifications. The General Provisions are available at

http://hidot.hawaii.gov/administration/con/

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HONOLULU, HAWAII

SPECIFICATIONS

PART II

TECHNICAL PROVISIONS

SECTION 01000 - DESCRIPTION OF WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

The General Provision 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.

1.2 SUMMARY

The work to be performed under this Contract is on an as-needed basis as determined by the State. Work shall include all labor, equipment, and materials necessary to complete the following work items:

A. Rigid Pavement Repair – Full Slab – Full Depth Replacement.

Work shall be performed in accordance with **Exhibit A - FAA AC 150/5380-6C Guidelines and Procedures for Maintenance of Airport Pavements (Appendix A - Figure A4).**

Typical slab size: 20’ x 20’ (Runway); 12’x12’ (Non-Runway)
Thickness: Approx. 22.5”
Dowels: 18” On Center

B. Rigid Pavement Repair – Partial Slab – Full Depth Replacement

Work shall be performed in accordance with **Exhibit A - FAA AC 150/5380-6C Guidelines and Procedures for Maintenance of Airport Pavements (Appendix A - Figure A6) unless otherwise specified by the RPR.**

C. Reconstruct Aggregate Basecourse.

D. Concrete Pavement Spall Repair.

E. Crack Sealing.

F. Joint Sealing.

1.3 LOCATION AND TIME OF THE WORK

A. The work to be performed under this contract is located at:
Daniel K. Inouye International Airport (HNL)

B. Projects are within a controlled area closed to public access, the Airports Operational Area (AOA). The Contractor shall meet requirements for working within the AOA as described in the Paragraph 1.4 AOA Safety and Security.

C. The airport shall remain operational at all times. Any damages to existing areas caused by the Contractor shall be repaired by the Contractor at no cost to the State.

D. Work hours shall be Monday to Friday excluding State Holidays from 2200 hours to 0600 hours or as otherwise specified by Airport Operations.

1.4 AOA SAFETY AND SECURITY

A. AOA Badges – All personnel accessing the AOA shall have AOA Badges with unescorted access issued by the Airport. AOA temporary escort badges shall be used only when the State determines that an emergency requires such use.

B. AOA Access Points – The Contractor shall be assigned only one access point for work phase. All personnel, vehicles, and equipment must enter and exit the AOA only through the assigned access point.

C. AOA Access Gates – Should the Contractor's assigned AOA access point be through an unguarded gate, the Contractor shall coordinate with the State to open and close the access gate. If the State determines that airport personnel are not available to provide gate access, the Contractor shall be responsible for the following:

1. Obtain AOA access gate keys from the Airport Security Office including any security deposit for the key(s).
2. Provide a gate guard familiar with all AOA security access requirements; knowledge of AOA access badge, AOA vehicle decal, and airport vehicle operator requirements; and a communication device and instructions to call for assistance whenever problems occur.
3. Proper control of the access gate in accordance with all airport security procedures.
4. Close the AOA gate during periods of prolonged inactivity and close and lock the gate whenever the gate is not in use or is unattended.

E. The Contractor shall develop a Construction Safety and Phasing Plan for the proposed work on the airfield and submit to the Airport Manager for approval.

1.5 AOA OPERATIONAL REQUIREMENTS

The Contractor shall be responsible for all their personnel and vehicle movements on the AOA. Should the State determine that a driver is failing to comply with airport regulations or instructions, the driver may be terminated or suspended and required to undergo additional training.

A. AOA Communication Devices – The Contractor shall have a dedicated radio monitoring person on the AOA whenever Contractor personnel are on site. The radio monitoring person's sole responsibility shall be to monitor the radio and relay any necessary instructions to the work crews. The radio monitoring person shall have no other duties while on the AOA. The Contractor shall provide the following communication devices:

1. A two-way radio capable of communicating on aviation frequencies including but not limited to:

   Daniel K. Inouye International Airport –
   118.7 (Tower), 121.9 (Ground), 121.8 (Ramp)

2. Cellular telephone with a listing of all required emergency contact numbers.

B. AOA Travel Routes – The Contractor will be assigned only one travel route per work area and shall ensure that all their personnel, vehicles, and equipment traverse the AOA only along the designated route. If the State determines that an emergency has made the designated route unusable, a temporary travel route will be assigned.

C. AOA Authorized Vehicles – Only vehicles considered safe and required to complete the Contractor's work shall be allowed to operate on the AOA. Each vehicle operating on the AOA must possess:

1. An AOA vehicle decal obtained from the Airport Security Office and displayed on the driver side front bumper. AOA temporary vehicle decals shall only be issued when the State determines that an emergency requires such use.
2. Insurance coverage as required by Article 7.1 of the General Provisions and as amended by the Special Provisions.

D. Vehicle and Equipment Requirements on the AOA – Each vehicle and driven piece of equipment shall possess the following when operating within the AOA.

1. Operations occurring at night or during periods of poor visibility shall require a flashing amber beacon mounted to the vehicle/equipment's highest point.

2. Daylight operations with clear visibility shall require a checkered orange and white flag attached to a staff that is mounted to each vehicle/equipment in lieu of a flashing amber beacon. The flag shall be at least 3 foot square with a checkered pattern of international orange and white squares that are at least 1 foot on each side.

3. Placards shall be on both sides of each vehicle or equipment at all times to identify the vehicle or equipment owner. Placards shall contain the company

name in letters at least 4” tall or company logo at least 6” high.

4. All additional equipment marking, lighting, and positioning that may be required by the FAA.

E. AOA Drivers – All people operating a vehicle or any driven piece of equipment on the AOA shall possess the following license, permit, and expertise:

1. Current and valid Hawaii State Driver’s License.

2. Current and valid Airport Vehicle Operator’s Permit.

3. Complete airport familiarization.

4. An understanding and ability to identify the following;
   a. All RSAs and TSAs.
   b. All AOA Markings, Lighting, and Signing
   c. The need for control of FOD.
   d. All AOA Equipment for Aircraft.
   e. All AOA critical areas.
   f. All AOA travel routes for the various work phases.

5. An understanding and ability to follow all ground vehicle operation and communication requirements while operating on the AOA.

F. Airport Vehicle Operator's Permit - Shall only be issued to people that apply through the Airport Security Office, and pass a written exam covering portions of the Airport Rules and Regulations related to vehicle operations on the AOA. The State may suspend or revoke an issued permit at any time for cause.

G. AOA Traffic Control - The Contractor shall furnish and provide the following traffic control devices as needed and can utilize airport equipment as available:

1. Runway Lighted X's - Whenever working within an RSA.
2. Low-Profile Barricades - Shall be used to designate areas closed to aircraft traffic and shall meet the requirements of AC 150/5370-2 (latest version).

H. AOA FOD Control - The Contractor shall keep all work areas, AOA travel routes, and all adjacent areas clean at all times. Unless otherwise directed by the Airport Manager, the Contractor shall properly haul and dispose all removed pavement materials and collected debris to a site off the Airport. The State will notify the Contractor to perform remedial cleaning whenever their FOD Control Operations are unsatisfactory. Upon notification, the Contractor shall be at the jobsite ready to perform remedial cleaning within one hour. Notification by telephone will be deemed as official.

I. Airport Staging Areas - The Contractor shall only stage its vehicles and equipment at State approved areas. No vehicle/equipment shall park within 4' of a security fence. Demarcation of the staging area shall be as follows:

1. Weighted Lighted Barricades shall be placed around the staging area perimeter at a maximum of 20' on center; and
2. Yellow Barrier Tape with the words" CAUTION DO NOT ENTER" continuously printed on the tape shall be used with barricades to demarcate the staging area perimeter.

1.6 COORDINATION OF CONSTRUCTION ON THE AOA

Work on the AOA requires Rwy and Twy closures that demand proper notification to numerous agencies responsible for public safety; hence, the Contractor shall only cancel work through the Airport Manager, Airport Operations Manager, or Airport Duty Manager. Whenever a cancellation is not made, and the Contractor is not at the assigned AOA Access Point within 30-minutes of the start time; all Contractor closures will be cancelled. The Contractor shall reimburse the State $600.00 for every cancellation the State deems unjustified. The reimbursement is to compensate the State for all unnecessary costs related to canceling existing and coordinating new closures.

1.7 CONSTRUCTION LIGHTING REQUIREMENTS

Should any part of the work area lack sufficient light, the Contractor shall provide sufficient artificial lighting to permit the work and inspection to be carried out efficiently, thoroughly, safely, and satisfactorily. Work and inspections shall not be performed with only flashlights and/or vehicle/equipment headlights. All lights shall be positioned so they do not blind aircraft pilots, or FAA-ATCT controllers. All wiring for electrical lights and power shall be properly installed, maintained, securely fastened and kept as far as possible from telephone and signal wires.

1.8 ENVIRONMENTAL AND HEALTH REQUIREMENTS

The Contractor shall perform the following in accordance with all applicable federal, state, local, and airport rules and regulations related to environmental pollution control, abatement, and fire code.

A. Airport Water - Airport water shall not be drawn from a tap lacking a reverse pressure principal backflow prevention device. Water valves shall be opened and closed so that water hammers are not produced. The Contractor shall furnish and install this type of equipment, as well as all fittings, appurtenances and bracings needed for the proper installation; and the Contractor shall remove all devices upon completion of their work.

B. Waste Disposal - Shall be performed properly. Materials shall not be burned, and construction waste shall not be disposed into Airport storm water or sewer systems.

C. Restoration - Completely restore to an acceptable condition, staging areas, work areas, AOA travel routes, and areas adjacent to the aforementioned.

D. Vehicle/Equipment Leaks and Material Spills - Shall be handled by the following five-step process and pertains to all fluids other than potable water.

1. All leaked or spilled fluids shall immediately be kept from entering the Airport storm water and sewer systems.
2. All fluid leaks or spills shall be respectively fixed or stopped, immediately after ensuring that the fluids are kept out of the Airport storm water and sewer systems.
3. All areas containing the leaks or spills shall be properly cleaned and restored.
4. Dispose all waste per Paragraph 1.8.B above.
5. Submit proper documentation to the State showing that all leaks or spills were properly cleaned and disposed.

E. Dust Control - Is required during all interior and exterior construction operations.

1.9 OTHER REQUIREMENTS

The Contractor shall also comply with the following requirements should they arise.

A. Any new TSA security requirement.

B. Any additional operational safety requirements generated by the FAA.

C. Provide additional lights along AOA travel routes should the Engineer deem additional safety enhancements are needed.

D. Any new environmental and health requirements generated by the EPA or DOH.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT AND PAYMENT

Work under this section not identified in the proposal schedule will not be measured nor paid for separately but shall be considered incidental to and included in the bid prices for the various items of work in this project.

Item No.	Item	Unit
01000.1	Mobilization/Traffic Control For Runway Closure	Day
01000.2	Mobilization/Traffic Control For Taxiway Closure	Day
01000.3	Mobilization/Traffic Control For Ramp Closure	Day

END OF SECTION

SECTION 01560 – GENERAL ENVIRONMENTAL, HEALTH, & SAFETY CONTROLS

PART I – GENERAL

1.01 RELATED DOCUMENTS

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 DESCRIPTION

This section addresses the prevention of environmental pollution as the result of construction operations under this contract. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare, unfavorably alter ecological balances of importance to human life, adversely affect other species of importance, or degrade the utilization of the environment for aesthetic and recreational purposes.

1.03 REFERENCES

All work shall conform to the most recent edition of the following Federal, State, and Local regulations, unless otherwise noted or specified on the drawings or in these specifications. Where conflicts among the requirements or with these specifications exists, the most stringent requirements shall apply.

A. DOTA Construction Site Runoff Control Program
http://hidot.hawaii.gov/airports/doing-business/engineering/environmental/construction-site-runoff-control-program

1. DOTA Construction Activities Best Management Practices (BMP) Field Manual.

B. Department of Health (DOH) Hazard Evaluation & Emergency Response (DOH HEER) https://health.hawaii.gov/heer/

C. State of Hawaii Administrative Rules, Title 11, Department of Health (DOH)

1. Chapter 46, Community Noise Control.

2. Chapter 59, Ambient Air Quality.

3. Chapter 60.1, Air Pollution Control.

4. Chapters 260.1, 261.1, 262.1, 263.1, 264.1, 265.1, 266.1, 268.1, 270.1, 271.1, 273.1, and 279.1, Hazardous Waste Management.

5. Chapter 451, State Contingency Plan.

6. Chapter 501, Asbestos Requirements.

D. CFR Title 40, Protection of the Environment, Chapter I, Environmental Protection Agency.

E. CFR Title 42, Public Health, Chapter I, Public Health Service, Department of Health and Human Services.

1.04 SUBMITTALS

A. The Contractor shall submit the following items as required:

1. Individual Wastewater System (IWS) Final Report: For projects involving the construction of an individual wastewater system, an IWS Final Report is required to be submitted to the DOTA Engineering Branch, Environmental Section (AIR-EE) for approval, prior to submitting to DOH Wastewater Branch and prior to project closeout.

2. Underground Injection Control (UIC) Well Final Report: For new drainage well construction and existing drainage well modification, a UIC Well Final Report is required to be submitted to AIR-EE for review and approval, prior to submitting to DOH Safe Drinking Water Branch (SDWB), and prior to project closeout. The Final Report shall also be submitted within the deadline specified on the UIC Approval to Construct. If a project involves abandoning an existing drainage well, written instructions shall be obtained from DOH SDWB and a copy provided to AIR-EE prior to backfilling the demolished well. All supporting documentation requested by DOH post demolition work shall be completed and provided to AIR-EE for review prior to submitting to DOH SDWB.

3. AST (Flammable/Combustible Liquid) Tank Installation: Provide signed record of Final Inspection issued by County Fire Department.

4. Waste Manifests: If a project will generate hazardous waste, the Contractor shall prepare waste manifests in accordance with HAR 11-262 and provide records to AIR-EE.

B. The Contractor shall comply with all applicable regulations and maintain records of permits, licenses, certificates, and other environmental regulatory requirement correspondence. Submit copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments, correspondence, records, and similar documents, established for compliance with environmental regulations bearing on performance of the work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 AIR POLLUTION CONTROL

A. Emission: The Contractor shall not be allowed to operate equipment and vehicles that show excessive emissions of exhaust gases until corrective repairs or adjustments are made, as determined by the Engineer.

B. Dust: The Contractor, for the duration of the contract, shall maintain all excavations, embankments, haul roads, permanent access roads, plant sites, waste disposal areas, borrow areas, graded areas, staging and storage areas, and all other work areas within or outside the project limits free from dust that would cause a hazard or nuisance to the work or operations of other Contractors, or to persons or property. Industry-accepted methods, that meet requirements of DOTA Construction BMP Field Manual as noted in Specification 01561 and that meet stabilization suitable for the area or materials involved.

C. Burning on Airport property shall not be permitted.

3.02 SPILL CONTROL

A. The Contractor shall follow the DOTA Construction Site Runoff Program and relevant documents, such as the Construction BMP Field Manual to implement BMPs to prevent spills and leaks and report and cleanup spills and leaks immediately, as required.

3.03 DISPOSAL

A. All unusable debris and waste material shall be hauled away to an appropriate local landfill. Contractor shall control dust during loading operations.

B. Contractor shall consult with the landfill and conduct any required waste characterization to ensure that waste meets the landfill's requirements for size, type, etc.

C. No burying of debris or waste materials, except for materials that are specifically indicated elsewhere in these specifications as suitable for backfill, shall be permitted on the project site.

D. Contractor shall manage all construction materials, debris, and waste in a manner that prevents Foreign Object Debris (FOD) from reaching the airfield, where it could be an aircraft safety hazard.

3.04 HAZARDOUS MATERIALS CONTROL

Hazardous materials shall be properly stored and handled. The use of prohibited hazardous materials, e.g., asbestos, lead paint, and polychlorinated biphenyls (PCBs), in the construction of this project shall be strictly prohibited. Any corrective action to remove and replace hazardous material and contaminated work areas shall be at the sole expense of the Contractor.

3.05 OCCUPATIONAL HEALTH AND SAFETY

The Contractor shall at all times comply with all State of Hawaii and Federal rules and regulations related to occupational health and safety and develop and follow a Health and Safety Plan describing measures the Contractor will employ to protect the health and safety of their employees. Include measures required to protect the public from dangers associated with their work.

PART 4 – MEASUREMENT AND PAYMENT

4.01 BASIS OF MEASUREMENT AND PAYMENT

All work specified in this Section shall not be measured nor paid for separately but shall be considered incidental to item 01561.1, Construction Site Pollution Controls.

END OF SECTION

SECTION 01561 – CONSTRUCTION SITE POLLUTION CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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 DESCRIPTION

A. This Section describes procedures for the proper application of management and engineering controls at State of Hawaii, Department of Transportation, Airports (DOTA) construction sites so that pollutants do not impact any storm drainage system, State water, soil, or groundwater.

B. The Contractor shall supply all labor, materials, and equipment necessary for the management of stormwater during construction and to carry out the work in accordance with these specifications, and all applicable Federal, State, and local regulations and latest amendments.

C. This Section also applies to construction support activities including concrete or asphalt batch plants, rock crushing plants, equipment staging yards/areas, material storage areas, excavated material disposal areas, borrow areas, waste management facilities, sanitary facilities, material storage areas, and temporary equipment fueling locations, regardless of their proximity to the Airport Property and State Right-of-Way. For areas serving multiple construction projects or operating beyond the completion of the construction project in which it supports, the Contractor shall be responsible for securing the necessary permits, clearances, and documents, and following the conditions of the permits and clearances, at no cost to the State.

D. The Contractor shall be responsible for all subcontractors, suppliers, and vendors, and shall ensure that the means and methods of construction activities of subcontractors, suppliers, and vendors are in full compliance with this Section.

E. The Contractor shall examine and be familiar with documents related to stormwater management at the airports and shall comply with related requirements for construction stormwater control. Should a requirement not be clearly described within the construction plans, specifications, permits and other applicable bid documents, notify the Engineer immediately for interpretation.

1.03 REFERENCES

All work shall conform to the most recent edition of the following, unless otherwise noted or specified on the drawings or in these specifications. Where conflicts among the requirements or with these specifications exists, the most stringent requirements shall apply.

A. DOTA Construction Site Runoff Control Program
http://hidot.hawaii.gov/airports/doing-business/engineering/environmental/construction-site-runoff-control-program

1. DOTA Construction Activities Best Management Practices (BMP) Field Manual.

2. DOTA Environmental Requirements for Construction Projects Standard Operating Procedures.

3. DOTA Stormwater Management Plans (SWMPs) for the Daniel K. Inouye International Airport (HNL) and Kahului Airport (OGG), as applicable.

4. DOTA Industrial SWPPPs for the HNL, OGG, and the Lihue Airport (LIH), as applicable.

B. State of Hawaii Administrative Rules, Title 11, Department of Health (DOH)
https://health.hawaii.gov/opppd/department-of-health-administrative-rules-title-11/

1. Chapter 54, Water Quality Standards

2. Chapter 55, Water Pollution Control

3. Chapter 451, State Contingency Plan

C. United States (U.S.) Code of Federal Regulations (CFR), Title 40, Chapter I: Environmental Protection Agency.

D. Hawaii Revised Statutes (HRS), Part I, Chapter 128D, “Environmental Response Law”.

PART 2 – PRODUCTS

2.01 MATERIALS

Comply with applicable materials described in the current DOTA Construction Activities BMP Field Manual. Refer to FAA Advisory Circulars and DOTA District Office, including Wildlife Hazard Management Plan, for additional guidance and conditions. In addition, materials shall comply with the following:

A. Grass: The FAA and USDA recommend the following grass species when requiring grass: “No-Mow” bermudagrass (“Green Velvet”) (Cynodon dactylon) or Seashore paspalum (Paspalum vaginatum). These species possess higher than average drought resistance, saline soil tolerances, and most importantly, do not produce seed heads attractive to the majority of hazardous avian species. Use stolons, sprigs, or plugs to avoid providing hazardous species with a readily available food source. The use of seeds is generally not allowed.

Alternative grass species shall only be applied with the approval by the Engineer

after consultation with United States Department of Agriculture (USDA) airport representative. This includes, but is not limited to, sodding, cuttings, and planting. Grass shall be a quick-growing species. Grass shall be suitable to the area and provide a temporary cover that will not compete later with permanent cover.

B. Irrigation: Any required irrigation shall be done after dark to reduce instances of water becoming a hazardous wildlife attractant.

PART 3 – EXECUTION

3.01 PRE-CONSTRUCTION REQUIREMENTS

Do not begin construction activities until all submittals detailed in this Subsection are completed, submitted to the Engineer, and accepted in writing by AIR-EE.

A. Water Pollution, Dust, Sediment, and Erosion Control Meeting: Schedule a water pollution, dust, sediment, and erosion control meeting with the Engineer after all documents required by AIR-EE are submitted to the Engineer and accepted in writing by AIR-EE. The meeting shall be scheduled a minimum of 14 calendar days prior to the Start Work Date. At a minimum, the meeting shall be attended by the Contractor, subcontractors whose work may provide an impact to stormwater or site environmental conditions, Engineer, AIR-EE, and any authorized representatives of the designated attendees. The meeting will discuss the sequence of work and plans and proposals for water pollution, dust, sediment, and erosion controls.

B. Land Disturbance Calculations: The Contractor is responsible for calculating the total land disturbance for the life of the project and complying with all environmental requirements associated with the total land disturbance calculated. Disturbance of land is defined by Hawaii Department of Health as "the penetration, turning, or moving of soil or resurfacing of pavement with exposure of the base course or the exposure of bare soil or ground surface, including the land surface exposed by construction roads, baseyards, staging areas, demolition, headquarters, and parking areas. It does not include grass or weed cutting, bush or tree trimming or felling that leaves soil or ground intact. It includes 'grubbing' in its normal meaning of the use of equipment to knock down and push vegetation out of the way, typically uprooting vegetation and disturbing the ground surface."

Land disturbing activities that shall be included in the disturbance area calculation shall follow the guidance provided in the Environmental Requirements for Construction Projects Standard Operating Procedures.

C. Site-Specific BMP (SSBMP) Plan or Stormwater Pollution Prevention Plan (SWPPP): The Contractor shall submit a SSBMP Plan (for projects disturbing less than one acre) or SWPPP (for projects disturbing one acre or more) using the latest DOTA template for acceptance by AIR-EE. If a SSBMP Plan or SWPPP was prepared by the Designer, the Contractor shall revise the plan using

the latest template to include additional information required of the Contractor and any changes the Contractor proposes. The SSBMP Plan or SWPPP shall include site-specific temporary BMPs following requirements and practices outlined in DOTA's "Construction Activities BMP Field Manual." All AIR-EE comments shall be resolved and the SSBMP Plan or SWPPP approved prior to the start of land-disturbing activities, including those activities that are needed for the implementation of the BMPs. Submission of the complete and acceptable SSBMP Plan or SWPPP is the sole responsibility of the Contractor, and additional contract time will not be issued for delays due to incompleteness.

D. SSBMP Plan/SWPPP Modifications: Modify, as necessary, and resubmit amended SSBMP Plan or SWPPP and construction schedules to the Engineer for acceptance by AIR-EE. Amendments to the SSBMP Plan or SWPPP shall be made under the following circumstances at a minimum:

1. Conditions that develop during construction that were unforeseen during the design and pre-construction stages that could impact stormwater, soil, or groundwater.

2. Changes to the Contractor's Means and Methods of Construction that could impact stormwater, soil, or groundwater.

3. Omitted conditions that should have been allowed for in the accepted documents.

4. A SSBMP Plan measure that replaces an accepted SSBMP Plan measure that was not satisfactorily performing.

5. Revised dates of installation and/or removal of SSBMP Plan measures.

SSBMP Plan/SWPPP modifications shall be submitted to the Engineer and accepted in writing by AIR-EE before implementing the revised site-specific BMPs in the field. Amendments to the SSBMP Plan or SWPPP shall be included with the original SSBMP Plan or SWPPP and documented in the Amendment Log.

E. Documentation: A copy of the accepted original or amended SSBMP Plan or SWPPP, with the signed certification by the authorized representative filed with DOH for SWPPPs, shall be kept on site or at an accessible location so that it can be made available at the time of an on-site inspection, or upon request by the Engineer, AIR-EE, DOTA's designated authorized representative, and/or DOH/EPA Representative.

F. NPDES Construction Permit: If the total land disturbance for the life of the project, including all construction support activity areas, is one acre or more, coverage under an NPDES Permit Authorizing Discharges of Storm Water Associated with Construction Activity (NPDES Construction Permit) authorizing stormwater discharges associated with construction activity is required from the Department of Health, Clean Water Branch (CWB).

1. Do not begin land-disturbing activities until the CWB has issued an Individual NPDES Permit or NGPC. Conduct land-disturbing activities in accordance with the conditions of the NPDES Permit and/or NGPC.

2. The Contractor shall submit a Notification of Start to CWB a minimum of seven calendar days before the start of construction and provide AIR-EE with a record of submittal.

3. Before construction begins, the Contractor shall assign one of their personnel as the Duly Authorized Representative, in accordance with Section 15 of Appendix A, Chapter 1155. The Duly Authorized Representative is responsible for compliance with the NPDES Construction Permit (i.e., operations of the construction project) and shall certify, sign, and date various documents, including the SWPPP and SWPPP inspection documents.

G. Solid Waste Disclosure: Submit the Solid Waste Disclosure Form for Construction Sites, if applicable, to the DOH Solid Waste Branch as specified on the form within 7 calendar days before the start of construction activities and provide a copy to the Engineer. Provide a copy of all the disposal receipts from the facility permitted by the Department of Health to receive solid waste to the Engineer. This shall also include documentation from any intermediary facility where solid waste is stored, handled or processed.

H. NPDES Hydrotesting Permit: If hydrotesting activities require effluent discharge into State waters or drainage systems, coverage under an NPDES Hydrotesting Waters Permit authorizing discharges associated with hydrotesting is required from the CWB. Do not begin hydrotesting activities until the CWB has issued an Individual NPDES Permit or NGPC for hydrotesting. Conduct Hydrotesting operations in accordance with the conditions of the NPDES Permit and/or NGPC.

I. NPDES Dewatering Permit: If dewatering activities require effluent discharge into State waters or drainage systems, coverage under an NPDES Dewatering Permit authorizing discharges associated with dewatering is required from the CWB. Do not begin dewatering activities until the CWB has issued an Individual NPDES Permit or NGPC for dewatering. Conduct dewatering operations in accordance with the conditions of the permit or NGPC.

J. Construction BMP Training: All Contractor's and subcontractor's employees on the project shall complete the DOTA Construction BMP Training prior to entering the construction site and every calendar year thereafter. All Contractor and subcontractor personnel involved with construction project responsibilities shall also be trained on the site-specific BMPs that are utilized during construction and spill response. Records of completion and/or training roster sign-in sheet shall be up to date and included in the SWPPP or SSBMP Plan. Additional training required by AIR-EE shall be at no additional time or cost to the project. There are two training options:

1. All Contractor and subcontractor employees involved with construction project responsibilities watch the DOTA Construction BMP Training Video located on the DOTA Construction Site Runoff Control Program webpage and complete the DOTA Construction BMP Training Survey with a passing score, or

2. The Contractor and subcontractor supervisors/managers watch the DOTA Construction BMP Training Video located on the DOTA Construction Site Runoff Control Program webpage, complete the DOTA Construction BMP Training Survey with a passing score, then train all employees involved with construction project responsibilities and submit a sign-in roster documenting all employees trained at the bottom of the DOTA Construction BMP Training Survey.

   DOTA Construction BMP Training Survey:
   https://hidot.hawaii.gov/airports/doing-business/engineering/environmental/construction-bmp-training-survey/

K. Construction Connection, Discharge, and Surface Runoff Permit: The Contractor shall complete the Contractor's section of the Construction Connection, Discharge, and Surface Runoff Permit and submit to AIR-EE for review. All AIR-EE comments shall be resolved prior to the start of land-disturbing activities.

3.02 CONSTRUCTION REQUIREMENTS

A. Construction Start: Do not expose or disturb surface area of earth material or initiate any land-disturbing activities until submittals detailed in Subsection 01561.3.01 – Pre-construction Requirements are completed, submitted to the Engineer and accepted in writing by AIR-EE. Once installation of BMPs is allowed, a Pre-construction BMP Inspection is conducted, and all deficiencies that are noted during the inspection shall be corrected prior to any other ground disturbance.

B. BMP Installation and Maintenance: Provide, install, maintain, monitor, repair and replace BMPs as needed to maintain efficacy. Address all inspection comments received from the Engineer, AIR-EE, and/or DOTA's designated authorized representative.

C. Protect temporarily or permanently disturbed soil surface from rainfall impact, runoff, and wind before the end of each work day. Coordinate and schedule the work to the maximum extent possible to minimize the amount of exposed or disturbed surface area of earth material.

D. Install and maintain stabilized construction entrances/exits, including any wheel washes, to minimize tracking of dirt and mud onto roadways, sidewalks, and other paved areas. Restrict traffic to stabilized construction entrance areas only. Clean dirt, mud, or other material tracked onto the road, sidewalk, or other paved area by the end of the same day in which the track-out occurs. If tracking is excessive or sediment is being transported farther along the pavement or

sidewalk by other vehicles traveling outside of the construction site, conduct cleaning and sweeping immediately. Modify stabilized construction entrances/exits, as needed, to prevent mud from being tracked onto road. Stabilize entire access roads if necessary.

E. Maintain all excavations, embankments, haul roads, permanent access roads, plant sites, waste disposal areas, borrow areas, and all other work areas within the project limits free from dust that would cause a hazard to the work, airport operations, operations of other contractors, or to persons or property. If chemicals are used as soil stabilizers for erosion and dust control, submit the manufacturer's product data sheets of the chemicals to the Project Manager for acceptance by AIR-EE. Oil treating shall not be used. Dust screens and fabrics are not allowed to be mounted on, or to inhibit the view of, the TSA and AOA Security Fences.

F. Cover exposed surfaces of materials completely with tarpaulin or a similar device when transporting aggregate, soil, excavated material, or other materials that may be a source of fugitive dust.

G. Protect ditches, channels, and other drainageways leading away from cuts and fills at all times by:

1. Hydromulching cuts and fills that may erode.

2. Installing check dams or other silt control devices.

3. Other methods acceptable to AIR-EE.

H. Clean up and remove any pollutant that is attributed to the Contractor. Care shall be taken to ensure that no petroleum/chemical products, bituminous materials, or other deleterious substances, including debris, are allowed to fall, flow, leach, or otherwise enter the sewage systems or storm drains. Deposition of solid waste or the discharge of liquid waste, such as fuels, lubricants, bituminous waste, untreated sewage and other pollutants that may contaminate stormwater, surface waters, soil, or groundwater shall not be permitted.

I. Disturbed Area Stabilization: Immediately initiate stabilization of exposed soil areas upon completion of land-disturbing activities for areas where disturbance has permanently or temporarily ceased on any portion of the site. Land-disturbing activities have permanently ceased when clearing and excavation within any area of the construction site that will not include permanent structures has been completed. Land-disturbing activities have temporarily ceased when clearing, grading, or excavation within any area of the site will not resume for a period of 14 or more calendar days, but such activities will resume in the future. The term "immediately" is used in this Section to define the deadline for initiating stabilization measures. "Immediately" means as soon as practicable, but no later than the end of the next work day, following the day when the land-disturbing activities have temporarily or permanently ceased.

1. After the initiation of stabilization, stabilization activities shall be completed according to the following timeline:

    a. For projects with an NPDES Construction Permit:

        - For construction areas discharging into waters not impaired for nutrients or sediments, complete installation of stabilization measures within 14 calendar days after the temporary or permanent cessation of land-disturbing activities.

        - For construction areas discharging into nutrient or sediment impaired waters, complete installation of stabilization measures within 7 calendar days after the temporary or permanent cessation of land-disturbing activities.

    b. For projects without an NPDES Construction Permit, complete stabilization within 14 calendar days after the temporary or permanent cessation of land-disturbing activities.

J. Notice of Cessation: For projects with an NPDES Construction Permit, the Contractor shall submit a Notice of Cessation to CWB within seven calendar days after the end of the month that the project was completed and provide AIR-EE with a record of submittal.

K. Changes to Land-disturbing Activities: The Contractor shall be responsible to prepare a new SWPPP or SSBMP Plans or amend existing SWPPP or SSBMP Plans if changes to the project or to the Contractor's activities result in land-disturbing activities additional to those previously approved:

1. Land-disturbing activity outside of the approved limits is NOT allowed until approval and proper permits are received. Revised documents, including an updated SWPPP or SSBMP Plan, shall be submitted to and approved by AIR-EE prior to conducting additional land-disturbing activities.

2. If coverage under an NPDES Construction Permit is needed, no activity in the additional area may occur until the additional permit coverage is granted:

    a. If the project was already granted coverage under an NPDES Construction Permit, additional coverage shall be obtained from CWB for the additional area, either by adding the area to existing project documents, and applying for NPDES Construction Permit coverage for the entire project OR by creating new documents and obtaining separate NPDES Construction Permit coverage for the additional area.

    b. If the new disturbed area will result in the total disturbed area

equaling one (1.0) acre or more for a project without existing NPDES Construction Permit coverage, NPDES Construction Permit coverage shall be obtained from CWB that will cover all land-disturbing activities anticipated for the life of the project.

3.03 INSPECTIONS

Refer to the DOTA Construction Site Runoff Program for information pertaining to AIR-EE BMP inspections (pre-construction, routine, and final). Contractor self-inspections shall occur based on the frequency outlined in the SSBMP Plan and, if applicable, NPDES Permit (HAR 11-55) and SWPPP requirements.

A. Corrective Actions: The Contractor shall be responsible for the correction of all deficiencies identified during any of the above inspections.

1. If the Contractor fails to satisfactorily address inspection deficiencies, the DOTA reserves the right to employ outside assistance or use the State's own labor forces to provide necessary corrective measures. The Contractor will be fully responsible for all related cost and time. The State will charge the Contractor such incurred costs plus any associated project engineering costs and will make appropriate deductions from the Contractor's progress payment. Additionally, DOTA can issue liquidated damages for deficiencies not resolved to DOTA's satisfaction and for illicit discharges or contaminant discharges to soil, groundwater, surface water, or State waters (see Appendix A).

2. Failure to install or maintain site-specific BMP measures may result in the assessment of liquidated damages (Appendix A). Depending on the severity of the deficiencies, additional enforcement actions, such as suspension of work and/or termination of the contract (with the Contractor's Surety being fully responsible for all additional costs incurred by the State), can be conducted and assessed against the Contractor.

3. For all citations or fines received by the DOTA for non-compliance, including non-compliance with NPDES Permit conditions, the Contractor shall reimburse the State within 30 calendar days for the full amount of outstanding cost that the State has incurred. The State may deduct incurred costs from the Contractor's progress payments; however, the Contractor shall be responsible for reimbursing the State if the costs exceed remaining payments owed to the Contractor.

4. The Contractor shall be responsible for all citations, fines and penalties levied by DOH or EPA against the State due to the Contractor's failure to satisfactorily address site-specific BMP deficiencies and/or any Contractor's illicit discharges. The State may make the appropriate deductions from the Contractor's progress payment.; however, the Contractor shall be responsible for reimbursing the State if the costs of correction exceed remaining payments owed to the Contractor.

PART 4 – MEASUREMENT AND PAYMENT

4.01 BASIS OF MEASUREMENT AND PAYMENT

Work under this Section will be paid for under the various contract items shown below. For ALLOWANCE items in the proposal schedule, the allowance is an estimate, and the amount shall not exceed the maximum amount shown in the Proposal Schedule. The Contractor shall provide an estimated cost for Construction Site Runoff Control for each proposal under the Contract. Payment shall be the actual cost as invoiced by the Contractor and approved by the DOTA Engineer. The Contractor shall be allowed to include overhead, profit, insurance and/or other markups, as stipulated in Section 9.5 of the General Provisions for Construction Projects, Air and Water Transportation Facilities Division.

Item No.	Item	Unit
01561.1	Construction Site Runoff Control Program	Allowance

Partial payments shall be paid in the Monthly Progress Payment as follows:

A. 20% of the line item price shall be paid upon the satisfactory completion of the Pre-construction BMP Inspection and associated corrective actions accepted by AIR-EE or their designated authorized representative, as described in Section 01561.3.03(A), above.

B. 70% of the line item price shall be paid in equal monthly payments over the duration of the contract. Failure to satisfactorily apply, maintain, or modify BMP measures and devices, and/or submittals shall result in the withholding of monthly progress payments for this line item.

For projects that will disturb one acre or more of land, or will be part of a larger common plan of development that will disturb one acre or more of land, payments shall be made only after Routine BMP Inspections described in Section 01561.3.03 above have been satisfactorily completed, and associated corrective actions accepted by AIR-EE or their designated authorized representative.

C. The remaining 10% of the line item price shall be paid after all temporary BMP measures have been satisfactorily removed.

Payment will be made only after the satisfactory completion of the Final BMP Inspection and associated corrective actions accepted by AIR-EE or their designated authorized representative, and acceptance of the Post-construction BMPs by AIR-EE or their designated authorized representative.

Liquidated Damages, up to $25,000 per day (Appendix A), shall be assessed for each non-compliance of the BMP requirements described in this Section. The Contractor shall not be entitled to recover any Liquidated Damages assessed, even after the

deficiencies have been corrected.

The Liquidated Damages cited in Appendix A are in excess of reimbursement for any citations, fines, or penalties levied by any regulatory agency against the State due to the Contractor's violations of clean water regulations or standards.

Appendix A. Liquidated Damages Schedule for Non-Compliances

Non-Compliance	Amount
Failure to obtain coverage under an NPDES Construction Permit for construction activities associated with a project that will disturb one acre or more of land, or will be part of a larger common plan of development that will disturb one acre or more of land, as defined by DOH.	$1,000 per calendar day per violation.
Failure to obtain coverage under an NPDES Hydrotesting Permit for hydrotesting activities that will require effluent discharge into State waters or drainage systems.	$1,000 per calendar day per violation.
Failure to obtain coverage under an NPDES Dewatering Permit for dewatering activities that will require effluent discharge into State waters or drainage systems.	$1,000 per calendar day per violation.
Failure to comply with the conditions specified in an NPDES Permit, or any other applicable permit.	$1,000 per calendar day per violation.
Failure to schedule a Pre-construction BMP Inspection and receive acceptance of all associated corrective actions prior to conducting land-disturbing activities.	$1,000 per calendar day per violation.
Failure to provide corrective actions accepted by AIR-EE or their designated authorized representative by the deadlines identified in the BMP inspection report.	$1,000 per calendar day per violation.
Failure to have the accepted SSBMP Plan and amendments or the accepted SWPPP and amendments available at a project construction site.	$1,000 per calendar day per violation.
Failure to properly install or maintain a BMP specified by the SSBMP Plan, SWPPP, contract drawings and documents, or permit.	$2,000 per calendar day per violation.

Non-Compliance	Amount
Failure to have an accepted amendment to the SSBMP Plan or an accepted amendment to the SWPPP prior to implementing changes to previously accepted BMPs. Note: Advance review and acceptance can be provided to satisfy this non-compliance. However, for projects with an NGPC or NPDES permit, the written amendment shall still be formally submitted for certification and signature by the authorized representative identified in the NGPC or NDPES Permit.	$2,000 per calendar day per violation.
Failure to conduct required inspections.	$1,000 for each of the first ten violations, $2,500 for each of the next ten violations, $5,000 for each subsequent violation.
Failure to maintain required records such as BMP inspection reports, rain gauge data logs, etc.	$500 per calendar day for the first ten days of each violation, $1,000 per calendar day for the next ten days of each violation, $2,500 per calendar day for each subsequent day of violation.
Any violation resulting in a polluted discharge.	Up to $25,000 per calendar day per violation.
Note: Liquidated Damages shown in the Table shall be assessed at the discretion of the DOTA.	

Assessment of Liquidated Damages for Non-Compliance:

The Contractor may be assessed liquidated damages by issuance of an Enforcement Letter. The Enforcement Letter shall indicate the amount of liquidated damages that are assessed for the non-compliances which shall be deducted from the Contractor's next progress payment. The Enforcement Letter will be sent electronically via e-mail and a hard copy to the Contractor's designated representative(s), identified in Section 01561.3.01(2)(d), responsible for the Contractor's Construction Site Runoff Control Program. An Enforcement Letter may be issued with or without previous verbal notifications, written warnings, or official enforcement letters (i.e. Warning Letter or Notice of Violation (NOV).

Liquidated Damages may be assessed for the following:

- Non-compliances listed in the Table, herein, included in Appendix A.
- Non-compliances have not been corrected in the timeframes noted.
- Corrective actions are not completed after a verbal notification, written warning (email or formal letter), or NOV is issued.
- Contractors are non-responsive to DOTA's directives.
- Repeated non-compliance.
- A polluted discharge has occurred.

The number of days used for the liquidated damages calculations shall start on the day that the non-compliance was required to be corrected and shall end on the day that the non-compliance is corrected and accepted. If DOTA's personnel are not able to go out in the field to verify that the BMP deficiencies are corrected in the timeframe specified, the Contractor can send photographs showing the corrected deficiency via e-mail to the DOTA Engineer and AIR-EE along with documentation on how the deficiency was corrected. The DOTA Engineer and AIR-EE may visit the site to verify the corrective actions are acceptable. If the corrective actions are acceptable, then the clock stops on the day that the documentation was received.

The Contractor shall not be entitled for compensation for any liquidated damages or penalty, fine, or citations assessed and deducted from the Contractor's progress payments, even after corrective actions have been taken.

END OF SECTION

SECTION 01562 – MANAGEMENT OF CONTAMINATED MEDIA, SOIL DISPOSAL, AND SOIL REUSE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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 DESCRIPTION

A. This Section describes procedures for the management of known and/or unknown contaminated media (e.g., soil, sediment, groundwater, soil vapor, and building materials) and disposal and on-site reuse of either contaminated or uncontaminated soil/sediment (referred to herein as "soil"), that may be disturbed or generated during excavation or demolition activities, or other construction activities associated with this project.

B. All soil shall be treated as potentially contaminated until it is determined otherwise.

C. The Contractor shall supply all labor, materials, and equipment necessary for the removal, temporary storage, testing, handling, backfilling and management of soil and contaminated media to carry out the work in accordance with these specifications, and all applicable Federal, State, and local regulations and latest amendments.

D. The Contractor shall follow the State of Hawaii, Department of Transportation, Airports (DOTA) Programmatic Environmental Hazard Evaluation and Environmental Hazard Management Plan (DOTA EHE-EHMP). References to the Site-specific Construction-Environmental Hazard Management Plan (C-EHMP) and C-EHMP Addendum do not apply, unless contamination is identified during construction that warrants additional plans, if directed by DOH.

E. Qualified Environmental Professional: The Contractor shall employ a Qualified Environmental Professional (QEP) who possesses a minimum of five (5) years of experience providing environmental oversight for the management of contaminated media during construction activities, who shall assist with sampling, testing, and creating plans including the preparation of the Contractor's C-EHMP (Site-Specific or Addendum). The QEP shall be identified in the applicable C-EHMP document.

F. The Contractor and their QEP shall review any site-specific investigation reports (e.g., Phase II Environmental Site Assessment [ESA]) or construction management plans, etc.) to understand the conditions that may affect work performance.

G. Should the Contractor deviate from the DOTA EHE-EHMP, C-EHMP Addendum, or Site-Specific EHMP, the Contractor shall be responsible to prepare or modify any existing Hawaii Department of Health (DOH) required C-EHMP (Site-specific or Addendum). Any deviation from construction EHMPs will require approval by DOH and the DOTA Engineering Branch, Environmental Section (AIR-EE) prior to implementation. The Contractor shall detail deviations from standard practices and explain how those deviations will be protective of human health and the environment.

H. The primary contaminant-related hazards addressed by the DOTA EHE-EHMP or a C-EHMP include, but are not limited to, the following Contaminants of Potential Concern (COPCs):

1. Petroleum-related Hydrocarbons, e.g., TPH-g, TPH-d, TPH-o, BTEX, and PAHs
2. Constituents of light distillate fuels and/or Chlorinated Solvents (together considered volatile organic compounds or VOCs)
3. Polychlorinated Biphenyls (PCBs)
4. Pesticides, e.g., Chlordane, Dieldrin
5. Metals, e.g., Arsenic, Barium, Cadmium, Total Chromium, Lead, Mercury, Selenium, and Silver
6. Per- and Polyfluoroalkyl Substances (PFAS)

In addition, free petroleum product (e.g., gasoline, aviation gasoline, diesel fuel, jet fuel, motor oils, lubricating oils) may be encountered in soil or groundwater in areas of previous petroleum releases.

Soil vapor may be present from volatile COPCs present in subsurface soil or groundwater.

Should changes in site conditions or additional site information identify contaminants or risks to human health and/or the environment not addressed by the DOTA EHE-EHMP or C-EHMP (Site-Specific or Addendum), the Contractor shall be responsible to revise, update, and finalize a C-EHMP (Site-Specific or Addendum), to be reviewed and approved by AIR-EE and the DOH Hazard Evaluation and Emergency Response (HEER) Office.

The Contractor shall coordinate with AIR-EE, as well as have any C-EHMP (Site-Specific or Addendum) approved by the HEER Office, prior to the start or continuation (in the case of an Addendum) of any related ground disturbing activities.

1.03 REFERENCES

All work shall conform to the latest edition of the following, unless otherwise noted or specified on the drawings or in these specifications. Where conflicts among the requirements or with these specifications exists, the most stringent requirements shall

apply.

A. DOTA Construction Site Runoff Control Program
https://hidot.hawaii.gov/airports/doing-business/engineering/environmental/construction-site-runoff-control-program/

1. DOTA EHE-EHMP

2. DOTA Construction Best Management Practices (BMP) Manual

B. Department of Health (DOH) Hazard Evaluation & Emergency Response (DOH HEER) https://health.hawaii.gov/heer/

1. Technical Guidance Manual (TGM) for Implementation of the State Contingency Plan (including updates).

2. Guidance for Soil Stockpile Characterization and Evaluation of Imported and Exported Fill Material.

3. HEER Office Screening for Environmental Hazards at Sites with Contaminated Soil and Groundwater.

4. HEER Office Construction EHMP and EHMP Addendum Template.

C. State of Hawaii Administrative Rules, Title 11, DOH
https://health.hawaii.gov/opppd/department-of-health-administrative-rules-title-11/

1. Chapter 54 Water Quality Standards

2. Chapter 58.1 Solid Waste Management Control

3. Chapter 59 Ambient Air Quality Standards

4. Chapter 11-260.1-279.1 Hazardous Waste Management: General Provisions

5. Chapter 280.1 Underground Storage Tanks

6. Chapter 451 State Contingency Plan

D. The Hawaii Environmental Response Law (Hawaii Revised Statutes [HRS] Chapter 128D) and the State Contingency Plan (Hawaii Administrative Rules [HAR] Title 11, Chapters 451-1–451-24).

E. American Petroleum Institute (API) RP 2219
https://www.api.org/oil-and-natural-gas/health-and-safety/refinery-and-plant-safety/occupational-safety/rp-2219

F. United States Code of Federal Regulations (CFR), Title 29: Labor

https://www.ecfr.gov/current/title-29

G. CFR, Title 40: Protection of the Environment
https://www.ecfr.gov/current/title-40

1. Part 50, “National Primary and Secondary Ambient Air Quality Standards A”.

2. Part 122, “EPA Administered Permit Program: The National Pollutant Discharge Elimination System”.

3. Part 261, “Identification and Listing of Hazardous Waste”.

4. Part 263, “Standards Applicable to Transporters of Hazardous Waste”.

5. Part 302, “Designation, Reportable Quantities, and Notification”.

H. CFR, Title 49: Transportation
https://www.ecfr.gov/current/title-49

1. Part 171, “General Information, Regulations, and Definitions”.

2. Part 172, “Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans”.

I. U.S. EPA Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA), Section 107(1), exemption for cleanup of legally applied pesticide products.
https://www.epa.gov/enforcement/superfund-enforcement-authorities

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 GENERAL WORK PROCEDURES

A. Prior to beginning work, the Contractor, the Contractor’s QEP, and the Engineer or their representative shall review and discuss all available information pertaining to contamination or potential contamination at the work site.

B. It should be noted that, in some cases, the contamination (e.g., soil or groundwater contaminated with metals, PCBs, pesticides, PFAS, etc.) may not be identifiable through visual and/or olfactory observation, and contaminant-specific field screening techniques may need to be implemented.

C. Potential or suspected contaminated media from separate locations or sources shall not be mixed or placed together without the approval of the Qualified Environmental Professional and AIR-EE.

D. The removal, transfer, or handling of explosive or flammable media shall be conducted using explosion-proof pumps and equipment. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck shall be vapor free. Discharge the vacuum pump exhaust gases through a hose of adequate size and length downwind of the truck and tank area. Vacuum truck operating and safety practices shall conform to API RP 2219. Collect tank residues in drums, tanks, or tank trucks labeled according to 49 CFR 171 and 49 CFR 172 and dispose of as required by regulation.

E. Contractor shall follow decontamination regulations and procedures as necessary.

F. Soil excavation, grading, and any disturbance of contaminated soil may cause a potential exposure to Contractor's employees and the public from the release of vapors or fugitive dust. The routes of exposure to dusts are by inhalation, ingestion, and dermal contact. The Contractor shall use engineering controls such as a cover, water spraying, and/or wind barriers to control fugitive dust to mitigate the release of and exposure to soil vapors.

G. The Contractor's QEP shall test excavated soil for the presence of COPCs and oversee excavated soil management in accordance with this Section and relevant guidance and regulations.

H. Contractor shall report construction activities in areas with contaminated soil or groundwater in accordance with an applicable C-EHMP or the DOTA EHE-EHMP. Contractor shall coordinate with the DOH HEER Office, the Engineer, and AIR-EE.

I. All Contractor correspondence with DOH and other regulatory agencies shall include the Engineer and AIR-EE.

3.02 PRECONSTRUCTION REQUIREMENTS

A. Submit the following a minimum of 30 calendar days prior to beginning any ground disturbing activities, for approval by AIR-EE.

1. The Contractor's revisions to the C-EHMP Addendum or Site-Specific C-EHMP completed in the design phase, or creation of a C-EHMP addendum if deviating from the DOTA EHE-EHMP, that includes, but is not limited to:

a. Procedures, engineering controls, and methods the Contractor will use during the excavation, soil stockpiling and segregation, temporary storage, testing, handling, treatment, backfilling, and disposal of contaminated media, work area isolation, construction barriers, dust control, decontamination, and emergency management.

b. Names of the Contractor's and their subcontractor's qualified personnel who will be supervising or managing contaminated materials at the site. Include the personnel's phone number and qualifications.

c. Name(s) of the Contractor's Qualified Environmental Professional, including their qualifications.

d. Proposed schedule of work.

e. Location map of temporary contaminated stockpiles and other contaminated media storage, including infrastructure such as pipes and appurtenances, if applicable.

f. All documents required as part of the appendices to the DOTA EHE-EHMP (e.g., health and safety plan and completing the management plans in the appendices) or C-EHMP (Site-Specific or Addendum) applicable appendices (e.g., health and safety plan, construction material documents, etc.).

3.03 CONSTRUCTION REQUIREMENTS

A. Soil Excavation and Stockpiling:

1. Notify the DOH HEER Office at least 90 calendar days prior to disturbing contaminated soil at "HEER Sites" utilizing the HI DOH e-Permitting System - Notification of Construction Activities (HEER Office). Version 1.6 (hawaii.gov) or most recent version available. Obtain AIR-EE's review and concurrence prior to submittal to DOH.

2. The disturbance of contaminated media shall be performed in accordance with the DOTA EHE-EHMP or the Contractor's approved C-EHMP (Site-Specific or Addendum), where applicable. The HEER Office and AIR-EE shall be immediately notified if contaminated media not previously known or anticipated is encountered. The HEER Office will determine whether additional sampling is required. The Contractor shall provide a location map with Global Positioning System (GPS) coordinates and approximate depth below ground surface at which contaminated media were encountered to the Engineer and AIR-EE.

3. Soil stockpiles shall be created and managed in accordance with project plans, the approved project-specific C-EHMP (if applicable), and the DOH Guidance for Soil Stockpile Characterization and Evaluation of Imported and Exported Fill Material. If deviating from a DOH-approved C-EHMP, approval from DOTA and DOH is required. Contractor shall secure approval of new or revised stockpile characterization plans from DOTA prior to implementation. Soils placed in watertight containers shall be covered with plastic sheeting or positioned under a roof when not in active use. Soil stockpiles and containers shall be located at least 50 feet

from drainage features, surface waters, and stormwater drainage paths.

4. Any liquid-phase oil or free product associated with the contaminated soil shall be drained prior to stockpiling. If feasible, the free product shall be separated from the soil, properly stored, profiled, and disposed of at an approved recycling or disposal facility.

B. Soil Testing and Disposal:

The Contractor shall test all soil generated during excavation, demolition, or other construction activities. Sampling and testing of stockpiles shall be, at a minimum, in accordance with the latest edition of the DOH's Guidance for Soil Stockpile Characterization and Evaluation of Imported and Exported Fill Material. The Contractor's QEP shall direct the soil sample collection and testing methods in accordance with the most current guidelines. All soil intended for disposal or reuse shall be tested for the presence of applicable COPCs as established by the QEP and as approved by AIR-EE.

Stockpiles shall be tested using multi-increment (MI) sampling methodology in accordance with the TGM. Alternative sampling approaches, and appropriate decision unit (DU) volumes for large volume soil stockpiles, should be discussed with AIR-EE and may be utilized on a case-by-case basis when approved by the HEER Office.

No soil from airport property shall be reused at private-owner off-site properties, even if the soil appears acceptable for unrestricted use based on testing conducted. Exceptions to this policy may only occur with the written approval of the Engineer and AIR-EE. Disposal or reuse of soil at a residential property or where there are sensitive receptors (i.e. schools, recreational areas, etc.) will not be allowed under any circumstance.

For the purposes of this Section "off-site" is defined as any location outside of the established project construction boundary from which excavated soil was generated. There are two off-site soil disposal/reuse categories applicable to this Section: (1) Off-site within the Airport Boundary, and (2) Off-site and outside of the DOTA Airport Property. "On-site" refers to within the construction project boundary from which excavated soil was generated.

1. For off-site soil reuse <u>within the airport boundary</u>:

   a. The Contractor shall secure approval from the Engineer and AIR-EE for transport to the reuse location(s) prior to moving the soil.

   b. Soil shall not be categorized as or contain a regulated hazardous waste.

   c. Soil shall not exceed the DOH Tier 1 Environmental Action Levels (EALs) for unrestricted use.

2. For off-site soil disposal/reuse outside the airport property boundary:

   a. The Contractor shall confirm and comply with the disposal/receiving facility's testing requirements, as well as their standards for disposal/reuse.

   b. Soil that is a regulated hazardous waste shall be disposed at an approved United States Environmental Protection Agency (EPA) regulated facility.

   c. Soil that is above the DOH Tier 1 EALs for commercial/industrial use but not a regulated hazardous waste shall be disposed of at a DOH or EPA permitted disposal facility (i.e., landfill).

   d. Soil that is below the Hawaii Department of Health (DOH) Tier 1 Environmental Action Levels (EAL) for unrestricted use may be reused at an appropriate location as approved by the Engineer and AIR-EE.

   e. For any contaminated media removed from Airport property to an approved facility, the Contractor shall be responsible for its legal transport and disposal. Contractor shall provide to the Engineer copies of any soil disposal receipts.

3. For on-site soil reuse:

   a. The Contractor shall representatively test all soils designated for on-site reuse. Testing can occur either *in situ* prior to excavation or after excavation. Soil that does not exceed applicable DOH Tier 1 Environmental Action Levels (EAL) for unrestricted use may be reused on-site (within construction site boundaries) with AIR-EE approval.

   b. Soil with contaminants that exceed DOH Tier 1 EALs may be approved for on-site (within construction site boundaries) reuse with written approval from AIR-EE and when the following conditions are met:

      i. Contaminated soil is reused within other contaminated areas in the proximity of its original location and for which a long term EHE-EHMP has been established and (if necessary) can be readily modified to accommodate that change in site conditions.

      ii. Contaminated soil is reused no less than 150 meters from the nearest surface water or surface water inlet.

iii. Contaminated soil is reused at an elevation above the tidally influenced high water table, and at least one foot below the finish surface grade, with the most contaminated soil placed at the bottom of the excavation and cleanest soil toward the ground surface. A minimum of one foot of clean soil shall comprise the final, top backfill layer and, unless waived by DOTA and DOH, an impervious layer shall cap this top layer.

iv. Contaminated soil is not reused within or beneath the footprint of a permanent building structure.

v. Contaminated soil to be reused cannot contain free oil, oil sheens, oil stains, or total petroleum hydrocarbons (TPH) concentrations exceeding 5,000 milligrams per kilogram (mg/kg).

C. Groundwater Management: Groundwater may be contaminated by petroleum hydrocarbons, dissolved metals, PFAS, VOCs, and/or pesticides, and may be encountered during soil excavation or dewatering activities.

1. If contaminated groundwater is discovered at a previously unknown source or site on the project, the Contractor shall immediately notify the Engineer, AIR-EE, and HEER Office. Provide a location map with GPS coordinates and approximate mean sea level depth of the groundwater at which the contamination was encountered.

2. The disturbance of contaminated groundwater shall be performed in accordance with the DOTA EHE-EHMP, or C-EHMP (Site-Specific or Addendum), where applicable. The HEER Office will determine whether additional sampling is required.

3. If free product is present in the extracted groundwater, it shall be separated from the groundwater, profiled, and disposed of at an DOH-approved recycling/disposal facility. Free product shall not be moved from one excavation to another. Engineering measures shall be taken to prevent the transfer of the free product during dewatering. Water contaminated with free product shall not be discharged from a dewatering pit.

4. Releases of contaminated groundwater to surface water bodies or areas beyond the work area is prohibited.

5. Groundwater shall only be re-infiltrated in the ground with the prior approval of AIR-EE and the HEER Office. Under circumstances where contaminated groundwater cannot be re-infiltrated, proper disposal at a licensed facility shall be conducted. Notification to the appropriate agencies and other pertinent information related to the discharge shall be conducted by copying the Engineer and AIR-EE on all correspondence

and copies of correspondence provided upon request.

6. The Contractor is responsible for the legal disposal or discharge of groundwater that is not re-infiltrated and shall provide AIR-EE with copies of waste manifests.

7. For groundwater containerized and removed from Airport property, the Contractor shall have representative samples taken and tested in accordance with DOH guidelines, standards, and regulations. A copy of the groundwater test results shall be submitted to AIR-EE. The groundwater shall not be disposed off-site without the approval of the Engineer and a written approval from the DOH-permitted facility receiving the groundwater indicating that they acknowledge the groundwater test results and providing their approval to dispose the groundwater at their facility. Transport off-site shall occur in DOT-approved containers or mobile tanks. Documentation for the removal of containerized groundwater is required in the Close-Out Report detailed in Section 3.04.

8. With approval from AIR-EE and oversight from the QEP, small volumes of groundwater may be disposed via evaporation from a constructed (lined) pond or basin, with solid residuals properly tested and disposed in accordance with this specification.

9. Release Reporting: Encountering previously unknown contaminated soil or groundwater during subsurface construction activities is considered a release and shall be reported to the HEER Office. Copies of the DOH Release Report, DOH-issued Release Number, and email correspondence (if applicable), shall be furnished to the Engineer and AIR-EE. The Contractor shall be responsible for release reporting and AIR-EE shall be included on all correspondence with the HEER office.

10. Report all leaks and spills immediately to AIR-EE, DOTA personnel, and regulatory agencies in accordance with the airport-specific DOTA Spill Reporting Fact Sheet available via the DOTA Construction Site Runoff Control Program Webpage at https://hidot.hawaii.gov/airports/doing-business/engineering/environmental/construction-site-runoff-control-program/.

    Releases that occur during construction activities or releases due to unforeseen events (spills) shall be reported immediately.

D. Underground Storage Tanks (USTs) and Utility Pipes:

1. For any UST or pipeline, whether unexpectedly discovered or a planned removal, the nature of the UST or pipeline and whether they are inactive shall be determined prior to removal. Immediately notify the Engineer, AIR-EE and HEER Office of any unexpected encounter with a UST or buried piping.

2. The Contractor shall record field observations of the UST and pipelines. These observations shall include, but are not limited to, the following:

   a. Location relative to fixed landmarks, including GPS coordinates. Provide a location map that shows the UST and pipelines that were encountered. The map shall include a North arrow and a scale.

   b. Depth, diameter, length, and type of piping. Describe the condition of the pipe.

   c. Volume and type of fuel or product, including analytical laboratory reports for the product recovered.

   d. Beginning and ending fluid levels, if applicable.

   e. Flow rates, if applicable.

   f. Direction of flow.

   g. Detailed photographs.

   h. Detailed description of actions taken following the discovery, such as cutting, product removal, and disposal.

3. Provide records of the field observations to the Engineer, AIR-EE, and HEER Office.

4. The removal of all USTs must comply with HAR § 11-280.1, and all correspondence related to identification, removal, and documentation shall be provided to the Engineer and AIR-EE. Only personnel knowledgeable and trained in pipeline and UST removal shall cut, drain, and remove USTs and pipelines. Hazardous conditions, particularly those created by explosive vapors and releases of product to the environment, shall be mitigated prior to removal activities. If any waste pipe or UST components are to be stored on-site prior to disposal, the area shall be lined with polyethylene plastic sheeting, 20 mil or thicker, and bermed to contain any free product. Provisions shall be in place to contain viscous products that may liquify after exposure to atmospheric heating. The waste pipe segments shall be drained of any residual product and stored on appropriate dunnage with the ends of the pipe sealed or covered to protect the interior of the pipe from contact with rainwater and wind.

5. All removed pipelines and USTs shall be properly disposed or recycled.

6. The Contractor shall prepare and submit a UST Removal Report, including the results of all sampling activities required under HAR § 11-280.1, to the Engineer, AIR-EE, and the DOH SHWB (UST

Program).

3.04 POST-CONSTRUCTION REQUIREMENTS

A. Submit a Project Close-out Report within 30 calendar days after work is completed. The Close-out Report shall contain the following applicable contents:

1. A signed letter certifying that the removal and disposal of all contaminated materials were completed in accordance with the DOTA EHE-EHMP or Contractor's approved C-EHMP (Site-Specific or Addendum), and all applicable Federal, State, and local rules and regulations.

2. All approved DOTA EHE-EHMP deviation request forms. (Reference DOTA EHE-EHMP.)

3. Any Site-Specific EHMP(s) or Long-term EHMP(s). For locations at an airport for which DOTA has already established a Site-Specific EHMP from previous projects, the DOTA's Site-Specific EHMP shall remain applicable. Contractor shall assist DOTA by providing requested project data and records necessary to draft any required amendments resulting from a change in site conditions due to construction.

4. All testing and laboratory results, including chain of custody, for any soil/sediment, groundwater, soil vapor, or other media sampling and analysis.

5. Any results from air monitoring.

6. Record of Field Observations, including location map with GPS coordinates, limits, and depths of any contaminated media (soil, groundwater, etc.) that were encountered at previously unknown source or sites on the project. Include a copy of the completed Hawaii Hazardous Substance Written Follow-up Notification form that was submitted to DOH and all other associated documents.

7. If contaminated soil was disposed off-site (off Airport Property), include the following:

a. A copy of the signed agreement from the receiving facility acknowledging the sample test results and indicating acceptance of the soil.

b. Documentation of the quantity of soil received by the facility.

c. Copies of the test results of the soil sampling.

d. All certifications, disposal forms, waste manifests, and summary logs.

8. If any soil was approved for reuse on-site (within the construction site boundaries) or off-site within Airport Property, at a minimum, include the following:

   a. Copies of the test results of the soil sampling.

   b. The quantity of soil that was re-used.

   c. Location map of the re-used soil. Include GPS coordinates of its emplaced limits.

   d. A brief description of the purpose of the reused soil (e.g., general fill, utility trench backfill material, etc.). Include the depth and thickness of its placement.

   e. Photos of the site after placement of the re-used soil has been completed.

9. Record of Field Observation of any unanticipated UST or pipeline discovered during construction activities, including a copy of the completed DOH Notice of Intent to Close Underground Storage Tanks form, UST Closure Report, and all other associated documents.

10. The Close-out Report may be distinct to each contaminated media type/source. For sites with multiple contaminated media types/sources, Close-out Reports for each contaminated media type can be submitted separately or combined into a project-wide compilation of reports.

PART 4 – MEASUREMENT AND PAYMENT

4.01 BASIS OF MEASUREMENT AND PAYMENT

Work specified in this Section will be paid at the unit price measurement noted below.

Item No.	Item	Unit
01562.1	Management of Contaminated Media, Soil Disposal, and Soil Reuse	Allowance

Payment shall be full compensation for work prescribed in this Section and contract documents and stipulated below.

For ALLOWANCE items in the Proposal Schedule, the allowance is an estimate and the amount shall not exceed the maximum amount shown in the Proposal Schedule. Payment shall be the actual cost as invoiced by the Contractor and approved by the DOTA Engineer. The Contractor shall be allowed to include overhead, profit, insurance and/or other mark-ups, as stipulated in Section 9.5 of the 2016 General Provisions for Construction Projects, Air and Water Transportation Facilities Divisions.

Should the DOTA receive reports of any illegal dumping of material, and if illegal dumping is confirmed to have occurred, the DOTA will assess a Liquated Damages amount of $5,000 per truck per day, until the illegally dumped material has been cleaned up or the incident has been remedied to the satisfaction of the Engineer with the DOH's concurrence. The Contractor shall not be entitled to recover any Liquidated Damages assessed, even after the non-compliance has been corrected.

The Contractor shall be responsible for reimbursing DOTA for all citations, fines, and penalties levied by DOH, EPA, Department of Labor and Industrial Relations, or any other regulatory agency against the State due to the Contractor's failure to properly manage contaminated medias, including non-compliance with the DOTA EHE-EHMP, DOTA Site-Specific EHMP, or and Site-specific C-EHMP or C-EHMP Addendum. The Contractor shall reimburse the State within 30 calendar days for the full amount of any outstanding cost that the State has incurred. The State may deduct all incurred costs from the Contractor's monthly progress payments; however, the Contractor shall be responsible for reimbursing the State if the costs of correction exceed remaining payments owed to the Contractor.

If the Contractor fails to satisfactorily address the non-compliance item, DOTA reserves the right to employ outside assistance or use the State's own labor forces to provide necessary corrective measures. The Contractor shall be fully responsible for all cost and time. The State shall charge the Contractor such incurred costs plus any associated project engineering costs and shall make appropriate deductions from the Contractor's monthly progress payment.

END OF SECTION

SECTION 02209 - CRUSHED AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The General Provision 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. This Section shall be in accordance with FAA Specification Item P-209: Crushed Aggregate Base Course, as included as an attachment to this Section.

1.2 DESCRIPTION OF WORK

This Section consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans, or as directed by the Engineer.

1.3 REFERENCES

Federal Aviation Administration (FAA)

1. FAA Specification Item P-209: Crushed Aggregate Base Course.

1.4 SUBMITTALS

Gradation of aggregate base course shall be submitted in accordance with FAA Specification Item P-209, paragraph 209-2.2.

Aggregate base samples and gradation test results from the in-place, uncompacted material shall be submitted in accordance with FAA Specification Item P-209, paragraph 209-2.3.

Field density results of compacted material meeting the requirements of FAA Specification Item P-209, paragraph 209-3.5 and 209-3.9.

PART 2 - PRODUCTS

2.1 Aggregates: in accordance with FAA Specification Item P-209, paragraph 209-2.1.

PART 3 - EXECUTION

3.1 Construction Methods shall be in accordance with FAA Specification Item P-209.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

Work for repair and compaction of disturbed crushed aggregate base course for concrete pavement repair shall be incidental to the concrete slab replacement work.

PART 5 - ATTACHMENTS

5.1 FAA Specification Item P-209 Crushed Aggregate Base Course.

Item P-209 Crushed Aggregate Base Course

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans, or as directed by the Engineer.

MATERIALS

209-2.1 Crushed aggregate base. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, crushed gravel, and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone, gravel, that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

Crushed Aggregate Base Material Requirements

Material Test	Requirement	Standard
Coarse Aggregate		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 98% with at least one fractured face[1]	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles [2]	ASTM D4791
Fine Aggregate		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

[2] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

209-2.2 Gradation requirements. The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

Gradation of Aggregate Base

Sieve Size	Design Range Percentage by Weight passing	Contractor's Final Gradation	Job Control Grading Band Tolerances[1] (Percent)
2 inch	100		0
1-1/2 inch	95-100		±5
1 inch	70-95		±8
3/4 inch	55-85		±8
No. 4	30-60		±8
No. 40[2]	10-30		±5
No. 200[2]	0-8		±3

[1] The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

[2] The fraction of material passing the No 200 sieve shall not exceed two-thirds the fraction passing the No 40 sieve.

209-2.3 Sampling and Testing.

a. Aggregate base materials. The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

b. Gradation requirements. The Contractor shall take at least two aggregate base samples per day in the presence of the Engineer to check the final gradation. Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the Engineer.

209-2.4 Separation Geotextile. (Not Used)

209-2.5 Preparation of cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 100 % of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

CONSTRUCTION METHODS

209-3.1 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the Engineer, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The Engineer must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the Engineer. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the Engineer.

209-3.2 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the Engineer before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase, at the Contractor's expense, may be required by the Engineer if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

209-3.3 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.5, the approved material may be transported directly to the placement.

209-3.4 Placement. The aggregate shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the Engineer, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The aggregate shall meet gradation and moisture requirements prior to compaction. The base course shall be constructed in lifts as established in the control strip, but not less than 4 inches nor more than 12 inches of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at the Contractor's expense.

209-3.5 Compaction. Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade.

The field density of each compacted lift of material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D1557. The moisture content of the material during placing operations shall be within ±2 percentage points of the optimum moisture content as determined by ASTM D6938. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

209-3.6 Weather limitations. Material shall not be placed unless the ambient air temperature is at least 40°F and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

209-3.7 Maintenance. The base course shall be maintained in a condition that will meet all specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.8 Surface tolerances. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and recompacted to grade until the required smoothness and accuracy are obtained and approved by the Engineer. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8-inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 50-foot grid and shall be within +0 and -1/2 inch of the specified grade, or as directed by the Engineer.

209-3.9 Acceptance sampling and testing. Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1200 square yds. Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM 1557. The in-place field density shall be determined per ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted and two additional random tests made at the Contractor's expense. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. Depth tests shall be made by test holes at least 3 inches in diameter that extend through the base, or as otherwise directed by the Engineer. The thickness of the base course shall

be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the Engineer for each area. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

END OF ITEM P-209

--------END OF SECTION 02209--------

SECTION 02501 – CEMENT CONCRETE PAVEMENT REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The General Provision 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. This Section shall be in accordance with FAA Specification Item P-501: Cement Concrete Pavement, as included as an attachment to this Section. Work shall be performed in accordance with Exhibit A - FAA AC 150/5380-6C Guidelines and Procedures for Maintenance of Airport Pavements (Appendix A - Figure A4 to A7).

1.2 DESCRIPTION OF WORK

This work shall consist of pavement composed of cement concrete with and without reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross- sections as determined by the RPR. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

Additional Concrete Repair Requirements

Contractor shall preserve existing doweling for concrete repair. Saw cutting and demolition shall be conducted in a manner to not damage doweling. In the event of damage, Contractor shall be responsible for corrective action including replacement of abutting slab. Corrective work shall be at the sole cost of the Contractor.

1.3 RELATED WORK SPECIFIED ELSEWHERE

Section 02605 – Joint Sealants for Pavements; FAA Specification Item P-605.
Section 02621 – Saw-Cut Grooves; FAA Specification Item P-621.
Exhibit - FAA Advisory Circular 150/5380-6C

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
Federal Aviation Administration (FAA)

1. FAA Specification Item P-501; Cement Concrete Pavement
2. Advisory Circular Advisory Circulars AC 150/5320-6 Airport Pavement Design and Evaluation

ASTM International (ASTM)

3. ASTM A184 Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
4. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
5. ASTM A704 Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
6. ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
7. ASTM A775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars

   ASTM A884 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
8. ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
9. ASTM A996 Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
10. ASTM A1035 Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
11. ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
12. ASTM A1078 Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
13. ASTM C29 Standard Test Method for Bulk Density ("Unit Weight") and Voids in aggregate.
14. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
15. ASTM C33 Standard Specification for Concrete Aggregates
16. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
17. ASTM C70 Standard Test Method for Surface Moisture in Fine Aggregate
18. ASTM C78 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
19. ASTM C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
20. ASTM C94 Standard Specification for Ready-Mixed Concrete
21. ASTM Cl 14 Standard Test Methods for Chemical Analysis of Hydraulic Cement
22. ASTM C117 Standard Test Method for Materials Finer than 75-pm (No. 200) Sieve in Mineral Aggregates by Washing

23. ASTM C123 Standard Test Method for Lightweight Particles in Aggregate
24. ASTM Cl36 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
25. ASTM C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
26. ASTM C136 Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
27. ASTM C138 Standard Test Method
28. ASTM Cl42 Standard Test Method for Clay Lumps and Friable Particles in aggregates
29. ASTM C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
30. ASTM Cl50 Standard Specification for Portland Cement
31. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete
32. ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete
33. ASTM Cl 73 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
34. ASTM C174 Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
35. ASTM C227 Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
36. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
37. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
38. ASTM C295 Standard Guide for Petrographic Examination of Aggregates for Concrete
39. ASTM C309Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
40. ASTM C311 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
41. ASTM C494Standard Specification for Chemical Admixtures for Concrete
42. ASTM C566Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
43. ASTM C595 Standard Specification for Blended Hydraulic Cements
44. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
45. ASTM C642 Standard Test Method for Density, Absorption, and Voids in Hardened Concrete

46. ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
47. ASTM C685 Standard Specifieation for Concrete Made by Volumetric Batching and Continuous Mixing
48. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
49. ASTM C989 Standard Specification for Slag Cement for Use in Concrete and Mortars
50. ASTM Cl017 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
51. ASTM Cl064 Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
52. ASTM Cl077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
53. ASTM Cl 157 Standard Performance Specification for Hydraulic Cement
54. ASTM Cl260 Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
55. ASTM Cl 365 Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
56. ASTM C1567 Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
57. ASTM Cl602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
58. ASTM D75 Standard Practice for Sampling Aggregates
59. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
60. ASTM D1752 Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
61. ASTM D2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
62. ASTM D3665 Standard Practice for Random Sampling of Construction Materials
63. ASTM D4791 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
64. ASTM E178 Standard Practice for Dealing with Outlying Observations

American Concrete Institute (ACI)

65. ACI 305R Guide to Hot Weather Concreting

66. ACI 306R Guide to Cold Weather Concreting

67. ACI 309R Guide for Consolidation of Concrete

Federal Highway Administration (FHWA)

68. HIPERPAV 3, version 3.2

1.5 SUBMITTALS

Concrete Mix Laboratory's current accreditation and accredited test methods shall be submitted in accordance with the requirements of FAA Specification Item P-501, paragraph 501-3.2.
Concrete Mix Proportions shall be submitted in accordance with the requirements of FAA Specification Item P-501, paragraph 501-3.3.

PART 2 - PRODUCTS

2.1 Aggregates: in accordance with FAA Specification Item P-501, paragraph 501-2.1.

2.2 Cement: in accordance with FAA Specification Item P-501, paragraph 501-2.2.

2.3 Cementitious Materials: in accordance with FAA Specification Item P-501, paragraph 501-2.3.

2.4 Joint Seal: in accordance with FAA Specification Item P-501, paragraph 501-2.4.

2.5 Isolation Joint Filler: in accordance with FAA Specification Item P-501, paragraph 501 2.5.

2.6 Steel Reinforcement: in accordance with FAA Specification Item P-501, paragraph 501 2.6.

2.7 Dowel and Tie Bars: in accordance with FAA Specification Item P-501, paragraph 501 2.7.

2.8 Curing Materials: in accordance with FAA Specification Item P-501, paragraph 501 2.8.

2.9 Admixtures: in accordance with FAA Specification Item P-501, paragraph 501 2.10.

2.10 Epoxy-Resin: in accordance with FAA Specification Item P-501, paragraph 501 2.11.

2.11 Composition of mixtures, job mix formula (JMF) laboratory, JMF, and control strip shall be in accordance with FAA Specification Item P-401.

PART 3 - EXECUTION

3.1 Construction Methods shall be in accordance with FAA Specification Item P-501 and FAA Advisory Circular 150/5380-6C.

3.2 The Contractor Quality Control shall be in accordance with FAA Specification Item P-501.

3.3 Material Acceptance shall be in accordance with FAA Specification Item P-501.

PART 4 - MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT AND PAYMENT

Item No.	Item	Unit
02501.1	Full Slab – Full Depth Replacement (144 to 400 SF Typical)	Cubic Yard
02501.2	Half Slab – Full Depth Replacement	Cubic Yard
02501.3	Quality Control Testing	Allowance
02501.4	Concrete Spall Repair	Allowance
02501.5	Allowance for Unforeseen Conditions	Allowance

For ALLOWANCE items in the Proposal Schedule, payment shall be the actual cost as invoiced by the Contractor and approved by the DOTA Engineer. The Contractor shall be allowed to include overhead, profit, insurance and/or other mark-ups, as stipulated in Section 9.5 of the 2016 General Provisions for Construction Projects, Air and Water Transportation Facilities Divisions.

PART 5 - ATTACHMENTS

5.1 FAA Specification Item P-501 Cement Concrete Pavement.

Item P-501 Cement Concrete Pavement

DESCRIPTION

501-1.1 This work shall consist of pavement composed of cement concrete with and without reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

MATERIALS

501-2.1 Aggregates.

a. Reactivity. Fine and Coarse aggregates to be used in PCC on this project shall be tested and evaluated by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Tests must be representative of aggregate sources which will be providing material for production. ASTM C1260 and ASTM C1567 tests may be run concurrently.

(1) Coarse aggregate and fine aggregate shall be tested separately in accordance with ASTM C1260, however, the length of test shall be extended to 28 days (30 days from casting). Tests must have been completed within 6 months of the date of the concrete mix submittal.

(2) The combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

(3) If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine aggregate. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in the table below.

Fine Aggregate Material Requirements		
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Sand Equivalent	**45** minimum	ASTM D2419
Fineness Modulus (FM)	$2.50 \leq FM \leq 3.40$	ASTM C136
Limits for Deleterious Substances in Fine Aggregate for Concrete		
Clay lumps and friable particles	1.0% maximum	ASTM C142
Coal and lignite	0.5% using a medium with a density of Sp. Gr. of 2.0	ASTM C123
Total Deleterious Material	1.0% maximum	

c. Coarse aggregate. The maximum size coarse aggregate shall be **1 inch**.

Aggregates delivered to the mixer shall be washed and clean, hard, uncoated aggregates consisting of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates shall have no known history of detrimental pavement staining. Steel blast furnace slag shall not be permitted. Coarse aggregate material requirements and deleterious limits are shown in the table below; washing may be required to meet aggregate requirements.

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8 (9.5 mm) sieve [1]	ASTM D4791
Bulk density of slag [2]	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29

[1] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

[2] Only required if slag is specified.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (75 µm)	ASTM C117	1.0[1]
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert[2] (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	0.1[3]

[1] The limit for material finer than 75-µm is allowed to be increased to 1.5% for crushed aggregates consisting of dust of fracture that is essentially free from clay or shale. Test results supporting acceptance of increasing limit to 1.5% with statement indicating material is dust of fracture must be submitted with Concrete mix. Acceptable techniques to characterizing these fines include methylene blue adsorption or X-ray diffraction analysis.

[2] Chert and aggregates with less than 2.4 specific gravity.

[3] The limit for chert may be increased to 1.0 percent by mass in areas not subject to severe freeze and thaw.

d. Combined aggregate gradation. This specification is targeted for a combined aggregate gradation developed following the guidance presented in United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. Base the aggregate grading upon a combination of all the aggregates (coarse and fine) to be used for the mixture proportioning. Three aggregate sizes may be required to achieve an optimized combined gradation that will produce a workable concrete mixture for its intended use. Use aggregate gradations that produce concrete mixtures with well-graded or optimized aggregate combinations. The Contractor shall submit complete mixture information necessary to calculate the volumetric components of the mixture. The combined aggregate grading shall meet the following requirements:

(1) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in paragraph 501-2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

(2) The CF shall be determined from the following equation:

CF = (cumulative percent retained on the 3/8 in. (9.5 mm) sieve)(100) / (cumulative percent retained on the No. 8 (2.36 mm) sieve)

(3) The WF is defined as the percent passing the No. 8 (2.36 mm) sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds (42 kg) of cementitious material per cubic meter yard greater than 564 pounds per cubic yard (335 kg per cubic meter).

(4) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary. The point determined by the plotting of the CF and WF may be adjusted during production ±3 WF and ±5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

e. Contractors combined aggregate gradation. The Contractor shall submit their combined aggregate gradation using the following format: Reference United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. The ETL is available at the following website:

https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tspwg-m-3-250-04-97-05

Contractor's Combined Aggregate Gradation

Sieve Size	Contractor's Concrete mix Gradation (Percent passing by weight)
2 inch (50 mm)	*
1-1/2 inch (37.5 mm)	*
1 inch (25.0 mm)	*
3/4 inch (19.0 mm)	*
1/2 inch (12.5 mm)	*
3/8 inch (9.5 mm)	*
No. 4 (4.75 mm)	*
No. 8 (2.36 mm)	*
No. 16 (1.18 mm)	*
No. 30 (600 µm)	*
No. 50 (300 µm)	*
No. 100 (150 µm)	*

501-2.2 Cement.

Cement shall conform to the requirements of ASTM **C150** Type I or II. Cement shall be low alkali cements (less than 0.6% equivalent alkali, the low reactivity option in ASTM C595.

501-2.3 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total alkali content less than 3% per ASTM C311. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Resident Project Representative (RPR).

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling

Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

501-2.4 Joint seal. The joint seal for the joints in the concrete pavement shall meet the requirements of FAA Specifications P-604 and FAA Specifications P-605.

501-2.5 Isolation joint filler. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1751 or ASTM D1752 and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the RPR. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the RPR.

501-2.6 Steel reinforcement. Reinforcing shall consist of deformed bars conforming to the requirements of ASTM A615.

501-2.7 Dowel and tie bars. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete.

a. Dowel Bars. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

b. Tie Bars. Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 Water. Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet the requirements of ASTM C1602.

501-2.9 Material for curing concrete. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class A, or Class B.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 Admixtures. Admixtures shall conform to the following specifications:

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Not used.

c. Other admixtures. Not used.

d. Lithium Nitrate. Not used

501-2.11 Epoxy-resin. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 Bond Breaker. Not Required

CONCRETE MIX

501-3.1. General. No concrete shall be placed until an acceptable concrete mix has been submitted to the RPR for review and the RPR has taken appropriate action. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 Concrete Mix Laboratory. The laboratory used to develop the concrete mix shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

501-3.3 Concrete Mix Proportions. Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-6.6 for a flexural strength of **650** psi per ASTM C78.

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be 470 pounds per cubic. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall be between 0.38 – 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches (50 mm) for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches (75 mm). For hand placement, the slump shall not exceed 4 inches (100 mm).

The results of the concrete mix shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

If a change in source(s) is made, or admixtures added or deleted from the mix, a new concrete mix must be submitted to the RPR for approval.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

501-3.4 Concrete Mix submittal. The concrete mix shall be submitted to the RPR at least 30 days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by the RPR.

Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

- Certified material test reports for aggregate in accordance with paragraph 501-2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).
- Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.
- Reactivity Test Results.
- Coarse aggregate quality test results, including deleterious materials.
- Fine aggregate quality test results, including deleterious materials.
- Mill certificates for cement and supplemental cementitious materials.
- Certified test results for all admixtures, including Lithium Nitrate if applicable.
- Specified flexural strength, slump, and air content.
- Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.
- Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.
- Correlation ratios for acceptance testing and Contractor QC testing, when applicable.
- Historical record of test results documenting production standard deviation, when applicable.

501-3.5 Cementitious materials.

a. Fly ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the concrete mix. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

501-3.6 Admixtures.

a. Air-entraining admixtures. Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 3.0. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Not used.

c. Other admixtures. Not used.

d. Lithium nitrate. Not used.

CONSTRUCTION METHODS

501-4.1 Control Strip. Not used

501-4.2 Equipment. The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials and performing all parts of the work to meet this specification.

a. Plant and equipment. The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. The truck mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

Equipment for transferring and spreading concrete from the transporting equipment to the paving lane in front of the finishing equipment shall be provided. The equipment shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

b. Finishing equipment.

(1) Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.

(2) Fixed-form. On projects requiring less than 10,000 cubic yards of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR. Hand screeding and float finishing may only be used on small irregular areas as allowed by the RPR.

c. Vibrators. Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309R, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the RPR.

Hand held vibrators may only be used in irregular areas and shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

d. Concrete saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one

standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

e. Fixed forms. Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the RPR. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4 inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the RPR. The forms shall extend the full depth of the pavement section.

501-4.3 Form setting. Forms shall be set to line and grade as shown on the plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the concrete placement.

501-4.4 Base surface preparation prior to placement. Any damage to the prepared base, subbase, and subgrade shall be corrected full depth by the Contractor prior to concrete placement. The underlying surface shall be entirely free of frost when concrete is placed. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete.

501-4.5 Handling, measuring, and batching material. Aggregate stockpiles shall be constructed and managed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

501-4.6 Mixing concrete. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is discharged from the truck should not exceed **[** 30 **]** minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. In no case shall the temperature of the concrete when placed exceed 90°F (32°C). Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified is not exceeded.

501-4.7 Weather Limitations on mixing and placing. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold weather. Unless authorized in writing by the RPR, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F

(4°C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F (2°C).

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F (10°C) at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F (66°C). The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

Curing during cold weather shall be in accordance with paragraph 501-4.13d.

b. Hot weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F (30°C), the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F (32°C). The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The concrete placement shall be protected from exceeding an evaporation rate of 0.2 psf (0.98 kg/m^2 per hour) per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

Curing during hot weather shall be in accordance with paragraph 501-4.13e.

c. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the RPR with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. (Federal Highway Administration HIPERPAV 3 is one example of a temperature management program.) As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 19-9, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

d. **Rain.** The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

501-4.8 Concrete Placement. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet (1 m). The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or

segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches 550 psi, based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. The Contractor must determine that the above minimum strengths are adequate to protection the pavement from overloads due to the construction equipment proposed for the project.

The Contractor shall have available materials for the protection of the concrete during cold, hot and/or inclement weather in accordance with paragraph 501-4.7.

a. Slip-form construction. The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well-defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches (23 cm) for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches (0.5 m).

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without, segregation, voids, or vibrator trails and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot (30 cm). The frequency of vibration or amplitude should be adjusted proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500-foot (150 m) segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch (6 mm), and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch (9 mm). (The total free edge of 500 feet (150 m) of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet (150 m) of paving lane originally constructed as a separate lane will have 1,000 feet (300 m) of free edge, 500 feet (150 m) of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches (0.5 m) from the edge.

When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the RPR.

b. Fixed-form construction. Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR.

Concrete for the full paving width shall be effectively consolidated by internal vibrators. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation, voids, or leaving vibrator trails.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches (50 mm). Vibrators shall not be used to transport or spread the concrete. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the RPR.

If a lack of consolidation of the hardened concrete is suspected by the RPR, referee testing may be required. Referee testing of hardened concrete will be performed by the RPR by cutting cores from the finished pavement after a minimum of 24 hours curing. The RPR shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the RPR based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards (382 m^2) of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee

tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 Strike-off of concrete and placement of reinforcement. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screed. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 Joints. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2-inch (12 mm) from their designated position and shall be true to line with not more than 1/4-inch (6 mm) variation in 10 feet (3 m). The surface across the joints shall be tested with a 12-foot (3 m) straightedge as the joints are finished and any irregularities in excess of 1/4 inch (6 mm) shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch (3 mm) wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris between the filler and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic

d. Dowels and Tie Bars for Joints

(1) Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in paragraph 501-4.10(f.). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

(2) Dowel bars. Dowel bars shall be placed across joints in the proper horizontal and vertical alignment as shown on the plans. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the RPR. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

(3) Placing dowels and tie bars. Horizontal spacing of dowels shall be within a tolerance of ±3/4 inch (19 mm). The vertical location on the face of the slab shall be within a tolerance of ±1/2 inch (12 mm). The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than 1/4 inch per feet (6 mm per 0.3 m), except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(a) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires.

At the Contractor's option, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the RPR.

(b) Construction joints. Install dowels and tie bars by the cast-in- place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

(c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum **450 psi** before drilling begins. Holes 1/8 inch (3 mm) greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of ±1/2 inch (12 mm) of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

e. Sawing of joints. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial saw-cut and maintained for the remaining cure period.

Joints shall be cut in locations as shown on the plans. The initial joint cut shall be a minimum 1/8 inch (3 mm) wide and to the depth shown on the plans. Prior to placement of joint sealant or seals, the top of the joint shall be widened by sawing as shown on the plans.

501-4.11 Finishing. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, edging of joints, and then texturing. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the RPR, may be used in accordance with the manufacturers requirements.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the RPR's approval.

Bridge deck finishers shall not be used.

d. Hand finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical.

e. Straightedge testing and surface correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a 12-foot (3.7-m) finishing straightedge swung from handles capable of spanning at least one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8 inch (3 mm) thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

501-4.12 Surface texture. The surface of the pavement shall be finished as designated below for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. The texture shall be uniform in appearance and approximately 1/16 inch (2 mm) in depth. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the RPR.

a. Brush or broom finish. Not used.

b. Burlap drag finish. Burlap, at least 15 ounces per square yard (555 grams per square meter), will typically produce acceptable texture. To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot (30 cm) from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface

c. Artificial turf finish. Not used.

501-4.13 Curing. Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious membrane method. Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon (4 liters) to not more than 150 square feet (14 sq m). The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed

condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the RPR, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

c. Water method. The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.

d. Concrete protection for cold weather. Maintain the concrete at a temperature of at least 50°F (10°C) for a period of 72 hours after placing and at a temperature above freezing for the remainder of the 7-day curing period. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the RPR.

501-4.14 Removing forms. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured in accordance with paragraph 501-4.13.

If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch (25 mm), shall be repaired with an approved grout, as directed by the RPR. Honeycombed areas that extend into the slab greater than a depth of 1 inch (25 mm) shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-4.19.

501-4.15 Saw-cut grooving. If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.

501-4.16 Sealing joints. The joints in the pavement shall be sealed in accordance with FAA Specification Item P-604.

501-4.17 Protection of pavement. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the RPR. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material,

etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the RPR.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days, the joints are protected, the concrete has attained a minimum field cured flexural strength of [450 psi (3100 kPa)], and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 Opening to construction traffic. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 pounds per square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 Repair, removal, or replacement of slabs. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 501-6.6 shall be removed and replaced or repaired, as directed by the RPR, at the Contractor's expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The RPR will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be have a diameter of 2 inches (50 mm) to 4 inches (100 mm), shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of the RPR the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch (3 mm) of the pavement surface.

a. Shrinkage cracks. Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the manufacturer and approved by the RPR. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the RPR. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with paragraphs 501-4.19b and 501-19c.

b. Slabs with cracks. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth.

c. Not used

d. Removal and replacement of full slabs. Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the RPR at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with paragraph 501-4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

e. Spalls along joints.

(1) Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.

(2) Spalls larger than one inch and/or deeper than the joint reservoir, but less than ½ the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:

i. Make a vertical saw cut at least one inch (25 mm) outside the spalled area and to a depth of at least 2 inches (50 mm). Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.

ii. Remove unsound concrete and at least 1/2 inch (12 mm) of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer.

iii. Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.

iv. Apply a prime coat of epoxy resin, Type III, Grade I, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face.

v. Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar.

vi. An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.

vii. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints.

(3) Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

f. Diamond grinding of Concrete surfaces. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed 1/2 inch (13 mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.

Diamond grinding shall be performed with a machine specifically designed for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with sufficient number of flush cut blades that create grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The Contractor shall determine the number and type of blades based on the hardness of the aggregate. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. All grinding shall be at the expense of the Contractor.

CONTRACTOR QUALITY CONTROL (CQC)

501-5.1 Quality control program. The Contractor shall develop a Quality Control Program in accordance with Item C-100. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program.

501-5.2 Contractor Quality Control (CQC). The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

501-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification.

a. Fine aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.

(3) Deleterious substances. Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in paragraph 501-2.1b, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.

(3) Deleterious substances. Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in paragraph 501-2.1c, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

c. Slump. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air content. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Unit weight and Yield. One test shall be made for each sublot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

f. Temperatures. Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

g. Smoothness for Contractor Quality Control.

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) "straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using either the FAA profile program, ProFAA, or FHWA profile program ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 501-4.19f or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 501-6.6.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need

corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade will be evaluated prior to and after placement of the concrete surface.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically and 0.1 feet (30 mm) laterally. The documentation will be provided by the Contractor to the RPR within 48 hours.

Areas with humps or depression that that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 501-4.19d. Grinding shall be in accordance with paragraph 501-4.19f. All corrections will be at the Contractors expense.

501-5.4 Control charts. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with paragraph 501-2.1d.

Control charts shall be posted in a location satisfactory to the RPR and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the RPR may halt production or acceptance of the material.

a. Fine and coarse aggregate gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the action and suspension limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least **[** two **]** samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

b. Slump and air content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

c. Combined gradation. The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with paragraph 501-2.1d.

Control Chart Limits[1]

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation[2]	*[3]	*[3]
Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch (+13 to -25 mm)	+1 to -1.5 inch (+25 to -38 mm)
Air Content	±1.5%	±2.0%

[1] Control charts shall developed and maintained for each control parameter indicated.

[2] Control charts shall be developed and maintained for each sieve size.

[3] Action and suspension limits shall be determined by the Contractor.

501-5.5 Corrective action at Suspension Limit. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.

c. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

d. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

e. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

MATERIAL ACCEPTANCE

501-6.1 Quality Assurance (QA) Acceptance sampling and testing. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the

exception of coring for thickness determination, will be performed by the RPR. The Contractor shall provide adequate facilities for the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 501-6.5b(1).

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F (16° to 27°C), and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

501-6.2 Quality Assurance (QA) testing laboratory. Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods will be submitted to the RPR prior to start of construction.

501-6.3 Lot size. Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of a day's production not to exceed 2,000 cubic yards. Each lot will be divided into approximately equal sublots with individual sublots between 400 to 600 cubic yards. Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

501-6.4 Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is, n=5 or n=6.

501-6.5 Acceptance Sampling and Testing.

a. Strength.

(1) Sampling. One sample will be taken for each sublot from the concrete delivered to the job site. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172.

(2) Test Specimens. The RPR will be responsible for the casting, initial curing, transportation, and curing of specimens in accordance with ASTM C31. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with ASTM C78. The strength for each sublot will be computed by averaging the results of the two test specimens representing that sublot.

(3) Acceptance. Acceptance of pavement for strength will be determined by the RPR in accordance with paragraph 501-6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and the remaining test values will be used to determine acceptance in accordance with paragraph 501-6.5b.

b. Pavement thickness.

(1) Sampling. One core will be taken by the Contractor for each sublot in the presence of the RPR. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.

Cores shall be a minimum 4 inch (100 mm) in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the RPR within one day after sampling.

(2) Testing. The thickness of the cores will be determined by the RPR by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.

(3) Acceptance. Acceptance of pavement for thickness will be determined by the RPR in accordance with paragraph 501-6.6.

501-6.6 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-6.5b:

(1) Strength

(2) Thickness

(3) Grade

(4) Profilograph smoothness

(5) Adjustments for repairs

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with paragraph 501-6.6b(1), 501-6.6b(2), and 501-6.6b(3), respectively. Acceptance for profilograph smoothness will be based on the criteria contained in paragraph 501-6.6b(4).

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full pavement. The PWL will be determined in accordance with procedures specified in Item C-110.

The lower specification tolerance limit (L) for strength and thickness will be:

Lower Specification Tolerance Limit (L)

Strength	0.93 × strength specified in paragraph 501-3.3
Thickness	Lot Plan Thickness in inches, - 0.50 in

b. Acceptance criteria.

(1) Strength . If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(**2) Thickness.** If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(3) Grade. The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections by more than 1/2 inch (12 mm) vertically. The documentation shall be stamped and signed by a licensed surveyor shall be in accordance with paragraph 501-

5.3h. Payment for sublots that do not meet grade for over 25% of the sublot shall be reduced by 5% and not be more than 95%.

(4) Profilograph roughness for QA Acceptance

Not used.

(5) Adjustments for repair. Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.

(6) Adjustment for grinding. For sublots with grinding over 25% of a sublot, payment will be reduced 5%.

END ITEM P-501

--------END OF SECTION 02501--------

SECTION 02605 – JOINT/CRACK SEALANTS FOR PAVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The General Provision 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. This Section shall be in accordance with FAA Specification Item P-621: Saw-cut Grooves, as included as an attachment to this Section.

1.2 DESCRIPTION OF WORK

This Section consists of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

1.3 RELATED WORK SPECIFIED ELSEWHERE

Section 02501 – Cement Concrete Pavement; FAA Specification P-501

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Federal Aviation Administration (FAA)

1. FAA Specification Item P-501: Cement Concrete Pavement
2. FAA Specification Item P-605: Joint Seals for Pavements

ASTM International

ASTM D789 Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)

ASTM D5249 Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt

1.5 SUBMITTALS

Submit in accordance with Section 01300 - Submittals.

List of proposed equipment to be used in performance of the work, including descriptive date, shall be submitted in accordance with FAA Specification Item P-605, paragraph 3.2.

PART 2 - PRODUCTS

2.1 Joint sealants: in accordance with FAA Specification Item P-605, paragraph 2.1.

2.2 Backer Rod: in accordance with FAA Specification Item P-605, paragraph 2.2.

2.3 Bond breaking tapes: in accordance with FAA Specification Item P-605, paragraph 2.3.

PART 3 - EXECUTION

3.1 Construction methods shall be in accordance with FAA Specification Item P-605.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

Joint replacement work in conjunction with slab replacement shall be considered incidental. Joint replacement not a part of the slab replacement work shall be paid under the following item:

Item No.	Item	Unit
02605.1	Joint Replacement And Crack Sealing	Allowance

For ALLOWANCE items in the Proposal Schedule, payment shall be the actual cost as invoiced by the Contractor and approved by the DOTA Engineer. The Contractor shall be allowed to include overhead, profit, insurance and/or other mark-ups, as stipulated in Section 9.5 of the 2016 General Provisions for Construction Projects, Air and Water Transportation Facilities Divisions.

PART 5 - ATTACHMENTS

5.1 FAA Specification Item P-605 Joint Sealants for Pavements.

PART 6 - **Item P-605 Joint Sealants for Pavements**

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D6690 Standard Specifications for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the joint.

605-2.3 Bond breaking tapes. Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F (3°C) greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch (3 mm) wider than the nominal width of the joint and shall not bond to the joint sealant.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F (10°C) and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 15 days prior to use on the project.

a. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

b. Sandblasting equipment. The Contractor must demonstrate sandblasting equipment including the air compressor, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the Resident Project Representative (RPR), that the method cleans the joint and does not damage the joint.

c. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

d. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

e. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch (12 mm) from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches (75 mm) from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet (15 m) ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install

the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

END ITEM P-605

-------END OF SECTION 02604-------

SECTION 02621 - SAW-CUT GROOVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provision 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. This Section shall be in accordance with FAA Specification Item P-621: Saw-cut Grooves, as included as an attachment to this Section.

1.2 DESCRIPTION OF WORK

A. This Section consists of constructing saw-cut grooves to minimize hydroplaning during wet weather, providing a skid resistant surface in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer.

1.3 RELATED WORK SPECIFIED ELSEWHERE

1.4 REFERENCES

A. Federal Aviation Administration (FAA)

1. FAA Specification Item P-621: Saw-Cut Grooves.

1.5 SUBMITTALS

A. Grooving sequence and method of placing guidelines to control grooving operation shall be submitted in accordance with FAA Specification Item P-621, paragraph 621-2.1.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Construction methods shall be in accordance with FAA Specification Item P-621.

3.2 Acceptance shall be in accordance with FAA Specification Item P-621.

PART 4 - MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

A. Work will not be measured separately for payment and is considered incidental to the various proposal items.

4.2 BASIS OF PAYMENT

A. Basis for payment shall be considered incidental to the various proposal items.

PART 5 - ATTACHMENTS

5.1 FAA Specification Item P-621 Saw-Cut Grooves.

Item P-621 Saw-Cut Grooves

DESCRIPTION

621-1.1 This item consists of constructing saw-cut grooves to minimize hydroplaning during wet weather, providing a skid resistant surface in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer.

CONSTRUCTION METHODS

621-2.1 Procedures. The Contractor shall submit to the Engineer the grooving sequence and method of placing guidelines to control grooving operation. Transverse grooves saw-cut in the pavement must form a 1/4 inch (+1/16 inch, -0 inch) wide by 1/4 inch (±1/16 inch) deep by 1-1/2 inch (-1/8 inch, +0 inch) center-to-center configuration. The grooves must be continuous for the entire runway length. They must be saw-cut transversely (perpendicular to centerline) in the runway and high-speed taxiway pavement to not less than 10 feet from the runway pavement edge to allow adequate space for equipment operation.

The saw-cut grooves must meet the following tolerances. The tolerances apply to each day's production and to each piece of grooving equipment used for production. The Contractor is responsible for all controls and process adjustments necessary to meet these tolerances. The Contractor shall routinely spot check for compliance each time the equipment aligns for a grooving pass.

a. Alignment tolerance. The grooves shall not vary more than ±1-1/2 inch in alignment for 75 feet along the runway length, allowing for realignment every 500 feet along the runway length.

b. Groove tolerance.

(1) Depth. The standard depth is 1/4 inch. At least 90% of the grooves must be at least 3/16 inch, at least 60% of the grooves must be at least 1/4 inch, and not more than 10% of the grooves may exceed 5/16 inch.

(2) Width. The standard width is 1/4 inch. At least 90% of the grooves must be at least 3/16 inch, at least 60% of the grooves must be at least 1/4 inch, and not more than 10% of the grooves may exceed 5/16 inch.

(3) Center-to-center spacing. The standard spacing is 1-1/2 inch. Minimum spacing 1-3/8 inch. Maximum spacing 1-1/2 inch.

Saw-cut grooves must not be closer than 3 inches or more than 9 inches from transverse joints in concrete pavements. Grooves must not be closer than 6 inches and no more than 18 inches from in-pavement light fixtures. Grooves may be continued through longitudinal construction joints. Where neoprene compression seals have been installed and the compression seals are recessed sufficiently to prevent damage from the grooving operation, grooves may be continued through the longitudinal joints. Where neoprene compression seals have been installed and the compression seals are not recessed sufficiently to prevent damage from the grooving operation, grooves must not be closer than 3 inches or more than 5 inches from the longitudinal joints. Where lighting cables are installed, grooving through longitudinal or diagonal saw kerfs shall not be allowed.

621-2.2 Environmental requirements. Discharge and disposal of waste slurry shall be the Contractor's responsibility.

621-2.3 Control strip. Groove a control strip in an area of the pavement outside of the trafficked area, as approved by the Engineer. The area shall be 150 feet long by two lanes wide. Demonstrate the setup and alignment process, the grooving operation, and the waste slurry disposal.

621-2.4 Existing pavements. Bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement shall not be grooved until such areas are adequately repaired or replaced.

621-2.5 New pavements. New asphalt and Portland cement concrete pavements shall be allowed to cure for a minimum of 30 days before grooving, to allow the material to become stable enough to prevent closing of the grooves under normal use. If it can be demonstrated that grooves are stable, and can be installed with no spalling, tearing or raveling of the groove edge, grooving may occur sooner than 30 days with approval of the Engineer. All grade corrections must be completed prior to grooving. Spalling along or tearing or raveling of the groove edges shall not be allowed.

621-2.6 Grooving machine. Provide a grooving machine that is power driven, self-propelled, specifically designed and manufactured for pavement grooving, and has a self-contained and integrated continuous slurry vacuum system as the primary method for removing waste slurry. The grooving machine shall be equipped with diamond-saw cutting blades, and capable of making at least 18 inches in width of multiple parallel grooves in one pass of the machine. Thickness of the cutting blades shall be capable of making the required width and depth of grooves in one pass of the machine. The cutting head shall not contain a mixture of new and worn blades or blades of unequal wear or diameter. Match the blade type and configuration with the hardness of the existing airfield pavement. The wheels on the grooving machine shall be of a design that will not scar or spall the pavement. Provide the machine with devices to control depth of groove and alignment.

621-2.7 Water supply. Water for the grooving operation shall be provided by the Contractor.

621-2.8 Clean-up. During and after installation of saw-cut grooves, the Contractor must remove from the pavement all debris, waste, and by-products generated by the operations to the satisfaction of the Engineer. Cleanup of waste material must be continuous during the grooving operation. Flush debris produced by the machine to the edge of the grooved area or pick it up as it forms. The dust coating remaining shall be picked up or flushed to the edge of the area if the resultant accumulation is not detrimental to the vegetation or storm drainage system. Accomplish all flushing operations in a manner to prevent erosion on the shoulders or damage to vegetation. Waste material must be disposed of in an approved manner. Waste material must not be allowed to enter the airport storm sewer system. The Contractor must dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations

621-2.9 Repair of damaged pavement. Grooving must be stopped and damaged pavement repaired at the Contractor's expense when directed by the Engineer.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5320-12 Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

END OF ITEM P-621

--------END OF SECTION 02621-------

U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

Subject: Guidelines and Procedures for Maintenance of Airport Pavements	**Date:** 10/10/2014 **Initiated by:** AAS-100	**AC No:** 150/5380-6C **Change:**

1. Purpose. This advisory circular (AC) provides guidelines and procedures for maintaining airport pavements.

2. Cancellation. This AC cancels AC 150/5380-6B, Guidelines and Procedures for Maintenance of Airport Pavements, dated September 28, 2007.

3. Application. The guidelines and procedures contained in this AC are recommended by the Federal Aviation Administration (FAA) for the maintenance and minor repairs of airport pavements. This AC offers general guidance for maintenance and is neither binding nor regulatory.

Use of this AC is not mandatory. For major maintenance projects, the airport should utilize plans and specifications developed under the direction of a pavement design engineer.

For all maintenance and repair projects funded with federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charge (PFC) Program, the airport must use the guidelines and specifications for materials and methods in AC 150/5370-10, Standards for Specifying Construction of Airports. Pavement maintenance discussed in this AC is specific to airfield pavements. Maintenance of airport access roads and other non-aeronautical pavements may typically use state highway standards.

4. Principal changes. The AC contains the following principal changes:

a. Revised and reformatted entire AC.

b. Added paragraph on operational safety on airports during construction in Chapter 1.

c. Simplified Chapter 2. Moved information on friction, drainage, etc., into Chapter 2.

d. Added paragraph on wildlife hazard attractants and mitigation with respect to drainage systems to Chapter 2.

e. Split Table 6-1 into two tables; updated and simplified tables for Quick Guide for Maintenance and Repair of Common Rigid Pavement Surface Problems and Quick Guide for Maintenance and Repair of Common Flexible Pavement Surface problems.

f. Deleted Tables 6-2 through 6-10 from previous release.

g. Deleted "Pavement Maintenance Management Program" from appendices. Information has been moved to AC 150/5380-7, Airport Pavement Management Program (PMP).

h. Deleted "Generic Specifications" and "Generic Typical Details" and replaced with typical repair procedures.

i. Updated Bibliography.

5. Related reading material. The publications in Appendix B, Bibliography, provide further guidance and technical information.

6. Metric units. Throughout this AC, U. S. customary units will be used followed with "soft" (rounded) conversion to metric units. The U. S. customary units govern.

7. Comments or suggestions for improvements to this AC should be sent to:

Federal Aviation Administration
Airport Engineering Division (AAS-100)
800 Independence Avenue, S.W.
Washington, DC 20591

8. Copies of this AC. This AC is available on the FAA Airport website: http://www.faa.gov/regulations_policies/advisory_circulars/.



Michael J. O'Donnell
Director of Airport Safety and Standards

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Chapter 1. Introduction to Airport Pavement Maintenance

1.1. General.

This advisory circular (AC) provides information on the types of pavement distress that occur to airport pavements and typical corrective action during preventive and remedial maintenance activities. Maintenance includes preventive and any regular or recurring work necessary to preserve existing airport pavements in good condition. Replacing individual parts and mending portions of a pavement are considered minor repair. Typical preventive and regular or recurring pavement maintenance includes: routine cleaning, filling, and/or sealing of cracks; patching pavement; seal coating; grading pavement edges; maintaining pavement drainage systems; and restoring pavement markings. Timely maintenance and repair of pavements is essential in maintaining adequate load-carrying capacity, good ride quality necessary for the safe operation of aircraft, good friction characteristics under all weather conditions, and minimizing the potential for foreign object debris (FOD).

Some older pavements were not designed for today's aircraft fleet and are exposed to much greater loads than those initially considered. FAA airport pavement design is based upon a minimum 20-year structural life, with the understanding that regular, routine maintenance is performed. Without regular maintenance, the pavement may not achieve the intended structural life.

Airport pavements require continual routine maintenance, rehabilitation and upgrading. Immediately after completion, airport pavements begin a gradual deterioration attributable to weather and loading. Normal distresses in the pavement structure due to weathering, fatigue effects, and differential movement in the underlying subbase occur over a period of years. This gradual deterioration is accelerated by, among other things, faulty construction techniques, substandard materials, or poor workmanship. Traffic loads in excess of those forecast during pavement design may also contribute to shortened pavement life.

The most effective means of preserving airport runways, taxiways, aprons, and other pavement areas is to implement a comprehensive maintenance program. An effective maintenance program takes a coordinated, budgeted, and systematic approach to both preventive and remedial maintenance. A systematic approach ensures continual vigilance and many airports using this approach have experienced tangible benefits. The comprehensive maintenance program should be updated annually and feature a schedule of inspections and a list of required equipment and products. The airport should systematically make repairs and take preventive measures when necessary.

Airport Improvement Program (AIP) grants require many airports to develop and maintain an effective airport pavement maintenance-management program. The FAA also encourages airports that are not specifically required to develop maintenance programs to do so as a means of preserving their facilities. Refer to AC 150/5380-7, Airport Pavement Management Program (PMP), for information on PMP.

Early detection and repair of pavement defects is the most important preventive maintenance procedure. Failure to perform routine maintenance during the early stages of deterioration will

eventually result in serious pavement distresses that require extensive repairs that will be costly in terms of dollars and closure time. The cause of pavement distresses must first be determined so an airport can select a repair method that not only corrects the present damage, but will also prevent or retard its progression.

Airports should prioritize long term solutions rather than focusing on immediate, short-term remedies. The selection of a rehabilitation method should consider both economic and engineering impacts of all practicable alternatives. The cost of rehabilitation alternatives should be compared over some finite period of time (life cycle), considering the future economic consequences of a repair method as well as the initial rehabilitation maintenance costs.

1.2. Operational safety on airports during construction.

Airports are complex environments, and procedures and conditions associated with construction and maintenance activities often affect aircraft operations and can jeopardize operational safety. Safety considerations are paramount and may make operational impacts unavoidable. However, careful planning, scheduling, and coordination of construction and maintenance activities can minimize disruption of normal aircraft operations and avoid situations that compromise the airport's operational safety. An airport operator has overall responsibility for all activities on an airport, including construction and maintenance. The airport operator must understand how construction and maintenance activities and aircraft operations affect one another to be able to develop an effective plan to complete the project.

An effective project construction safety and phasing plan (CSPP) should be developed for maintenance activities. The development of the CSPP includes identifying the areas of the airport affected by the project; the impact to normal airport operations, if any, and any temporary changes that are required with respect to air traffic operations, aircraft rescue and fire fighting (ARFF) or other operations; and how risk will be managed. AC 150/5370-2, Operational Safety on Airports During Construction, provides additional information and guidance about safety on airports during construction.

Chapter 2. Airport Pavements

2.1. General.

This chapter is a very general and brief overview of airport pavements. Airport pavements are designed, constructed, and maintained to support the critical loads imposed by aircraft. Airport pavements produce a firm, stable, smooth, skid-resistant, all-year, all-weather surface free of debris or other particles that may be blown or picked up by propeller wash or jet blast. The quality and thickness of the pavement must ensure the pavement will not fail under the imposed loads and the pavement must be durable enough to withstand the abrasive action of traffic, adverse weather conditions, and other deteriorating influences. To ensure the necessary strength of the pavement and to prevent unmanageable distresses from developing, the airport should consider various design, construction, and material-related parameters. For guidance and design standards for pavements, refer to AC 150/5320-6, Airport Pavement Design and Evaluation. For materials and methods for construction of airports, refer to AC 150/5370-10, Standards for Specifying Construction of Airports. The ACs are available at http://www.faa.gov/regulations_policies/advisory_circulars/.

2.2. Types of pavements.

Pavements generally fall into two types: flexible and rigid. Figure 2-1 shows a typical pavement structure and acceptable materials for each layer.

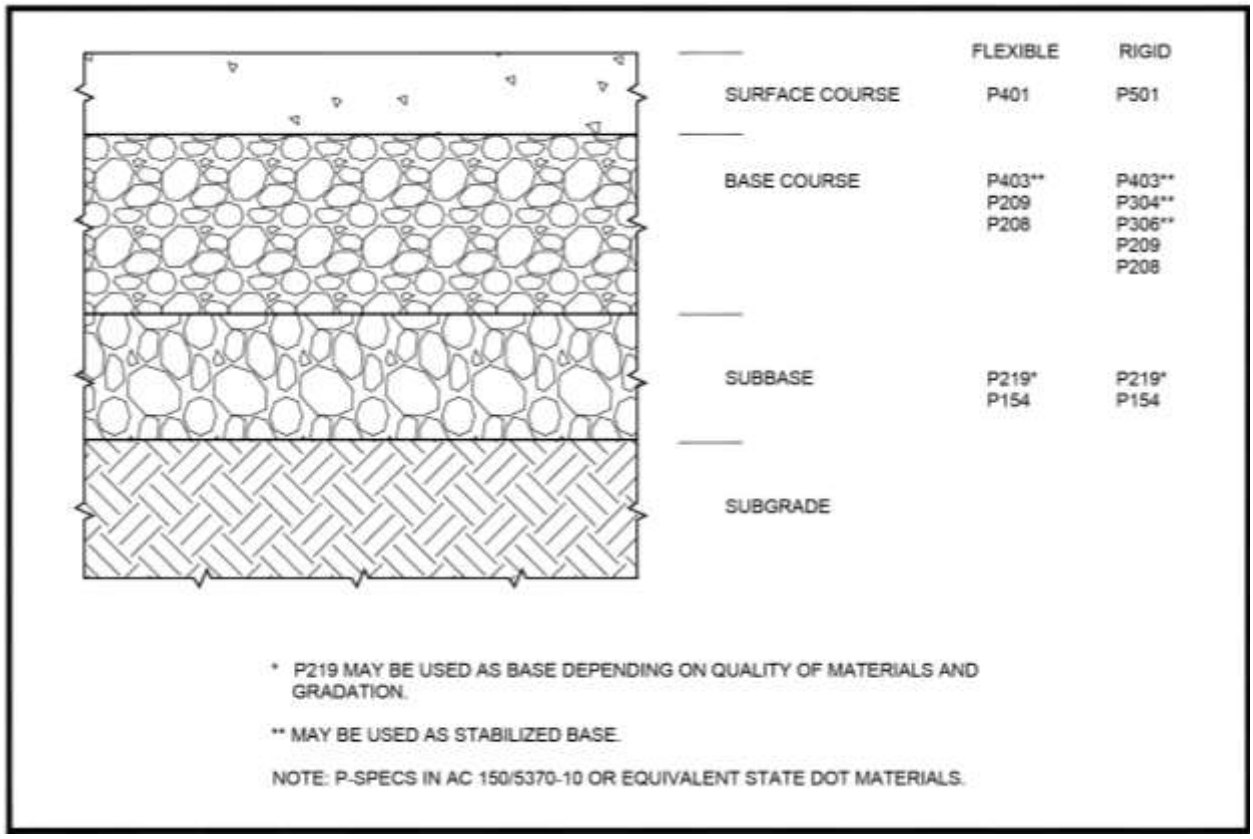


Figure 2-1. Typical pavement structure

2.2.1. Flexible pavement composition and structure. Flexible pavements support loads through bearing. They comprise several layers of carefully selected materials designed to gradually distribute loads from the pavement surface to the layers underneath. The design ensures the load transmitted to each successive layer does not exceed the layer's load-bearing capacity. The various layers composing a flexible pavement section and the functions the various layers perform are described below.

a. Bituminous surface (wearing course). The bituminous surface, or wearing course, is made up of a mixture of various selected aggregates bound together with asphalt cement or other bituminous binders. The material used in the surface course is commonly referred to as Hot-Mix Asphalt (HMA). The HMA prevents the penetration of surface water into the base course; provides a smooth, well-bonded surface free from loose particles, which might endanger aircraft or people; resists the stresses caused by aircraft loads; and supplies a skid-resistant surface without causing undue wear on tires.

b. Base course. The base course serves as the principal structural component of the flexible pavement. It distributes the imposed wheel load to the pavement foundation, the subbase, and/or the subgrade. The base course must have sufficient quality and thickness to prevent failure in the subgrade and/or subbase, withstand the stresses produced in the base itself, resist vertical pressures that tend to produce consolidation and distortion of the surface course, and resist volume changes caused by fluctuations in its moisture content. The quality of the base course is a function of its composition, physical properties, and compaction of the material. The materials composing the base course are select hard, durable aggregates, which generally fall into two main classes: stabilized and granular. The stabilized bases normally consist of crushed or uncrushed aggregate bound with a stabilizer, such as portland cement or asphalt cement. The granular bases normally consist of crushed or uncrushed aggregate constructed on a prepared subgrade.

c. Subbase. The subbase layer is used in areas where frost action is severe or the subgrade soil is weak. The subbase course functions like the base course, but the material requirements for the subbase are not as strict as those for the base course because the subbase is subjected to lower load stresses. The subbase consists of stabilized or properly compacted granular material.

d. Subgrade. The subgrade is the soil layer that forms the foundation of the pavement section. Subgrade soils are subjected to lower stresses than the surface, base, and subbase courses. Since load stresses decrease with depth, the controlling subgrade stress usually lies at the top of the subgrade. The combined thickness of subbase, base, and surface course must be great enough to reduce the stresses occurring in the subgrade to values that will not cause excessive distortion or displacement of the subgrade soil layer.

2.2.2. Rigid pavement composition and structure. Rigid pavements support loads through flexural action. Rigid pavements normally use portland cement concrete (PCC) as the prime structural element. Depending on conditions, engineers may design the PCC pavement slab with plain, lightly reinforced, continuously reinforced, or pre-stressed concrete. The PCC pavement slab is usually placed on a compacted granular or treated subbase supported by a compacted subgrade. The subbase provides uniform stable support and may provide subsurface drainage. The PCC pavement slab has considerable flexural strength and spreads the applied loads over a

large area. Rigid pavement strength is most economically built into the PCC pavement slab itself with optimum use of low-cost materials under the slab. The various layers composing a rigid pavement section and the functions the various layers perform are described below.

a. PCC pavement slab (surface course). The PCC pavement slab provides structural support to the aircraft, provides a skid-resistant surface, and prevents the infiltration of surface water into the subbase.

b. Base. The base provides uniform stable support for the pavement slab. The base also serves to control frost action, provide subsurface drainage, control swelling of subgrade soils, provide a stable construction platform for rigid pavement construction, and prevent pumping of fine-grained soils. Rigid pavements generally require a minimum base thickness of 4 inches (10 cm).

c. Stabilized base. All new rigid pavements designed to accommodate aircraft weighing 100,000 pounds (45,000 kg) or more must have a stabilized base. The structural benefit imparted to a pavement section by a stabilized base is reflected in the modulus of subgrade reaction assigned to the foundation.

d. Subbase. The subbase layer is used in areas where frost action is severe or the subgrade soil is weak. The subbase course functions like the base course, but the material requirements for the subbase are not as strict as those for the base course because the subbase is subjected to lower load stresses. The subbase consists of stabilized or properly compacted granular material.

e. Subgrade. The subgrade is the soil layer that forms the foundation of the pavement section. Subgrade soils are subjected to lower stresses than the surface and subbase courses. These stresses decrease with depth, and the controlling subgrade stress is usually at the top of the subgrade unless unusual conditions exist. Unusual conditions, such as a layered subgrade or sharply varying water content or densities, may change the locations of the controlling stress. The soils investigation should check for these conditions. The pavement structure above the subgrade must be capable of reducing stresses imposed on the subgrade to values that are low enough to prevent excessive distortion or displacement of the subgrade soil layer.

2.3. Drainage of airport pavements.

Maintenance of the airport drainage system is essential in airport pavement preventive maintenance. No other factor plays a more important role in the ability of a pavement to withstand the effects of weather and traffic. The drainage system collects and removes surface water runoff, removes excess ground water, lowers the water table, and protects slopes from erosion. An inadequate drainage system can cause saturation of the subgrade and subbase, slope erosion, and loss of the load-bearing capacity of the paved surfaces.

Water has a detrimental effect on pavement performance, primarily by either weakening subsurface materials or eroding material by free water movement. For flexible pavements, the weakening of the base, subbase, or subgrade when saturated with water is one of the main causes of pavement failures. In rigid pavement, free water, trapped between the concrete surface and an impermeable layer directly beneath the concrete, will move due to pressure caused by loadings. This movement of water (referred to as pumping) erodes the subsurface material, creating voids

under the concrete surface. In frost areas, subsurface water will contribute to frost damage by heaving during freezing and loss of subgrade support during thawing. Poor subsurface drainage can also contribute to secondary damage such as durability cracking (D cracking) or swelling of subsurface materials.

The type, speed, and volume of traffic will influence the criteria used in the design of pavement drainage systems. For rigid pavements, pumping is greatly increased as the volume and speed of the traffic increases. For flexible pavements, the buildup of pore pressures as a result of high-volume, high-speed traffic is a primary cause of the weakening of the pavement structure. For these reasons, the criteria for a subsurface drainage system under airfield runways and taxiways will be more stringent than for airfield parking aprons or other pavements that have low-volume and low-speed traffic.

The two types of water to be considered are surface water and subsurface water. Surface water is the most important source of water and the source of most concern. Subsurface water is important in frost areas and areas of very high water table or areas of artesian water because the free water collects under the surface by freeze/thaw action. In many areas, perched water may develop under pavements due to a reduced rate of evaporation of the water from the surface. Where drainage is required for surface and subsurface water, it is generally good practice for each system to function independently.

a. Surface drainage. Surface drainage controls, collects, and disposes of water from rainstorms and melting snow and ice that accumulate on the surface of the pavement and nearby ground. Surface drainage of pavements is achieved by constructing the pavement surface and adjacent ground in a way that allows for adequate runoff. The water may be collected at the edges of the paved surface. Although some water will enter the pavement structure through cracks, open joints, and other surface openings, this penetration may be kept to a minimum by proper surface maintenance procedures. Surface water should not be allowed to enter a subdrainage system because it often contains soil particles that may cause the subdrains to silt up.

b. Subsurface drainage. Subsurface drainage is provided for the pavement by a permeable layer of aggregate or permeable stabilized layers with longitudinal pipes for collecting the water and outlet pipes for rapid removal of the water from the subsurface drainage system. Subsurface drains may also consist of perforated collection pipes or conduits in a permeable sand or gravel trench encased in geotextiles with outlet pipes. These systems remove excess water from pavement foundations to prevent weakening of the base and subgrade and to reduce damage from frost action. Subsurface drainage placed at the pavement edge also minimizes surface runoff from entering the perimeter of the pavement structure.

AC 150/5320-5, Airport Drainage Design, contains additional guidance and technical information on airport drainage.

2.3.1. Maintenance of subsurface drainage systems. Commitment to maintenance is as important as providing subsurface drainage systems. In fact, an improperly maintained drainage system can cause more damage to the pavement structure than if no drainage were provided at all. Poor maintenance leads to clogged or silted outlets and edge-drain pipes, missing rodent

screens, excessive growth of vegetation blocking outlet pipes and openings on daylighted bases, and growth of vegetation in side ditches. These problems can potentially cause the back up of water within the pavement system, thereby defeating the purpose of providing the drainage system. Inspections and maintenance of subsurface drainage systems should be made an integral part of the policy of any agency installing these systems.

2.3.2. Drainage inspection. The pavement maintenance program should take into account the importance of adequate drainage of surface and ground water because water is directly or partly responsible for many pavement failures and deterioration. Sufficient drainage for collection and disposal of surface runoff and excess ground water is vital to the stability and serviceability of pavement foundations. Trained personnel should conduct periodic and complete inspections of drainage systems and record and correct defective conditions of surface and subsurface drainage systems. Runway and taxiway edge drains and catch basins should be inspected at intervals (e.g., spring, summer, fall, and winter) and monitored following unusually heavy rainfall. The personnel making the inspection should look for distress signals that may indicate impending problems including: ponding of water; soil buildup at pavement edges preventing runoff; eroded ditches and spill basins; broken or displaced inlet grates or manhole covers; clogged or silted inlet grates and manhole covers; blocked subsurface drainage outlets; broken or deformed pipes; backfill settlement over pipes; erosion around inlets; generally poor shoulder shaping and random erosion; and discoloration of pavement at joints or cracks.

2.3.3. Wildlife hazard attractants and mitigation. Throughout the planning, design, construction, and maintenance of airport surface storm drainage and subsurface drainage systems the airport must emphasize and address the elimination and/or mitigation of drainage features in the project(s) that could attract hazardous wildlife on and/or around an airport. Refer to the following documents and sites for guidance on wildlife hazards at airports:

a. AC 150/5200-33, Hazardous Wildlife Attractants On or Near Airports, contains guidance on certain land uses that have the potential to attract hazardous wildlife on or near airports. The AC is available at: http://www.faa.gov/airports/resources/advisory_circulars/.

b. Wildlife Hazard Management at Airports, A Manual for Airport Personnel and additional information on wildlife issues can be found on the FAA Wildlife Hazard Mitigation website at: http://www.faa.gov/airports/airport_safety/wildlife/.

2.4. Pavement Management Program (PMP).

A PMP provides one method of establishing an effective maintenance and repair system. A PMP is a systematic and consistent procedure for scheduling maintenance and rehabilitation based on maximizing benefits and minimizing costs. A PMP not only evaluates the present condition of a pavement, but also can be used to forecast its future condition. By projecting the rate of deterioration, a PMP can facilitate a life-cycle cost analysis for pavement maintenance/repair procedures and help determine the best alternative.

The primary component of any PMP is the ability to track a pavement's deterioration and determine the cause of the deterioration. This requires an evaluation procedure that is objective, systematic, and repeatable. One such procedure is the Pavement Condition Index (PCI). The

PCI is a rating of the surface condition of a pavement and indicates functional performance. A PCI evaluation may also provide an indication of the pavement's structural performance. Periodic PCI determinations on the same pavement will show the change in performance level over time. Airports can use the pavement condition survey to develop pavement performance data. Distress intensity recorded over time helps determine how the pavement is performing. The rate at which the distress intensity increases is a good indicator of the pavement performance. The PCI is determined in accordance with procedures contained in ASTM D5340, Standard Test Method for Airport Pavement Condition Index Surveys. Refer to AC 150/5380-7 for additional information on PMP.

2.5. Friction.

Airports should maintain runway pavements that provide surfaces with good friction characteristics under all weather conditions. Over time, the skid-resistance of runway pavement deteriorates due to a number of factors, the primary ones being mechanical wear and polishing action from aircraft tires rolling or braking on the pavement and the accumulation of contaminants, chiefly rubber, on the pavement surface. The effect of these two factors is directly dependent upon the volume and type of aircraft traffic. Other influences on the rate of deterioration includes, but is not limited to, local weather conditions, the type of pavement (HMA or PCC), the materials used in original construction, any subsequent surface treatment, drainage, and airport maintenance practices.

AC 150/5320-12, Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces, provides guidance on frequency and procedures for conducting friction surveys. Visual observations made during a pavement inspection are an inadequate predictor of skid resistance.

Contaminants, such as rubber deposits, dust particles, jet fuel, oil spillage, water, snow, ice, and slush, all cause friction loss on runway pavement surfaces. Removal and runway treatment for snow, ice, and slush are covered in AC 150/5200-30, Airport Winter Safety and Operations. The most persistent contaminant problem is deposit of rubber from tires of landing jet aircraft. Rubber deposits occur at the touchdown areas on runways and can be quite extensive. Heavy rubber deposits can completely cover the pavement surface texture causing loss of aircraft braking capability and directional control, particularly when runways are wet.

2.6. Nondestructive Testing (NDT).

In addition to collecting information from visual inspections of the pavement areas and historical construction records, airports should consider collecting data from nondestructive testing. Such data may be used to evaluate the pavement load-carrying capacity. Refer to AC 150/5370-11, Use of Nondestructive Testing Devices in the Evaluation of Airport Pavements, for information on NDT.

Chapter 3. Pavement Distress

3.1. General.

This chapter provides a discussion and description of the types of pavement distress and relates them to likely causal factors. Various external signs or indicators make the deterioration of a pavement apparent, and often reveal the probable causes of the failure. AC 150/5380-7, ASTM D5340, and ASTM D6433, Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys, provide additional information on distresses.

3.2. Types of pavement distress.

The discussions of problems related to pavement distress are generally based on whether the pavement has a flexible or rigid surface type.

3.2.1. Flexible pavement distresses.

a. Cracking. Cracks in flexible pavements are caused by deflection of the surface over an unstable foundation, shrinkage of the surface, thermal expansion and contraction of the surface, poorly constructed lane joints, or reflection cracking. The following types of cracks commonly occur in flexible pavements.

(1) Longitudinal and transverse cracks. Longitudinal and transverse cracks may result from shrinkage or contraction of the HMA surface. Shrinkage of the surface material is caused by oxidation and age hardening of the asphalt material. Contraction is caused by thermal fluctuations. Poorly constructed paving lane joints may accelerate the development of longitudinal joint cracks. This type of cracking is not load associated.

(2) Block cracking. Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 1 foot by 1 foot (0.3 m by 0.3 m) to 10 feet by 10 feet (3 m by 3 m). Block cracking is caused mainly by contraction of the asphalt and daily temperature cycling that results in daily stress/strain cycling. It is not load associated. The occurrence of block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large portion of pavement area, but sometimes will occur only in non-traffic areas. Block cracking differs from alligator cracking which is discussed in (4) below.

(3) Reflection cracking. Vertical or horizontal movement in the pavement beneath an overlay cause this type of distress. This movement may be due to expansion and contraction caused by temperature and moisture changes or traffic loads. The cracks in HMA overlays reflect the crack pattern or joint pattern in the underlying pavement. They occur most frequently in HMA overlays on PCC pavements. However, they may also occur on overlays of HMA pavements when cracks or joints in the old pavement have not been properly repaired.

(4) Alligator or fatigue cracking. Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the HMA surface under repeated traffic loading. The cracking begins at the bottom of the HMA surface (or stabilized base) where tensile stress and strain are highest under a wheel load. The cracks propagate to the surface

initially as a series of parallel cracks. After repeated traffic loading or excessive deflection of the HMA surface over a weakened or under-designed foundation or interlayer, the cracks connect, forming many sided sharp angled pieces that develop a pattern resembling chicken wire or alligator skin. The pieces are less than 2 feet (0.6 m) on the longest side.

(5) Slippage cracks. Slippage cracks appear when braking or turning wheels cause the pavement surface to slide and deform. This usually occurs when there is a low-strength surface mix or poor bond between the surface and the next layer of the pavement structure. These cracks are crescent or half-moon-shaped with the two ends pointing away from the direction of traffic.

b. Disintegration. Disintegration in a flexible pavement is typically caused by climate, insufficient compaction of the surface, insufficient asphalt binder in the mix, loss of adhesion between the asphalt coating and aggregate particles, or severe overheating of the mix. The following types of disintegration commonly occur.

(1) Raveling. Raveling is the wearing away of the pavement surface caused by the dislodging of aggregate particles. This distress may indicate that the asphalt binder has aged and hardened significantly. As the raveling continues, larger pieces break free, and the pavement takes on a rough and jagged appearance which can produce a significant source for FOD.

(2) Weathering. Weathering is the wearing away of the asphalt binder and fine aggregate matrix from the pavement surface. The asphalt surface begins to show signs of aging which may be accelerated by climatic conditions. Loss of fine aggregate matrix is noticeable and may be accompanied by fading of the asphalt pavement color.

(3) Potholes. A pothole is defined as a disruption in the pavement surface where a portion of the pavement material has broken away, leaving a hole. Most potholes are caused by fatigue of the pavement surface. As fatigue cracks develop, they interlock forming alligator cracking. When the sections of cracked pavement work loose, they may eventually be picked out of the surface by continued wheel loads, and form a pothole. In northern climates, where freeze-thaw cycles are severe, pothole development is exacerbated due to the continuous freeze-thaw action and may not be related solely to traffic patterns. Although possible, potholes are not a common distress to airfields.

(4) Asphalt stripping. Asphalt stripping is caused by moisture infiltration into the HMA pavement structure leading to "stripping" of the bituminous binder from the aggregate particles. Asphalt stripping of HMA pavements may also be caused by cyclic water-vapor pressures within the mixture scrubbing the binder from the aggregates.

(5) Jet blast erosion. Jet blast erosion is defined as a darkened area of pavement surface where the bituminous binder has been burned or carbonized. Localized burned areas may vary in depth up to approximately 1/2-inch (13 mm).

(6) Patching and utility cut patch. A patch is defined as an area where the original pavement has been removed and replaced by a filler material. Deterioration of a patch typically progresses at a higher rate than the original pavement. Deterioration of patch areas affects the ride quality and creates FOD potential.

c. Distortion. Distortion in flexible pavements is caused by foundation settlement, insufficient compaction of the pavement courses, a lack of stability in the bituminous mix, poor bond between the surface and the underlying layer of the pavement structure, and swelling soils or frost action in the subgrade. The following types of distortion commonly occur in flexible pavement.

(1) Rutting. A rut is characterized by a surface depression in the wheel path. In many instances, ruts become noticeable only after a rainfall when the wheel paths fill with water. This type of distress is caused by a permanent deformation in any one of the pavement layers or subgrade, resulting from the consolidation or displacement of the materials due to traffic loads.

(2) Corrugation. Corrugation results from a form of plastic surface movement typified by ripples across the surface. Corrugation can be caused by a lack of stability in the mix or a poor bond between material layers.

(3) Shoving. Shoving is the localized bulging of a pavement surface. It can be caused by lack of stability in the mix, shear movement at an interlayer, or lateral stresses produced by adjacent PCC pavement during expansion.

(4) Depressions. Depressions are localized low areas of limited size. Light depressions are typically only noticeable after a rain, when ponding creates "birdbath" areas. Depressions may result from heavier traffic than the pavement was designed for; localized settlement of the underlying pavement layers; or poor construction methods.

(5) Swelling. An upward bulge in the pavement's surface characterizes swelling. It may occur sharply over a small area or as a longer gradual wave. Both types of swelling may be accompanied by surface cracking. A swell is usually caused by frost action surrounding dissimilar material types in the subgrade or by swelling soil.

d. Loss of skid resistance. Factors that decrease the skid resistance of a pavement surface and can lead to hydroplaning include too much asphalt in the bituminous mix; too heavy a tack coat; poor aggregate which is subject to wear; paint; and buildup of contaminants. In flexible pavements, a loss of skid resistance may result from the following distresses.

(1) Polished aggregate. Aggregate polishing is caused by repeated traffic applications. Polished aggregate is present when the portion of aggregate extending above the asphalt is either very small, of poor quality, or there are no rough or angular particles to provide good skid resistance.

(2) Contaminants. Accumulation of rubber particles, oils, or other external materials on the pavement surface will reduce the skid resistance of a pavement. In addition, buildup of rubber deposits in pavement grooves will reduce the effectiveness of the grooves and increase the likelihood of hydroplaning.

(3) Bleeding. Bleeding is characterized by a film of bituminous material on the pavement surface that resembles a shiny, glass-like, reflecting surface that usually becomes quite sticky. It is caused by excessive amounts of asphalt binder in the mix and/or low air-void content. Bleeding occurs when asphalt binder fills the voids in the mix during hot weather and

then expands out onto the surface of the pavement. Bleeding may also result when an excessive tack coat is applied prior to placement of the HMA surface. Since the bleeding process is not reversible during cold weather, asphalt binder will accumulate on the surface. Extensive bleeding may cause a severe reduction in skid resistance.

(4) Fuel/oil spillage. Continuous fuel/oil spillage on a HMA surface will soften the asphalt. Areas subject to only minor fuel/oil spillage will usually heal without repair, and only minor damage will result.

3.2.2. Rigid pavement distresses.

a. Cracking. Cracks in rigid pavements often result from stresses caused by expansion and contraction or warping of the pavement. Overloading, loss of subgrade support, and insufficient and/or improperly cut joints acting singly or in combination are also possible causes. The following types of cracking typically occur in rigid pavements.

(1) Longitudinal, transverse, and diagonal cracks. A combination of repeated loads and shrinkage stresses usually causes this type of distress. It is characterized by cracks that divide the slab into two or three pieces that may indicate poor construction techniques, underlying pavement layers that are structurally inadequate for the applied load, or pavement overloads.

(2) Corner breaks. Load repetition, combined with loss of support and curling stresses, usually causes cracks at the slab corner. The lack of support may be caused by pumping or loss of load transfer at the joint. Corner breaks are characterized by a crack that intersects the joints at a distance less than or equal to one-half of the slab length on both sides, measured from the corner of the slab. A corner break differs from a corner spall in that the break extends vertically through the entire slab thickness; a corner spall intersects the joint at an angle.

(3) Durability "D" cracking. D cracking usually appears as a pattern of cracks running in the vicinity of and parallel to a joint or linear crack. It is caused by the concrete's inability to withstand environmental factors such as freeze-thaw cycles because of variable expansive aggregates. This type of cracking may eventually lead to disintegration of the concrete within 1 to 2 feet (0.3 m to 0.6 m) of the joint or crack.

(4) Shrinkage cracking. Shrinkage cracks are hairline cracks that are usually only a few feet long and do not extend across the entire slab. They are formed during the setting and curing of the concrete and usually do not extend through the depth of the slab. Typically, shrinkage cracks do not extend greater than 1/4-inch (6 mm) from the slab surface and may be primarily in the finished surface paste only.

(5) Shattered slab/intersecting cracks. A shattered slab is defined as a slab where intersecting cracks break up the slab into four or more pieces. This is primarily caused by overloading due to traffic and/or inadequate foundation support.

b. Joint seal damage. Joint seal damage is any condition that enables incompressible foreign material such as soil or rocks to accumulate in the joints or that allows infiltration of water. Accumulation of foreign materials prevents the slabs from expanding and may result in

buckling, shattering, or spalling. Water infiltration through joint seal damage can cause pumping or deterioration of the base. Typical types of joint seal damage include stripping of joint sealant, extrusion of joint sealant, hardening of the filler (oxidation), loss of bond to the slab edges, and absence of sealant in the joint. Joint seal damage is caused by improper joint width, use of the wrong type of sealant, incorrect application, not properly cleaning the joint before sealing, and/or climate (aging).

c. Disintegration. Disintegration is the breaking up of a pavement into small, loose pieces including the dislodging of aggregate particles. Improper curing and finishing of the concrete, unsuitable aggregates, and improper mixing of the concrete can cause this distress. Disintegration typically falls into the following categories.

(1) Scaling, map cracking, and crazing. Scaling is the disintegration and loss of the wearing surface. A surface weakened by improper curing or finishing and freeze-thaw cycles can lead to scaling. Map cracking or crazing refers to a network of shallow hairline cracks that extend only through the upper surface of the concrete. Crazing usually results from improper curing and/or finishing of the concrete and may lead to scaling of the surface.

(2) Alkali-Silica Reactivity (ASR). ASR is another source of distress associated with map cracking. ASR is caused by an expansive reaction between alkalis and certain reactive silica minerals, which forms a gel. The gel absorbs water, causing expansion, which may damage the concrete and adjacent structures. Alkalis are most often introduced by the portland cement within the pavement. ASR may be indicated by cracking of the concrete pavement (often in a map pattern); white, brown, gray or other colored gel or staining that may be present at the crack surface; and/or an increase in concrete volume (expansion) that may result in distortion of adjacent or integral structures or physical elements.

(3) Joint spalling. Joint spalling is the breakdown of the slab edges within 2 feet (0.6 m) of the side of the joint. A joint spall usually does not extend vertically through the slab but intersects the joint at an angle. Joint spalling often results from excessive stresses at the joint or crack caused by infiltration of incompressible materials or weak concrete at the joint (caused by overworking) combined with traffic loads. Joint spalling also results when dowels, which prevent slab movement, become misaligned either through improper placement or improper slippage preparation.

(4) Corner spalling. Corner spalling is the raveling or breakdown of the slab within approximately 2 feet (0.6 m) of the corner. It differs from a corner break in that the spall usually angles downward to intersect the joint, while a break extends vertically through the slab. The same mechanisms that cause joint spalling often cause corner spalling, but this type of distress may appear sooner because of increased exposure.

(5) Blowups. Blowups, although not common, usually occur at a transverse crack or joint that is not wide enough to permit expansion of the concrete slabs. Insufficient width may result from infiltration of incompressible materials into the joint space or by gradual closure of the joint caused by expansion of the concrete due to ASR. When expansive pressure cannot be relieved, a localized upward movement of the slab edges (buckling) or shattering will occur in the vicinity of the joint. Blowups normally occur only in thin pavement sections, although

blowups can also appear at drainage structures (manholes, inlets, etc.). The frequency and severity of blowups may increase with an asphalt overlay due to the additional heat absorbed by the dark asphalt surface. They generally occur during hot weather because of the additional thermal expansion of the concrete.

(6) Popouts. A popout is defined as a small piece of pavement that breaks loose from the concrete surface. This is caused by freeze-thaw action in combination with expansive aggregates and can be caused by ASR. Popouts usually range from approximately 1 to 4 inches (2.5 to 10 cm) in diameter and from 1/2 to 2 inches (1.3 to 5 cm) deep. A popout may also be caused by a singular piece of large aggregate that breaks loose from the concrete surface or caused by clay balls in the concrete mix.

(7) Patching. A patch is defined as an area where the original pavement has been removed and replaced by a filler material. Deterioration of a patch typically progresses at a higher rate than the original pavement. Patching is usually divided into two types:

(a) Small. A small patch is defined as an area less than 5 ft^2 (0.5 m^2).

(b) Large and utility cuts. A large patch is defined as an area greater than 5 ft^2 (0.5 m^2). A utility cut is defined as a patch that has replaced the original pavement due to placement of underground utilities.

d. Distortion. Distortion refers to a change in the pavement surface's original position, and it results from foundation settlement, expansive soils, frost-susceptible soils, or loss of fines through improperly designed subdrains or drainage systems. The following types of distortion generally occur.

(1) Pumping. The deflection of the slab when loaded may cause pumping, which is characterized by the ejection of water and underlying material through the joints or cracks in a pavement. As the water is ejected, it carries particles of gravel, sand, clay, or silt with it, resulting in a progressive loss of pavement support that can lead to cracking. Evidence of pumping includes surface staining and base or subgrade material on the pavement close to joints or cracks. Pumping near joints indicates poor joint-load transfer, a poor joint seal, and/or the presence of ground water.

(2) Settlement or faulting. Settlement or faulting is a difference in elevation at a joint or crack caused by upheaval or non-uniform consolidation of the underlying pavement layer(s) material. This condition may result from loss of fines, frost heave, or swelling soils.

e. Loss of skid resistance. Skid resistance refers to the ability of a pavement to provide a surface with the desired friction characteristics under all weather conditions. It is a function of the surface texture. Loss of skid resistance is caused by the wearing down of the textured surface through normal wear and tear or the buildup of contaminants.

(1) Polished aggregates. Some aggregates become polished quickly under traffic. Naturally polished aggregates create skid hazards if used in the pavement without crushing. Crushing the naturally polished aggregates creates rough angular faces that provide good skid resistance.

(2) Contaminants. Rubber deposits building up over a period of time will reduce the surface friction characteristics of a pavement. Oil spills and other contaminants will also reduce the surface friction characteristics. In addition, buildup of rubber deposits in pavement grooves will reduce the effectiveness of the grooves and increase the likelihood of hydroplaning.

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Chapter 4. Guidelines for Inspection of Pavements.

4.1. Introduction to pavement inspection.

Airports should prioritize the upkeep and repair of all pavement surfaces in the aircraft operating areas of the airport to help ensure safe aircraft operations. While deterioration of the pavements from usage and exposure to the environment cannot be completely prevented, a timely and effective maintenance program can minimize this deterioration. Adequate and timely maintenance is the greatest single means of controlling pavement deterioration. The failure of airport pavements and drainage features can be directly attributed to inadequate maintenance characterized by the absence of a vigorously followed inspection program. Maintenance, no matter how effectively carried out, cannot overcome or compensate for a major design or construction inadequacy, but it can prevent the total and possibly disastrous failure that can result from such deficiencies. Maintenance inspections reveal at an early stage where a problem exists and provide warning and sufficient time to perform corrective action. Postponement of minor maintenance may evolve into major pavement repairs. Visible evidence of excessive stress and/or environmental distress in pavement systems may include cracks, holes, depressions, and other types of pavement distresses. The formation of distresses in airport pavements may severely affect the structural integrity, ride quality, and safety of airport pavements. To alleviate the effects of distresses and to improve the airport pavement serviceability, airports should adopt an effective and timely inspection and maintenance program and adequate repair procedures.

Although there are numerous distress types associated with airfield pavements, a particular concern on airfield pavements is the possibility that pavement distress will generate loose material that may strike aircraft propellers or be ingested into jet engines. This loose material and the resulting damage are commonly labeled as FOD. FOD can cause considerable damage to an aircraft and increase the cost of maintaining the aircraft in a safe operating condition. More important, FOD can cause undetected damage to an aircraft, making it unsafe to operate. All pavement inspections should address the issue of FOD to minimize its potential hazard. AC 150/5210-24, Airport Foreign Object Debris (FOD) Management, provides guidance on reducing FOD hazards.

AC 150/5200-18, Airport Safety Self-Inspection, provides information on airport self-inspection operational items such as pavement areas, safety areas, markings, signs, lighting, aircraft rescue and fire fighting, fueling operations, navigational aids, ground vehicles, obstructions, public protection, hazard management, construction, and snow and ice control.

4.2. Inspection procedures.

Maintenance is an ongoing process and a critical responsibility of airport personnel. Effective maintenance programs require a series of scheduled, periodic inspections, conducted by experienced engineers, technicians, or maintenance personnel. These inspections must be controlled to ensure that each element or feature is thoroughly inspected, potential problem areas are identified, and proper corrective measures are recommended and implemented. The maintenance program must provide for adequate follow-up to ensure corrective work is expeditiously accomplished and recorded. The organization and scope of maintenance activities

will vary in complexity and degree from airport to airport, however, the general types of maintenance required will be similar.

4.2.1. Inspection schedules. The airport is responsible for establishing a schedule for regular and routine pavement inspections to ensure all areas are thoroughly inspected. Conditions that may adversely affect the pavement, such as severe weather, may necessitate additional inspections. Airport personnel should also solicit reports from airport users and conduct daily drive-by-type inspections.

4.2.2. Recordkeeping. The airport should prepare and maintain records of all inspections and maintenance performed. These records should document the existing distresses, locations, probable causes, remedial actions required, and any follow up inspections and maintenance required. Records of materials and equipment used for maintenance and repair work should also be kept on file for future reference. Periodic review of these references may help reduce maintenance costs and improve pavement performance. AC 150/5380-7, Airport Pavement Management Program (PMP), provides additional guidance.

Chapter 5. Materials and Equipment

5.1. General.

Maintenance includes any regular or recurring work necessary to preserve existing airport pavements in good condition. Work typically involves the care or cleaning of existing airport pavement and incidental or minor pavement repair. Maintenance activities typically require a work crew of two to six people who are trained in the various repair techniques and who are familiar with the materials and equipment necessary to perform the routine pavement maintenance. Work requiring more staff is typically beyond the scope of normal maintenance activities. The following sections identify commonly used materials and equipment for normal maintenance activities. Additional information on materials and methods is also available in AC 150/5370-10. Equivalent state pavement specifications may also be used.

5.2. Common materials for maintenance and repair.

The materials listed below are commonly used for maintenance and repair of pavements.

5.2.1. Hot-mix asphalt (HMA). HMA is a blend of asphalt binder and well-graded, high-quality aggregates. The materials are mixed in a plant and placed and compacted while hot. HMA is used for construction of new airfield pavement and patching and overlay of airfield pavements. HMA for maintenance and repair should be equivalent or better than the existing pavement. P-401, Hot Mix Asphalt (HMA) Pavements or P-403, Hot Mix Asphalt (HMA) Pavements (Base, Leveling or Surface Course) in AC 150/5370-10; or equivalent state pavement specifications should be used.

5.2.2. Tack coat. A tack coat is a light application of emulsified asphalt applied to an existing pavement to provide a bond with an overlying course, such as a HMA overlay. A tack coat is also used on the sides of an existing pavement that has been cut vertically before patching. Asphalt emulsions are manufactured in several grades and are selected by the desired setting time. P-603, Bituminous Tack Coat in AC 150/5370-10 or equivalent state specifications may be used.

5.2.3. Crack and joint sealing material. Material for sealing cracks should meet ASTM standards for the type of pavement and service for which the sealant is intended.

a. ASTM D5893, Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

b. ASTM D6690, Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

c. ASTM D5249, Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints.

5.2.4. Crack filler material. Material for filling cracks should meet ASTM D5078, Standard Specification for Crack Filler, Hot-Applied, for Asphalt Concrete and Portland Cement Concrete Pavements.

5.2.5. Concrete. Concrete is a blend of portland cement, fine and coarse aggregate, and water, with or without additives. Concrete is used to repair a distressed portland cement concrete pavement so it may be used at its original designed capacity. P-501, Portland Cement Concrete Pavement in AC 150/5370-10 or equivalent state pavement specifications with non-reactive materials may be used.

5.2.6. Other materials and products. There are many other products available, such as epoxy resins and special concrete mixtures, that may be used for repair of pavements. The selection and use of these products must be in accordance with the manufacturers' requirements for the intended application. Local experience and conditions dictate acceptable products. State Departments of Transportation (DOTs) may also maintain list of materials that have performed well in a geographic area.

AC 150/5370-10 is another good source of information on materials and methods used for construction on airports.

5.3. Equipment for pavement maintenance.

There are many different types and models of equipment airports can use for pavement maintenance. Some commonly used pavement maintenance equipment include the following.

5.3.1. Power Saws. A pavement power saw is usually a one-person-operated, dolly-mounted unit with an abrasive circular blade. This type of saw can cut a straight line through flexible or rigid pavements and leave vertical sides. A random crack saw has a small diameter saw blade capable of tracking the crack.

5.3.2. Jackhammers. Jackhammers with chisel heads are commonly used for removal of existing pavement surfaces. Jackhammers must be used with caution to avoid damage to remaining pavement. Light, 30 pound (14 kg) or less, chipping hammers should be used to prepare partial depth repair patches.

5.3.3. Pavement grinders. A pavement grinder may be a one-person-operated, dolly-mounted unit with an abrasive cylindrical head 4 inches (10 cm) or more wide, or it may be variable-width diamond grinding equipment. Diamond grinding is a common rehabilitation technique used for tasks as varied as paint removal and pavement texturing.

5.3.4. Hand tools. Hand tools such as chisels, sledgehammers, shovels, pry bars, and picks can be used to remove deteriorated pavement. Rakes, lutes, and other such hand tools are used to move and level material placed in a patch area.

5.3.5. Front-end loaders and skid-steer loaders. Front-end loaders are useful when loading trucks with removed pavement. Skid-steer loaders are small versatile loaders that can be equipped with numerous attachments such as brooms or milling heads. Their small size and maneuverability make them ideal for maintenance activities.

5.3.6. Asphalt kettle. Asphalt kettles are usually small-tractor-mounted units that have the capacity to heat and store 40 to 500 gallons (150 to 2000 liters) of bituminous material. A pump forces the liquid material through spray nozzles located on a hand-held hose. These

units are used for priming and tacking on small jobs and for crack or surface sealing of HMA surfaces.

5.3.7. Vibratory plate compactors. Vibratory plate compactors are hand-operated units used to compact granular base or HMA plant-mix materials.

5.3.8. Vibratory and non-vibratory steel-wheel rollers. Steel-wheel rollers are used to compact material, including HMA in patchwork areas. Smaller rollers can be hand operated, while large rollers are self-powered.

5.3.9. Joint plow. A joint plow is used to remove old sealer from joints. This is usually a specially made tool attached to a small loader or tractor.

5.3.10. Joint router. A joint router is used to clear existing cracks or joints to be resealed. A router is usually a self-powered machine operating a rotary cutting tool. A rotary routing tool with a V-shaped end can be used for cleaning out random cracks. The use of a random crack saw is preferred for PCC pavements.

5.3.11. Random crack saw. A random crack saw is designed to follow irregular crack patterns in concrete and asphalt surfaces. The crack saw utilizes small diameter, dry-cut diamond blades in standard widths to create smooth sided cuts to prepare surfaces for proper crack filling. A center mounted blade configuration allows a crack saw to pivot about its own axis to more exactly follow random crack patterns easily.

5.3.12. Air compressor and sand blasting. Sand blasting may be used for final removal of old joint sealant, and is recommended for the final cleaning method for PCC surfaces prior to application of new sealant. Joints and cracks should be blown out with clean, dry compressed air immediately before applying new sealant. Air compressors must be equipped with oil and moisture traps to prevent contaminating the cleaned surface.

5.3.13. Pavement sweeper. A pavement sweeper can be used for cleaning the pavement surface and removing excess aggregate before and after repairs.

5.3.14. Heating kettle. A heating kettle is a mobile, indirect-fired double boiler used to melt hot-applied joint sealing material. It is equipped with a means to agitate and circulate the sealer to ensure uniform heating and melting of the entire charge in the kettle. Sealants may be applied to joints with an applicator attached directly to a pump unit on the kettle.

5.3.15. Pouring pot. A pouring pot, hand carried or mounted on a hand-pushed pot dolly, is used to pour hot sealing materials into a prepared crack or joint.

5.3.16. High-pressure water. High-pressure water, with the proper selection of spray nozzle and pressure, can be used to clean out joints prior to resealing and to clean vertical faces of pavement to be patched. Pressure should be monitored and controlled to the minimum necessary to minimize any damage to the remaining pavement.

5.3.17. Hot air lance. A hot air lance can be used to dry and heat cracks in existing bituminous material.

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Chapter 6. Pavement Repair Methods.

6.1. General.

This chapter describes various repair methods airports can use to correct airfield pavement distress. While these repair methods apply to specific types of distress and pavements, methods used should take into account the possibility of foreign object debris (FOD) damage to aircraft. FOD is defined as any object, live or not, located in an inappropriate location in the airport environment that has the capacity to injure airport or air carrier personnel and damage aircraft. FOD damage is any damage attributed to a foreign object that can be expressed in physical or economic terms, which may or may not downgrade the product's safety or performance characteristics. Repair activities may leave potential FOD at or near the repair sites. All maintenance activities must include quality control to assure that repairs are conducted properly and clean-up activities undertaken to remove FOD potential. AC 150/5210-24 provides additional guidance to help manage debris hazards associated with maintenance activities

The first step in rehabilitating or preparing a pavement for repair is to identify the causes of distress. Then, the proper procedures for repairing - which will not only correct the damage, but also prevent or retard its further occurrence - may be applied. Pavement repairs should be made as quickly as possible after the need for them arises to help ensure continued and safe aircraft operations. Airports should perform repairs at early stages of distress, even when the distresses are considered minor. A delay in repairing pavements may allow minor distresses to progress into major failures. While deterioration of pavements due to traffic and adverse weather conditions cannot be completely prevented, maintenance and repair programs can significantly reduce the rate of deterioration and minimize the damage.

Weather conditions may limit repair measures undertaken to prevent further pavement damage. For example, rehabilitation by crack filling is more effective in cool and dry weather conditions, whereas pothole patches, seal coats, and other surface treatments require warm, dry weather for best results. This does not mean that resurfacing work cannot be performed under cold and damp conditions or that crack filling cannot be done in warm weather. Rather, these repairs just require much greater care when made during such periods. The procedures in Appendix A list the weather and temperature limitations for each repair procedure. When emergency pavement repairs are required and weather conditions exceed the procedure recommendations, the initial repair will be temporary and replaced as soon as weather conditions permit.

6.2. Repair methods for flexible pavements.

6.2.1. General. The selection of a repair method for flexible pavements will depend on the type of damage; climate; experience; and availability of materials among others. Table 6-1 summarizes some common problems and potential repair methods.

6.2.2. Crack repair. Cracks take many forms, such as longitudinal, transverse, block, alligator, slippage, and reflection cracks. For some, such as longitudinal and transverse cracks, simple crack filling may be the proper corrective action. Refer to Appendix A1 and Figure A-1 for crack repair in flexible pavement.

6.2.3. Partial and full depth repair. Some cracks may require partial or full depth repair of the damaged pavement. Partial depth repairs may be an alternative for pavements greater than 5 inches (13 cm) thick. Full depth repairs are typically required for pavement less than 5 inches (13 cm) thick. Refer to Appendix A2 and Figure A-2 for partial depth crack repair in flexible pavement. Refer to Appendix A3 and Figure A-3 for full depth crack repair in flexible pavement.

6.3. Repair methods for rigid pavements.

6.3.1. General. The selection of a repair method for rigid pavements will depend on the type of damage, climate, experience, and availability of materials among others. Table 6-2 summarizes some common problems and potential repair methods. Refer to Appendix A4 and Figure A-4 for a plan view of typical rigid pavement full depth repairs including a corner break; partial slab replacement; and full depth slab replacement.

6.3.1.1. Crack repair and joint sealing. Sealing cracks prevents surface moisture from entering the pavement structure. This type of repair may require establishing a sealant reservoir. A concrete saw is preferable to router equipment because a router can cause micro-cracks in the adjacent concrete pavement. Shrinkage cracks are non-structural and non-propagating cracks that are cosmetic and typically do not require repairs.

Refer to AC 150/5370-10, Items P-604 Compression Joint Seals for Concrete Pavements and P-605, Joint Sealants for Concrete Pavements for information and guidance on joint and crack sealants. A silicone sealant per ASTM D5893 can be used for edge joints between flexible and rigid pavements. Silicone should not be used to seal flexible pavement to flexible pavement joints.

6.3.1.2. Full depth repair. Full depth rigid pavement repair requires the complete removal of the damaged concrete pavement. The base and sub base material may also require repair if they are damaged during removal of the pavement or by water infiltration and subsequent pumping action.

a. Corner break. A corner break is a crack that intersects the joints of a slab at a distance less than or equal to one-half the slab length on both sides of the slab, measured from the corner of the slab. The crack extends vertically through the entire slab thickness. Load repetition combined with loss of support and curling stresses cause corner breaks. Refer to Appendix A5 and Figure A-5 for full depth repair of a corner break.

b. Partial slab replacement. Refer to Appendix A6 and Figure A-6 for partial slab replacement procedures.

c. Full slab replacement. Refer to Appendix A7 and Figure A-7 for full slab replacement procedures.

6.3.1.3. Partial depth repair

a. Joint spall repair. Joint spalling is the breakdown of the slab edges within 2 feet (0.6 m) of the side of the joint. A joint spall usually does not extend vertically through the slab,

intersecting the joint at an angle. Refer to Appendix A8 and Figure A-8 for joint spall repair procedures.

6.4. Temporary patching of rigid pavements.

Broken rigid pavement areas can be patched with flexible pavement as an interim measure. Full-depth HMA repairs will interrupt the structural integrity of the rigid pavement and may lead to additional failures. Such full-depth repairs are considered temporary, and corrective long-term repairs must be scheduled.

The minimum depth of repair for portland cement concrete should be 2 inches (5 cm). Repairs made thinner than 2 inches (5 cm) usually deteriorate quickly on an airfield pavement. (Most distresses needing repair will extend at least 2 inches (5 cm) into the pavement.) Rigid pavement repairs that are thinner than 2 inches (5 cm) may benefit from the use of epoxy materials.

Table 6-1. Quick guide for maintenance and repair of common flexible pavement surface problems

Problem	Repair	Probable Cause
Weathering/ Oxidation	- Apply surface treatment - Overlay	- Environment - Lack of timely surface treatments
Cracks	- Remove old sealer material if present - Clean and prepare cracks - Seal/reseal cracks - Joint heating may be an option for longitudinal cracks when under the direction of an engineer. (Operate heaters to avoid excessive heat on the pavement.)	- Age - Environmental conditions - Bitumen too hard or overheated in mix - Sealant defects (e.g., incorrect application temperature, improper sealant selection, improper crack preparation)
Alligator or fatigue cracking	- Remove and replace damaged pavement, including the base and/or subbase course if required.	- Base and/or Subgrade failure - Overload - Under-designed surface course (too thin)
Patches	- Remove/replace. - Repair and Resurface	- Inadequate/Improper repair detail/material - Age
Surface irregularities (e.g., rutting, wash-boarding, birdbaths)	- Remove and replace damaged areas - Surface grinding/milling	- Traffic - Age
Loss of Skid Resistance	- Remove rubber/surface contamination - Apply surface treatment	- Rubber deposits/surface contamination - Polished aggregate - Improper surface treatment
Bleeding	- Blot with sand and remove sand prior to resuming aircraft operations. Excessive bleeding may require removal and replacement of pavement.	- Overly rich mix/low air void content. Bleeding may be a precursor to other surface deformities forming, e.g., rutting, wash-boarding, etc.
Drainage	- Grade pavement shoulders, clear drainage path - Clean out drainage structures, e.g., edge drains, outfalls, etc.	- Poor maintenance of drainage facilities - Poor maintenance of grade

Table 6-2. Quick guide for maintenance and repair of common rigid pavement surface problems

Problem	Repair	Probable Cause
Joint sealant damage	- Remove old sealant, clean joints, reseal	- Age - Environmental conditions - Sealant defects (e.g., incorrect application temperature, improper sealant selection, improper joint preparation)
Cracks	- Clean and seal cracks - Repair/replace slab - Evaluate adequacy of pavement structure; may require strengthening	- Loss of slab support - Load repetition; curling stresses; and shrinkage stresses
Corner Breaks	- Seal and maintain until full depth patch	- Loss of slab support - Load repetition and curling stresses
Joint spalling	- Remove lose material; refill with approved product; reseal - Partial depth repair	- Latent defects, i.e., excessive finishing - Incompressible matter in joint spaces - Snow plow damage
Slab blowup	- Replace slab in blowup area; clean and reseal joints.	- Incompressible material in joints preventing slab from expanding
Loss of Skid Resistance	- Remove rubber/surface contamination. - Grinding.	- Rubber deposits/surface contamination - Age, i.e., surface wear
Drainage	- Grade pavement shoulders, clear drainage path - Clean out drainage structures, e.g., edge drains, outfalls, etc.	- Poor maintenance of drainage facilities - Poor maintenance of grade
Popouts	- Remove FOD	- Material
Patches	- Remove/replace	- Inadequate/Improper repair detail/material - Age

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Appendix A. Repair Procedures

The following typical details and repair procedures are intended for use for minor maintenance repair of airport pavements. For major maintenance projects, the airport should utilize plans and specifications developed under the direction of a pavement design engineer.

For all maintenance and repair projects funded with federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charge (PFC) Program, the airport must use the guidelines and specifications for materials and methods in AC 150/5370-10, Standards for Specifying Construction of Airports.

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A1. PROCEDURE FOR CRACK REPAIR OF FLEXIBLE PAVEMENT

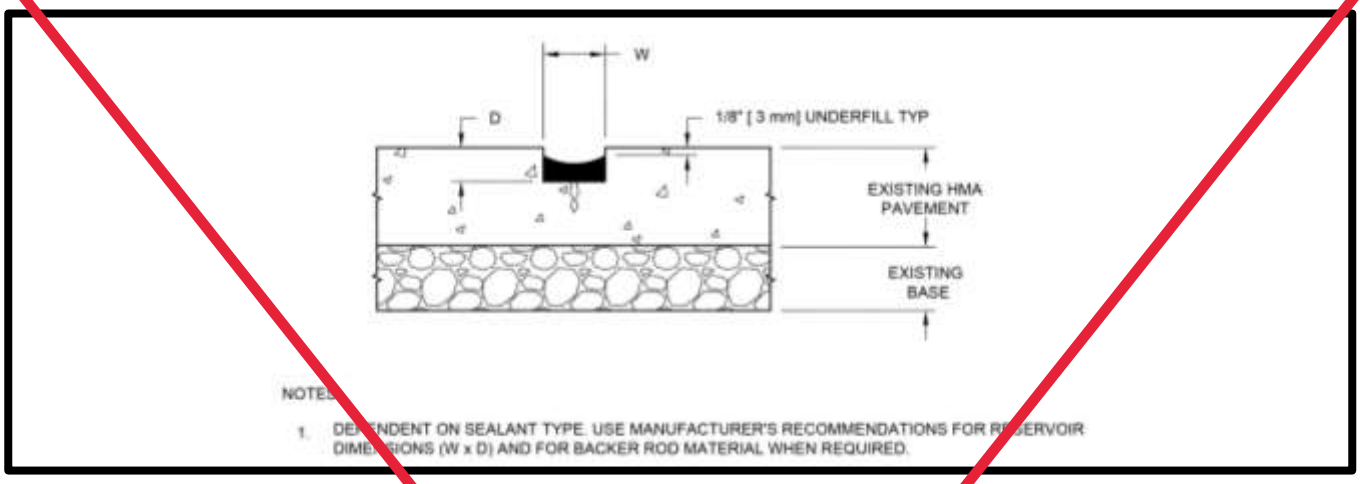


Figure A-1. Crack repair of flexible pavement

WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin crack repair during inclement weather.
- The pavement temperature should be 50°F (10°C) and rising or meet the manufacturer's recommendations at the time of application of the crack sealing material.
- Do not apply sealant if moisture is observed in the crack.

PREPARATION

To choose sealant:

- Consider your geographic area, climate, and past performance of the sealant
- Hot-applied sealants must meet the requirements of ASTM D6690
- Cold-applied sealants must meet the requirements of ASTM D977

REPAIR PROCEDURE

Use this procedure to repair cracks less than 1 inch (2.5 cm) in width in flexible pavements.

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, signs, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area of crack repair.
3. Use an air compressor with an operable oil and water trap to clean all cracks with compressed hot air.
4. If necessary, saw or rout the cracks to the required width and depth. Use the sealant manufacturer's specifications to determine the sealant reservoir dimensions (W × D).
5. Inspect the cracks for proper width, depth, alignment, and preparation. Make sure the crack surface faces are dry.
6. To obtain the width and depth ratio required by the sealant manufacturer's specifications may require installation of backer rod. Make sure the backer rod:
   - Meets the requirements of ASTM D5249
   - Is compatible with the sealant
   - Is 25% larger in diameter than the width of the sealant reservoir
7. Apply the sealant uniformly from the bottom to the top of the crack avoiding voids or entrapping air.
8. Make sure the surface of the sealant remains ¼ inch to ⅜ inch (6 mm to 9 mm) below the existing pavement surface.
9. Do not allow traffic until the sealants have cured.
10. Completely clean the work area before opening to aircraft traffic.

MATERIAL REQUIREMENTS

ASTM D977	Standard Specification for Emulsified Asphalt
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

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A2. PARTIAL DEPTH CRACK REPAIR IN FLEXIBLE PAVEMENT

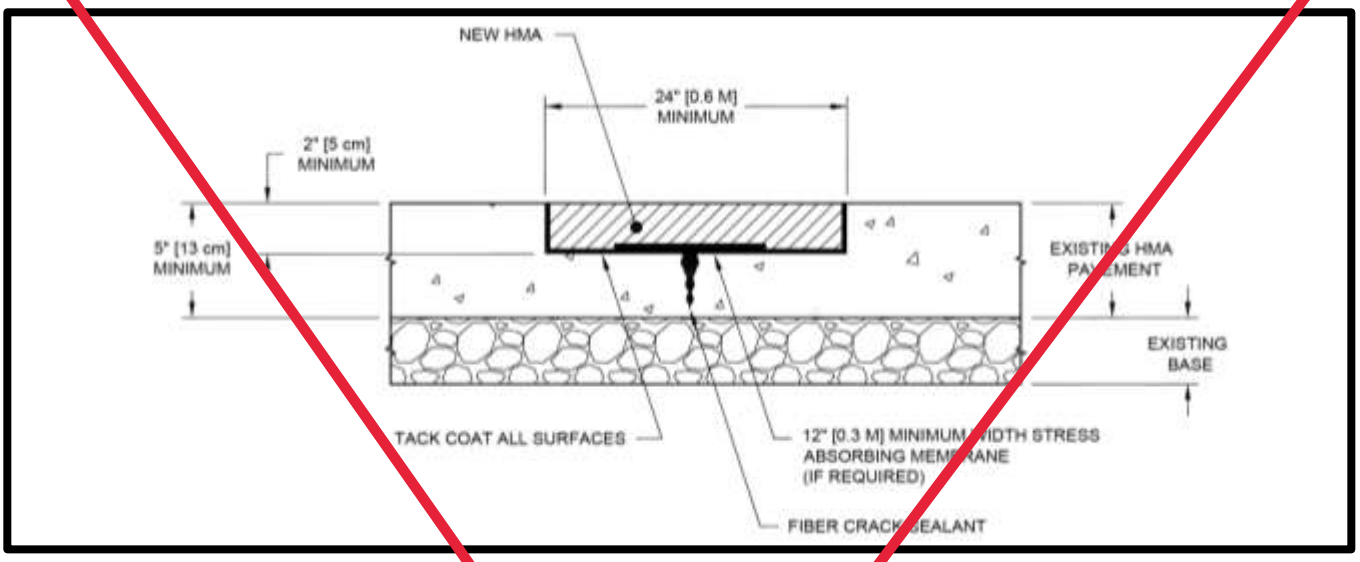


Figure A-2. Partial depth crack repair in flexible pavement

WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin crack repair during inclement weather.
- HMA should not be placed upon a wet surface or when the surface temperature of the underlying course is less than 45°F (7°C).
- The pavement temperature should be 50°F (10°C) and rising or meet the manufacturer's recommendations at the time of application of the crack sealing material.
- Do not apply sealant if moisture is observed in the crack.

REPAIR PROCEDURE

Use this procedure to repair HMA Pavements that are 5 inches (13 cm) or greater in thickness with cracks greater than 1 inch (2.5 cm).

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, signs, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area of crack repair.
3. Saw cut or mill out an area 24 inches (0.6 m) wide by 2 to 3 inches (5 to 8 cm) deep centered on the crack. Extend the saw cut or mill out the area a minimum of 12 inches (30 cm) beyond the limits of the distressed pavement area.
4. Use an air compressor with an operable oil and water trap to clean all cracks with compressed hot air.
5. Fill the crack flush with fiber crack filler per the sealant manufacturer's specifications. Apply the sealant uniformly from the bottom to the top of the crack avoiding voids or entrapping air.
6. Apply a 12 inch (30 cm) repair membrane centered over the crack. (Installation of the membrane is optional.)
7. Apply a tack coat to the bottom and sides of the repair area. Make sure the tack meets the requirements of P-603 and ASTM D3628.
8. Fill the patch area with HMA equivalent or better than the existing pavement. Use P-401, P-403 or equivalent State DOT dense mix and compact to the minimum density specified.
9. Use a straight-edge to verify the patch is flush with adjacent pavement.
10. Do not allow traffic until the HMA has cured.
11. Completely clean the work area before opening to aircraft traffic.

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MATERIAL REQUIREMENTS

ASTM D977	Standard Specification for Emulsified Asphalt
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
P-401	Hot Mix Asphalt (HMA) Pavements, AC 150/5370-10, Standards for Specifying Construction of Airports
P-403	Hot Mix Asphalt (HMA) Pavements (Base, Leveling, or Surface Course), AC 150/5370-10, Standards for Specifying Construction of Airports

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A3. FULL DEPTH CRACK REPAIR IN FLEXIBLE PAVEMENT

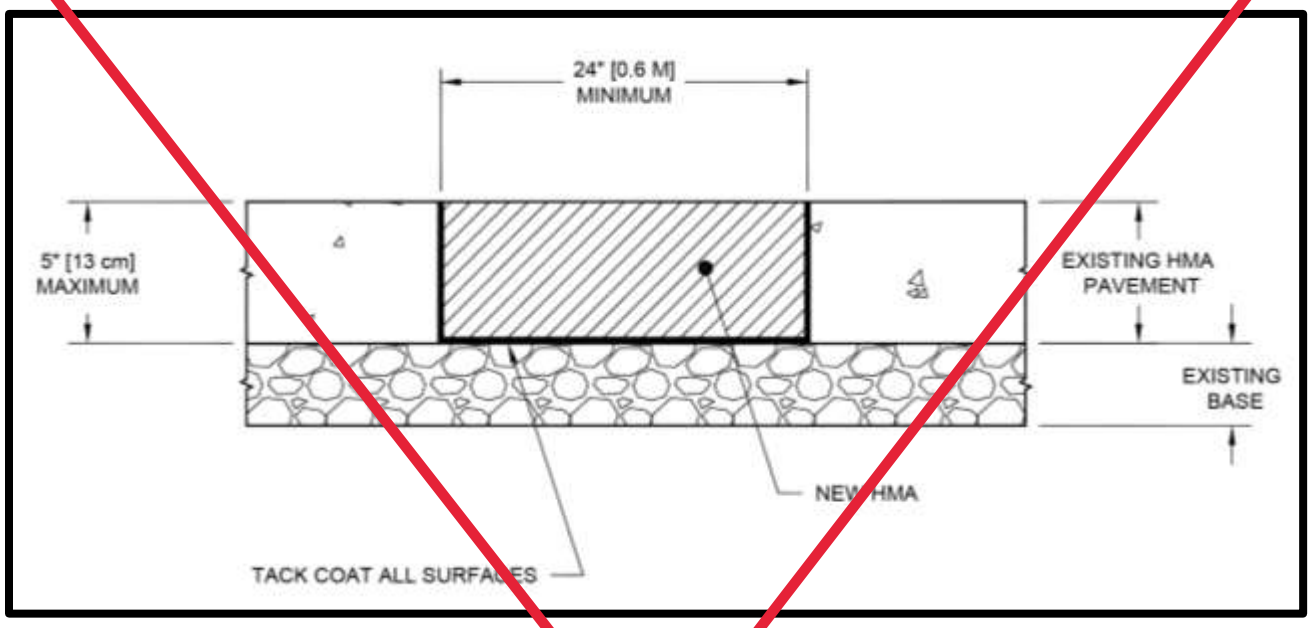


Figure A-3. Full depth crack repair in flexible pavement

WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin crack repair during inclement weather.
- HMA should not be placed upon a wet surface or when the surface temperature of the underlying course is less than 45°F (7°C).

REPAIR PROCEDURE

Use this procedure to conduct full depth repairs of flexible pavements and to repair cracks greater than 1 inch (2.5 cm) in flexible pavements 5 inches (13 cm) or less in thickness.

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area of crack repair.
3. Saw cut or mill out an area 24 inches (0.6 m) wide to the full depth of the HMA centered on the crack. Extend the saw cut or mill out an area a minimum of 12 inches (30 cm) beyond the limits of the distressed pavement area.
4. Repair and re-compact the base as necessary.
5. Apply a tack coat to the bottom and sides of the repair area. Make sure the tack meets the requirements of P-603 and ASTM D3628.
6. Fill the patch area with HMA equivalent to or better than the existing pavement. Use P-401, P-403 or equivalent State DOT dense mix and compact to the minimum density specified.
7. Use a straight-edge to verify that the patch is flush with adjacent pavement.
8. Do not allow traffic until HMA has cured.
9. Completely clean the work area before opening to aircraft traffic.

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MATERIAL REQUIREMENTS

ASTM D977	Standard Specification for Emulsified Asphalt
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
P-401	Hot Mix Asphalt (HMA) Pavements, AC 150/5370-10, Standards for Specifying Construction of Airports
P-403	Hot Mix Asphalt (HMA) Pavements (Base, Leveling, or Surface Course), AC 150/5370-10, Standards for Specifying Construction of Airports
P-603	Bituminous Tack Coat, AC 150/5370-10, Standards for Specifying Construction of Airports

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A4. RIGID PAVEMENT REPAIR – PLAN VIEW

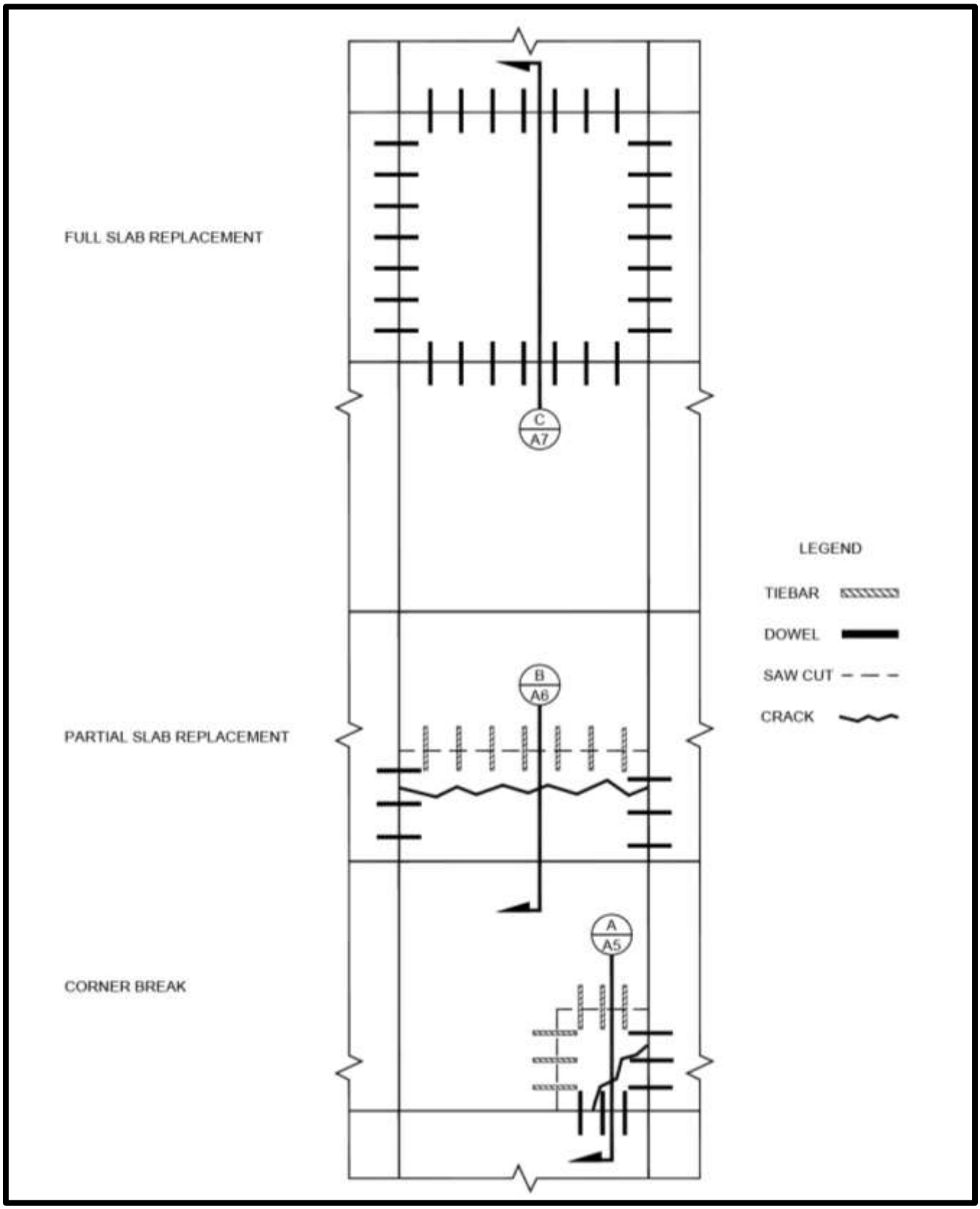


Figure A-4. Rigid pavement repair – plan view

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A5. FULL DEPTH REPAIR IN RIGID PAVEMENT – CORNER BREAK

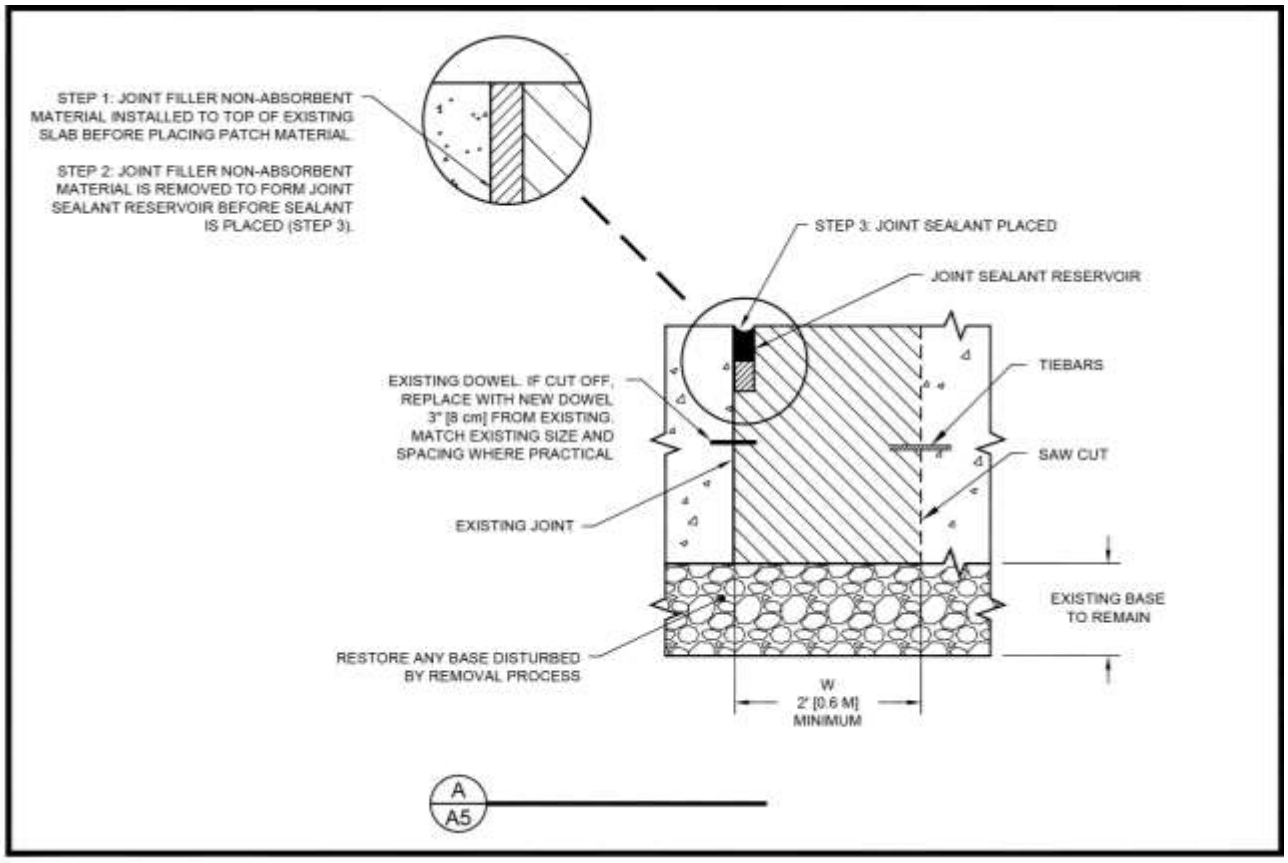


Figure A-5. Full depth repair in rigid pavement – corner break

Repair Procedure and Weather and Temperature Requirements are on the back of this page.

MATERIAL REQUIREMENTS

ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM A615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
P-501	Portland Cement Concrete (PCC) Pavement, AC 150/5370-10, Standards for Specifying Construction of Airports

State Department of Transportation specifications for pavements

WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin repairs during inclement weather.
- Do not place concrete unless the ambient temperature is at least 40°F (4°C) and rising and the concrete temperature is greater than or equal to 50°F (10°C).
- Do not place concrete on frozen base, ice, or snow.
- When the ambient temperature exceeds 85°F (29°C), sprinkle the adjacent concrete and base with water immediately before placing concrete.
- Place concrete at the coolest temperature practicable, and never allow the placed concrete temperature to exceed 90°F (32°C).

REPAIR PROCEDURE

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area to be repaired. For corner breaks the repair area should be square.
3. Make a full-depth saw cut along the constructed joints at least 2 feet (0.6 m) beyond the limits of the break and make saw cuts perpendicular to the constructed joints from these points until they intersect. See Figure A-4.
4. If dowels or tie bars are present along any edges, either of the following options is acceptable:
   - If dowels or tie bars will be exposed and saved, saw edges full depth just beyond the end of the dowels or tie bars. Carefully saw joints on the joint line to within 1 inch (2.5 cm) of the depth of the dowel or tie bar. Use light 30 pound (14 kg) or less jackhammers or other approved equipment to carefully break up and remove the narrow strips of concrete along the doweled edges.
   - If dowel or tie bars are cut and replaced, make a full depth saw cut along the constructed joint cutting the dowels and tie bars.
5. Take care to prevent damage to remaining dowels, tie bars, or concrete.
6. Use light weight equipment, i.e., jackhammers less than 30 pounds (14 kg), hand tools, etc., to remove the remaining damaged PCC pavement. Work from inside the saw cut toward the edge of the slab of the area being removed to prevent damage to the pavement remaining.
7. Remove by hand all loose material and vacuum to minimize any disturbance to the subgrade or base materials.
8. Restore subgrade or base material if required.
9. Install deformed tie-bars in each face of the parent panel by drilling horizontal holes into the face and using an epoxy bonding agent.
10. ~~If existing dowel bars have been cut and removed, install new dowel bars of the type and size of the existing dowel bars in the joint that parallels the direction of traffic. On aprons and areas where traffic may be oblique to joints, install dowels in both joint faces.~~
11. Install dowels by drilling and epoxying into the PCC pavement at least 3 inches (8 cm) from the location of the existing dowels which were cut off. Space dowel bars at least 3 inches (8 cm) from the edge of the repair area and at least one bar spacing apart at corners of intersecting joints.
12. Oil the exposed ends of dowel bars prior to backfilling the repair area with concrete.
13. Install nonabsorbent board or other approved material within the limits of the joint seal reservoir (Step 1). The nonabsorbent board will be a standard ½ inch (13 mm) asphalt impregnated fiber-board or other approved material. For joints wider than ½ inch (13 mm), adjust the width of the nonabsorbent board to fit the joint width.
14. Fill the repair area with concrete and consolidate with a vibrator. Concrete should meet the requirements of P-501 or State DOT specifications for pavements.
15. Finish the surface to match existing pavement.
16. Spray with curing compound per ASTM C309.
17. Remove the nonabsorbent board (Step 2) and place joint sealant per ASTM D6690 and manufacturer's requirements (Step 3).
18. Do not allow traffic until the patch has cured.
19. Completely clean the work area before opening the pavement to aircraft traffic.

A6. FULL DEPTH REPAIR IN RIGID PAVEMENT – PARTIAL SLAB REPLACEMENT

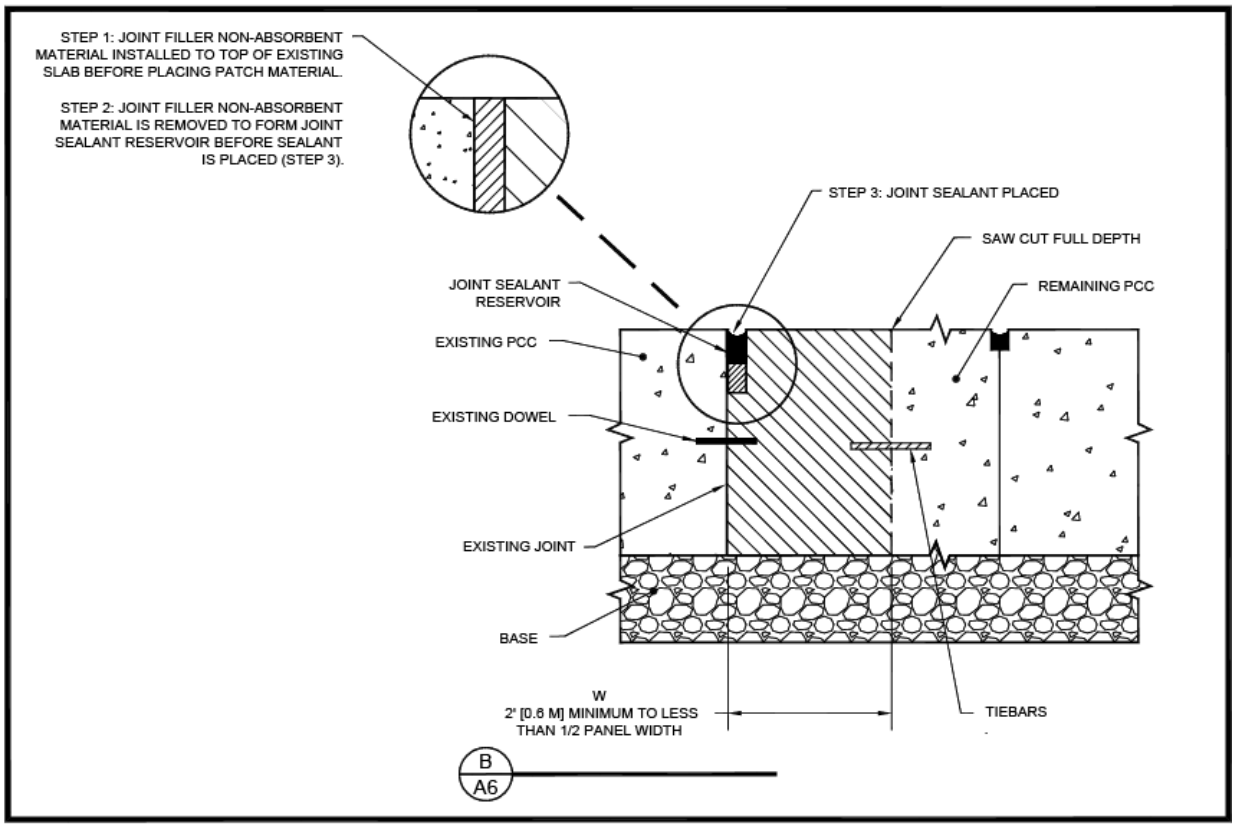


Figure A-6. Full depth repair in rigid pavement – partial slab replacement

Repair Procedure and Weather and Temperature Requirements are on the back of this page.

MATERIAL REQUIREMENTS

ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM A615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
P-501	Portland Cement Concrete (PCC) Pavement, AC 150/5370-10, Standards for Specifying Construction of Airports

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WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin repairs during inclement weather.
- Do not place concrete unless the ambient temperature is at least 40°F (4°C) and rising and the concrete temperature is greater than or equal to 50°F (10°C).
- Do not place concrete on frozen base, ice, or snow.
- When the ambient temperature exceeds 85°F (29°C), sprinkle the adjacent concrete and base with water immediately before placing concrete.
- Place concrete at the coolest temperature practicable, and never allow the placed concrete temperature to exceed 90°F (32°C).

REPAIR PROCEDURE

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area to be repaired.
3. Make a full-depth saw cut along the constructed joints at least 2 feet (0.6 m) beyond the limits of the damaged pavement and make a saw cut perpendicular to the constructed joints from these points across the width of the pavement panel. See Figure A-4.
4. If dowels or tie bars are present along any edges, either of the following options is acceptable:
   - If dowels or tie bars will be exposed and saved, saw edges full depth just beyond the end of the dowels or tie bars. Carefully saw joints on the joint line to within 1 inch (2.5 cm) of the depth of the dowel or tie bar. Carefully break up and remove the narrow strips of concrete along doweled edges using light 30 pound (14 kg) or less jackhammers, or other approved equipment.
   - If dowels or tie bars are to be cut and replaced, make a full depth saw cut along the constructed joint cutting the dowels and tie bars.
5. Take care to prevent damage to the dowels, tie bars, or to concrete that remains in place.
6. Make additional saw cuts within the limits of the repair area, dividing the repair area into quarters.
7. Use light weight equipment, i.e., jackhammers less than 30 pounds (14 kg), hand tools, etc., to remove the damaged PCC pavement. Work from inside the saw cut toward the interior of the area being removed to prevent damage to the pavement remaining.
8. Remove by hand all loose material and vacuum to minimize any disturbance to the subgrade or base materials.
9. Restore subgrade or base material if required.
10. Install deformed tie-bars in the face of the parent panel by drilling horizontal holes in to the face and using an epoxy bonding agent.
11. ~~If existing dowel bars have been cut and removed, install dowel bars of the type and size of the existing dowel bars in the joints that are parallel to the direction of traffic. On aprons and areas where traffic may be oblique to joints, install dowels in both joint faces.~~
12. Install dowels by drilling and epoxying into the PCC pavement at least 3 inches (8 cm) from the location of the existing cut dowels. Space dowel bars at least 3 inches (8 cm) from the edge of the repair area and at least one bar spacing apart at corners of intersecting joints.
13. Oil the exposed ends of dowel bars prior to backfilling repair area with concrete.
14. Install nonabsorbent board or other approved material within the limits of the joint seal reservoir (Step 1). The nonabsorbent board will be a standard ½ inch (13 mm) asphalt impregnated fiber-board. For joints wider than ½ inch (13 mm), adjust the width of the nonabsorbent board to fit the joint width.
15. Fill the repair area with concrete and consolidate with a vibrator. Use concrete meeting the requirements of P-501 or State DOT specifications for pavements.
16. Finish the surface to match the existing surface.
17. Spray with curing compound per ASTM C309.
18. Remove the nonabsorbent board or other approved material (Step 2) and place joint sealant per ASTM D6690 (Step 3).
19. Thoroughly clean the work area before opening the pavement to aircraft traffic.
20. Do not allow traffic until the concrete has cured.

A7. FULL DEPTH REPAIR IN RIGID PAVEMENT – FULL SLAB REPLACEMENT

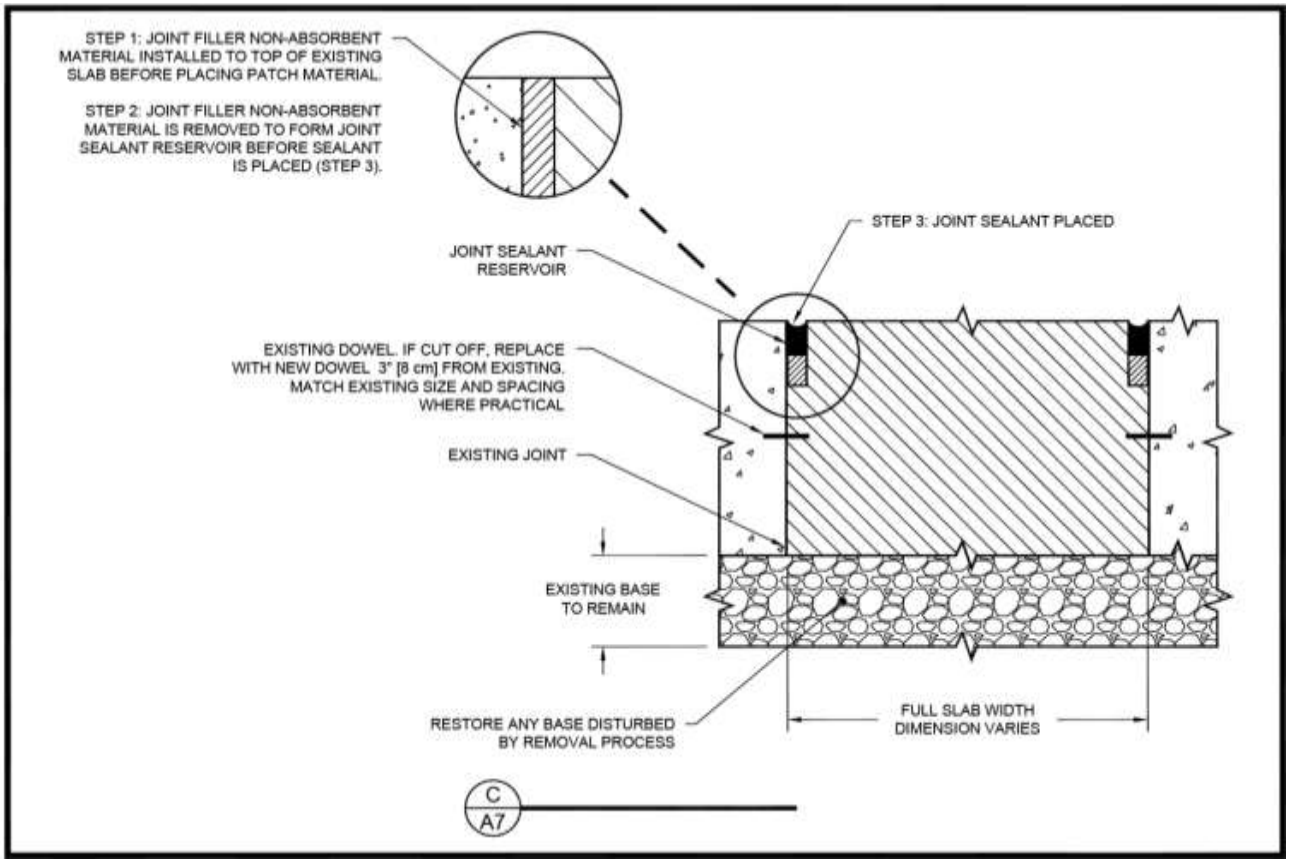


Figure A-7. Full depth repair in rigid pavement – full slab replacement

Repair Procedure and Weather and Temperature Requirements are on the back of this page.

MATERIAL REQUIREMENTS

ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM A615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
P-501	Portland Cement Concrete (PCC) Pavement, AC 150/5370-10, Standards for Specifying Construction of Airports

State Department of Transportation specifications for pavements

WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin repairs during inclement weather.
- Do not place concrete unless the ambient temperature is at least 40°F (4°C) and rising and the concrete temperature is greater than or equal to 50°F (10°C).
- Do not place concrete on frozen base, ice, or snow.
- When the ambient temperature exceeds 85°F (29°C), sprinkle the adjacent concrete and base with water immediately before placing concrete.
- Place concrete at the coolest temperature practicable, and never allow the placed concrete temperature to exceed 90°F (32°C).

REPAIR PROCEDURE

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area to be repaired.
3. Make a full-depth saw cut along the constructed joints at least 2 feet (0.6 m) beyond the limits of the damaged pavement and make a saw cut perpendicular to the constructed joints from these points across the width of the pavement panel.
4. If dowels or tie bars are present along any edges, either of the following options is acceptable:
   - If dowels or tie bars will be exposed and saved, edges will be sawed full depth just beyond the end of the dowels or tie bars. Carefully saw joints on the joint line to within 1 inch (2.5 cm) of the depth of the dowel or tie bar. Carefully break up the narrow strips of concrete along doweled edges using light 30 pound (14 kg) or less jackhammers, or other approved equipment.
   - If dowels or tie bars are to be cut and replaced, make a full depth saw cut along the constructed joint cutting the dowels and tie bars.
5. Take care to prevent damage to the dowels, tie bars, or to concrete that remains in place.
6. Make additional saw cuts within the limits of the repair area dividing the repair area into quarters.
7. Use light weight equipment, i.e., jackhammers less than 30 pounds (14 kg), hand tools, etc., to remove the damaged PCC pavement. Work from inside the saw cut toward the interior of the area being removed to prevent damage to the pavement remaining.
8. Remove by hand all loose material and vacuum to minimize any disturbance to the subgrade or base materials.
9. Restore subgrade or base material if required.
10. ~~If existing dowel bars have been cut and removed, install dowel bars of the type and size of the existing dowel bars in the joints that are parallel to the direction of traffic. On aprons and areas where traffic may be oblique to joints, install dowels in both joint faces.~~
11. Install dowels by drilling and epoxying into the PCC pavement at least 3 inches (8 cm) from the location of the existing dowels which were cut off. Space dowel bars at least 3 inches (8 cm) from the edge of the repair area and at least one bar spacing apart at corners of intersecting joints.
12. Oil the exposed ends of dowel bars prior to backfilling repair area with concrete.
13. Install nonabsorbent board or other approved material within the limits of the joint seal reservoir (Step 1). The nonabsorbent board will be a standard ½ inch (13 mm) asphalt impregnated fiber-board. For joints wider than ½ inch (13 mm), adjust the width of the nonabsorbent board to fit the joint width.
14. Fill the repair area with concrete and consolidate with a vibrator. Use concrete meeting the requirements of P-501 or State DOT specifications for pavements.
15. Finish the surface to match the existing surface.
16. Spray with curing compound per ASTM C309.
17. Remove the nonabsorbent board or other approved material (Step 2) and place joint sealant per ASTM D6690 (Step 3).
18. Thoroughly clean the work area before opening the pavement to aircraft traffic.
19. Do not allow traffic until the concrete has cured.

A8. JOINT SPALL REPAIR IN RIGID PAVEMENT

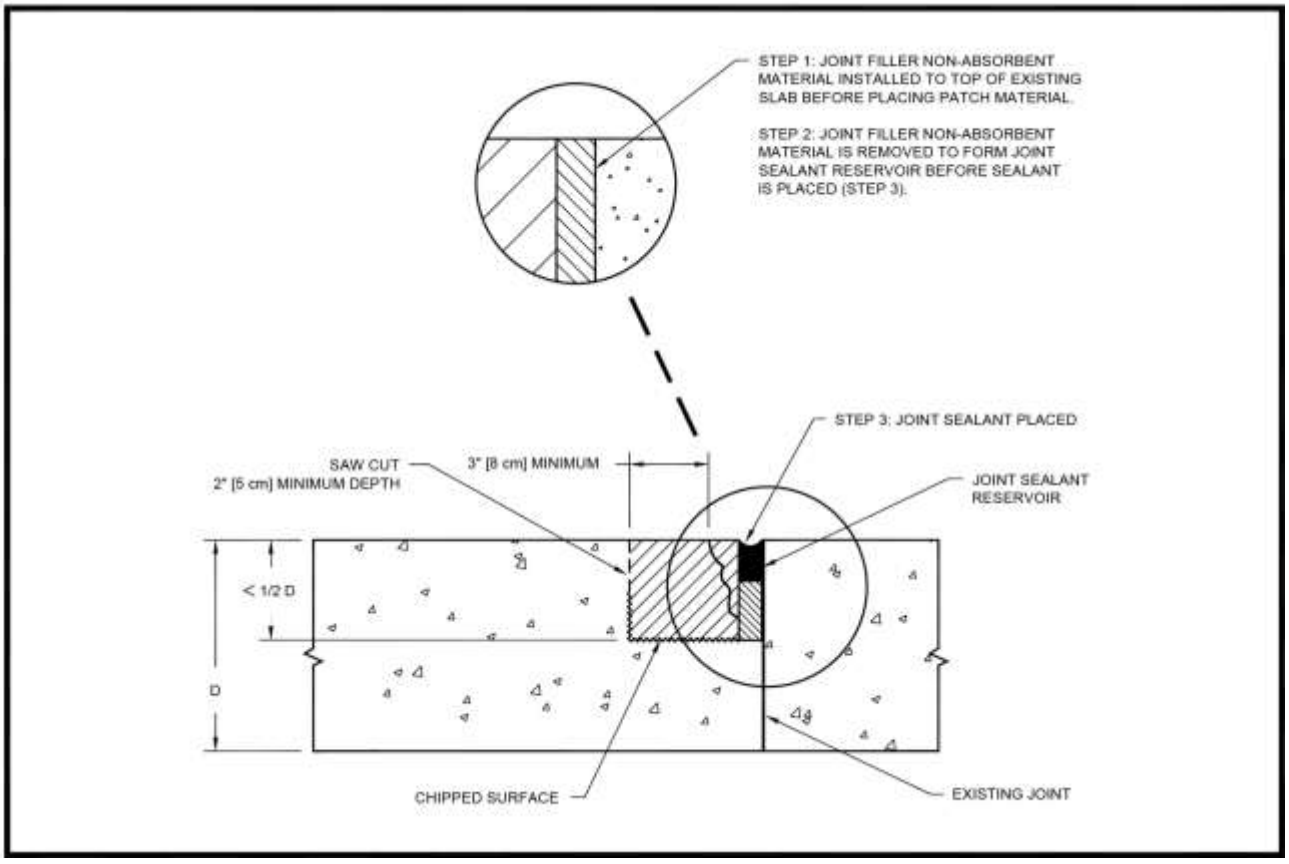


Figure A-8. Joint spall repair in rigid pavement

Repair Procedure and Weather and Temperature Requirements are on the back of this page.

MATERIAL REQUIREMENTS

ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C881	Standard Specifications for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
P-501	Portland Cement Concrete (PCC) Pavement, AC 150/5370-10, Standards for Specifying Construction of Airports

State Department of Transportation specifications for pavements

WEATHER AND TEMPERATURE REQUIREMENTS

- Do not begin repairs during inclement weather.
- Do not place concrete unless the ambient temperature is at least 40°F (4°C) and rising and the concrete temperature is greater than or equal to 50°F (10°C).
- Do not place concrete on frozen base, ice, or snow.
- When the ambient temperature exceeds 85°F (29°C), sprinkle the adjacent concrete and base with water immediately before placing concrete.
- Place concrete at the coolest temperature practicable, and never allow the placed concrete temperature to exceed 90°F (32°C).

REPAIR PROCEDURE

1. Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, etc.; and all NOTAMS have been issued for affected areas of the airfield.
2. Mark the limits of the area of spall repair.
3. Make vertical saw cuts a minimum of 2 inches (5 cm) in depth and approximately 3 inches (8 cm) beyond the limit of the spall area. Saw cuts should be straight lines defining the perimeter of the spall repair area. The spall repair area should be a rectangular area.
4. When there are adjacent spall repair areas within a slab, the minimum distance between spall repair areas is 1-1/2 feet (45 cm). When spall repair areas are less than 1-1/2 feet (45 cm) apart, combine the spall repair areas into one repair. When the spall repair areas are greater than 1-1/2 feet (45 cm) apart, maintain separate spall repair areas.
5. Chip out and remove all unsound concrete and at least ½ inch (13 mm) of visually sound concrete between the saw cut and the joint, or crack.
6. Use light weight equipment, i.e., jackhammers less than 30 pounds (14 kg), hand tools, etc., to remove the damaged PCC pavement. Work from inside the saw cut toward the joint to prevent damage to the remaining pavement.
7. Remove all loose material by hand and vacuum to minimize any damage to the remaining pavement.
8. Clean the spall repair area with high-pressure water.
9. Place nonabsorbent board or other approved material (Step 1) in the existing joint and form a new joint sealant reservoir adjacent to the repair area. Maintain the joint through the full depth of the spall repair and prevent a bond between the patch and the adjacent slab.
10. Prepare the surface of the joint repair area in accordance with the manufacturer's recommendations for the material used for the repair. This may require treating the surface of the spall repair with a neat cement grout or a liquid bonding agent.
11. Place the patch.
12. Finish the patch to match the texture of the adjacent pavement.
13. Cure the patch in accordance with the material manufacturer's recommendations.
14. Remove the nonabsorbent board or other approved material from the joint (Step 2) and place joint sealant per ASTM D6690 (Step 3).
15. Protect the patch from traffic until the material has set.
16. Thoroughly clean the work area before opening the pavement to aircraft traffic.

Appendix B. Bibliography

1. American Concrete Pavement Association (ACPA), http://www.acpa.org/:

- Guidelines for Full-Depth Repair (TB002P), 1995.
- Guidelines for Partial-Depth Repair (TB003P), 1998.
- Joint and Crack Sealing and Repair for Concrete Pavements (TB012P), 1993.
- Diamond Grinding and Concrete Pavement Restoration (TB008P), 2000.
- Concrete Pavement Restoration Guide: Procedures for Preserving Concrete Pavements (TB020P), 1998.
- Concrete Repair Manual for Airfields (JP002P), 2003.
- Concrete Crack and Partial-Depth Spall Repair Manual (JP003P), 2004.

2. The Asphalt Institute (AI), http://www.asphaltinstitute.org/:

- Asphalt in Pavement Preservation and Maintenance, MS-16, 4th Edition.
- The Basic Asphalt Emulsion Manual, MS-19, 4th Edition.
- Asphalt Overlays for Highway and Street Rehabilitation, MS-17, 3rd Edition.

3. Advisory Circulars, http://www.faa.gov/airports/resources/advisory_circulars/:

- AC 150/5200-18, Airport Safety Self-Inspection.
- AC 150/5200-30, Airport Winter Safety and Operations.
- AC 150/5200-33, Hazardous Wildlife Attractants On or Near Airports.
- AC 150/5210-24, Airport Foreign Object Debris (FOD) Management.
- AC 150/5320-5, Airport Drainage Design.
- AC 150/5320-6, Airport Pavement Design and Evaluation.
- AC 150/5320-12, Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces.
- AC 150/5220-22, Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns.
- AC 150/5370-2, Operational Safety on Airports During Construction.

- AC 150/5370-10, Standards for Specifying Construction of Airports.
- AC 150/5370-11, Use of Nondestructive Testing Devices in the Evaluation of Airport Pavements.
- AC 150/5380-7, Airport Pavement Management Program.

4. Unified Facilities Criteria (UFC), http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4:

- UFC 3-270-01, Asphalt Maintenance and Repair, 15 March 2001.
- UFC 3-270-02, Asphalt Crack Repair, 15 March 2001.
- UFC 3-270-03, Concrete Crack and Partial-Depth Spall Repair, 15 March 2001.
- UFC 3-270-04, Concrete Repair, 15 March 2001.

Requirements of Chapter 104, HRS
Wages and Hours of Employees on Public Works Law

Chapter 104, HRS, applies to every public works construction project over $2,000, regardless of the method of procurement or financing (purchase order, voucher, bid, contract, lease arrangement, warranty, SPRB).

Rate of Wages for Laborers and Mechanics

- Minimum prevailing wages (basic hourly rate plus fringe benefits), as determined by the Director of Labor and Industrial Relations and published in wage rate schedules, shall be paid to the various classes of laborers and mechanics working on the job site. [§104-2(a), (b), Hawaii Revised Statutes (HRS)]

- If the Director of Labor determines that prevailing wages have increased during the performance of a public works contract, the rate of pay of laborers and mechanics shall be raised accordingly. [§104-2(a) and (b), HRS; §12-22-3(d) Hawaii Administrative Rules (HAR)]

Overtime

- Laborers and mechanics working on a Saturday, Sunday, or a legal holiday of the State or more than eight hours a day on any other day shall be paid overtime compensation at not less than one and one-half times the basic hourly rate plus the cost of fringe benefits for all hours worked. If the Director of Labor determines that a prevailing wage is defined by a collective bargaining agreement, the overtime compensation shall be at the rates set by the applicable collective bargaining agreement [§§104-1, 104-2(c), HRS; §12-22-4.1, HAR]

Weekly Pay

- Laborers and mechanics employed on the job site shall be paid their full wages at least once a week, without deduction or rebate, except for legal deductions, within five working days after the cutoff date. [§104-2(d), HRS]

Posting of Wage Rate Schedules

- Wage rate schedules with the notes for prevailing wages and special overtime rates, shall be posted by the contractor in a prominent and easily accessible place at the job site. A copy of the entire wage rate schedule shall be given to each laborer and mechanic employed under the contract, except when the employee is covered by a collective bargaining agreement. [§104-2(d), HRS]

Withholding of Accrued Payments

- If necessary, the contracting agency may withhold accrued payments to the contractor to pay to laborers and mechanics employed by the contractor or subcontractor on the job site any difference between the wages required by the public works contract or specifications and the wages received. [§104-2(e), HRS]

Certified Weekly Payrolls and Payroll Records

- A certified copy of all payrolls shall be submitted weekly to the contracting agency. [§104-3(a), HRS; §12-22-10, HAR]

- The contractor is responsible for the submission of certified copies of the payrolls of all subcontractors. The certification shall affirm that the payrolls are correct and complete, that the wage rates listed are not less than the applicable rates contained in the applicable wage rate schedule, and that the classifications for each laborer or mechanic conform with the work the laborer or mechanic performed. [§104-3(a), HRS; §12-22-10, HAR]

- Payroll records shall be maintained by the contractor and subcontractors for three years after completion of construction. The records shall contain: [§104-3(b), HRS; §12-22-10, HAR]
  - the name and home address of each employee
  - the last four digits of social security number
  - a copy of the apprentice's registration with DLIR
  - the employee's correct classification
  - rate of pay (basic hourly rate + fringe benefits)
  - itemized list of fringe benefits paid
  - daily and weekly hours worked
  - weekly straight time and overtime earnings
  - amount and type of deductions
  - total net wages paid
  - date of payment

- Records shall be made available for examination by the contracting agency, the Department of Labor and Industrial Relations (DLIR), or any of its authorized representatives, who may also interview employees during working hours on the job. [§§104-3(c), 104-22(a), HRS; §12-22-10, HAR]

Termination of Work on Failure to Pay Wages

- If the contracting agency finds that any laborer or mechanic employed on the job site by the contractor or any subcontractor has not been paid prevailing wages or overtime, the contracting agency may, by written notice to the contractor, terminate the contractor's or subcontractor's right to proceed with the work or with the part of the work in which the required wages or overtime compensation have not been paid. The contracting agency may complete this work by contract or otherwise, and the contractor or contractor's sureties shall be liable to the contracting agency for any excess costs incurred. [§104-4, HRS]

Apprentices

- Apprentice wage rates apply to contractors who are a party to a bona fide apprenticeship program which has been registered with the DLIR. In order to be paid apprentice rates, apprentices must be parties to an agreement either registered with or recognized as a USDOL nationally approved apprenticeship program by the DLIR, Workforce Development Division, (808) 586-8877, and the apprentice must be individually registered by name with the DLIR. [§12-22-6(1) and (2), HAR]

- The number of apprentices on any public work in relation to the number of journeyworkers in the same craft classification as the apprentices employed by the same employer on the same public work may not exceed the ratio allowed under the apprenticeship standards registered with or recognized by the DLIR. A registered or recognized apprentice receiving the journeyworker rate will not be considered a journeyworker for the purpose of meeting the ratio requirement. [§12-22-6(3), HAR]

Enforcement

- To ensure compliance with the law, DLIR and the contracting agency will conduct investigations of contractors and subcontractors. If a contractor or subcontractor violates the law, the penalties are: [§104-24, HRS]

  - First Violation — Equal to 25% of back wages found due or $250 per offense up to $2,500, whichever is greater.
  - Second Violation — Equal to amount of back wages found due or $500 for each offense up to $5,000, whichever is greater.
  - Third Violation — Equal to two times the amount of back wages found due or $1,000 for each offense up to $10,000, whichever is greater; and
    Suspension from doing any new work on any public work of a governmental contracting agency for three years.

  ▪ A violation would be deemed a second violation if it occurs within two years of the **first notification of violation**, and a third violation if it occurs within three years of **the second notification of violation**. [§104-24, HRS; §12-22-25(b), HAR]

  ▪ **Suspension**: For a first or second violation, the department shall immediately suspend a contractor who fails to pay wages or penalties until all wages and penalties are paid in full. For a third violation, the department shall penalize and suspend the contractor as described above, **except that if the contractor continues to violate the law, then the department shall immediately suspend the contractor for a mandatory three years. The contractor shall remain suspended until all wages and penalties are paid in full.** [§§104-24, 104-25, HRS]

- **Suspension**: Any contractor who fails to make payroll records accessible or provide requested information within 10 days, or fails to keep or falsifies any required record, shall be assessed a penalty including suspension as provided in Section 104-22(b) and 104-25(a)(3), HRS. [§104-3(c), HRS; §12-22-26, HAR]

- If any contractor interferes with or delays any investigation, the contracting agency shall withhold further payments until the delay has ceased. Interference or delay includes failure to provide requested records or information within ten days, failure to allow employees to be interviewed during working hours on the job, and falsification of payroll records. The department shall assess a penalty of $10,000 per project, and $1,000 per day thereafter, for interference or delay. [§104-22(b), HRS; §12-22-26, HAR]

- Failure by the contracting agency to include in the provisions of the contract or specifications the requirements of Chapter 104, HRS, relating to coverage and the payment of prevailing wages and overtime, is not a defense of the contractor or subcontractor for noncompliance with the requirements of this chapter. [§104-2(f), HRS]

For additional information, visit the department's website at *http://labor.hawaii.gov/wsd*
or contact any of the following DLIR offices:

Oahu (Wage Standards Division) .....(808) 586-8777
Hawaii Island.....(808) 974-6464
Maui and Kauai .....(808) 243-5322

PROPOSAL TO THE
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

PROJECT:	Repair of Cement Concrete Pavement at Daniel K. Inouye International Airport Honolulu, Oahu, Hawaii
PROJECT NO.:	BO1649-73
COMPLETION TIME:	1,096 Calendar days from the date indicated in the Notice to Proceed from the Department.
PROJECT MANAGER:	Gary Kam Department of Transportation Airports Daniel K. Inouye International Airport 300 Rodgers Boulevard #12 Honolulu, HI 96819 Email: gary.yt.kam@hawaii.gov Phone: (808)-834-6091
ELECTRONIC SUBMITTAL:	**Bidders shall submit and upload the complete proposal to HIePRO prior to the bid opening date and time. Any additional support documents explicitly designated as confidential and/or proprietary shall be uploaded as a separate file to HIePRO. See SPECIAL PROVISIONS 2.8 PREPARATION AND DELIVERY OF BID for complete details. FAILURE TO UPLOAD THE COMPLETE PROPOSAL TO HIePRO SHALL BE GROUNDS FOR REJECTION OF THE BID.**

Director of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Sir:

The undersigned Bidder declares the following:

1. It has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this proposal.

2. It has not been assisted or represented on this matter by any individual who has, in a State capacity, been involved in the subject matter of this contract within the past two years.

3. It has not and will not, either directly or indirectly offered or given a gratuity (i.e. an entertainment or gift) to any State or County employee to obtain a contract or favorable treatment under a contract.

The undersigned Bidder further agrees to the following:

1. If this proposal is accepted, it shall execute a contract with the Department to provide all necessary labor, machinery, tools, equipment, apparatus and any other means of construction, to do all the work and to furnish all the materials specified in the contract in the manner and within the time therein prescribed in the contract, and that it shall accept in full payment therefore the sum of the unit and/or lump sum prices as set forth in the attached proposal schedule for the actual quantities of work performed and materials furnished and furnish satisfactory security in accordance with Section 103D-324, Hawaii Revised Statutes, within 10 days after the award of the contract or within such time as the Director of Transportation may allow after the undersigned has received the contract documents for execution, and is fully aware that non-compliance with the aforementioned terms will result in the forfeiture of the full amount of the bid guarantee required under Section 103D-323, Hawaii Revised Statutes.

2. That the quantities given in the attached proposal schedule are approximate only and are intended principally to serve as a guide in determining and comparing the bids.

3. That the Department does not either expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of the work, as may be deemed necessary or advisable by the Director of Transportation, and that all increased or decreased quantities of work shall be performed at the unit prices set forth in the attached proposal schedule except as provided for in the specifications.

4. In case of a discrepancy between unit prices and the totals in said Proposal Schedule, the unit prices shall prevail.

5. Agrees to begin work within 10 working days after the date of notification to commence with the work, which date is in the notice to proceed, and shall finish the entire project within the time prescribed.

6. The Director of Transportation reserves the right to reject any or all bids and to waive any defects when in the Director's opinion such rejections or waiver will be for the best interest of the public.

7. The undersigned Bidder further agrees to the following: Pursuant to HRS §103D-405(d), any contractor (including consultants) paid for services to develop or prepare specifications or work statements shall be precluded from submitting an offer or receiving a contract for that particular solicitation. This includes the preparation of reports relied upon by HDOT in the development of the project scope.

The Bidder acknowledges receipt of and certifies that it has completely examined the following listed items: the Hawaii Department of Transportation, Air and Water Transportation Facilities Division General Provisions for Construction Projects dated 2016, the Notice to Bidders, the Special Provisions, if any, the Technical Provisions, the Proposal, the Contract and Bond Forms, and the Project Plans.

In accordance with Section 103D-323, Hawaii Revised Statutes, this proposal is accompanied with a bid security in the amount of 5% of the total amount bid, in the form checked below. (Check applicable bid security submitted with bid.)

_____ Surety Bid Bond (Use standard form),

_____ Cash,

_____ Cashier's Check,

_____ Certified Check, or

_____ _____.
(Fill in other acceptable security.)

The undersigned Bidder acknowledges receipt of any addendum issued by the Department by recording in the space below the date of receipt.

Addendum No. 1 _____ Addendum No. 3 _____

Addendum No. 2 _____ Addendum No. 4 _____

In accordance with Section 103D-302, Hawaii Revised Statutes, the undersigned as Bidder, has listed the name of each person or firm, who will be engaged by the Bidder on the project as a Subcontractor or Joint Contractor and the nature of work to be done by each. **The Bidder must adequately and unambiguously disclose the unique nature and scope of the work to be performed by each Subcontractor or Joint Contractor.** For each listed firm, the Bidder declares the respective firm is a Subcontractor or Joint Contractor and is subject to evaluation as a Subcontractor or Joint Contractor. It is understood that failure to comply with the aforementioned requirements may be cause for rejection of the bid submitted.

Name of Subcontractor	Nature and Scope of Work
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Name of Joint Contractor	Nature and Scope of Work
1.	
2.	
3.	

NOTES:

"None" or if left blank indicates no Subcontractor or Joint Contractor.

If more space is needed, attach additional sheets.

The undersigned hereby certifies that the bid prices contained in the attached proposal schedule have been carefully checked and are submitted as correct and final.

This declaration is made with the understanding that the undersigned is subject to the penalty of perjury under the laws of the United States and is in violation of the Hawaii Penal Code, Section 710-1063, unsworn falsification to authorities, of the Hawaii Revised Statutes, for knowingly rendering a false declaration.

_____
Bidder (Company Name)

By_____
Authorized Signature

_____
Print Name and Title

_____

_____
Business Address

_____
Business Telephone

_____
Date

_____
Contact Person (If different from above)

Phone:_____ Email:_____

NOTE:

If Bidder is a CORPORATION, the legal name of the corporation shall be set forth above, the corporate seal affixed, together with the signature(s) of the officer(s) authorized to sign contracts for the corporation. Please attach to this page current (not more than six months old) evidence of the authority of the officer(s) to sign for the corporation.

If Bidder is a PARTNERSHIP, the true name of the partnership shall be set forth above, with the signature(s) of the general partner(s). Please attach to this page current (not more than six months old) evidence of the authority of the partner authorized to sign for the partnership.

If Bidder is an INDIVIDUAL, the bidder's signature shall be placed above.

If signature is by an agent, other than an officer of a corporation or a partner of a partnership, a POWER OF ATTORNEY must be on file with the Department before opening bids or submitted with the bid. Otherwise, the Department may reject the bid as irregular and unauthorized.

PREFERENCES

Bidders acknowledge that while preferences are considered in the evaluation of bids, the award of the contract will be in the amount of the bid offered exclusive of any preferences.

A. HAWAII BIDDER PREFERENCE

In accordance with HRS §103D-302, the Hawaii bidder preference is applicable to this solicitation for evaluation purposes only. Bidders desiring to qualify for the five per cent (5%) preference shall submit with their bid a completed *Hawaii Bidder/Offeror Preference Certification Form* (Form SPO-081) at or before the time set for receipt of bids. Certifications submitted for previous or other solicitations will not be accepted.

( ) Yes, the Bidder elects to receive the Hawaii Bidder Preference and has included the Form SPO-081 with the bid.

B. APPRENTICESHIP AGREEMENT PREFERENCE

In accordance with HRS §103-55.6, the estimated value of this public works contract is $250,000 or more and the apprenticeship agreement preference is applicable to this solicitation for evaluation purposes only. Bidders desiring to qualify for the five per cent (5%) preference shall submit with their bid a complete, valid CERTIFICATION OF BIDDER'S PARTICIPATION IN APPROVED APPRENTICESHIP PROGRAM UNDER ACT 17 (Certification Form 1) ***for each apprenticeable trade*** the Bidder will employ on the project.

( ) Yes, the Bidder elects to receive the Apprenticeship Agreement Preference and has attached Certification Form(s) 1 for each apprenticeable trade the Bidder will employ for this project (excluding subcontractors).

By submission of this offer, the Bidder certifies that it has indicated **all apprenticeable trades that Bidder will employ** for this project (excluding subcontractors) by listing the applicable trades below:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

(Attach additional sheet if necessary.)

Form 1 Required. Failure to submit a valid Form 1 with the bid for every apprenticeable trade that Bidder will employ on the project will result in the preference being denied, regardless of whether the trade is listed above. If a Form 1 is submitted for a trade that is not listed above, the Form 1 will take

precedence over the listing and may be used to qualify Bidder for the preference.

Form 2 Required. If awarded the contract with the Apprenticeship Agreement Preference applied, then for the duration of the contract, the Bidder **shall** certify each month that work is being conducted on the project that the Contractor continues to be a participant in the relevant apprenticeship program for each trade it employs. Monthly certification shall be made on the Certification Form 2 and submitted to the HDOT.

Failure to comply with the requirements of the Apprenticeship Agreement Preference program will subject the Contractor to sanctions pursuant to HRS §103-55.6.

C. HAWAII PRODUCTS PREFERENCE

Hawaii Products Preference shall not apply to this solicitation.

D. RECYCLED PRODUCT PREFERENCE

Recycled Product Preference shall not apply to this solicitation.

STATE OF HAWAII
Hawaii Bidder/Offeror
Preference Certification Form
(As Defined in HRS103D-1001)

I, _____, _____ of
(Authorized Officer's Name) (Office or Position Held)

_____, certify the following:
(Name of Bidder/Offeror)

(1) That the Bidder/Offeror holds a valid commercial place of business located in the State of Hawaii at the following address:

_____

_____,

and that the above-named office was opened on the following date: _____,

and has been staffed by the Bidder/Offeror or an employee of the Bidder/Offeror for not less than two (2) consecutive years immediately preceding the time and date set for the opening of bids or receipt of proposals;

(2) That the bid or proposal in response to IFB/RFP No. _____, is submitted under the name under which the Bidder/Offeror is authorized to do business in the State;

(3) That not less than fifty-one percent (51%) of the total direct labor hours required for performance of the contract will be performed within the State; and

(4) If the Bidder/Offeror is a joint venture, the Bidder/Offeror is composed entirely of parties meeting the requirements of paragraphs (1), (2), and (3).

I certify under penalty of perjury that the above statements are true. I agree to maintain the above qualifications throughout contract performance; any changes in eligibility shall be reported to the Contract Administrator or purchasing agency's contact person identified in the RFP/IFB. I acknowledge that failure to maintain the above qualifications triggers a price adjustment equal to the value of the preference applied and may constitute cause for debarment under HRS §103D-702.

_____
Signature of Authorized Officer

_____
Print Name and Title

_____
Date

REPAIR OF CEMENT CONCRETE PAVEMENT
AT DANIEL K, INOUYE INTERNATIONAL AIRPORT
HONOLULU, OAHU, HAWAII
STATE PROJECT NO. BO1649-73
PROPOSAL SCHEDULE

Item No.	Description	Approx. Quantity	Unit	Unit Price	Total
01000.1	Mobilization/Traffic Control For Runway Closure	1	DAY	$ _____	$ _____
01000.2	Mobilization/Traffic Control For Taxiway Closure	1	DAY	$ _____	$ _____
01000.3	Mobilization/Traffic Control For Ramp Closure	1	DAY	$ _____	$ _____
01561.1	Construction Site Runoff Control Program	ALLOW	ALLOW	ALLOW	$ 20,000
01562.2	Management of Contaminated Medias, Soil Disposal, and Soil Reuse	ALLOW	ALLOW	ALLOW	$ 20,000
Concrete Pavement Repair					
02501.1	Full Slab - Full Depth Replacement	30	CY	$ _____	$ _____
02501.2	Half Slab - Full Depth Replacement	15	CY	$ _____	$ _____
02501.3	Quality Control Testing	ALLOW	ALLOW	ALLOW	$ 20,000
Miscellaneous Work					
02501.4	Concrete Spall Repair	ALLOW	ALLOW	ALLOW	$ 50,000
02501.5	Allowance for Unforeseen Conditions	ALLOW	ALLOW	ALLOW	$ 20,000
02605.1	Joint Replacement and Crack Sealing	ALLOW	ALLOW	ALLOW	$ 20,000

TOTAL AMOUNT FOR COMPARISON OF BIDS $ _____

Bids shall include all applicable taxes and fees. The prices bid herein shall include all labor, materials, equipment, and incidentals necessary to construct all items in place, including installation and testing of equipment, complete and ready for operation, all in accordance with the plans and specifications.

Notes:

1. Bids shall include all Federal, State, County and other applicable taxes and fees.
2. The TOTAL AMOUNT FOR COMPARISON OF BIDS shall be used to determine the lowest responsible bidder.
3. Bidders shall complete all unit prices and amounts. Failure to do so shall be grounds for rejection of bid.
4. If a discrepancy occurs between unit bid price and the bid price, the unit bid price shall govern.

5. **Bidders shall submit and upload the complete proposal to HIePRO prior to the bid opening date and time. Proposals received after said due date and time shall not be considered. Any additional support documents explicitly designated as confidential and/or proprietary shall be uploaded as a separate file to HIePRO. Bidders shall not include confidential and/or proprietary documents with the proposal. The record of each bidder and respective bid shall be open to public inspection**. Original (wet ink, hard copy) proposal documents are not required to be submitted. **Contract award shall be based on evaluation of proposals submitted and uploaded to HIePRO.**

   FAILURE TO UPLOAD THE COMPLETE PROPOSAL TO HIePRO SHALL BE GROUNDS FOR REJECTION OF THE BID.
   If there is a conflict between the specification document and the HIePRO solicitation, the specifications shall govern and control, unless otherwise specified.

6. Any contract which is awarded shall be an open-ended contract since the exact value of work to be performed during the contract period cannot be determined beforehand. The unit price for each item of work on any particular work order shall be that which corresponds to the quantity of work for that item actually performed for each work order.
7. The quantities on the proposal schedule are for bidding purposes only, and this is no guarantee of the quantity of work that will be issued.
8. The State reserves the right to reject any or all Proposals and to waive any defects in the best interest of the State.
9. Submission of a Proposal is a warranty that the bidder has made an examination of the project site and is fully aware of all conditions to be encountered in performing the work and the requirements of the plans and specifications.
10. The bidder's attention is directed to Section 2.11 – BID SECURITY of the "General Provisions" as amended by the Special Provisions.
11. Bidders shall be paid for actual work performed as directed by the Engineer for allowance items. Bidder will not he paid overhead and profit for unused allowance funds.
12. If the lowest TOTAL AMOUNT FOR COMPARISON OF BIDS is less than, or approximately equal to the funds available for this project, an award will be made to the lowest responsible bidder.

SURETY BID BOND

Bond No. _____

KNOW TO ALL BY THESE PRESENTS:

That we, _____
(full name or legal title of offeror)
as Offeror, hereinafter called the Principal, and

_____
(name of bonding company)
as Surety, hereinafter called Surety, a corporation authorized to transact business as a Surety in the State of Hawaii, are held and firmly bound unto

_____
(State/county entity)
as Owner, hereinafter called Owner, in the penal sum of

_____
(required amount of bid security)
Dollars($_____),lawful money of the United States of America, for the payment of which sum well and truly to be made, the said Principal and the said Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS:

The Principal has submitted an offer for

_____
(project by number and brief description)

NOW, THEREFORE:

The condition of this obligation is such that if the Owner shall reject said offer, or in the alternate, accept the offer of the Principal and the Principal shall enter into a contract with the Owner in accordance with the terms of such offer, and give such bond or bonds as may be specified in the solicitation or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof as specified in the solicitation then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed this _____ day of _____, _____

_____
Name of Principal (Offeror) (Seal)

_____
Signature

_____
Print Name and Title

_____
Name of Surety (Seal)

_____
Signature

_____
Print Name and Title

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

AIRPORTS

SAMPLE FORMS

CONTRACT

THIS AGREEMENT, made this day of _____, by and between the STATE OF HAWAII, by its Director of Transportation, hereinafter referred to as "STATE", and «CONTRACTOR», «STATE_OF_INCORPORATON», whose business/post office address is «ADDRESS», hereinafter referred to as CONTRACTOR";

WITNESSETH: That for and in consideration of the payments hereinafter mentioned, the CONTRACTOR hereby covenants and agrees with the STATE to complete in place, furnish and pay for all labor and materials necessary for "«PROJECT_NAME_AND_NO»", or such a part thereof as shall be required by the STATE, the total amount of which labor, material and construction shall be computed at the unit and/or lump sum prices set forth in the attached proposal schedule and shall be the sum of «BASIC»----DOLLARS ($«BASIC_NUMERIC») as follows:

SAMPLE

TOTAL AMOUNT FOR COMPARISON OF BIDS……$«BASIC_NUMERIC»

which sum shall be provided from State funds, all in accordance with the specifications, the special provisions, if any, the notice to bidders, the instructions to bidders, the proposal and plans for «PROJECT_NO_ONLY», and any supplements thereto, on file in the office of the Director of Transportation. These documents, together with all alterations, amendments, and additions thereto and deductions therefrom, are attached hereto or incorporated herein by reference and made a part of this contract.

The CONTRACTOR hereby covenants and agrees to complete such construction within «WORKING_DAYS» from the date indicated in the Notice to Proceed from the State subject, however, to such extensions as may be provided for in writing under the specifications.

For and in consideration of the covenants, undertakings and agreements of the CONTRACTOR herein set forth and upon the full and faithful performance thereof by the CONTRACTOR, the STATE hereby agrees to pay the CONTRACTOR the sum of «BASIC»---DOLLARS ($«BASIC_NUMERIC») in lawful money, but not more than such part of the same as is actually earned according to the STATE's determination of the actual quantities of work performed and materials furnished by the CONTRACTOR at the unit or lump sum prices set forth in the attached proposal schedule. Such payment, including any extras, shall be made, subject to such additions or deductions hereto or hereafter made in the manner and at the time prescribed in the specifications and this contract.

An additional sum of «EXTRAS»-----DOLLARS ($«EXTRA_NUMERIC») is hereby provided for extra work.

SAMPLE

All words used herein in the singular shall extend to and include the plural. All words used in the plural shall extend to and include the singular. The use of any gender shall extend to and include all genders.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed the day and year first above written.

STATE OF HAWAII

_____
Director of Transportation

«CONTRACTOR» (Seal)

_____
Signature

_____
Print name

_____
Print Title

_____
Date

SAMPLE

PERFORMANCE BOND (SURETY)
(6/21/07)

KNOW TO ALL BY THESE PRESENTS:

That _____,
(Full Legal Name and Street Address of Contractor)

as Contractor, hereinafter called Principal, and _____

_____
(Name and Street Address of Bonding Company)

as Surety, hereinafter called Surety, a corporation(s) authorized to transact business as a surety in the State of Hawaii, are held and firmly bound unto the _____,
(State/County Entity)

its successors and assigns, hereinafter called Obligee, in the amount of _____

_____
DOLLARS ($_____), to which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above-bound Principal has signed a Contract with Obligee on _____, for the following project:_____
_____
_____
_____
_____
_____
hereinafter called Contract, which Contract is incorporated herein by reference and made a part hereof.

NOW THEREFORE, the condition of this obligation is such that:

If the Principal shall promptly and faithfully perform, and fully complete the Contract in strict accordance with the terms of the Contract as said Contract may be modified or amended from time to time; then this obligation shall be void; otherwise to remain in full force and effect.

Surety to this Bond hereby stipulates and agrees that no changes, extensions of time, alterations, or additions to the terms of the Contract, including the work to be performed thereunder, and the specifications or drawings accompanying same, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such changes, extensions of time, alterations, or additions, and agrees that they shall become part of the Contract.

In the event of Default by the Principal, of the obligations under the Contract, then after written Notice of Default from the Obligee to the Surety and the Principal and subject to the limitation of the penal sum of this bond, Surety shall remedy the Default, or take over the work to be performed under the Contract and complete such work, or pay moneys to the Obligee in satisfaction of the surety's performance obligation on this bond.

Signed this _____ day of _____, _____.

(Seal) _____
Name of Principal (Contractor)

* _____
Signature

_____
Title

(Seal) _____
Name of Surety

* _____
Signature

_____
Title

*ALL SIGNATURES MUST BE ACKNOWLEDGED
BY A NOTARY PUBLIC

PERFORMANCE BOND

KNOW TO ALL BY THESE PRESENTS:

That we, _____
(full legal name and street address of Contractor)

as Contractor, hereinafter called Contractor, is held and firmly bound unto the

_____
(State/County entity)

its successors and assigns, as Obligee, hereinafter called Obligee, in the amount

_____DOLLARS $_____),
(Dollar amount of Contract)

lawful money of the United States of America, for the payment of which to the said Obligee, well and truly to be made, Contractor binds itself, its heir, executors, administrators, successors and assigns, firmly by these presents. Said amount is evidenced by:

☐ **Legal Tender**;

☐ **Share Certificate** unconditionally assigned to or made payable at sight to _____
Description:_____;

☐ **Certificate of Deposit**, No. _____, dated _____ issued by _____ drawn on _____ a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

☐ **Cashier's Check** No. _____, dated _____ drawn on _____ a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

☐ **Teller's Check** No. _____, dated _____ drawn on _____ a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

☐ **Treasurer's Check** No. _____, dated _____ drawn on _____ a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

☐ **Official Check** No. _____, dated _____ drawn on _____ a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

☐ **Certified Check** No. _____, dated _____ accepted by a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

WHEREAS:

The Contractor has by written agreement dated _____ entered into a contract with Obligee for the following Project:_____

_____

hereinafter called Contract, which Contract is incorporated herein by reference and made a part hereof.

NOW THEREFORE,

The Condition of this obligation is such that, if Contractor shall promptly and faithfully perform the Contract in accordance with, in all respects, the stipulations, agreements, covenants and conditions of the Contract as it now exists or may be modified according to its terms, and shall deliver the Project to the Obligee, or to its successors or assigns, fully completed as in the Contract specified and free from all liens and claims and without further cost, expense or charge to the Obligee, its officers, agents, successors or assigns, free and harmless from all suits or actions of every nature and kind which may be brought for or on account of any injury or damage, direct or indirect, arising or growing out of the doing of said work or the repair or maintenance thereof or the manner of doing the same or the neglect of the Contractor or its agents or servants or the improper performance of the Contract by the Contractor or its agents or servants or from any other cause, then this obligation shall be void; otherwise it shall be and remain in full force and effect.

AND IT IS HEREBY STIPULATED AND AGREED that suit on this bond may be brought before a court of competent jurisdiction without a jury, and that the sum or sums specified in the said Contract as liquidated damages, if any, shall be forfeited to the Obligee, its successors or assigns, in the event of a breach of any, or all, or any part of, covenants, agreements, conditions, or stipulations contained in the Contract or in this bond in accordance with the terms thereof.

The amount of this bond may be reduced by and to the extent of any payment or payments made in good faith hereunder.

Signed and sealed this _____ day of _____, _____.

(Seal)_____
Name of Contractor

_____
Signature*

_____
Title

*ALL SIGNATURES MUST BE ACKNOWLEDGED
BY A NOTARY PUBLIC

LABOR AND MATERIAL PAYMENT BOND (SURETY)
(6/21/07)

KNOW TO ALL BY THESE PRESENTS:

That _____,
(Full Legal Name and Street Address of Contractor)

as Contractor, hereinafter called Principal, and _____

_____,
(Name and Street Address of Bonding Company)
as Surety, hereinafter called Surety, a corporation(s) authorized to transact business as a surety in the State of Hawaii, are held and firmly bound unto the _____,
(State/County Entity)

its successors and assigns, hereinafter called Obligee, in the amount of _____

_____
_____ Dollars ($_____), to which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above-bound Principal has signed Contract with the Obligee on _____ for the following project:_____
_____
_____
_____
_____
hereinafter called Contract, which Contract is incorporated herein by reference and made a part hereof.

NOW THEREFORE, the condition of this obligation is such that if the Principal shall promptly make payment to any Claimant, as hereinafter defined, for all labor and materials supplied to the Principal for use in the performance of the Contract, then this obligation shall be void; otherwise to remain in full force and effect.

1. Surety to this Bond hereby stipulates and agrees that no changes, extensions of time, alterations, or additions to the terms of the Contract, including the work to be performed thereunder, and the specifications or drawings accompanying same, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such changes, extensions of time, alterations, or additions, and agrees that they shall become part of the Contract.

2. A "Claimant" shall be defined herein as any person who has furnished labor or materials to the Principal for the work provided in the Contract.

Every Claimant who has not been paid amounts due for labor and materials furnished for work provided in the Contract may institute an action against the Principal and its Surety on this bond at the time and in the manner prescribed in Section 103D-324, Hawaii Revised Statutes, and have the rights and claims adjudicated in the action, and judgment rendered thereon; subject to the Obligee's priority on this bond. If the full amount of the liability of the Surety on this bond is insufficient to pay the full amount of the claims, then after paying the full amount due the Obligee, the remainder shall be distributed pro rata among the claimants.

Signed this _____ day of _____, _____.

(Seal) _____
Name of Principal (Contractor)

* _____
Signature

_____
Title

(Seal) _____
Name of Surety

* _____
Signature

_____
Title

*ALL SIGNATURES MUST BE ACKNOWLEDGED
BY A NOTARY PUBLIC

CHAPTER 104, HRS COMPLIANCE CERTIFICATE

The undersigned bidder does hereby certify to the following:

1. Individuals engaged in the performance of the contract on the job site shall be paid:

A. Not less than the wages that the director of labor and industrial relations shall have determined to be prevailing for corresponding classes of laborers and mechanics employed on public works projects; and

B. Overtime compensation at one and one-half times the basic hourly rate plus fringe benefits for hours worked on Saturday, Sunday, or a legal holiday of the State or in excess of eight hours on any other day.

2. All applicable laws of the federal and state governments relating to workers' compensation, unemployment compensation, payment of wages, and safety shall be fully complied with.

DATED at Honolulu, Hawaii, this _____ day of _____, 20___.

«CONTRACTOR»
Name of Corporation, Partnership, or Individual

Signature and Title of Signer

Notary Seal
NOTARY ACKNOWLEDGEMENT

Subscribed and sworn before me this
_____day of_____
Notary signature_____
Notary public, State of _____
My Commission Expires:_____

Notary Seal
NOTARY CERTIFICATION

Doc. Date: _____ #Pages: ____
Notary Name: _____ _____Circuit
Doc. Description: _____

_____
Notary signature_____
Date _____

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL BY THESE PRESENTS:

That we, _____
(full legal name and street address of Contractor)

as Contractor, hereinafter called Contractor, is held and firmly bound unto _____
(State/County entity)

its successors and assigns, as Obligee, hereinafter called Obligee, in the amount

_____DOLLARS ($_____),
(Dollar amount of Contract)

lawful money of the United States of America, for the payment of which to the said Obligee, well and truly to be made, Contractor binds itself, its heir, executors, administrators, successors and assigns, firmly by these presents. Said amount is evidenced by:

- ☐ **Legal Tender**;

- ☐ **Share Certificate** unconditionally assigned to or made payable at sight to_____
  Description:_____

- ☐ **Certificate of Deposit, No.** _____, dated _____
  issued by _____
  drawn on _____
  a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

- ☐ **Cashier's Check No.** _____, dated _____
  drawn on _____
  a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

- ☐ **Teller's Check No.** _____, dated _____
  drawn on _____
  a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

- ☐ **Treasurer's Check No.** _____, dated _____
  drawn on _____
  a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

- ☐ **Official Check No.** _____, dated _____
  drawn on _____
  a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

- ☐ **Certified Check No.** _____, dated _____
  accepted by a bank, savings institution or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, payable at sight or unconditionally assigned to _____;

WHEREAS:

The Contractor has by written agreement dated _____ entered into a contract with Obligee for the following Project:_____

_____

hereinafter called Contract, which Contract is incorporated herein by reference and made a part hereof.

NOW THEREFORE,

The condition of this obligation is such that, if Contractor shall promptly and faithfully perform the Contract in accordance with, in all respects, the stipulations, agreements, covenants and conditions of the Contract as it now exists or may be modified according to its terms, free from all liens and claims and without further cost, expense or charge to the Obligee, its officers, agents, successors or assigns, free and harmless from all suits or actions of every nature and kind which may be brought for or on account of any injury or damage, direct or indirect, arising or growing out of the doing of said work or the repair or maintenance thereof or the manner of doing the same or the neglect of the Contractor or its agents or servants or the improper performance of the Contract by the Contractor or its agents or servants or from any other cause, then this obligation shall be void; otherwise it shall be and remain in full force and effect.

AND IT IS HEREBY STIPULATED AND AGREED that suit on this bond may be brought before a court of competent jurisdiction without a jury, and that the sum or sums specified in the said Contract as liquidated damages, if any, shall be forfeited to the Obligee, its successors or assigns, in the event of a breach of any, or all, or any part of, covenants, agreements, conditions, or stipulations contained in the Contract or in this bond in accordance with the terms thereof.

AND IT IS HEREBY STIPULATED AND AGREED that this bond shall inure to the benefit of any and all persons entitled to file claims for labor performed or materials furnished in said work so as to give any and all such persons a right of action as contemplated by Sections 103D-324(d) and 103D-324(e), Hawaii Revised Statutes.

The amount of this bond may be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payments of mechanics' liens which may be filed of record against the Project, whether or not claim for the amount of such lien be presented under and against this bond.

Signed this _____ day of _____, _____.

(Seal) _____
Name of Contractor

* _____
Signature

_____
Title

*ALL SIGNATURES MUST BE
ACKNOWLEDGED BY A NOTARY PUBLIC

PROVISIONS TO BE INCLUDED IN CONSTRUCTION PROCUREMENT SOLICITATIONS

1. Definitions for terms used in HRS Chapter 103B as amended by Act 192, SLH 2011:

   a. "Contract" means contracts for construction under 103D, HRS.

   b. "Contractor" has the same meaning as in Section 103D-104, HRS, provided that "contractor" includes a subcontractor where applicable.

   c. "Construction" has the same meaning as in Section 103D-104, HRS.

   d. "General Contractor" means any person having a construction contract with a governmental body.

   e. "Procurement Officer" has the same meaning as in Section 103D-104, HRS.

   f. "Resident" means a person who is physically present in the State of Hawai'i at the time the person claims to have established the person's domicile in the State of Hawai'i and shows the person's intent is to make Hawai'i the person's primary residence.

   g. "Shortage trade" means a construction trade in which there is a shortage of Hawai'i residents qualified to work in the trade as determined by the Department of Labor and Industrial Relations.

2. HRS Chapter 103B as amended by Act 192, SLH 2011–Employment of State Residents Requirements:

   a. A Contractor awarded a contract shall ensure that Hawai'i residents comprise not less than 80% of the workforce employed to perform the contract work on the project. The 80% requirement shall be determined by dividing the total number of hours worked on the contract by Hawai'i residents, by the total number of hours worked on the contract by all employees of the Contractor in the performance of the contract. The hours worked by any Subcontractor of the Contractor shall count towards the calculation for this section. The hours worked by employees within shortage trades, as determined by the Department of Labor and Industrial Relations (DLIR), shall not be included in the calculation for this section.

EXHIBIT 1

b. Prior to award of a contract, an Offeror/Bidder may withdraw an offer/bid without penalty if the Offeror/Bidder finds that it is unable to comply with HRS Chapter 103B as amended by Act 192, SLH 2011.

c. Prior to starting any construction work, the Contractor shall submit the subcontract dollar amount for each of its Subcontractors.

d. The requirements of this section shall apply to any subcontract of $50,000 or more in connection with the Contractor; that is, such Subcontractors must also ensure that Hawai'i residents comprise not less than 80% of the Subcontractor's workforce used to perform the subcontract.

e. The Contractor and any Subcontractor whose subcontract is $50,000 or more shall comply with the requirements of HRS Chapter 103B as amended by Act 192, SLH 2011.

1) Certification of compliance shall be made in writing under oath by an officer of the General Contractor and applicable Subcontractors and submitted with the final payment request.

2) The certification of compliance shall be made under oath by an officer of the company by completing a "Certification of Compliance for Employment of State Residents" form and executing the Certificate before a licensed notary public.

3) In addition to the certification of compliance as indicated above, the Contractor and Subcontractors shall maintain records such as certified payrolls for laborers and mechanics who performed work at the site and time sheets for all other employees who performed work on the project. These records shall include the names, addresses and number of hours worked on the project by all employees of the Contractor and Subcontractor who performed work on the project to validate compliance with HRS Chapter 103B as amended by Act 192, SLH 2011. The Contractor and Subcontractors shall retain these records and provide access to the State for a minimum period of four (4) years after the final payment, except that if any litigation, claim, negotiation, investigation, audit or other action involving the records has been started before the expiration of the four-year period, the Contractor and Subcontractors shall retain the records until completion of the action and resolution of all issues that arise from it, or until the end of the four-year period, whichever occurs later. Furthermore, it shall be the Contractor's responsibility to enforce compliance with this provision by any Subcontractor.

f. A General Contractor or applicable Subcontractor who fails to comply with this section shall be subject to any of the following sanctions:

1) With respect to the General Contractor, withholding of payment on the contract until the Contractor or its Subcontractor complies with HRS Chapter 103B as amended by Act 192, SLH 2011.

2) Proceedings for debarment or suspension of the Contractor or Subcontractor under Hawai'i Revised Statues §103D-702.

3. Conflict with Federal Law: This section shall not apply if the application of this section is in conflict with any federal law, or if the application of this section will disqualify the State from receiving Federal funds or aid.

CERTIFICATION OF COMPLIANCE
FOR
EMPLOYMENT OF STATE RESIDENTS
HRS CHAPTER 103B, AS AMENDED BY ACT 192, SLH 2011

Project Title: _____

Agency Project No: _____

Contract No.: _____

As required by Hawai'i Revised Statutes Chapter103B, as amended by Act 192, Session Laws of Hawaii 2011–Employment of State Residents on Construction Procurement Contracts, I hereby certify under oath, that I am an officer of _____ and
(Name of Contractor or Subcontractor Company)
for the Project Contract indicated above, _____ was in
(Name of Contractor or Subcontractor Company)
compliance with HRS Chapter 103B, as amended by Act 192, SLH 2011, by employing a workforce of which not less than eighty percent are Hawai'i residents, as calculated according to the formula in the solicitation, to perform this Contract.

☐ I am an officer of the **Contractor** for this contract.

☐ I am an officer of a **Subcontractor** for this contract.

CORPORATE SEAL

_____
(Name of Company)

_____
(Signature)

_____
(Print Name)

_____
(Print Title)

Subscribed and sworn to me before this
_____ day of _____, 2011.

_____
Notary Public, 1st Circuit, State of Hawai'i
My commission expires: _____

Doc. Date: _____ # of Pages_____ 1st Circuit
Notary Name: _____
Doc. Description: _____
_____
_____

_____
Notary Signature Date
NOTARY CERTIFICATION

EXHIBIT 2