

**INVITATION TO BID**  
**Project No.**

**, AK**



**State of Alaska**  
**Department of Military and Veterans Affairs**  
**Facilities Management Office**  
**PO Box 5169, JBER, Alaska 99505**

**Bids Due:**

**@ 1:00 P.M. Alaska time**



THE STATE  
of **ALASKA**  
GOVERNOR MIKE DUNLEAVY

**Department of Labor and  
Workforce Development**

P.O. Box 111149  
Juneau, Alaska 99811-1149  
Main: 907.465.2700, Fax: 907.465.2764

**Department of Transportation  
and Public Facilities**

P.O. Box 112500  
Juneau, Alaska 99811-2500  
Main: 907.465.3900, Fax: 907.586.8365

Dear Prospective Contractor:

If you are considering bidding on an Alaska public works project, please remember the positive benefits of hiring locally. Construction, maintenance, and operation of public works projects are vital to the economic health of Alaska, and good paying jobs associated with such projects are important to Alaskans throughout the state.

If you want to hire more Alaskans, we're here to help. Hiring local workers is cost-effective and can benefit your business in many ways. The Alaska Department of Labor and Workforce Development's Job Center staff can connect you with qualified, skilled Alaskan workers through the Alaska Labor Exchange (ALEXsys) employee/employer database. Call (907) 465-2712 to get connected with a Job Center and potential employees in your community.


Work Opportunity Tax Credits (WOTC) are available to employers who hire qualified new employees who are unemployed disabled veterans, recipients of Temporary Assistance or food stamps, ex-offenders, and residents of Empowerment Zones or Renewal Communities. The WOTC program saved employers operating in Alaska over \$3.2 million last year. For information on the tax credit program call (907) 465-5952 or visit the WOTC website, [www.jobs.alaska.gov/wotc.htm](http://www.jobs.alaska.gov/wotc.htm).

The Department of Transportation and Public Facilities, the Department of Labor and Workforce Development, the Alaska Native Coalition on Employment and Training (ANCET), and other industry training providers work closely together to recruit women, Alaska Natives, minorities and veterans for training and job referral. We can assist your business in finding qualified employees right now, as well as help you institute training programs to ensure a stable and skilled workforce over the long term. There are many high school and adult training programs across the state that prepare Alaska residents for construction jobs and to learn a trade as a registered apprentice. Alaska has over 1,500 registered apprentices and our job centers can assist employers that want to hire apprentices. Alaska's prevailing wage is adjusted to allow employers to pay apprentices at a reduced rate while they are learning their trade, offsetting your costs of training the apprentice. Additionally, there are on-the-job training wage incentives available for employers that hire apprentices.

If you are awarded a contract, we will send you additional information on the business benefit of hiring locally and how to use the free Alaska Labor Exchange System to find qualified Alaska residents. Your effort to hire locally is appreciated very much. We wish you well in the upcoming construction season and thank you for putting Alaskans to work.

Sincerely,

  
Cathy Muñoz, Acting Commissioner  
Department of Labor  
and Workforce Development

  
Ryan Anderson, P.E., Commissioner  
Department of Transportation  
and Public Facilities

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STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**INVITATION TO BID**  
for Construction Contract

Date \_\_\_\_\_

Project Name and Number \_\_\_\_\_

The Department invites bidders to submit bids for furnishing all labor, equipment, and materials and performing all work for the project described below. The Department will only consider bids received **before 1:00 PM local time (per the Department's time source) on the** \_\_\_\_\_

Location of Project: \_\_\_\_\_  
Contracting Officer: \_\_\_\_\_  
Issuing Office: \_\_\_\_\_

Description of Work: \_\_\_\_\_ State Funded  Federal Aid

The Engineer's Estimate is \_\_\_\_\_

All work shall be completed in \_\_\_\_\_ Calendar Days, or by \_\_\_\_\_.  
The Department will identify interim completion dates, if any, in the Special Provisions.

The apparent successful bidder must furnish a payment bond in the amount of 100% of the contract and a performance bond in the amount of 100% of the contract as security conditioned for the full, complete and faithful performance of the contract. The apparent successful bidder must execute the said contract and bonds within fifteen calendar days, or such further time as may be allowed in writing by the Contracting Officer, after receiving notification of the acceptance of their bid.

**Submission of Bidding Documents**

Bidders may submit bidding documents electronically via the Department's approved online bidding service, through the mail or hand delivered. For mailed or hand delivered bids and for electronically submitted bids with a paper bid guaranty, documents shall be submitted in a sealed envelope marked as follows:

Bidding Documents for Project:	ATTN:
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It is incumbent upon the bidder to ensure its bid, any amendments, and/or withdrawal arrive, in its entirety, at the location and before the deadline stated above. A bidder sending a bid amendment or withdrawal via email or fax must transmit its documentation to the Department at this email address: [mvafmocontracts@alaska.gov](mailto:mvafmocontracts@alaska.gov)

To be responsive, a bid must include a bid BOND equal to 5% of the amount bid. *(When calculating the bid amount for purposes of determining the 100% value of the bid guaranty, a bidder shall include its base bid amount, plus the amount bid for alternate and supplemental bid items, if any.)*

The Department hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this Invitation, Disadvantaged Business Enterprises will be afforded full opportunity to submit bids and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

## NOTICE TO BIDDERS

### The Engineer's Estimate is:

The following data may assist bidders in preparing their bid:

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If a bidder has any questions related to procurement, design, constructability, quantities, or other technical aspects of this project, it must direct its inquiries in writing via email with "Project Number \_\_\_\_\_" in the subject line to: [mvafmocontracts@alaska.gov](mailto:mvafmocontracts@alaska.gov)

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A bidder requesting assistance in viewing the project site must make arrangements at least 48 hours in advance.

The point of contact for inquiries for this project is \_\_\_\_\_.

Email: \_\_\_\_\_ Phone: \_\_\_\_\_

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A bidder may direct questions concerning bidding procedures and requirements to:

Email: \_\_\_\_\_ Phone: \_\_\_\_\_

- 
1. The contractor shall ensure that all necessary permits are filled out if work that involves ground disturbance occurs on Joint Base Elmendorf-Richardson:
    - a. A Dig Permit is required and must be submitted to the project manager before any ground disturbance occurs on JBER,
    - b. A Construction General Permit (CGP) is required and must be submitted to the project manager before ground disturbance equaling one (1) acre or more occurs on JBER,
    - c. A Storm Water Pollution Prevention Plan (SWPPP) is required and must be submitted to the project manager before ground disturbance equaling three (3) acres or more occurs on JBER.

Other Information:

# GENERAL REQUIREMENTS

## PART 1 – GENERAL REQUIREMENTS

### 1.01 RELATED REQUIREMENTS

A. All contract documents are related to this Section.

### 1.02: WORK COVERED BY CONTRACT

A. Work under this Contract includes providing all design, a set of engineered drawings pertaining to this project in PDF format, materials, equipment, permits, tools, labor, travel, licenses, insurance, disposal, and all other expenses to complete the project detailed herein. All work must be completed in accordance with the terms and conditions of the Contract Documents.

### 1.03: Asphalt maintenance & repair:

A. Power wash the asphalt area that is shown on the marked-up map in the attachments, identify & repair all cracks then seal asphalt. Materials & methods used for crack repair and sealing must be in accordance to the “Department of Defense” (DOD) manual in attachment number #1.

C. Re-stripe the asphalt surface, striping must match original striping. All material & methods used must comply to the “Department of Defense” (DOD) manual in attachment number #1.

D. Remove built up sediment from inside the aircraft tie-downs and grounding points, contractor must ensure that they are fully operational.

### 1.04: Concrete Sidewalk & Curb Repair:

A. Contractor shall repair all sidewalks & curbs that are identified on the attached marked-up map.

B. All material & methods used, shall comply with the “Department of Defense” (DOD) manual that is in attachment number #1.

**1.05:** Contractor shall coordinate all work activity with the FMO project manager prior to commencement of the work. This is an active airfield & access is restricted.

## **Bid Alternates**

**Bid Alt # 1**

**Bid Alt # 2**

**Bid Alt # 3**

**Bid Alternates Continuation Page**

**Bid Alt # 4**

**Bid Alt # 5**

**Bid Alt # 6**

- D. Contractor must comply with all applicable Federal, State, and Local Regulations and Requirements including but not limited to; Unified Facilities Criteria (UFC), OSHA, FFA, NEC, and NFPA.
- E. Hours of operations for this project will be determined by the Project Manager and can change with no-notice due to mission requirements at no cost to the State.

**1.03 CONTRACT**

- A. Construct the Work under a single lump sum Contract.

**1.04 WORK BY OTHERS**

- A. Other State projects may be scheduled to be under construction in the vicinity of the project.
- B. Cooperate with other Contractors, Department Consultants, and the DMVA to minimize conflict with construction operations.

**1.05 WORK SEQUENCE AND MILESTONES**

- A. A pre-bid walk through to understand and familiarize with existing site conditions may be mandatory. See the Scope Of Work for details.

Base passes for projects on a military installation can be scheduled with the project manager no sooner than 48 hours in advance:

Name:

Phone:

Email:

Walk-through:

If you need base access, email

- B. Upon receipt of Notice to Proceed (NTP) the CONTRACTOR will be expected to prepare submittals, a detailed project schedule and obtain required permits and line locates.
- C. All work shall be substantially complete by \_\_\_\_\_.
- D. This is an active facility all work shall be coordinated with the Project Manager to minimize disruption to daily activities and to provide uninterrupted building access.

**1.06 CONTRACTOR USE OF THE PREMISES**

- A. Coordinate use of the premises under direction of DMVA.
- B. Assume full responsibility for the protection of the facility, roads and grounds in the project vicinity from construction related activities.
- C. Obtain permission and pay for use of additional storage, Work or parking areas needed for construction operations.

- D. Any outage must be notified to the project manager at least \_\_\_\_\_ prior.
- E. The project Site shall be kept clean and organized. Stored materials must always be secured and Foreign Object Debris (FOD) picked up daily.

### 1.07 SECURITY REQUIREMENTS

- A. When Contractor considers Work has reached Final Completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and request Department of Military and Veterans Affairs perform final inspection.
- B. In addition to submittals required by the conditions of the Contract, provide submittals required by governing authorities, and submit a Final Statement of Accounting giving total Contract Price and sum due.

### 1.08 DELAY DAMAGES

- A. Failure to Meet Substantial Completion Date: All work must be substantially complete by \_\_\_\_\_. For each calendar day that the work is not Substantially Complete, after the expiration of the Contract Time or the Substantial Completion dates have passed. The DEPARTMENT shall deduct \_\_\_\_\_ a day from progress payments.
- B. Failure to Meet Final Completion Date: All work must be finally complete by \_\_\_\_\_. For each calendar day that the work is substantially complete, but the project is not at Final Completion, after the Final Completion Date has passed, the DEPARTMENT shall deduct \_\_\_\_\_ from progress payments.
- C. If no money is due the CONTRACTOR, the DEPARTMENT shall have the right to recover these sums from the CONTRACTOR, from the Surety, or from both. These are liquidated damages and not penalties. These charges shall reimburse the DEPARTMENT for its additional administrative expenses incurred due to CONTRACTOR'S failure to complete the work within the time specified.
- D. Permitting the CONTRACTOR to continue and finish the work or any part of it after the Contract time has elapsed or the completion date has passed does not waive the DEPARTMENT'S rights to collect liquidated damages under this section.

## PART 2 – PRODUCTS

- A. Submit product data to project manager for approval prior to installation for all materials being installed.

### **PART 3 – EXECUTION**

1. All materials and debris removed during project will be the responsibility of the contractor to remove from job site for proper disposal. Arrangement of Dumpster for disposal of debris is the contractor's responsibility.
2. All materials and debris must be stored and disposed in the designated areas only to ensure safe operations. Continuous policing of debris is mandatory to allow continued safe operative environment.
3. Contractors must comply with OSHA Safety Standards, clean the work area on a daily basis and, provide safety barriers, dust control and access to be maintained during the project.
4. When applicable, the contractor must perform a documented hazardous material survey, and notify the DMVA Environmental Program Specialist, for removal and disposal hazardous material and hazardous waste generated. All hazardous materials must be removed before demolition.
5. Hazardous Material may include:
  - Lead-based paint;
  - Asbestos containing materials, such as insulation, ceiling or floor tiles, mastics, grout, roofing or siding, etc.;
  - Mercury in switches, thermostats, electronics, fluorescent bulbs, and other equipment;
  - Chlorofluorocarbons (CFCs) or other harmful chemicals in old refrigerators, air conditioners, and aerosol cans;
  - Polychlorinated biphenyls (PCBs) in transformers, lubricants, paints, and sealants;
  - Potentially toxic household or agricultural chemicals, including certain paints, cleaning products, and pesticides.
6. Contractors must store any construction equipment holding petroleum, oil, or lubricants on impervious surfaces whenever possible. Spill kits must be accessible during construction and if there is a spill, personnel must follow the DMVA Installation Spill Contingency Plan (ISCP). See enclosed ISCP.

## **PART 4 – ENVIRONMENTAL REQUIREMENTS**

## **PART 5 – ATTACHMENTS**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

**END OF SECTION**

# Environmental Requirements

**DEPARTMENT OF THE ARMY ALASKA ARMY NATIONAL GUARD ELEMENT, JOINT FORCES HEADQUARTERS 49000 ARMY GUARD ROAD JOINT BASE ELMENDORF - RICHARDSON AK 99505-0800**

2 June 2025

MEMORANDUM FOR RECORD

SUBJECT: Environmental MFR for BAAF Hangar 4 & 6 Ramp Repairs and Striping Project.

1. Asbestos was a common additive in concrete poured prior to 1990 on JBER. Sampling is recommended in areas where work will disturb this material. The contractor must notify the Project Manager or DMVA-CFMO Environmental staff immediately if ACM is encountered and the following applies:

a. Contractor or Subcontractor must be accredited as an Asbestos Hazard Emergency Response Act (AHERA) Management Planner and Inspector.

b. The credentials of the Contractor must be vetted. They should submit their resume and training credentials to CFMO-DMVA Project Manager for review.

c. Samples must be sent to an EPA accredited laboratory for analysis.

d. A work plan must be submitted prior to the work beginning detailing how the Contractor will handle asbestos if encountered and include the following: Dust mitigation methods, Safety measures in compliance with 29 CFR 1926.62, Sampling and disposal plan, adherence to all JBER requirements, including JBER Solid Waste Management Plan and the JBER Integrated Hazardous Materials Plan, NESHAP Notification in accordance with 40 CFR 61.145.

e. A final report must be submitted to CFMO-DMVA Project Manager detailing the work that was done and include the manifest and disposal receipts. This is a must because CFMO-DMVA Environmental have annual Tier II EPCRA reporting requirements.

2. Airfield Striping shall adhere to Unified Facilities Criteria (UFC) 3-260-02 Pavement Designs for Airfields. Aircraft mooring points are required to meet UFC- 3-260-01 Airfield and Heliport Planning and Design. Ground Points are required to meet UFC 3-575-01 Lighting and Static Electricity.

3. Pressure washing may create excess water that will flow off from the facility. Flow should be identified, and waddles should be put in place to catch any discharge.

4. If any new concrete is poured a concrete washout point should be identified prior to the placement of concrete and waddles should be placed around to reduce the discharge of concrete or wash water to the environment.

5. Sealing and striping that occurs shall be conducted with a consideration of precipitation or snowmelt and the potential for run-off from the property or drift from the wind.

Contractor shall apply product when weather is appropriate. Mitigation shall be provided against any potential runoff including the placement of boom or waddles as appropriate to prevent any potential run-off of applied sealant. If the Contractor plans to use a herbicide to kill weeds or any other vegetation that is growing out of cracks, the Integrated Pest Management Coordinator must be notified (907-428-7157) to approve herbicide product prior to application.

6. BAAF has a Spill Prevention, Control, and Countermeasure (SPCC) plan. The Contractor shall adhere at least to the standards and contingencies withing the SPCC.

7. The AKARNG/DMVA CFMO Environmental Hazardous Waste Program Manager does not anticipate any issues concerning reportable releases of hazardous substances as specified in 40 CFR 302 for the project. It is the Contractor's responsibility to remove all construction debris and wastes generated from project activities in accordance with JBER, State, Federal and local regulations. All military, civilian, and Contractor personnel operating on JBER must abide by the most current version of the JBER Integrated Solid Waste Management Plan. Non-hazardous waste must be disposed at a permitted RCRA Subtitle D landfill. The Contractor must adhere to JBER's Integrated Hazardous Material Plan due to DMVA and AKARNG being a tenant on Air Force land. If the Contractor has questions about waste disposal, reach out to JBER 673rd Non-Hazardous Solid Waste Program Manager at (907) 384-7854. A copy of the signed waste manifest must be sent to DMVA-FMO Environmental Section Hazardous Waste Program Manager (907-428-7182).

8. If there will be ground disturbance, the Contractor shall prepare an Erosion and Sediment Control Plan (ESCP) if ground disturbance is less than an acre. A sample can be found on JBER's Water Quality website (<https://www.jber.jb.mil/Services-Resources/Environmental/Water-Quality>). The Contractor must also file for a Base Civil Engineer Work Clearance Request, the "dig permit". This is required by the Air Force for any work that disturbs the ground surface by any means on JBER. This request must be processed prior to the start of the work If ground disturbance (including equipment staging areas, maintenance areas, and construction easements if they occur atop a soil surface

which has not been included in the calculation for area of soil disturbance) is an acre or greater, filing a Notice of Intent (NOI) under the Construction General Permit is required by Alaska Department of Environmental Conservation (ADEC) to comply with stormwater regulations and if the ground disturbance is three acres or greater, a Storm Water Pollution Prevention Plan is required in addition to the NOI. If the project is five or more acres.

9. The Contractor shall submit to the Project Manager a copy of the As-Builts in both PDF and AutoCAD DWG file formats when projects contain building or land modifications for DMVA-CFMO records.

10. Contractor is required to repair any disturbed ground surface. Joint Base Elmendorf-Richardson (JBER) authorization to apply hydroseed after 1 August is required. The Contractor shall use appropriate Seed Mix and application method in line with JBER Guidance. Contractor may submit an alternate seed mix when the specified seed is not commercially available. Provide a letter confirming the specified seed is not available. Include an agronomist certified seed mix design, including application rate, suited to the project site. Surface preparation must be completed before the seeding operation, including removing ruts, stumps, holes, humps, large stones, etc. Hydroseeding under fiber mats, especially in high traffic or sloped areas, can help to encourage growth. A Management Plan is required for hydroseed work to ensure proper application, growth and coverage. Monitoring and watering until 70% of the expected seed growth is established is required.

11. In the event of a spill, leak or any discharge of petroleum, oil, lubricants (POL), hazardous materials or hazardous waste during the contractor's operations the contractor shall report the spill to the Alaska Department of Environmental Conservation according to 18 AAC 75. In the event of a spill as described above the contractor shall be held responsible for all fines, response and remediation as required by ADEC under 18 AAC 75. A reportable spill is defined in 18 AAC 75.300. The contractor shall notify the Water Resource Program Manager and the Building Management Specialist in the event of a spill in addition to the above-mentioned reporting to ADEC.

12. Equipment, vehicles and spillable materials shall be staged and stored on impervious surfaces whenever possible. Staging areas will be identified and provided to the BMS and WRPM prior to mobilization. Secondary containment and drip pans shall be implemented to mitigate risk of spill from any of the contractor's equipment, vehicle or materials. The contractor shall provide and maintain spill response supplies on site sufficient to manage any incidental releases caused from construction activities. Any erodible materials or waste materials that are stored outside shall be covered by plastic or a non-erodible material and secured.

13. The Contractor shall use Best Management Practices to minimize fugitive dust emissions.

14. The point of contact for this action is Patrick Geary, National Environmental Policy Act (NEPA) Program Manager, 907-428-7157, or via email at [patrick.geary@alaska.gov](mailto:patrick.geary@alaska.gov).

Encl DONALD FLOURNOY

DMVA-FMO-ENV Environmental

Program Manager



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**REQUIRED DOCUMENTS**  
Federal-Aid Contracts

**REQUIRED FOR BID.** Bids will not be considered if the following documents are not completely filled out and submitted at the time of bidding:

**1. Bid Forms**

- a. Bid Cover Page
- b. Bid Schedule
- c. Bid Bond (as applicable) (25D-14)
- d. SUPPLEMENTAL REQUIREMENTS FOR DMVA \ FMD FEDERALLY FUNDED CONTRACTS 2013
- e. Bid Attachments (as applicable)
- f. Certificate of Buy American Compliance (Form 25D-151 or Form 25D-152)
- g. Bid Form (25D-9)

**REQUIRED FOR BID MODIFICATIONS.** Any bid revisions must be submitted by the bidder prior to bid opening. Use the following form to modify Manual (paper) bids:

**2. Bid Modification (Form 25D-16)**

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**REQUIRED AFTER NOTICE OF APPARENT LOW BIDDER.** The apparent low bidder is required to complete and submit the following documents within 5 working days after receipt of written notification:

1. Subcontractor List (Form 25D-5)
2. Summary of Good Faith Effort Documentation (Form 25A-332A), and Contact Reports (Form 25A-321A)
3. DBE Utilization Report (Form 25A-325C)
4. Prime Contractor's Written DBE Commitment (Form 25A-326) for each DBE to be used on the project.

**REQUIRED FOR BUY AMERICAN WAIVER REQUESTS.** When Certificate of Buy American Compliance (Form 25D-151 or 25D-152) indicates the bidder will request a waiver, the bidder is required to complete and submit the following documents within 5 working days after receipt of written notification:

5. Buy American Request for Type 3 Waiver (Form 25D-153) (contact contracting office if this form is needed)
6. Buy American Percentage (Form 25D-155) (contact contracting office if this form is needed)
7. Buy American Assembly Questionnaire (Form 25D-156) (contact contracting office if this form is needed)

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**REQUIRED FOR AWARD.** In order to be awarded the contract, the successful bidder must completely fill out and submit the following documents within the time specified in the intent to award letter:

1. Construction Contract (Form 25D-10A)
2. Payment Bond (Form 25D-12)
3. Performance Bond (Form 25D-13)
4. Contractor's Questionnaire (25D-8)
5. Certificate of Insurance (from carrier)
6. EEO-1 Certification (Form 25A-304)
7. Bidder Registration (Form 25D-6) Bidders must register annually with the Civil Rights Office in order to be eligible for award.
8. Certification Regarding Tax Delinquency and Felony Convictions (Form 25D-159)
9. Buy American Certificate (25D-61) (as applicable)

STATE OF ALASKA  
Department Of Military And Veterans Affairs

**INFORMATION TO BIDDERS**

This Information to Bidders outlines requirements that a bidder must follow when submitting a bid. The Department will reject a noncompliant bid.

**100.01 BIDDERS QUALIFICATIONS**

A bidder shall:

Submit evidence of a valid Department of Commerce, Community, and Economic Development certificate of Contractor Registration (Contractor Registration), under AS 08.18, and submit evidence of a valid Alaska Business License prior to award; and

When requested, submit a completed Contractor's Questionnaire (Form 25D-8) stating previous experience in performing comparable work, business and technical organization, financial resources, and equipment available to be used in performing the work.

Before a bid is considered for award, the bidder may be requested by the Department to submit a statement of facts, in detail, as to his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the contemplated work.

**100.02 CONTENTS OF BID PACKAGE**

Upon request, the Department will furnish prospective bidders with a bid package, at the price stated in the Invitation To Bid.

The bid package includes the following:

- 1) Location and description of the project;
- 2) Time in which the work must be completed;
- 3) Amount of the bid guaranty;
- 4) Date, time, and place when bids are due;
- 5) Plans and specifications; and
- 6) Bid forms.

Unless otherwise stated in the bid package, the Plans, Contract Provisions and Specifications, Standard Modifications, Special Provisions, permits, forms and any other documents designated in the bid package are considered a part of the bid whether attached or not.

**100.03 EXAMINATION OF CONTRACT REQUIREMENTS**

Bidders are responsible for carefully examining the plans, specifications and all other documents incorporated in the contract to determine the requirements thereof before preparing bids.

Any explanation desired by bidders regarding the meaning or interpretation of drawings and specifications must be requested in writing and with sufficient time allowed for a reply to reach them before the submission of their bids. Oral explanations or instructions given before the award of the contract will not be binding. Any interpretation made will be in the form of an addendum to the specifications or drawings and will be furnished to all bidders and its receipt by the bidder shall be acknowledged.

#### **100.04 CONDITIONS AT SITE OF WORK**

Bidders are responsible for visiting the site to ascertain pertinent local conditions such as the location, accessibility and character of the site, labor conditions, the character and extent of the existing work within or adjacent thereto, and any other work being performed thereon.

#### **100.05 PREPARATION OF BIDS**

A. A bidder shall prepare its bid using the Department provided bid forms or legible copies of the Department's forms.

The bid must be signed in ink by the person or persons authorized to sign the Contract for the bidder. If a bidder is a corporation, the bid must be signed by a corporate officer or agent with authority to bind the corporation. If a bidder is a partnership, a partner must sign. If the bidder is a joint venture, each principal member must sign. If a bidder is a sole proprietorship, the owner must sign. Each person signing the bid must initial any changes made to entries on the bid forms.

B. The bid schedule contains empty space(s) that call for the bidder to enter its proposed price for each corresponding item which may include unit price or lump sum items and alternative, optional or supplemental price schedules or a combination thereof which will result in a total bid amount for the proposed construction.

C. The bidder shall specify the price or prices bid in figures. On unit price contracts the bidder shall also show the products of the respective unit prices and quantities written in figures in the column provided for the purpose and the total amount of the proposal obtained by adding the amounts of the several items. All the figures shall be in ink or typed.

D. Neither conditional nor alternative bids will be considered unless called for.

#### **100.06 BID SECURITY**

All bids shall be accompanied by a bid security in the amount specified on the Invitation to Bid. The bid security shall be unconditionally payable to the State of Alaska and shall be in the form of an acceptable Bid Bond (Form 25D-14) made payable to the State of Alaska.

The surety of a Bid Bond may be any corporation or partnership authorized to do business in Alaska as an insurer under AS 21.09. A legible power of attorney shall be included with each Bid Bond (Form 25D-14).

A Bid Bond must be accompanied by a legible Power of Attorney.

An individual surety will not be accepted as a bid security.

#### **100.07 ADDENDA REQUIREMENTS**

The Department will issue addenda if it determines, in its discretion, that clarifications or changes to the Contract documents or bid due date are needed. The Department may send addenda by any reasonable method such as fax, email, or may post the addenda on its website or online bidding service. Unless picked up in person or included with the bid documents, addenda or notice that an addendum has been issued will be addressed to the individual or company to whom bidding documents were issued and sent to the email address or fax number on the plan holders' list. Notwithstanding the Department's efforts to distribute addenda, bidders are responsible for ensuring that they have received all addenda affecting the Invitation To Bid. Bidders must acknowledge all addenda on the Bid Forms, by fax, or by email before the deadline stated in the Invitation to Bid.

#### **100.08 DELIVERY OF BIDS**

Emailed bids are preferred or bids can be submitted in a sealed envelope. When bids are submitted in a sealed envelope, the envelope shall clearly indicate its contents and the address of the Department's designated contracts office, as specified on the Invitation to Bid. Bids for other work may not be included in the envelope. Faxed bids will not be considered, unless specifically called for in the Invitation to Bid.

#### **100.09 WITHDRAWAL OR REVISION OF BIDS**

Bids may be withdrawn or revised in writing delivered by mail, fax, or email, provided that the Department's designated office receives the withdrawal or revision before the deadline stated in the Invitation To Bid. Withdrawal requests must be signed and submitted by the bidder's duly appointed representative who is legally authorized to bind the bidder. Revisions shall include both the modification of the unit bid price and the total modification of each item modified but shall not reveal the amount of the total original or revised bids.

#### **100.10 PROTEST OF INVITATION TO BID**

An interested party, as defined in AS 36.30.699, may protest an Invitation to Bid before the bid opening in accordance with AS 36.30.560 and AS 36.30.565. The interested party must submit a protest to the Contracting Officer.

#### **100.011 RECEIPT AND OPENING OF BIDS**

The Department will only consider bids, revisions, and withdrawals received before the deadline stated in the Invitation to Bid.

The Department will assemble, open, and publicly announce bids at the time and place indicated in the Invitation to Bid, or as soon thereafter as practicable. The Department is not responsible for prematurely opening or for failing to open bids that are improperly addressed or identified.

#### **100.012 NONRESPONSIVE BIDS**

1. A bid shall be rejected as nonresponsive if it:
  - a. Is not properly signed by an authorized representative of the bidder and in a legally binding manner;
  - b. Contains unauthorized additions, conditional or alternative bids, or other irregularities that make the bid incomplete, indefinite, or ambiguous;
  - c. Includes a reservation of the right to accept or reject any award, or to enter into a contract pursuant to an award,
  - d. Fails to include an acceptable bid guaranty with the bid;
  - e. Is materially unbalanced; or
  - f. Fails to meet any other material requirement of the Invitation To Bid.
2. A bid may be rejected as nonresponsive, in the Department's discretion, if it:
  - a. Is not typed or completed in ink;
  - b. Fails to include an acknowledgement of receipt of each addendum by assigned number and date of issue; or
  - c. Is missing a bid price for any pay item, except when alternate pay items are authorized.

#### **100.013 BIDDERS INTERESTED IN MORE THAN ONE BID**

A party who has quoted prices to a bidder is not thereby disqualified from quoting prices to other bidders or from submitting a bid directly for the work.

#### **100.014 ELECTRONIC MAIL**

Within its submitted bid, a bidder must include a current electronic mail (email) address of bidder's representative who possesses authority to receive, process, and respond to Department emails regarding the advertised project.

The Department may send notices and information to a bidder by using the furnished email address of the bidder's authorized representative.

A bidder shall notify the Department if the bidder requests the Department to send email notices or information to an address different from the email address initially provided in its bid forms. The bidder shall notify the Department of such change by sending a request in writing to the Contract's point of contact identified on the Invitation to Bid that is signed by a representative who is authorized and empowered to legally bind the bidder.

Delivery of an email sent by the Department is complete upon receipt in the addressee's email account. An email sent after 4:30 pm shall be deemed to have occurred at the opening of business on the next working day.

If needed, the Department may demonstrate proof of email delivery by affidavit or certification that includes the following:

1. The date and time that the Department sent the email message;
2. The email address from which the Department sent the message;
3. The name and email address to which the Department sent the message;
4. A statement that the Department sent the email message and that the person signing the affidavit or certification believes the transmission to have been complete and without error; and
5. An attached copy of the subject email.

#### **100.015      CONSIDERATION OF BIDS**

Until the Award, the Department may reject any or all bids, waive minor informalities or advertise for new bids without liability to any bidder if the Department, in its discretion, determines that to do so is in the best interests of the State.

A bidder may request withdrawal of a bid after opening and before the Award only in accordance with AS 36.30.160(b) and State procurement regulations. The bidder must submit the request to the Contracting Officer.

An interested party, as defined in AS 36.30.699, may protest a proposed Award of contract as per AS 36.30.560 and AS 36.30.565. The bidder must submit the protest to the Contracting Officer.

**WHOLLY STATE-FUNDED PROJECTS.** On wholly state-funded projects, determination of the low bidder will include bidder preferences as required under AS 36.30.321, according to subsections 1-3 below. Alaska Bidder Preference, Alaska Veteran Preference, and Alaska Product Preference are not applicable on projects with federal funding.

1. Alaska Bidder Preference: A bidder claiming this preference shall provide with their bid an Alaska Bidder Preference Certification, certifying they qualify as an Alaska bidder eligible for Alaska Bidder Preference according to AS 36.30.

If the bidder qualifies as an Alaska bidder, a five percent (5%) preference will be applied to the price of the bid. "Alaska bidder" means a person who:

- a. holds a current Alaska business license;
- b. submits a bid for goods, services, or construction under the name as appearing on the person's current Alaska business license;

- c. has maintained a place of business within the state staffed by the bidder or an employee of the bidder for a period of six months immediately preceding the date of the bid;
  - d. is incorporated or qualified to do business under the laws of the state, is a sole proprietorship and the proprietor is a resident of the state, is a limited liability company organized under AS 10.50 and all members are residents of the state, or is a partnership under former AS 32.05, AS 32.06, or AS 32.11 and all partners are residents of the state; and
  - e. If a joint venture, is composed entirely of ventures that qualify under (a) through (d), above.
2. Alaska Veteran Preference: A bidder claiming this preference shall provide an Alaska Veteran Preference Certification, certifying they qualify as an Alaska bidder eligible for Alaska Veteran preference according to AS 36.30.

If a bidder qualifies as an Alaska bidder and is a qualifying entity, an Alaska Veteran Preference of 5 percent shall be applied to the bid price. The preference may not exceed \$5,000 (AS 36.30.321). A “qualifying entity” means a:

- a. sole proprietorship owned by an Alaska veteran;
- b. partnership under AS 32.06 or AS 32.11 if a majority of the partners are Alaska veterans;
- c. limited liability company organized under AS 10.50 if a majority of the members are Alaska veterans; or
- d. corporation that is wholly owned by individuals, and a majority of the individuals are Alaska veterans.

A preference under this section is in addition to any other preference for which the bidder qualifies.

To qualify for this preference, the bidder must add value by the bidder itself actually performing, controlling, managing and supervising a significant part of the services provided or the bidder must have sold supplies of the general nature solicited to other state agencies, governments, or the general public.

An Alaska veteran is a resident of Alaska who:

- 1) served in the Armed forces of the United States, including a reserve unit of the United States armed forces; or the Alaska Territorial Guard, the Alaska Army National Guard, the Alaska Air National Guard, or the Alaska Naval Militia; and
  - 2) was separated from service under a condition that was not dishonorable.
3. Alaska Product Preference: A bidder claiming this preference shall complete and sign the Alaska Product Preference Worksheet, according to the worksheet instructions, and submit the completed worksheet with their bid.

Except for timber, lumber and manufactured lumber products used in the construction project under AS 36.30.322(b), an Alaska products preference will be given as required under AS 36.30.326 - 36.30.332 when the bidder designates the use of Alaska products.

If the successful bidder/contractor proposes to use an Alaska product and does not do so, a penalty will be assessed against the successful bidder/contractor according to AS 36.30.330(a).

Each Alaska product declared on the Alaska Product Preference Worksheet must have an "Approval" date on the Alaska Product Preference Program List, that is on or before the bid opening date for this contract, and that does not expire before the bid opening date for this contract.

#### **100.016 RESPONSIBILITY OF BIDDERS**

The Department may find a bidder is nonresponsible for any one of the following reasons, but is not limited in its responsibility analysis to the following factors:

1. Evidence of bid rigging or collusion;
2. Fraud or dishonesty in the performance of previous contracts;
3. More than one bid for the same work from an individual, firm, or corporation under the same or different name;
4. Unsatisfactory performance on previous or current contracts;
5. Failure to pay, or satisfactorily settle, all bills due for labor and material on previous contracts;
6. Uncompleted work that, in the judgment of the Department, might hinder or prevent the bidder's prompt completion of additional work, if awarded;
7. Failure to reimburse the State for monies owed on any previous contracts;
8. Default under previous contracts;
9. Failure to submit evidence of registration and licensing;
10. Failure to comply with any qualification requirements of the Department;
11. Engaging in any activity that constitutes a cause for debarment or suspension under the State Procurement Code (AS 36.30) or submitting a bid during a period of debarment;
12. Failure to satisfy the responsibility standards set out in state regulations;
13. Lack of skill, ability, financial resources, or equipment required to perform the contract;  
or
14. Lack of legal capacity to contract.

Nothing contained in this section deprives the Department of its discretion in determining the lowest responsible bidder.

## **100.017 SUBCONTRACTOR LIST**

The apparent low bidder shall submit a completed Subcontractor List, Form 25D-5, within five working days following receipt of written notification by the Department that it is the low bidder.

An apparent low bidder who fails to submit a completed Subcontractor List form within the time allowed will be declared nonresponsible and may be required to forfeit the bid security. The Department will then consider the next lowest bidder for award of the Contract.

If a bidder fails to list a subcontractor, or lists more than one subcontractor for the same portion of work, and the value of that work is in excess of one-half of one percent of the total bid amount, the bidder agrees to perform that portion of work without a subcontractor and represents that it is qualified to perform that work.

A bidder who lists as a subcontractor another contractor who, in turn, sublets the majority of the work required under the Contract, violates this subsection.

A bidder or Contractor may, without penalty, replace a listed subcontractor who:

- 1) Fails to comply with licensing and registration requirements of AS 08.18;
- 2) Fails to obtain a valid Alaska business license;
- 3) Files for bankruptcy or becomes insolvent;
- 4) Fails to execute a subcontract for performance of the work for which the subcontractor was listed, and the bidder acted in good faith;
- 5) Fails to obtain bonding acceptable to the Department;
- 6) Fails to obtain insurance acceptable to the Department;
- 7) Fails to perform the subcontract work for which the subcontractor was listed;
- 8) Must be replaced to meet the bidder's required state or federal affirmative action requirements;
- 9) Refuses to agree or abide with the bidder's labor agreement; or
- 10) Is determined by the Department to be not responsible.

In addition to the circumstances described above, a Contractor may in writing request permission from the Department to add a new subcontractor or replace a listed subcontractor. The Department will approve the request if it determines in writing that allowing the addition or replacement is in the best interest of the State.

A bidder or Contractor shall submit a written request to add a new subcontractor or replace a listed subcontractor to the Contracting Officer a minimum of five working days before the date the new subcontractor is scheduled to begin work on the construction site. The request must state the basis for the request and include supporting documentation acceptable to the Contracting Officer.

If a bidder violates this subsection, the Contracting Officer may:

- 1) Cancel the Contract after Award without any damages accruing to the Department; or
- 2) After notice and a hearing, assess a penalty on the bidder in an amount not exceeding 10 percent of the value of the subcontract at issue.

#### **100.018 AWARD OF CONTRACT**

The Department will award the Contract to the lowest responsible and responsive bidder unless it rejects all bids. The Department will notify all bidders in writing via email, fax, or U.S. Mail of its intent to award.

In order to establish a clear and definitive basis of award for contracts with additive alternates, the State has established a budgeted amount from which the order of bidders will be determined. The amount will be disclosed when timely received bids are announced. The low bid will be determined by considering the basic bid and additive alternate(s) in the order listed on the Bid Schedule up to a total not to exceed the budgeted amount. The State reserves the right to reject all bids. The State also reserves the right to award the contract above or below the budgeted amount to the low bidder based on any combination of alternate(s) or no alternate(s), providing that the low bidder remains unchanged.

The Department will notify the successful bidder in writing of its intent to award the Contract and request that certain required documents, including the Contract Form, bonds, and insurance be submitted within the time specified. The successful bidder's refusal to sign the Contract and provide the requested documents within the time specified may result in cancellation of the notice of intent to award and forfeiture of the bid security.

If an award is made, it will be made as soon as practicable and usually within 40 days after bid opening. Award may be delayed due to bid irregularities or a bid protest, or if the award date is extended by mutual consent. Bids shall be valid for 120 days after bid opening, and may be extended by mutual consent.

#### **100.019 RETURN OF BID SECURITY**

The Department will return bid securities, other than bid bonds:

1. To all except the two lowest responsive and responsible bidders, as soon as practicable after the opening of bids; and
2. To the two lowest responsive and responsible bidders immediately after Contract award.

#### **100.020 PERFORMANCE AND PAYMENT BONDS**

The successful bidder shall furnish all required Performance and Payment Bonds on forms provided by the Department for the sums specified in the Contract. If no sum is specified, the successful bidder shall comply with AS 36.25.010. The Surety on each bond may be any corporation or partnership authorized to do business in the state as an insurer under AS 21.09 or two individual sureties approved by the Contracting Officer.

If individual sureties are used, two individual sureties must each provide the Department with security assets located in Alaska equal to the penal amount of either the performance bond or the payment bond. Any costs incurred by the Contractor and the individual Surety are subsidiary and shall be borne by the Contractor or the individual Surety. In no event will the Department be liable for these costs.

Individual sureties shall provide security by one, or a combination, of the following methods:

1. Escrow Account, with a federally insured financial institution, in the name of the Department. Acceptable securities include, but are not limited to, cash, treasury notes, bearer instruments having a specific value, or money market certificates.
2. Irrevocable letters of credit, from a financial institution approved by the Contracting Officer, with the Department named as beneficiary.
3. Cashier's or certified check made payable to the State of Alaska issued by financial institutions approved by the Contracting Officer.

These bonds and security assets, as applicable, shall remain in effect for 12 months after the date of final payment or, if longer, until all obligations and liens under this Contract are satisfied, including, but not limited to, obligations under General Conditions, Subsection 12.7.

The Department may, in its discretion, notify the bonding company or Surety of any potential default or liability.

The Contractor shall substitute, within five working days, another bond or surety acceptable to the Department if an individual Surety or the Surety on any bond furnished in connection with the Contract:

1. Becomes insolvent or is declared bankrupt;
2. Loses its right to do business in any state affecting the work;
3. Ceases to meet Contract requirements;
4. Fails to furnish reports of financial condition upon request; or
5. Otherwise becomes unacceptable to the Department.

When approved by the Contracting Officer, the Contractor may replace:

1. An individual surety with a corporate surety; or
2. Posted collateral with substitute collateral.

Failure to maintain the specified bonds or to provide substitute bonds when required under this section may be grounds for withholding contract payments until substitute bonding is obtained, and may, in the Department's discretion, be grounds for declaring the Contractor in default.



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

## FEDERAL EEO BID CONDITIONS

### STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS FOR ALL NON-EXEMPT FEDERAL AND FEDERALLY-ASSISTED CONSTRUCTION CONTRACTS TO BE AWARDED IN THE STATE OF ALASKA

#### Authority and Guidelines.

The Alaska Department of Military and Veterans Affairs, as a State Agency, has authority under 23 U.S.C. 140 and its implementing regulations to conduct a compliance program addressing Equal Employment Opportunity (EEO) and Affirmative Action (AA) in employment on non-exempt federal and federally-assisted construction contracts that are awarded in the State of Alaska. The STA's authority to administer a contract compliance with Nondiscrimination, EEO and AA programs are authorized under 23 U.S.C., 49 U.S.C., Title VI of the Civil Rights Act of 1964, MAP-21 and implementing regulations. The provisions of 23 CFR 200 and 49 CFR 21 provide authority to determine, and where necessary obtain compliance with the nondiscrimination provisions of Title VI. Under the provisions of Title VI 23 USC and related regulations, including 49 CFR 21 and 26, and 23 CFR Part 200, 230 and 633, it is the STA's responsibility to ensure compliance with and to enforce on all projects of Federal-aid contractors and subcontractors, whether a particular contract or work-site involves Federal-aid funds or not.

These citations confirm the requirement for contractors to provide, and States to obtain information that ensure non-discrimination in employment on all of Federal and federally-assisted projects, and through these provisions, provide for EEO for minorities and women in all terms and conditions of their employment at all of their facilities and on all projects.

1. Definitions. As used in these specifications:
  - a. **“Covered area”** means the geographical area described in the solicitation from which this contract resulted;
  - b. **“Employer identification number”** means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
  - c. **“Minority”** includes:
    - (1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
    - (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race);
    - (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - (4) American Indian or Alaska Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the DOL in the covered area, either individually or through an association, its affirmative action obligations on all work in the Plan area shall be in accordance with that Plan for those trades that have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make good faith effort to achieve an equal representation of minority and female employment under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or subcontractors in an approved Plan does not excuse any covered Contractor's or subcontractor's failure to make good faith efforts to achieve the Plan.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 5(a) through 5(p) of these specifications.
5. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
  - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligations to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
  - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
  - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
  - d. Provide immediate written notification to the Civil Rights Office's Contract Compliance Officer when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
  - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 5(b) above.
  - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendent, general foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and dispositions of the subject matter.
  - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
  - i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
  - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
  - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
  - l. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
  - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
  - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-use toilet, necessary changing facilities and necessary sleeping facilities shall be provided to assure privacy between the sexes.
  - o. Document and maintain a record of all solicitations of offers for subcontractors from minority and female construction contractors and suppliers, including circulations of solicitations to minority and female contractor associations and other business associations.
  - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
6. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations 5(a) through 5(p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any or more of its obligations under 5(a) through 5(p) of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its

individual EEO obligations, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

7. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation if a particular group is employed in a substantially disparate manner.
8. The Contractor shall not use the equal employment or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
9. The Contractor shall not enter into any subcontract with any person or firm debarred from government contracts.
10. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in item 5(a-p) above, so as to achieve maximum results from its efforts to ensure equal employment opportunities.
11. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic apprentice, trainees, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that the existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
12. Nothing herein provided shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Programs).
13. The Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
14. EEO/AA obligations are applicable to all of the Contractor's construction work (whether or not it is federal or federally-assisted) performed in the covered area. The hours on minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of equalizing minority and female employment percentages shall be a violation of the contract. Compliance with equal minority and female employment utilization will be measured against the total work hours performed.
15. The Contractor shall provide written notification to the Department, for all subcontracts documents as follows: the name, address and telephone number of subcontractors and their employer identification number; the estimated dollar amount of the subcontracts; estimated starting and completion dates of the subcontracts; and the geographical area in which the contract is to be performed.  
  
This written notification shall be required for all construction subcontracts in excess of \$10,000 at any tier for construction work under the contract resulting from this project's solicitation.
16. As used in the Bid Notice, and in the contract resulting from this project's solicitation, the "covered area" is the State of Alaska.



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**EEO-1 CERTIFICATION**  
Federal-Aid Contracts

This certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor [41 CFR 60-1.7 (b) (1)] and must be completed by the successful Bidder and each proposed Subcontractor participating in this contract.

**PLEASE CHECK APPROPRIATE BOXES**

The  Bidder  Proposed Subcontractor hereby CERTIFIES:

**PART A.** Bidders and proposed Subcontractors with 50 or more year-round employees and a federal contract amounting to \$50,000 or more are required to submit one federal Standard Report Form 100 during each year that the two conditions exist (50 employees and a \$50,000 federal contract).

The company named below (Part C) is exempt from the requirements of submitting the Standard Report Form 100 this year.

NO (go to PART B)  YES (go to PART C)

Instructions and blank Standard Report Form 100 may be obtained by contacting:

EEOC - Surveys Division  
131 M Street, NE - Room 4SW22G  
Washington, D.C. 20507  
Telephone number: (877)392-4647 or (866)286-6440

**PART B.** The company named below has submitted the Standard Report Form 100 this year.

NO  YES

**Note:** Bidders and proposed Subcontractors who have not filed the required Standard Report Form 100 and are not exempt from filing requirements will not be awarded this contract or subcontract until Form 100 has been filed for the current year ending June 30.

**PART C.**

\_\_\_\_\_  
Signature of Authorized Company Representative

\_\_\_\_\_  
Title

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Company Address (Street or PO Box, City, State, Zip)

\_\_\_\_\_  
Date

( )  
\_\_\_\_\_  
Phone Number



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**CONTACT REPORT**

Federal-Aid Contracts

**Project Name and Number**

Specific Work or Materials (by pay Item): \_\_\_\_\_

**DBE Firm Contacted:**

\_\_\_\_\_  
Name Address Phone Number

**A. INITIAL CONTACT:** (See important contact information on instruction sheet)

Method:

Phone  Publication  Email  FAX  Other

1. Date \_\_\_\_\_

2. Person Contacted \_\_\_\_\_  
Name Title

3. DBE's Response: Date: \_\_\_\_\_ Method:  Phone  Email  FAX  Other

Submitted an acceptable sub-bid. (If sub-bid accepted, skip to Section D)

Not interested: Indicate Reason(s) \_\_\_\_\_

Needs more information: Date Prime provided requested information \_\_\_\_\_

Will provide quote by: Date \_\_\_\_\_

Received unacceptable sub-bid (complete Section C)

**B. FOLLOW-UP CONTACT:**

Method:

Phone  Publication  Email  FAX  Other

1. Date \_\_\_\_\_

2. Person Contacted \_\_\_\_\_  
Name Title

3. DBE's Response: Date: \_\_\_\_\_ Method:  Phone  Email  FAX  Other

Submitted an acceptable sub-bid. (If sub-bid accepted, skip to Section D)

Received unacceptable sub-bid (complete Section C)

Other result: \_\_\_\_\_

**C. EXPLANATION OF FAILURE TO ACHIEVE AN ACCEPTABLE SUB-BID:**

1. Were the following required efforts made?

a.  Yes  No Identified specific items of work, products, materials, etc. when asking for quote(s).

b.  Yes  No Offered assistance in acquiring necessary bonding, insurance, and business development related assistance.

c.  Yes  No Provided all appropriate information concerning the specific work items or materials.

2. Was the DBE's quote non-competitive?  Yes  No

3. Was the DBE unable to perform in some capacity?  Yes  No If "Yes", explain: \_\_\_\_\_

**D. CERTIFICATION:** I certify that the information provided above is accurate and that efforts to solicit sub-bids were made in good faith.

\_\_\_\_\_  
Signature of Company Representative Title Date

\_\_\_\_\_  
Name of DOT&PF Reviewer Title Date

## INSTRUCTIONS

**Project Name and Number:** Enter project name and number as they appear on bid

documents. **Work or Materials:** Identify the specific work item or material that you

requested this firm to furnish. **Firm Contacted:** Enter name of firm as it appears in

the current DOT&PF DBE directory.

**Address:** Enter address of firm contacted. **Phone Number:** Enter phone number of firm contacted.

**A. INITIAL CONTACT** (Must be made at least seven calendar days prior to bid opening.)

1. **Date and Method of Initial Contact:** Indicate the method and date that actual contact was made or the date correspondence was postmarked. Leaving a "please call me" message does not constitute a contact. Attach a copy of dated letter or fax.
2. **Name and Title of Person Contacted.** Enter name and title of company representative with whom you corresponded or discussed submitting a sub-bid.
3. **DBE's Response:** Indicate one or more of the responses listed. If a firm bid was received and accepted, skip to section D.

### **B. FOLLOW-UP CONTACT**

If no response or an inconclusive response was received from the initial contact, a follow-up contact is required to determine for a certainty that the firm does not intend to submit a sub-bid or to conclude discussions with a sub-bid submittal.

1. **Date and Method of Follow-up Contact:** Indicate the method and date that actual contact was made or the date correspondence was postmarked. Leaving a "please call me" message does not constitute a contact. Attach a copy of dated letter or fax.
2. **Name and Title of Person Contacted.** Enter name and title of company representative with whom you corresponded or discussed submitting a sub-bid.
3. **DBE's Response:** Indicate one or more of the responses listed. If a firm bid was received and accepted, skip to section D.

### **C. EXPLANATION OF FAILURE TO ACHIEVE AN ACCEPTABLE SUB-BID**

1. A NO response to items 1a., b., or c. will result in rejection of this contact. Be specific on results of discussions.
2. A YES answer to item 2. is grounds for rejecting a DBE sub-bid.
3. A YES answer to item 3. is grounds for rejecting a DBE sub-bid, only if the inability to perform is in an area of work specifically identified as a sub-item under the applicable bid item.

### **D. CERTIFICATION**

This certification of accuracy and good faith by the Contractor will be verified by contact with the listed firm. Falsification of information on the DBE Contact Report is grounds for debarment action under AS 36.30.640(4).





STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**SUMMARY OF GOOD FAITH EFFORT DOCUMENTATION**  
Federal-Aid Contracts

Project Name and Number \_\_\_\_\_

Contractor: \_\_\_\_\_

List all items considered for DBE utilization. GFE requires at a minimum that the Contractor consider all items identified on Form 25A-324.

a. MATERIAL OR SPECIFIC ITEM OF WORK (SPECIFY PAY ITEM)	b. ACCEPTABLE DBE QUOTE RECEIVED <sup>1</sup>	c. # OF DBEs CONTACTED IN DBE DIRECTORY	d. # OF DBEs THAT RESPONDED <sup>2</sup>	e. # OF DBE QUOTES RECEIVED
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

- 1. Check if acceptable DBE quote was received (if so, skip c, d, and e)
- 2. Attach completed Contact Reports, Form 25A-321A

LIST ADDITIONAL ITEMS ON REVERSE SIDE

a. MATERIAL OR SPECIFIC ITEM OF WORK (SPECIFY PAY ITEM)	b. ACCEPTABLE DBE QUOTE RECEIVED <sup>1</sup>	c. # OF DBEs CONTACTED IN DBE DIRECTORY	d. # OF DBEs THAT RESPONDED <sup>2</sup>	e. # OF DBE QUOTES RECEIVED
9.				
10.				
11.				
12.				
13.				
14.				
15.				

- 1. Check if acceptable DBE quote was received (if so, skip c, d, and e)
- 2. Attach completed Contact Reports, Form 25A-321A

Comments:



**BUY AMERICAN REQUEST  
FOR TYPE 3 WAIVER**  
Federal-Aid Airport Contracts

Project Name and Number:

TYPE 3 WAIVER			
LIST MATERIAL OR EQUIPMENT	COST OF U.S. STEEL AND MANUFACTURED GOODS (US)	COST OF NON-DOMESTIC STEEL OR MANUFACTURED GOODS (NON)	COST OF US STEEL OR GOODS DIVIDED BY TOTAL COST, WRITTEN AS A PERCENTAGE $US/(US+NON) \times (100) \%$

I certify under penalty of law that all steel and manufactured goods furnished for this project are produced in the United States, and comply with the requirements of 49 USC § 50101 and Contract subsection GCP 60-09 Buy American Preference; except for those steel and manufactured goods that are listed on this Request for Waiver. I understand that if FAA does not approve this Request for Waiver, I agree to fully comply with the requirements of 49 USC § 50101.

I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

\_\_\_\_\_ Date

\_\_\_\_\_ Signature

\_\_\_\_\_ Company Name

\_\_\_\_\_ Title

**Form Instructions:**

1. Select Type 3 Waiver to request waiver of 100% Buy American Preferences if the cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components of the facility or equipment, and final assembly of the facility or equipment has occurred in the United States.
  - a. List all product components and subcomponents that are not comprised of 100% US domestic content (Exclude products listed on the FAA Nationwide Buy American Waivers Issued listing and products excepted by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
  - b. Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture (Department Form 25D-155).
  - c. Percentage of non-domestic component and subcomponent cost as compared to total “item” component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture (Department and Form 25D-156).
2. All waiver requests must be submitted to DOT&PF within 5 working days after date of notification of apparent low bidder, or as directed by the Contracting Officer.



# Buy American Preferences - Final Assembly Questionnaire

## Federal-Aid Airport Contracts

To assist the Federal Aviation Administration (FAA) in making the determination of whether final assembly of the product occurs in the United States, please complete and submit this questionnaire when requesting a Buy American Waiver under 49 U.S.C. 50101(b)(3)(A).

**1. Describe the assembly process occurring at the specified final location in the United States.**

*Please describe the final assembly process and its various operations.*

*How long does the final assembly process take to complete?*

**2. Describe the resources used to conduct the assembly of the product at the specified location in the United States.**

*How many employees are involved in the final assembly process and what is the general skill level of those employees?*

*What type of equipment is used during the final assembly process?*

*What is a rough estimate of the associated cost to conduct final assembly of the product at the specified location in the United States?*



STATE OF ALASKA
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND
FELONY CONVICTIONS

Region

Project Name:

As a condition of bid responsiveness on FAA funded projects, the bidder must complete, sign, date, and submit this certification statement with their proposal. As a condition of approval of Subcontracts on FAA funded projects, the Subcontractor or Lower Tier Subcontractor must complete, sign, and date the certification statements and the Contractor must submit the certifications with the subcontracts for approval.

The Applicant must complete the following two certification statements. The Applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. If the Contract is awarded, the Applicant agrees it will incorporate this provision for certification in all subcontracts and lower tier subcontracts.

Certifications

- a) The Applicant represents that it is [ ] is not [ ] a corporation that has any Federal Tax Delinquency, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.
b) The Applicant represents that it is [ ] is not [ ] a corporation that has a Felony Conviction under any Federal law within the preceding 24 months.

Note

If an Applicant responds in the affirmative to either of the above representations, the Applicant is ineligible to receive an award (or a proposed subcontract award, as applicable) unless the Department has received notification from the FAA suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the Department about its tax liability or conviction to the Department, who will then notify the FAA Airports District Office, which will then notify the FAA's SDO to facilitate completion of the required considerations before award decisions (or subcontractor approval decisions) are made.

Definitions

Applicant: The Bidder before award of contract. The Contractor, Subcontractor, and Lower Tier Subcontractor after award.

Suspension and Debarment Official (SDO): An official in the FAA National Office that has authority to determine whether an Applicant is suspended or debarred from performing the FAA funded work.

Felony conviction: Felony conviction means a conviction within the preceding twenty four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

Date

Signature

Company Name

Title



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**BID FORM**

by

---

**Company Name**

---

**Company Address (Street or PO Box, City, State, Zip)**

**TO THE CONTRACTING OFFICER,  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS:**

In compliance with your Invitation to Bid dated \_\_\_\_\_, the Undersigned proposes to furnish and deliver all the materials and do all the work and labor required in the construction of the above-referenced Project, located at or near \_\_\_\_\_, Alaska, according to the plans and specifications and for the amount and prices named herein as indicated on the Bid Schedule consisting of \_\_\_\_\_ sheets, which is made a part of this Bid.

The Undersigned declares that he has carefully examined the contract requirements and that he has made a personal examination of the site of the work; that he understands that the quantities, where such are specified in the Bid Schedule or on the plans for this project, are approximate only and subject to increase or decrease, and that he is willing to perform increased or decreased quantities of work at unit prices bid under the conditions set forth in the Contract Documents.

The Undersigned hereby agrees to execute the said contract and bonds within fifteen calendar days, or such further time as may be allowed in writing by the Contracting Officer, after receiving notification of the acceptance of this bid, and it is hereby mutually understood and agreed that in case the Undersigned does not, the accompanying bid guarantee shall be forfeited to the State of Alaska, Department of Military and Veterans Affairs as liquidated damages, and the said Contracting officer may proceed to award the contract to others.

The Undersigned agrees to commence the work within 10 calendar days, and to complete the work within \_\_\_\_\_ calendar days, after the effective date of the Notice to Proceed, or by \_\_\_\_\_, unless extended in writing by the Contracting Officer.

The Undersigned proposes to furnish Payment Bond in the amount of **100%** (of the contract) and Performance Bond in the amount of **100%** (of the contract), as surety conditioned for the full, complete and faithful performance of this contract.

The Undersigned acknowledges receipt of the following addenda to the drawings and/or specifications (give number and date of each).

<b>Addenda Number</b>	<b>Date Issued</b>	<b>Addenda Number</b>	<b>Date Issued</b>	<b>Addenda Number</b>	<b>Date Issued</b>

---

**NON-COLLUSION DECLARATION**

The Undersigned declares, under penalty of perjury under the laws of the United States, that neither he nor the firm, association, or corporation of which he is a member, has, 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 bid.

---

**The Undersigned has read the foregoing and hereby agrees to the conditions stated therein by affixing his signature below:**

\_\_\_\_\_  
**Signature of Authorized Company Representative**

\_\_\_\_\_  
**Typed Name and Title**

(    ) \_\_\_\_\_  
**Phone Number**

(    ) \_\_\_\_\_  
**Fax Number**

## BID SCHEDULE

The bidder shall insert a fixed price in figures opposite each pay item appearing in the bid schedule. No price is to be entered or tendered for any item not appearing in the bid schedule.

Conditioned or qualified bids will be considered non-responsive.

The low bid will be determined by considering the basic bid and bid option(s) listed on the bid schedule up to a total not to exceed the budgeted amount. The State reserves the right to reject all bids. The State also reserves the right to award the contract above or below the budgeted amount to the low bidder based on any combination of option(s) or no option(s), providing that the low bidder remains unchanged

<b>PAY ITEM</b>	<b>DESCRIPTION OF PAY ITEM</b>	<b>TOTAL BID PRICE, IN FIGURES</b>
<b>Bid</b>	Furnish all labor, material, equipment, supervision, and provide all work to complete the scope of work as described in Section 01 General Requirements, for the lump sum price of:	\$ _____
<b>Bid Alt #1</b>		\$ _____
<b>Bid Alt #2</b>		\$ _____
<b>Bid Alt #3</b>		\$ _____
<b>Bid Alt #4</b>		\$ _____
<b>Bid Alt #5</b>		\$ _____
<b>Bid Alt #6</b>		\$ _____

\_\_\_\_\_  
Contractor's Name (Printed)

\_\_\_\_\_  
Contractor's Name (Signature)



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**BID BOND**

For

DATE BOND EXECUTED: \_\_\_\_\_

PRINCIPAL (Legal name and business address):

TYPE OF ORGANIZATION:

	[ ] Individual	[ ] Partnership
	[ ] Joint Venture	[ ] Corporation
STATE OF INCORPORATION:		

SURETY(IES) (Name and business address):

<b>A.</b>	<b>B.</b>	<b>C.</b>
PENAL SUM OF BOND:		DATE OF BID:

We, the PRINCIPAL and SURETY above named, are held and firmly bound to the State (State of Alaska), in the penal sum of the amount stated above, for the payment of which sum will be made, we bind ourselves and our legal representatives and successors, jointly and severally, by this instrument.

THE CONDITION OF THE FOREGOING OBLIGATION is that the Principal has submitted the accompanying bid in writing, date as shown above, on the above-referenced Project in accordance with contract documents filed in the office of the Contracting Officer, and under the Invitation for Bids therefor, and is required to furnish a bond in the amount stated above.

If the Principal's bid is accepted and he is offered the proposed contract for award, and if the Principal fails to enter into the contract, then the obligation to the State created by this bond shall be in full force and effect.

If the Principal enters into the contract, then the foregoing obligation is null and void.

**PRINCIPAL**

Signature(s)	1.	2.	3.
Name(s) & Title(s) (Typed)	1.	2.	3.

Corporate Seal

See Instructions on Reverse

**CORPORATE SURETY(IES)**

<b>Surety A</b>	Name of Corporation	State of Incorporation	Liability Limit \$
Signature(s)	1.	2.	Corporate Seal
Name(s) & Titles (Typed)	1.	2.	

<b>Surety B</b>	Name of Corporation	State of Incorporation	Liability Limit \$
Signature(s)	1.	2.	Corporate Seal
Name(s) & Titles (Typed)	1.	2.	

<b>Surety C</b>	Name of Corporation	State of Incorporation	Liability Limit \$
Signature(s)	1.	2.	Corporate Seal
Name(s) & Titles (Typed)	1.	2.	

**INSTRUCTIONS**

1. This form shall be used whenever a bid bond is submitted.
2. Insert the full legal name and business address of the Principal in the space designated. If the Principal is a partnership or joint venture, the names of all principal parties must be included (e.g., "Smith Construction, Inc. and Jones Contracting, Inc. DBA Smith/Jones Builders, a joint venture"). If the Principal is a corporation, the name of the state in which incorporated shall be inserted in the space provided.
3. Insert the full legal name and business address of the Surety in the space designated. The Surety on the bond may be any corporation or partnership authorized to do business in Alaska as an insurer under AS 21.09. Individual sureties will not be accepted.
4. The penal amount of the bond may be shown either as an amount (in words and figures) or as a percent of the contract bid price (a not-to-exceed amount may be included).
5. The scheduled bid opening date shall be entered in the space marked Date of Bid.
6. The bond shall be executed by authorized representatives of the Principal and Surety. Corporations executing the bond shall also affix their corporate seal.
7. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.
8. The states of incorporation and the limits of liability of each surety shall be indicated in the spaces provided.
9. The date that bond is executed must not be later than the bid opening date.





STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**BUY AMERICAN CERTIFICATE**  
Federal-Aid Airport Contracts

By submitting a bid under this solicitation, except for those items listed by the offeror below or on a separate and clearly identified attachment, the offeror certifies that steel and each manufactured product is produced in the United States (as defined in Subsection 60-09, Buy American Steel and Manufactured Products for Construction Contracts) and that components of unknown origin are considered to have been produced or manufactured outside the United States.

Attach manufacturer's mill test reports with the Buy American Certification signed by the manufacturer.

Articles, materials, and supplies excepted from this provision are listed on the reverse of this form.

PRODUCT <sup>1</sup>	COUNTRY OF ORIGIN

\_\_\_\_\_  
**Contractor**

\_\_\_\_\_  
**Signature of Contractor's Representative**

\_\_\_\_\_  
**Date**

1. Enter "NONE" on the first line if there are no exceptions.

**List of supplies and materials that the U.S. Government has determined are not produced in the United States in sufficient and reasonably available quantities and of sufficient quality. (Jan 1991)**

Acetylene, black	Manganese
Agar, bulk	Menthol, natural bulk
Anise	Mica
Antimony, as metal or oxide	Microprocessor chips (brought onto a construction site as separate units for incorporation into building systems during construction or repair and alteration of real property.)
Asbestos, amosite, chrysolite, and Crocidolite	Nickel, primary, in ingots, pigs, shots, cathodes, or similar forms; nickel oxide and nickel salts.
Bananas	Nitroguanidine (also known as picrite)
Bauxite	Nux vomica, crude
Beef, corned, canned	Oiticica oil
Beef extract	Olive oil Olives (green), pitted or unpitted, or stuffed, in bulk.
Bephenium Hydroxynapthoate	Opium, crude
Bismuth	Oranges, mandarin, canned
Books, trade, text, technical, or scientific; newspapers; pamphlets; magazines; periodicals; printed briefs and films; not printed in the United States and for which domestic editions are not available.	Petroleum, crude oil, unfinished oils, and finished products (see definitions at the end)
Brazil nuts, unroasted	Pine needle oil
Cadmium, ores and flue dust	Platinum and related group metals, refined as sponge, powder, ingots, or cast bars.
Calcium cyanamide	Pyrethrum flowers
Capers	Quartz crystals
Cashew nuts	Quebracho
Castor beans and castor oil	Quinidine
Chalk, English	Quinine
Chestnuts	Rabbit fur felt
Chicle	Radium salts, source and special nuclear materials
Chrome ore or chromite	Rosettes
Cinchona bark	Rubber, crude and latex
Cobalt, in cathodes, rondelles, or other primary ore and metal forms.	Rutile
Cocoa beans	Santonin, crude
Coconut and coconut meat, unsweetened, in shredded, desiccated or similarly prepared form.	Secretin
Coffee, raw or green bean	Shellac
Colchicine alkaloid, raw	Silk, raw and unmanufactured
Copra	Spare and replacement parts for equipment of foreign manufacture, and for which domestic parts are not available.
Cork, wood or bark and waste	Spices and herbs, in bulk
Cover glass, microscope slide	Sugars, raw
Cryolite, natural	Swords and scabbards
Dammar gum	Talc, block, steatite
Diamonds, industrial, stones and abrasives	Tantalum
Emetine, bulk	Tapioca flour and cassava
Ergot, crude	Tartar, crude; tartaric acid and cream of tartar in bulk.
Erthrityl tetranitrate	Tea in bulk
Fair linen, altar	Thread, metallic (gold)
Fibers of the following types: abaca, abace, agave, coir, flax, jute, jute burlaps, palmyra and sisal.	Thyme oil
Goat and kidskins	Tin in bars, blocks, and pigs
Graphite, natural, crystalline, crucible grade	Tripolidine hydrochloride
Handsewing needles	Tungsten
Hemp yarn	Vanilla beans
Hogbristles for brushes	Venom, cobra
Hyoscine, bulk	Wax, canauba
Ipecac, root	Woods; logs, veneer, and lumber of the following species: Alaskan yellow cedar, angelique, balsa, ekki greenhart, lignum vitae, mahogany, and teak.
Iodine, crude	Yarn, 50 Denier rayon
Kaurigum	
Lac	
Leather, sheepskin, hair type	
Lavender oil	

**List of Supplies/Materials that the U.S. Government Has Determined Are Not Produced In the United States In Sufficient and Reasonably Available Quantities And of Sufficient Quality (Jan 1991) (CONTINUED)**

Petroleum terms are used as follows:

“Crude oil” means crude petroleum, as it is produced at the wellhead, and liquids (under atmospheric conditions) that have been recovered from mixtures of hydrocarbons that existed in a vaporous phase in a reservoir and that are not natural gas products.

“Finished products” means any one or more of the following petroleum oils, or a mixture or combination of these oils, to be used without further processing except blending by mechanical means:

- (A) “Asphalt” - a solid or semi-solid cementitious material that (1) gradually liquefies when heated, (2) has bitumens as its predominating constituents, and (3) is obtained in refining crude oil.
- (B) “Fuel oil” - a liquid or liquefiable petroleum product burned for lighting or for the generation of heat or power and derived directly or indirectly from crude oil, such as kerosene, range oil, distillate fuel oils, gas oil, diesel fuel, topped crude oil, or residues.
- (C) “Gasoline” - a refined petroleum distillate that, by its consumption, is suitable for use as a carburant in internal combustion engines.
- (D) “Jet fuel” - a refined petroleum distillate used to fuel jet propulsion engines.
- (E) “Liquefied gases” - hydrocarbon gases recovered from natural gas or produced from petroleum refining and kept under pressure to maintain a liquid state at ambient temperatures.
- (F) “Lubricating oil” - a refined petroleum distillate or specially treated petroleum residue used to lessen friction between surfaces.
- (G) “Naphtha” - a refined petroleum distillate falling within a distillation range overlapping the higher gasoline and the lower kerosenes.
- (H) “Natural gas products” - liquids (under atmospheric conditions) including natural gasoline, that -
  - (1) are recovered by a process of absorption, adsorption, compression, refrigeration, cycling, or a combination of these processes, from mixtures of hydrocarbons that existed in a vaporous phase in a reservoir, and
  - (2) when recovered and without processing in a refinery, definitions of products contained in subdivision (B), (C), and (G) above.
- (I) “Residual fuel oil” - a topped crude oil or viscous residuum that, as obtained in refining or after blending with other fuel oil, meets or is the equivalent of MILSPEC Mil-F-859 for Navy Special Fuel Oil and any more viscous fuel oil, such as No. 5 or Bunker C.

“Unfinished oils” means one or more of the petroleum oils listed under “Finished products” above, or a mixture or combination of these oils, that are to be further processed other than by blending by mechanical means.



**STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS**

**CERTIFICATE OF BUY AMERICAN COMPLIANCE FOR TOTAL FACILITY**

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with its proposal. The bidder or offeror must indicate how it intends to comply with 49 USC § 50101 by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e. not both) by inserting a checkmark (✓) or the letter "X".

Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:

- a) Only installing steel and manufactured products produced in the United States;
- b) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
- c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- d) To provide to the Department evidence that documents the source and origin of the steel and manufactured product (accompanied by Department Form 25D-154).
- e) To faithfully comply with providing U.S. domestic products.
- f) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for a Type 3 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:

- a) To submit to the Department within 5 working days after date of notification of apparent low bidder, a formal waiver request (using Department Form 25D-153) and required documentation that supports the type of waiver being requested.
- b) That failure to submit the required documentation within the specified timeframe is cause for a nonresponsible determination that may result in rejection of the proposal.
- c) To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.
- d) To furnish U.S. domestic product for any waiver request that the FAA rejects.
- e) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

**Required Documentation**

**Type 3 Waiver** - The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the “facility”. Use Department Forms 25D-153, 25D-155 and 25D-156 to summarize product data. The required documentation for a Type 3 waiver is:

- a) Listing of all manufactured products that are not comprised of 100 percent U.S. domestic content (excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly and installation at project location.
- c) Percentage of non-domestic component and subcomponent cost as compared to total “facility” component and subcomponent costs, excluding labor costs associated with final assembly and installation at project location.

**False Statements:** Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

\_\_\_\_\_

Company Name

\_\_\_\_\_

Title



**STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS**

**Certificate of Buy American Compliance for Manufactured Products**

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one on the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (not both) by inserting a checkmark (✓) or the letter "X".

- Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:
- a) Only installing steel and manufactured products produced in the United States;
  - b) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
  - c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- d) To provide to the Department evidence that documents the source and origin of the steel and manufactured product (accompanied by Department Form 25D-154);
  - e) To faithfully comply with providing U.S. domestic product;
  - f) To furnish U.S. domestic product for any waiver request that the FAA rejects; and
  - g) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
- The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for a Type 3 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:
- a) To submit to the Department within 5 working days after date of notification of apparent low bidder, a formal waiver request (using Department Form 25D-153) and required documentation that supports the type of waiver being requested.
  - b) That failure to submit the required documentation within the specified timeframe is cause for a nonresponsible determination that may result in rejection of the proposal.
  - c) To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.
  - d) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

**Required Documentation**

**Type 3 Waiver** - The cost of the item components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the “item”. Use Department Forms 25D-153, 25D-155 and 25D-156 to summarize product data. The required documentation for a Type 3 waiver is:

- a) Listing of all product components and subcomponents that are not comprised of 100 percent U.S. domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
- c) Percentage of non-domestic component and subcomponent cost as compared to total “item” component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

**False Statements:** Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Title



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

**SUBCONTRACTOR LIST**

The apparent low bidder shall complete this form and submit it so as to be received by the Contracting Officer prior to the close of business on the fifth working day after receipt of written notice from the Department.

An apparent low bidder who fails to submit a completed Subcontractor List form within the time allowed will be declared nonresponsible and may be required to forfeit the bid security.

Scope of work must be clearly defined. If an item of work is to be performed by more than one firm, indicate the portion or percent of work to be done by each.

**Check as applicable:**     All Work on the above-referenced project will be accomplished without subcontracts

Or

List all first tier Subcontractors as follows:

FIRM NAME, ADDRESS, PHONE NO.	AK BUSINESS LICENSE NO., CONTRACTOR'S REGISTRATION NO.	SCOPE OF WORK TO BE PERFORMED

CONTINUE SUBCONTRACTOR INFORMATION ON REVERSE

For projects with federal-aid funding, I hereby certify Alaska Business Licenses and Contractor Registrations will be valid for all subcontractors prior to award of the subcontract. For projects without federal-aid funding (State funding only), I hereby certify the listed Alaska Business Licenses and Contractor Registrations were valid at the time bids were opened for this project.

\_\_\_\_\_  
Signature of Authorized Company Representative

\_\_\_\_\_  
Title

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Company Address (Street or PO Box, City, State, Zip)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Phone Number





# STATE OF ALASKA DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

## BIDDER REGISTRATION

All firms are required to submit a Bidder's Registration form before an Alaska Department of Military and Veteran's Affairs project can be awarded. The Bidder Registration form must be submitted to the Civil Rights Officer (CRO) on an annual basis by January 1 and is valid thru December 31. Complete this form for each contractor and subcontractor.

Name of Firm: \_\_\_\_\_

Street Address: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Fax number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

Date Firm was Established: \_\_\_\_\_

Check all that apply:

Subcontractor?

Service Provider?

Material Supplier?

Manufacturer?

Certified DBE? \*

Self-Certified SBE? \*

Identify specialty: \_\_\_\_\_

Identify service: \_\_\_\_\_

Identify material: \_\_\_\_\_

Identify product: \_\_\_\_\_

\*DBE- Disadvantaged Business Enterprise

\*SBE- Small Business Enterprise (Complete page 2 of this form.)

### Firm's gross annual receipts:

< \$500,000

\$500,000- \$999,999

\$1,000,000- \$4,999,999

\$5,000,000- \$9,999,999

\$10,000,000- \$16,999,999

> \$17,000,000

### Type of contracts/proposals bid by the firm (check all that apply):

Highways  Airports  Transit  AMHS

\_\_\_\_\_  
Signature of Company Representative

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

Send this completed form with your bid



STATE OF ALASKA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

## CONSTRUCTION CONTRACT

This CONTRACT, between the STATE OF ALASKA, DEPARTMENT OF Military and Veterans Affairs, herein called the Department, acting by and through its Contracting Officer, and

**Company Name**

**Company Address (Street or PO Box, City, State, Zip)**

a/an  Individual  Partnership  Joint Venture  Sole Proprietorship  Corporation incorporated under the laws of the State of \_\_\_\_\_, its successors and assigns, herein called the Contractor, is effective the date of the signature of the Contracting Officer on this document.

WITNESSETH: That the Contractor, for and in consideration of the payment or payments herein specified and agreed to by the Department, hereby covenants and agrees to furnish and deliver all the materials and to do and perform all the work and labor required in the construction of the above-referenced project at the prices bid by the Contractor for the respective estimated quantities aggregating approximately the sum of

\_\_\_\_\_ Dollars  
(\$ \_\_\_\_\_), and such other items as are mentioned in the original Bid, which Bid and prices named, together with the Contract Documents are made a part of this Contract and accepted as such.

It is distinctly understood and agreed that no claim for additional work or materials, done or furnished by the Contractor and not specifically herein provided for, will be allowed by the Department, nor shall the Contractor do any work or furnish any material not covered by this Contract, unless such work is ordered in writing by the Department. In no event shall the Department be liable for any materials furnished or used, or for any work or labor done, unless the materials, work, or labor are required by the Contract or on written order furnished by the Department. Any such work or materials which may be done or furnished by the Contractor without written order first being given shall be at the Contractor's own risk, cost, and expense and the Contractor hereby covenants and agrees to make no claim for compensation for work or materials done or furnished without such written order.

The Contractor further covenants and agrees that all materials shall be furnished and delivered and all labor shall be done and performed, in every respect, to the satisfaction of the Department, on or before: \_\_\_\_\_ or within \_\_\_\_\_ calendar days. It is expressly understood and agreed that in case of the failure on the part of the Contractor, for any reason, except with the written consent of the Department, to complete the furnishing and delivery of materials and the doing and performance of the work before the aforesaid date, the Department shall have the right to deduct from any money due or which may become due the Contractor, or if no money shall be due, the Department shall have the right to recover \_\_\_\_\_ dollars (\$ \_\_\_\_\_) per day for each calendar day elapsing between the time stipulated for the completion and the actual date of completion in accordance with the terms hereof; such deduction to be made, or sum to be recovered, not as a penalty but as liquidated damages.

The bonds given by the Contractor in the sum of \$ \_\_\_\_\_ Payment Bond, and \$ \_\_\_\_\_ Performance Bond, to secure the proper compliance with the terms and provisions of this Contract, are submitted herewith and made a part hereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contract and hereby agree to its terms and conditions.

---

**CONTRACTOR**

---

**Company Name**

---

**Signature of Authorized Company Representative**

---

**Typed Name and Title**

---

**Date**

(Corporate Seal)

---

**STATE OF ALASKA  
Department of Military and Veterans  
Affairs**

---

**Signature of Contracting Officer**

---

**Typed Name**

---

**Date**



STATE OF ALASKA
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

PERFORMANCE BOND

For

Bond No. \_\_\_\_\_

KNOW ALL WHO SHALL SEE THESE PRESENTS:

That \_\_\_\_\_
of \_\_\_\_\_ as Principal,
and \_\_\_\_\_
of \_\_\_\_\_ as Surety,
firmly bound and held unto the State of Alaska in the penal sum of \_\_\_\_\_ Dollars

(\$ \_\_\_\_\_) good and lawful money of the United States of America for the payment whereof, well and truly to be paid to the State of Alaska, we bind ourselves, our heirs, successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has entered into a written contract with said State of Alaska, on the \_\_\_\_\_ of \_\_\_\_\_ A.D., 20\_\_\_\_, for construction of the above-named project, said work to be done according to the terms of said contract.

Now, THEREFORE, the conditions of the foregoing obligation are such that if the said Principal shall well and truly perform and complete all obligations and work under said contract and if the Principal shall reimburse upon demand of the Department of Military and Veterans Affairs any sums paid him which exceed the final payment determined to be due upon completion of the project, then these presents shall become null and void; otherwise they shall remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at \_\_\_\_\_, this \_\_\_\_\_ day of \_\_\_\_\_ A.D., 20\_\_\_\_.

Principal: \_\_\_\_\_

Address: \_\_\_\_\_

By: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Phone: ( ) \_\_\_\_\_

Surety: \_\_\_\_\_

Address: \_\_\_\_\_

By: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Phone: ( ) \_\_\_\_\_

The offered bond has been checked for adequacy under the applicable statutes and regulations:

Alaska Department of Military and Veteran's Affairs Authorized Representative

Date

See Instructions on Reverse

## INSTRUCTIONS

1. This form shall be used whenever a performance bond is required. There shall be no deviation from this form without approval from the Contracting Officer.
2. The full legal name, business address, phone number, and point of contact of the Principal and Surety shall be typed on the face of the form. Where more than a single surety is involved, a separate form shall be executed for each surety.
3. The penal amount of the bond, or in the case of more than one surety the amount of obligation, shall be typed in words and in figures.
4. Where individual sureties are involved, a completed Affidavit of Individual Surety shall accompany the bond. Such forms are available upon request from the Contracting Officer.
5. The bond shall be signed by authorized persons. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of authority must be furnished.



STATE OF ALASKA
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

PAYMENT BOND

For

Bond No. \_\_\_\_\_

KNOW ALL WHO SHALL SEE THESE PRESENTS:

That \_\_\_\_\_
of \_\_\_\_\_ as Principal,
and \_\_\_\_\_
of \_\_\_\_\_ as Surety,
firmly bound and held unto the State of Alaska in the penal sum of \_\_\_\_\_ Dollars

(\$ \_\_\_\_\_) good and lawful money of the United States of America for the payment whereof, well and truly to be paid to the State of Alaska, we bind ourselves, our heirs, successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has entered into a written contract with said State of Alaska, on the \_\_\_\_\_ of \_\_\_\_\_ A.D., 20\_\_\_\_, for construction of the above-referenced project, said work to be done according to the terms of said contract.

Now, THEREFORE, the conditions of the foregoing obligation are such that if the said Principal shall comply with all requirements of law and pay, as they become due, all just claims for labor performed and materials and supplies furnished upon or for the work under said contract, whether said labor be performed and said materials and supplies be furnished under the original contract, any subcontract, or any and all duly authorized modifications thereto, then these presents shall become null and void; otherwise they shall remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at \_\_\_\_\_, this \_\_\_\_\_ day of \_\_\_\_\_ A.D., 20\_\_\_\_\_.

Principal: \_\_\_\_\_

Address: \_\_\_\_\_

By: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Phone: ( ) \_\_\_\_\_

Surety: \_\_\_\_\_

Address: \_\_\_\_\_

By: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Phone: ( ) \_\_\_\_\_

The offered bond has been checked for adequacy under the applicable statutes and regulations:

\_\_\_\_\_
Alaska Department of Military and Veteran's Affairs Authorized Representative

\_\_\_\_\_
Date

See Instructions on Reverse

## INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, shall be used whenever a payment bond is required. There shall be no deviation from this form without approval from the Contracting Officer.
2. The full legal name, business address, phone number, and point of contact of the Principal and Surety shall be typed on the face of the form. Where more than a single surety is involved, a separate form shall be executed for each surety.
3. The penal amount of the bond, or in the case of more than one surety the amount of obligation, shall be typed in words and in figures.
4. Where individual sureties are involved, a completed Affidavit of Individual Surety shall accompany the bond. Such forms are available upon request from the Contracting Officer.
5. The bond shall be signed by authorized persons. Where such persons are signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of authority must be furnished.



2. What percent of the total value of this contract do you intend to subcontract? \_\_\_\_\_ %

3. Do you propose to purchase any equipment for use on this project?  
[ ] No [ ] Yes If YES, describe type, quantity, and approximate cost:

---

---

---

4. Do you propose to rent any equipment for this work?  
[ ] No [ ] Yes If YES, describe type and quantity:

---

---

---

5. Is your bid based on firm offers for all materials necessary for this project?  
[ ] Yes [ ] No If NO, please explain:

---

---

---

**C. EXPERIENCE**

1. Have you had previous construction contracts or subcontracts with the State of Alaska?  
[ ] Yes [ ] No

Describe the most recent or current contract, its completion date, and scope of work:

---

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---

---

2. List, as an attachment to this questionnaire, other construction projects you have completed, the dates of completion, scope of work, and total contract amount for each project completed in the past 12 months.

**I hereby certify that the above statements are true and complete.**

\_\_\_\_\_  
**Name of Contractor**

\_\_\_\_\_  
**Name and Title of Person Signing**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Date**

**STATE OF ALASKA  
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES  
DOCUMENT 00700 - ISSUED DECEMBER 2011**

**GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT FOR BUILDINGS**

**ARTICLE 1 - DEFINITIONS**

**ARTICLE 2 - AUTHORITIES AND LIMITATIONS**

- 2.1 Authorities and Limitations
- 2.2 Evaluations by Contracting Officer
- 2.3 Means and Methods
- 2.4 Visits to Site

**ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**

- 3.1 Incomplete Contract Documents
- 3.2 Copies of Contract Documents
- 3.3 Scope of Work
- 3.4 Intent of Contract Documents
- 3.5 Discrepancy in Contract Documents
- 3.6 Clarifications and Interpretations
- 3.7 Reuse of Documents

**ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS**

- 4.1 Availability of Lands
- 4.2 Visit to Site/Place of Business
- 4.3 Explorations and Reports
- 4.4 Utilities
- 4.5 Damaged Utilities
- 4.6 Utilities Not Shown or Indicated
- 4.7 Survey Control

**ARTICLE 5 - BONDS AND INSURANCE**

- 5.1 Delivery of Bonds
- 5.2 Bonds
- 5.3 Replacement of Bond and Surety
- 5.4 Insurance Requirements
- 5.5 Indemnification

**ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES**

- 6.1 Supervision of Work
- 6.2 Superintendence by CONTRACTOR
- 6.3 Character of Workers
- 6.4 CONTRACTOR to Furnish
- 6.5 Materials and Equipment
- 6.6 Anticipated Schedules
- 6.7 Finalizing Schedules
- 6.8 Adjusting Schedules
- 6.9 Substitutes or "Or-Equal" Items
- 6.10 Substitute Means and Methods
- 6.11 Evaluation of Substitution
- 6.12 Dividing the Work
- 6.13 Subcontractors
- 6.14 Use of Premises
- 6.15 Structural Loading
- 6.16 Record Documents

- 6.17 Safety and Protection
- 6.18 Safety Representative
- 6.19 Emergencies
- 6.20 Shop Drawings and Samples
- 6.21 Shop Drawing and Sample Review
- 6.22 Maintenance During Construction
- 6.23 Continuing the Work
- 6.24 Consent to Assignment
- 6.25 Use of Explosives
- 6.26 CONTRACTOR's Records
- 6.27 Load Restrictions

**ARTICLE 7 - LAWS AND REGULATIONS**

- 7.1 Laws to be Observed
- 7.2 Permits, Licenses, and Taxes
- 7.3 Patented Devices, Materials and Processes
- 7.4 Compliance of Specifications and Drawings
- 7.5 Accident Prevention
- 7.6 Sanitary Provisions
- 7.7 Business Registration
- 7.8 Professional Registration and Certification
- 7.9 Local Building Codes
- 7.10 Air Quality Control
- 7.11 Archaeological or Paleontological Discoveries
- 7.12 Applicable Alaska Preferences
- 7.13 Wages and Hours of Labor
- 7.14 Overtime Work Hours and Compensation

**ARTICLE 8 - OTHER WORK**

- 8.1 Related Work at Site
- 8.2 Access, Cutting, and Patching
- 8.3 Defective Work by Others
- 8.4 Coordination

**ARTICLE 9 - CHANGES**

- 9.1 DEPARTMENT's Right to Change
- 9.2 Authorization of Changes within the General Scope
- 9.3 Directive
- 9.4 Change Order
- 9.5 Shop Drawing Variations
- 9.6 Changes Outside the General Scope; Supplemental Agreement
- 9.7 Unauthorized Work
- 9.8 Notification of Surety
- 9.9 Differing Site Conditions
- 9.10 Interim Work Authorization

**ARTICLE 10- CONTRACT PRICE; COMPUTATION AND CHANGE**

- 10.1 Contract Price
- 10.2 Claim for Price Change
- 10.3 Change Order Price Determination
- 10.4 Cost of the Work
- 10.5 Excluded Costs
- 10.6 CONTRACTOR's Fee
- 10.7 Cost Breakdown
- 10.8 Cash Allowances

- 10.9 Unit Price Work
- 10.10 Determinations for Unit Prices

**ARTICLE 11- CONTRACT TIME, COMPUTATION AND CHANGE**

- 11.1 Commencement of Contract Time; Notice to Proceed
- 11.2 Starting the Work
- 11.3 Computation of Contract Time
- 11.4 Time Change
- 11.5 Extension Due to Delays
- 11.6 Essence of Contract
- 11.7 Reasonable Completion Time
- 11.8 Delay Damages

**ARTICLE 12 - QUALITY ASSURANCE**

- 12.1 Warranty and Guaranty
- 12.2 Access to Work
- 12.3 Tests and Inspections
- 12.4 Uncovering Work
- 12.5 DEPARTMENT May Stop the Work
- 12.6 Correction or Removal of Defective Work
- 12.7 One Year Correction Period
- 12.8 Acceptance of Defective Work
- 12.9 DEPARTMENT may Correct Defective Work

**ARTICLE 13- PAYMENTS TO CONTRACTOR AND COMPLETION**

- 13.1 Schedule of Values
- 13.2 Preliminary Payments
- 13.3 Application for Progress Payment
- 13.4 Review of Applications for Progress Payments
- 13.5 Stored Materials and Equipment
- 13.6 CONTRACTOR's Warranty of Title
- 13.7 Withholding of Payments
- 13.8 Retainage
- 13.9 Request for Release of funds
- 13.10 Substantial Completion
- 13.11 Access Following Substantial Completion
- 13.12 Final Inspection
- 13.13 Final Completion and Application for Payment
- 13.14 Final Payment
- 13.15 Final Acceptance
- 13.16 CONTRACTOR's Continuing Obligation
- 13.17 Waiver of Claims by CONTRACTOR
- 13.18 No Waiver of Legal Rights

**ARTICLE 14- SUSPENSION OF WORK AND TERMINATION**

- 14.1 DEPARTMENT May Suspend Work
- 14.2 Default of Contract
- 14.3 Rights or Remedies
- 14.4 Convenience Termination

**ARTICLE 15- CLAIMS AND DISPUTES**

- 15.1 Notification
- 15.2 Presenting the Claim
- 15.3 Claim Validity, Additional Information & DEPARTMENT's Action
- 15.4 Contracting Officer's Decision
- 15.5 Fraud and Misrepresentation in Making Claims

## **ACKNOWLEDGMENT**

"The State of Alaska, General Conditions of the Construction Contract for Buildings" is based on the "Standard General Conditions of the Construction Contract" as published by the National Society of Professional Engineers (document number 1910-8, 1983 edition) on behalf of the Engineers Joint Construction Documents Committee. Portions of the NSPE General Conditions are reprinted herein by the express permission of NSPE. Modifications to the NSPE text are made to provide for State laws, regulations, and established procedures.

The granting of permission by NSPE to allow the State of Alaska to preprint portions of the NSPE document 1910-8, 1983 edition does not constitute approval of the State of Alaska General Conditions of the Construction Contract for Buildings.

## **ARTICLE 1 - DEFINITIONS**

Wherever used in the Contract Documents the following terms, or pronouns in place of them, are used, the intent and meaning, unless a different intent or meaning is clearly indicated, shall be interpreted as set forth below.

The titles and headings of the articles, sections, and subsections herein are intended for convenience of reference.

Terms not defined below shall have their ordinary accepted meanings within the context which they are used. Words which have a well-known technical or trade meaning when used to describe work, materials or equipment shall be interpreted in accordance with such meaning. Words defined in Article 1 are to be interpreted as defined.

**Addenda** - All clarifications, corrections, or changes issued graphically or in writing by the DEPARTMENT after the Advertisement but prior to the opening of Proposals.

**Advertisement** - The public announcement, as required by law, inviting bids for Work to be performed or materials to be furnished.

**Application for Payment** - The form provided by the DEPARTMENT which is to be used by the CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

**Approved or Approval** - 'Approved' or 'Approval' as used in this contract document shall mean that the Department has received a document, form or submittal from the contractor and that the Department has taken "No exceptions" to the item submitted. Unless the context clearly indicates otherwise, approved or approval shall not mean that the Department approves of the methods or means, or that the item or form submitted meets the requirements of the contract or constitutes acceptance of the Contractor's work. Where approved or approval means acceptance, then such approval must be set forth in writing and signed by the contracting officer or his designee.

**Architect** - Where used in the contract documents, "ARCHITECT" shall mean the DEPARTMENT'S ENGINEER.

**Architect/Engineer** - Where used in the contract documents, "ARCHITECT/ENGINEER" shall mean the DEPARTMENT'S ENGINEER.

**A.S** - Initials which stand for Alaska Statute.

**Award** - The acceptance, by the DEPARTMENT, of the successful bid.

**Bid Bond** - A type of Proposal Guaranty.

**Bidder** - Any individual, firm, corporation or any acceptable combination thereof, or joint venture submitting a bid for the advertised Work.

**Calendar Day** - Every day shown on the calendar, beginning and ending at midnight.

**Change Order** - A written order by the DEPARTMENT directing changes to the Contract Documents, within their general scope.

**Consultant** - The person, firm, or corporation retained directly by the DEPARTMENT to prepare Contract Documents, perform construction administration services, or other Project related services.

**Contingent Sum Work Item** - When the bid schedule contains a Contingent Sum Work Item, the Work covered shall be performed only upon the written Directive of the Project Manager. Payment shall be made as provided in the Directive.

**Contract** - The written agreement between the DEPARTMENT and the CONTRACTOR setting forth the obligations of the parties and covering the Work to be performed, all as required by the Contract Documents.

**Contract Documents** - The Contract form, Addenda, the bidding requirements and CONTRACTOR's bid (including all appropriate bid tender forms), the bonds, the Conditions of the Contract and all other Contract requirements, the Specifications, and the Drawings furnished by the DEPARTMENT to the CONTRACTOR, together with all Change Orders and documents approved by the Contracting Officer, for inclusion, modifications and supplements issued on or after the Effective Date of the Contract.

**Contracting Officer** - The person authorized by the Commissioner to enter into and administer the Contract on behalf of the DEPARTMENT. He has authority to make findings, determinations and decisions with respect to the Contract and, when necessary, to modify or terminate the Contract. The Contracting Officer is identified on the construction Contract.

**CONTRACTOR** - The individual, firm, corporation or any acceptable combination thereof, contracting with the DEPARTMENT for performance of the Work.

**Contract Price** - The total moneys payable by the DEPARTMENT to the CONTRACTOR under the terms of the Contract Documents.

**Contract Time** - The number of Calendar Days following issuance of Notice-to-Proceed in which the project shall be rendered Substantially Complete, or if specified as a calendar date, the Substantial Completion date specified in the Contract Documents

**Controlling Item** - Any feature of the Work on the critical path of a network schedule.

**Defective** - Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents.

**DEPARTMENT** - The Alaska Department of Transportation and Public Facilities. References to "Owner", "State", "Contracting Agency", mean the DEPARTMENT.

**Directive** - A written communication to the CONTRACTOR from the Contracting Officer interpreting or enforcing a Contract requirement or ordering commencement of an item of Work.

**Drawings** - The Drawings which show the character and scope of the Work to be performed and which have been furnished by the DEPARTMENT or the DEPARTMENT's Consultant and are by reference made a part of the Contract Documents.

**ENGINEER** - The DEPARTMENT'S authorized representative of the Contracting Officer, as defined in the DEPARTMENT'S *delegation of authority letter* to be issued after notice-to-proceed, who is responsible for administration of the contract.

**Equipment** - All machinery together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the work.

**Final Acceptance** - The DEPARTMENT's written acceptance of the Work following Final Completion and the performance of all Contract requirements by the CONTRACTOR.

**Final Completion** - The Project (or specified part thereof) has progressed to the point that all required Work is complete as determined by the Contracting Officer.

**Furnish** - To procure, transport, and deliver to the project site materials, labor, or equipment, for installation or use on the project.

**General Requirements** - Sections of Division 1 of the Specifications which contain administrative and procedural requirements as well as requirements for temporary facilities which apply to Specification Divisions 2 through 16.

**Holidays** - In the State of Alaska, Legal Holidays occur on:

1. New Years Day - January 1
2. Martin Luther King's Birthday - Third Monday in January
3. President's Day - Third Monday in February
4. Seward's Day - Last Monday in March
5. Memorial Day - Last Monday in May
6. Independence Day - July 4
7. Labor Day - First Monday in September
8. Alaska Day - October 18
9. Veteran's Day - November 11
10. Thanksgiving Day - Fourth Thursday in November
11. Christmas Day - December 25
12. Every Sunday
13. Every day designated by public proclamation by the President of the United States or the Governor of the State as a legal Holiday.

If any Holiday listed above falls on a Saturday, Saturday and the preceding Friday are both legal Holidays. If the Holiday should fall on a Sunday, except (12) above, Sunday and the following Monday are both legal Holidays. See Title 44, Alaska Statutes.

**Inspector** - The Engineer's authorized representative assigned to make detailed observations relating to contract performance.

**Install** - Means to build into the Work, ready to be used in complete and operable condition and in compliance with Contract Documents.

**Interim Work Authorization** - A written order by the Engineer initiating changes to the Contract, within its general scope, until a subsequent Change Order is executed.

**Invitation for Bids** - A portion of the bidding documents soliciting bids for the Work to be performed.

**Laboratory** - The official testing laboratories of the DEPARTMENT or such other laboratories as may be designated by the Engineer or identified in the contract documents.

**Materials** - Any substances specified for use in the construction of the project.

**Notice of Intent to Award** - The written notice by the DEPARTMENT to all Bidders identifying the apparent successful Bidder and establishing the DEPARTMENT's intent to execute the Contract when all conditions required for execution of the Contract are met.

**Notice to Proceed** - A written notice to the CONTRACTOR to begin the Work and establishing the date on which the Contract Time begins.

**Payment Bond** - The security furnished by the CONTRACTOR and his Surety to guarantee payment of the debts covered by the bond.

**Performance Bond** - The security furnished by the CONTRACTOR and his Surety to guarantee performance and completion of the Work in accordance with the Contract.

**Preconstruction Conference** - A meeting between the CONTRACTOR and the Engineer, and other parties affected by the construction, to discuss the project before the CONTRACTOR begins work.

**Project** - The total construction, of which the Work performed under the Contract Documents is the whole or a part, where such total construction may be performed by more than one CONTRACTOR.

**Project Manager** - The authorized representative of the Contracting Officer who is responsible for administration of the Contract.

**Proposal** - The offer of a Bidder, on the prescribed forms, to perform the Work at the prices quoted.

**Proposal Guaranty** - The security furnished with a Proposal to guarantee that the bidder will enter into a Contract if his Proposal is accepted by the DEPARTMENT.

**Quality Assurance (QA)** - Where referred to in the technical specifications (Divisions 2 through 16), Quality Assurance refers to measures to be provided by the CONTRACTOR as specified.

**Quality Control (QC)** - Tests and inspections by the CONTRACTOR to insure the acceptability of materials incorporated into the work. QC test reports are used as a basis upon which to determine whether the Work conforms to the requirements of the Contract Documents and to determine its acceptability for payment.

**Regulatory Requirements** - Laws, rules, regulations, ordinances, codes and/or orders.

**Schedule of Values** - The DEPARTMENT's document, submitted by the CONTRACTOR and reviewed by the Contracting Officer, which shall serve as the basis for computing payment and for establishing the value of separate items of Work which comprise the Contract Price.

**Shop Drawings** - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the CONTRACTOR to illustrate material, equipment, fabrication, or erection for some portion of the Work. Where used in the Contract Documents, "Shop Drawings" shall also mean "Submittals".

**Specifications** - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative and procedural details applicable thereto.

**Subcontractor** - An individual, firm, or corporation to whom the CONTRACTOR or any other Subcontractor sublets part of the Contract.

**Substantial Completion** - Although not fully completed, the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Contracting Officer, as evidenced by the DEPARTMENT's written notice, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to Substantial Completion thereof.

**Supplemental Agreement** - A written agreement between the CONTRACTOR and the DEPARTMENT covering work that is not within the general scope of the Contract.

**Supplementary Conditions** - The part of the Contract Documents which amends or supplements these General Conditions.

**Supplier** - A manufacturer, fabricator, distributor, materialman or vendor of materials or equipment.

**Surety** - The corporation, partnership, or individual, other than the CONTRACTOR, executing a bond furnished by the CONTRACTOR.

**Traffic Control Plan (TCP)** - A drawing of one or more specific plans that detail the routing of pedestrian, and/or vehicular traffic through or around a construction area.

**Unit Price Work** - Work to be paid for on the basis of unit prices.

**Using Agency** - The entity who will occupy or use the completed Project.

**Utility** - The privately, publicly or cooperatively owned lines, facilities and systems for producing, transmitting or distributing communications, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, storm water not connected with highway or street drainage, and other similar commodities, including publicly owned fire and police signal systems, street lighting systems, and railroads which directly or indirectly serve the public or any part thereof. The term "utility" shall also mean the utility company, inclusive of any wholly owned or controlled subsidiary."

**Work** - Work is the act of, and the result of, performing services, furnishing labor, furnishing and incorporating materials and equipment into the Project and performing other duties and obligations, all as required by the Contract Documents. Such Work, however incremental, will culminate in the entire completed Project, or the various separately identifiable parts thereof.

## **ARTICLE 2 - AUTHORIZATION AND LIMITATIONS**

### **2.1 Authorities and Limitations**

- 2.1.1 The Contracting Officer alone, shall have the power to bind the DEPARTMENT and to exercise the rights, responsibilities, authorities and functions vested in the Contracting Officer by the Contract Documents. The Contracting Officer shall have the right to designate in writing authorized representatives to act for him. Wherever any provision of the Contract Documents specifies an individual or organization, whether governmental or private, to perform any act on behalf of or in the interest of the DEPARTMENT that individual or organization shall be deemed to be the Contracting Officer's authorized representative under this Contract but only to the extent so specified.
- 2.1.2 The CONTRACTOR shall perform the Work in accordance with any written order (including but not limited to instruction, direction, interpretation or determination) issued by an authorized representative in accordance with the authorized representative's authority to act for the Contracting Officer. The CONTRACTOR assumes all the risk and consequences of performing the Work in accordance with any order (including but not limited to instruction, direction, interpretation or determination) of anyone not authorized to issue such order, and of any order not in writing.
- 2.1.3 Should the Contracting Officer or his authorized representative designate Consultant(s) to act for the DEPARTMENT as provided for in Paragraph 2.1.1, the performance or nonperformance of the Consultant under such authority to act, shall not give rise to any contractual obligation or duty of the Consultant to the CONTRACTOR, any Subcontractor, any Supplier, or any other organization performing any of the Work or any Surety representing them.

### **2.2 Evaluations by Contracting Officer:**

- 2.2.1 The Contracting Officer will decide all questions which may arise as to:
- a. Quality and acceptability of materials furnished;
  - b. Quality and acceptability of Work performed;
  - c. Compliance with the schedule of progress;
  - d. Interpretation of Contract Documents;
  - e. Acceptable fulfillment of the Contract on the part of the CONTRACTOR.
- 2.2.2 In order to avoid cumbersome terms and confusing repetition of expressions in the Contract Documents the terms "as ordered", "as directed", "as required", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used it shall be understood as if the expression were followed by the words "the Contracting Officer".
- When such terms are used to describe a requirement, direction, review or judgment of the Contracting Officer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise).
- 2.2.3 The use of any such term or adjective shall not be effective to assign to the DEPARTMENT any duty of authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

### **2.3 Means & Methods:**

The means, methods, techniques, sequences or procedures of construction, or safety precautions and the program incident thereto, and the failure to perform or furnish the Work in accordance with the Contract Documents are the sole responsibility of the CONTRACTOR.

### **2.4 Visits to Site/Place of Business:**

The Contracting Officer will make visits to the site and approved remote storage sites at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. The Contracting Officer may, at reasonable times, inspect that part of the plant or place of business of the CONTRACTOR or Subcontractor that is related to the performance of the Contract. Such observations or the lack of such observations shall in no way relieve the CONTRACTOR from his duty to perform the Work in accordance with the Contract Documents.

## **ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**

### **3.1 Incomplete Contract Documents:**

The submission of a bid by the Bidder is considered a representation that the Bidder examined the Contract Documents to make certain that all sheets and pages were provided and that the Bidder is satisfied as to the conditions to be encountered in performing the Work. The DEPARTMENT expressly denies any responsibility or liability for a bid submitted on the basis of an incomplete set of Contract Documents.

### **3.2 Copies of Contract Documents:**

The DEPARTMENT shall furnish to the CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.

### **3.3 Scope of Work:**

The Contract Documents comprise the entire Contract between the DEPARTMENT and the CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the Regulatory Requirements of the place of the Project.

It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of the Contract to create in the public or any member thereof a third party benefit, or to authorize anyone not a party to this Contract to maintain a suit pursuant to the terms or provisions of the Contract.

### **3.4 Intent of Contract Documents:**

- 3.4.1 It is the intent of the Contract Documents to describe a functionally complete Project to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied, without any adjustment in Contract Price or Contract Time, whether or not specifically called for.
- 3.4.2 Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Regulatory Requirements of any governmental authority, whether such reference be specific or by implication, shall mean the edition stated in the Contract Documents or if not stated the latest standard specification, manual, code or Regulatory Requirements in effect at the time of Advertisement for the Project (or, on the Effective Date of the Contract if there was no Advertisement). However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the DEPARTMENT and the CONTRACTOR, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the DEPARTMENT or any of the DEPARTMENT's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

### **3.5 Discrepancy in Contract Documents:**

- 3.5.1 Before undertaking the Work, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures, and dimensions shown thereon and all applicable field measurements. Work in the area by the CONTRACTOR shall imply verification of figures, dimensions and field measurements. If, during the above study or during the performance of the Work, the CONTRACTOR finds a conflict, error, discrepancy or omission in the Contract Documents, or a discrepancy between the Contract Documents and any standard specification, manual, code, or Regulatory Requirement which affects the Work, the CONTRACTOR shall promptly report such discrepancy in writing to the Contracting Officer. The CONTRACTOR shall obtain a written interpretation or clarification from the Contracting Officer before proceeding with any Work affected thereby. Any adjustment made by the CONTRACTOR without this

determination shall be at his own risk and expense. However, the CONTRACTOR shall not be liable to the DEPARTMENT for failure to report any conflict, error or discrepancy in the Contract Documents unless the CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

### 3.5.2 Discrepancy - Order of Precedence:

When conflicts errors, or discrepancies within the Contract Documents exist, the order of precedence from most governing to least governing will be as follows:

- Contents of Addenda
- Supplementary Conditions
- General Conditions
- General Requirements
- Technical Specifications
- Drawings
- Recorded dimensions will govern over scaled dimensions
- Large scale details over small scale details
- Schedules over plans
- Architectural drawings over structural drawings Structural drawings over mechanical and electrical drawings

### 3.6 Clarifications and Interpretations:

The Contracting Officer will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as the Contracting Officer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

### 3.7 Reuse of Documents:

Neither the CONTRACTOR nor any Subcontractor, or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with the DEPARTMENT shall have or acquire any title to or ownership rights in any of the Contract Documents (or copies thereof) prepared by or for the DEPARTMENT and they shall not reuse any of the Contract Documents on extensions of the Project or any other project without written consent of the Contracting Officer.

Contract Documents prepared by the CONTRACTOR in connection with the Work shall become the property of the DEPARTMENT.

## **ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS**

### **4.1 Availability of Lands:**

The DEPARTMENT shall furnish as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for use of the CONTRACTOR in connection with the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the DEPARTMENT, unless otherwise provided in the Contract Documents. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment. The CONTRACTOR shall provide all waste and disposal areas, including disposal areas for hazardous or contaminated materials, at no additional cost to the DEPARTMENT.

### **4.2 Visit to Site:**

The submission of a bid by the CONTRACTOR is considered a representation that the CONTRACTOR has visited and carefully examined the site and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the Contract Documents.

### **4.3 Explorations and Reports:**

Reference is made to the Supplementary Conditions for identification of those reports of explorations and tests of subsurface conditions at the site that have been utilized by the DEPARTMENT in preparation of the Contract Documents. The CONTRACTOR may for his purposes rely upon the accuracy of the factual data contained in such reports, but not upon interpretations or opinions drawn from such factual data contained therein or for the completeness or sufficiency thereof. Except as indicated in the immediately preceding sentence and in paragraphs 4.4 and 9.9, CONTRACTOR shall have full responsibility with respect to surface and subsurface conditions at the site.

### **4.4 Utilities:**

The horizontal and vertical locations of known underground utilities as shown or indicated by the Contract Documents are approximate and are based on information and data furnished to the DEPARTMENT by the owners of such underground utilities.

#### **4.4.2 The CONTRACTOR shall have full responsibility for:**

- a. Reviewing and checking all information and data concerning utilities.
- b. Locating all underground utilities shown or indicated in the Contract Documents which are affected by the Work.
- c. Coordination of the Work with the owners of all utilities during construction.
- d. Safety and protection of all utilities as provided in paragraph 6.17.
- e. Repair of any damage to utilities resulting from the Work in accordance with 4.4.4 and 4.5.

#### **4.4.3 If Work is to be performed by any utility owner, the CONTRACTOR shall cooperate with such owners to facilitate the Work.**

#### **4.4.4 In the event of interruption to any utility service as a result of accidental breakage or as result of being exposed or unsupported, the CONTRACTOR shall promptly notify the utility owner and the Contracting Officer. If service is interrupted, repair work shall be continuous until the service is restored. No Work shall be undertaken around fire hydrants until provisions for continued service has been approved by the local fire**

authority.

#### **4.5 Damaged Utilities:**

When utilities are damaged by the CONTRACTOR, the utility owner shall have the choice of repairing the utility or having the CONTRACTOR repair the utility. In the following circumstances, the CONTRACTOR shall reimburse the utility owner for repair costs or provide at no cost to the utility owner or the DEPARTMENT, all materials, equipment and labor necessary to complete repair of the damage:

- a. When the utility is shown or indicated in the Contract Documents.
- b. When the utility has been located by the utility owner.
- c. When no locate was requested by the CONTRACTOR for utilities shown or indicated in the Contract Documents.
- d. All visible utilities.
- e. When the CONTRACTOR could have, otherwise, reasonably been expected to be aware of such utility.

#### **4.6 Utilities Not Shown or Indicated:**

If, while directly performing the Work, an underground utility is uncovered or revealed at the site which was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.19) identify the owner of such underground utility and give written notice thereof to that owner and to the Contracting Officer. The Contracting Officer will promptly review the underground utility to determine the extent to which the Contract Documents and the Work should be modified to reflect the impacts of the discovered utility. The Contract Documents will be amended or supplemented in accordance with paragraph 9.2 and to the extent necessary through the issuance of a change document by the Contracting Officer. During such time, the CONTRACTOR shall be responsible for the safety and protection of such underground utility as provided in paragraph 6.17. The CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are directly attributable to the existence of any underground utility that was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of.

#### **4.7 Survey Control:**

The DEPARTMENT will identify sufficient horizontal and vertical control data to enable the CONTRACTOR to survey and layout the Work. All survey work shall be performed under the direct supervision of a registered land surveyor when required by paragraph 7.8. Copies of all survey notes shall be provided to the DEPARTMENT at an interval determined by the Project Manager. The Project Manager may request submission on a weekly or longer period at his discretion. Any variations between the Contract Documents and actual field conditions shall be identified in the survey notes.

## ARTICLE 5 - BONDS, INSURANCE, AND INDEMNIFICATION

### 5.1 Delivery of Bonds:

When the CONTRACTOR delivers the executed Contract to the Contracting Officer, the CONTRACTOR shall also deliver to the Contracting Officer such bonds as the CONTRACTOR may be required to furnish in accordance with paragraph 5.2.

### 5.2 Bonds:

The CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount as shown on the Contract as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These bonds shall remain in effect for one year after the date of Final Acceptance and until all obligations under this Contract, except special guarantees as per 12.7, have been met. All bonds shall be furnished on forms provided by the DEPARTMENT (or copies thereof) and shall be executed by such Sureties as are authorized to do business in the State of Alaska. The Contracting Officer may at his option copy the Surety with notice of any potential default or liability.

### 5.3 Replacement of Bond and Surety:

If the Surety on any bond furnished in connection with this Contract is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.2, or otherwise becomes unacceptable to the DEPARTMENT, or if any such Surety fails to furnish reports as to his financial condition as requested by the DEPARTMENT, the CONTRACTOR shall within five days thereafter substitute another bond and Surety, both of which must be acceptable to DEPARTMENT.

An individual Surety may be replaced by a corporate Surety during the course of the Contract period. If the Surety desires to dispose of the collateral posted, the DEPARTMENT may, at its option, accept substitute collateral.

### 5.4 Insurance Requirements:

5.4.1 The CONTRACTOR shall provide evidence of insurance with a carrier or carriers satisfactory to the DEPARTMENT covering injury to persons and/or property suffered by the State of Alaska or a third party, as a result of operations which arise both out of and during the course of this Contract by the CONTRACTOR or by any Subcontractor. This coverage will also provide protection against injuries to all employees of the CONTRACTOR and the employees of any Subcontractor engaged in Work under this Contract. The delivery to the DEPARTMENT of a written 30 day notice is required before cancellation of any coverage or reduction in any limits of liability. Insurance carriers shall have an acceptable financial rating.

5.4.2 The CONTRACTOR shall maintain in force at all times during the performance of the work under this agreement the following policies and minimum limits of liability. Failure to maintain insurance may, at the option of the Contracting Officer, be deemed Defective Work and remedied in accordance with the Contract. Where specific limits and coverages are shown, it is understood that they shall be the minimum acceptable. The requirements of this paragraph shall not limit the CONTRACTOR's responsibility to indemnify under paragraph 5.5. Additional insurance requirements specific to this Contract are contained in the Supplementary Conditions, when applicable.

a. Workers' Compensation Insurance: The Contractor shall provide and maintain, for all employees of the Contractor engaged in work under this contract, Workers' Compensation Insurance as required by AS 23.30.045. The Contractor shall be responsible for Workers' Compensation Insurance for any subcontractor who provides services under this contract, to include:

1. Waiver of subrogation against the State and Employer's Liability Protection in the amount of \$500,000 each accident/\$500,000 each disease.

2. If the Contractor directly utilizes labor outside of the State of Alaska in the prosecution of the work, "Other States" endorsement shall be required as a condition of the contract.
  3. Whenever the work involves activity on or about navigable waters, the Workers' Compensation policy shall contain a United States Longshoreman's and Harbor Worker's Act endorsement, and when appropriate, a Maritime Employer's Liability (Jones Act) endorsement with a minimum limit of \$1,000,000.
- b. Comprehensive or Commercial General Liability Insurance: Such insurance shall cover all operations by or on behalf of the CONTRACTOR and provide insurance for bodily injury and property damage liability including coverage for:

premises and operations; products and completed operations; contractual liability insuring obligations assumed under paragraph 5.5, Indemnification; broad form property damage; and personal injury liability.

The minimum limits of liability shall be:

1. If the CONTRACTOR carries a *Comprehensive General Liability* policy, the limits of liability shall not be less than a Combined Single Limit for bodily injury, property damage and Personal Injury Liability of:  
\$1,000,000 each occurrence  
\$2,000,00 aggregate
2. If the CONTRACTOR carries a *Commercial General Liability* policy, the limits of liability shall not be less than:  
\$1,000,000 each occurrence (Combined Single Limit for bodily injury and property damage)  
\$1,000,000 for Personal Injury Liability  
  
\$2,000,000 aggregate for Products-Completed Operations  
\$2,000,000 general aggregate

The State of Alaska, DEPARTMENT of Transportation and Public Facilities shall be named as an "Additional Insured" under all liability coverages listed above.

- c. Automobile Liability Insurance:  
Such insurance shall cover all owned, hired and non-owned vehicles and provide coverage not less than that of the Business Automobile Policy in limits not less than the following:

\$1,000,000 each occurrence  
(Combined Single Limit for bodily injury and property damage.)

- d. Builder's Risk Insurance:  
Coverage shall be on an "All Risk" completed value basis including "quake and flood" and protect the interests of the DEPARTMENT, the CONTRACTOR and his Subcontractors. Coverage shall include all materials, supplies and equipment that are intended for specific installation in the Project while such materials, supplies and equipment are located at the Project site, in transit from port of arrival to job site and while temporarily located away from the Project site.

In addition to providing the above coverages the CONTRACTOR shall ensure that Subcontractors provide insurance coverages as noted in clauses a., b., and c. of this subparagraph. Builders Risk Insurance will only be required of subcontractors if so stated in the Supplementary Conditions.

- e. Other Coverages:  
As specified in the Supplementary Conditions.

- 5.4.3 In addition to providing the above coverages the Contractor shall, in any contract or agreement with subcontractors performing work, require that all indemnities and waivers of subrogation it obtains, and that any stipulation to be named as an additional insured it obtains, also be extended to waive rights of subrogation against the State of Alaska and to add the State of Alaska as additional named indemnitee and as additional insured.

Evidence of insurance shall be furnished to the Department prior to the award of the contract. Such evidence, executed by the carrier's representative and issued to the Department, shall consist of a certificate of insurance or the policy declaration page with required endorsements attached thereto which denote the type, amount, class of operations covered, effective (and retroactive) dates, and dates of expiration. Acceptance by the Department of deficient evidence does not constitute a waiver of contract requirements.

When a certificate of insurance is furnished, it shall contain the following statement:

"This is to certify that the policies described herein comply with all aspects of the insurance requirements of (Project Name and Number)"

### **5.5 Indemnification:**

The CONTRACTOR shall indemnify, save harmless, and defend the DEPARTMENT, its agents and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from the construction or the CONTRACTOR's performance of this Contract; however, this provision has no effect if, but only if, the sole proximate cause of the injury or damage is the DEPARTMENT's negligence.

## **ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES**

### **6.1 Supervision of Work:**

The CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. All Work under this Contract shall be performed in a skillful and workmanlike manner. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

### **6.2 Superintendence by CONTRACTOR:**

The CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent. The Contracting Officer shall be advised in writing of the superintendent's name, local address, and telephone number. This written advice is to be kept current until Final Acceptance by the DEPARTMENT. The superintendent will be the CONTRACTOR's representative at the site and shall have full authority to act and sign documents on behalf of the CONTRACTOR.

All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall cooperate with the Contracting Officer in every way possible.

### **6.3 Character of Workers:**

The CONTRACTOR shall provide a sufficient number of competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The CONTRACTOR shall at all times maintain good discipline and order at the site. The Contracting Officer may, in writing, require the CONTRACTOR to remove from the Work any employee the Contracting Officer deems incompetent, careless, or otherwise detrimental to the progress of the Work, but the Contracting Officer shall have no duty to exercise this right.

### **6.4 CONTRACTOR to Furnish:**

Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance testing, start-up and completion of the Work.

### **6.5 Materials and Equipment:**

All materials and equipment shall be of specified quality and new, except as otherwise provided in the Contract Documents. If required by the Contracting Officer, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be effective to assign to the DEPARTMENT or any of the DEPARTMENT's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

### **6.6 Anticipated Schedules:**

- 6.6.1 Within fourteen (14) calendar days after the date of the Notice to Proceed, the CONTRACTOR shall submit to the Contracting Officer for review an anticipated progress schedule indicating the starting and completion dates of the various stages of the Work. No individual stage of work shall exceed fourteen (14) calendar days.

- 6.6.2 Within twenty one (21) days after the date of the Notice to Proceed, the CONTRACTOR shall submit to the Contracting Officer for review an anticipated schedule of Shop Drawing submissions
- 6.6.3 Prior to submitting the CONTRACTOR's first Application for Payment, the CONTRACTOR shall submit for review and approval:

Anticipated Schedule of Values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by the CONTRACTOR at the time of submission.

#### **6.7 Finalizing Schedules:**

Prior to processing the first Application for Payment the Contracting Officer and the CONTRACTOR will finalize schedules required by paragraph 6.6. The finalized progress schedule will be acceptable to the DEPARTMENT as providing information related to the orderly progression of the Work to completion within the Contract Time; but such acceptance will neither impose on the DEPARTMENT nor relieve the CONTRACTOR from full responsibility for the progress or scheduling of the Work. If accepted, the finalized schedule of Shop Drawing and other required submissions will be acknowledgment by the DEPARTMENT as providing a workable arrangement for processing the submissions. If accepted, the finalized Schedule of Values will be acknowledgment by the DEPARTMENT as an approximation of anticipated value of Work accomplished over the anticipated Contract Time. Receipt and acceptance of a schedule submitted by the CONTRACTOR shall not be construed to assign responsibility for performance or contingencies to the DEPARTMENT or relieve the CONTRACTOR of his responsibility to adjust his forces, equipment, and work schedules as may be necessary to insure completion of the Work within prescribed Contract Time. Should the prosecution of the Work be discontinued for any reason, the CONTRACTOR shall notify the Contracting Officer at least 24 hours in advance of resuming operations.

#### **6.8 Adjusting Schedules:**

Upon substantial changes to the schedule or upon request the CONTRACTOR shall submit to the Contracting Officer for acceptance (to the extent indicated in paragraph 6.7 and the General Requirements) adjustments in the schedules to reflect the actual present and anticipated progress of the Work.

#### **6.9 Substitutes or "Or-Equal" Items:**

- 6.9.1 Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that substitution is limited or not permitted, materials or equipment of other Suppliers may be accepted by the Contracting Officer only if sufficient information is submitted by the CONTRACTOR which clearly demonstrates to the Contracting Officer that the material or equipment proposed is equivalent or equal in all aspects to that named. The procedure for review by the Contracting Officer will include the following as supplemented in the General Requirements.
- 6.9.2 Requests for review of substitute items of material and equipment will not be accepted by the Contracting Officer from anyone other than the CONTRACTOR.

- 6.9.3 If the CONTRACTOR wishes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall make written application to the Contracting Officer for Approval thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as the specified. The application will state that the evaluation and Approval of the proposed substitute will not delay the CONTRACTOR's timely achievement of Substantial or Final Completion, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with the DEPARTMENT for Work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.
- 6.9.4 All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by the DEPARTMENT in evaluating the proposed substitute. The DEPARTMENT may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed substitute. The Contracting Officer may reject any substitution request which the Contracting Officer determines is not in the best interest of the DEPARTMENT.
- 6.9.5 Substitutions shall be permitted during or after the bid period as allowed and in accordance with Document 00020 - Invitation for Bids, Document 00700 – General Conditions, and Document 01630 - Product Options and Substitutions.

**6.10 Substitute Means and Methods:**

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, the CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the Contracting Officer, if the CONTRACTOR submits sufficient information to allow the Contracting Officer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by the Contracting Officer will be similar to that provided in paragraph 6.9 as applied by the Contracting Officer and as may be supplemented in the General Requirements.

**6.11 Evaluation of Substitution:**

The Contracting Officer will be allowed a reasonable time within which to evaluate each proposed substitute. The Contracting Officer will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the Contracting Officer's prior written Approval which will be evidenced by either a Change Order or a Shop Drawing Approved in accordance with Sections 6.20 and 6.21. The Contracting Officer may require the CONTRACTOR to furnish at the CONTRACTOR's expense a special performance guarantee or other Surety with respect to any substitute.

**6.12 Dividing the Work:**

The divisions and sections of the Specifications and the identifications of any Drawings shall not control the CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

**6.13 Subcontractors:**

The CONTRACTOR may utilize the services of appropriately licensed Subcontractors on those parts of the Work which, under normal contracting practices, are performed by Subcontractors, in accordance with the following conditions:

- 6.13.1 The CONTRACTOR shall not award any Work to any Subcontractor without prior written Approval of the Contracting Officer. This Approval will not be given until the CONTRACTOR submits to the Contracting Officer a written statement concerning the proposed award to the Subcontractor which shall contain required Equal Employment Opportunity documents, evidence of insurance whose limits are acceptable to the CONTRACTOR, and an executed copy of the subcontract. All subcontracts shall contain provisions for prompt payment, release of retainage, and interest on late payment amounts and retainage as specified in A.S. 36.90.210. Contracts between subcontractors, regardless of tier, must also contain these provisions. No acceptance by the Contracting Officer of any such Subcontractor shall constitute a waiver of any right of the DEPARTMENT to reject Defective Work.
- 6.13.2 The CONTRACTOR shall be fully responsible to the DEPARTMENT for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions.
- 6.13.3 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of the DEPARTMENT and contains waiver provisions as required by paragraph 13.17 and termination provisions as required by Article 14.
- 6.13.4 Nothing in the Contract Documents shall create any contractual relationship between the DEPARTMENT and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of the DEPARTMENT to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Regulatory Requirements. The DEPARTMENT will not undertake to settle any differences between or among the CONTRACTOR, Subcontractors, or Suppliers.
- 6.13.5 The CONTRACTOR and Subcontractors shall coordinate their work and cooperate with other trades so to facilitate general progress of Work. Each trade shall afford other trades every reasonable opportunity for installation of their work and storage of materials. If cooperative work of one trade must be altered due to lack of proper supervision, or failure to make proper provisions in time by another trade, such conditions shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time.
- 6.13.6 The CONTRACTOR shall include on his own payrolls any person or persons working on this Contract who are not covered by written subcontract, and shall ensure that all Subcontractors include on their payrolls all persons performing Work under the direction of the Subcontractor.

#### **6.14 Use of Premises:**

The CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project limits and approved remote storage sites and lands and areas identified in and permitted by Regulatory Requirements, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. The CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against the DEPARTMENT by any such owner or occupant because of the performance of the Work, the CONTRACTOR shall hold the DEPARTMENT harmless.

#### **6.15 Structural Loading:**

The CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

#### **6.16 Record Documents:**

The CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Directives, Change Orders, Supplemental Agreements, and written interpretations and clarifications (issued pursuant to paragraph 3.6) in good order and annotated to show all changes made during construction. These record documents together with all Approved samples and a counterpart of all Approved Shop Drawings will be available to the Contracting Officer for reference and copying. Upon completion of the Work, the annotated record documents, samples and Shop Drawings will be delivered to the Contracting Officer. Record documents shall accurately record variations in the Work which vary from requirements shown or indicated in the Contract Documents.

#### **6.17 Safety and Protection:**

The CONTRACTOR alone shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

- 6.17.1 All employees on the Work and other persons and organizations who may be affected thereby;
- 6.17.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
- 6.17.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

The CONTRACTOR shall comply with all applicable Regulatory Requirements of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time except as stated in 4.6, except damage or loss attributable to unforeseeable causes beyond the control of and without the fault or negligence of the CONTRACTOR, including but not restricted to acts of God, of the public enemy or governmental authorities. The CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until Final Acceptance (except as otherwise expressly provided in connection with Substantial Completion).

#### **6.18 Safety Representative:**

The CONTRACTOR shall designate a responsible safety representative at the site. This person shall be the CONTRACTOR's superintendent unless otherwise designated in writing by the CONTRACTOR to the Contracting Officer.

#### **6.19 Emergencies:**

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the DEPARTMENT, is obligated to act to prevent threatened damage, injury or loss. The CONTRACTOR shall give the Contracting Officer prompt written notice if the CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the DEPARTMENT determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a change will be authorized by one of the methods indicated in Paragraph 9.2, as determined appropriate by the Contracting Officer.

## **6.20 Shop Drawings and Samples:**

- 6.20.1 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the Contracting Officer for review and Approval in accordance with the accepted schedule of Shop Drawing submissions the required number of all Shop Drawings, which will bear a stamp or specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as the Contracting Officer may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Contracting Officer to review the information as required.
- 6.20.2 The CONTRACTOR shall also submit to the Contracting Officer for review and Approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.
- 6.20.3 Before submission of each Shop Drawing or sample the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.
- 6.20.4 At the time of each submission the CONTRACTOR shall give the Contracting Officer specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to the Contracting Officer for review and Approval of each such variation. All variations of the proposed Shop Drawing from that specified will be identified in the submission and available maintenance, repair and replacement service will be indicated. The submittal will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such variation, including costs of redesign and claims of other Contractors affected by the resulting change, all of which shall be considered by the DEPARTMENT in evaluating the proposed variation. If the variation may result in a change of Contract Time or Price, or Contract responsibility, and is not minor in nature; the CONTRACTOR must submit a written request for Change Order with the variation to notify the DEPARTMENT of his intent. The DEPARTMENT may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed variation. The Contracting Officer may reject any variation request which the Contracting Officer determines is not in the best interest of the DEPARTMENT.

## **6.21 Shop Drawing and Sample Review:**

- 6.21.1 The Contracting Officer will review with reasonable promptness Shop Drawings and samples, but the Contracting Officer's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate acceptance of the assembly in which the item functions. The CONTRACTOR shall make corrections required by the Contracting Officer and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review. The CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by the Contracting Officer on previous submittals.
- 6.21.2 The Contracting Officer's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless the CONTRACTOR has in writing advised the Contracting Officer of each such variation at the time of submission as required by paragraph 6.20.4. The Contracting Officer if he so determines, may give written Approval of each such variation by Change Order, except that, if the variation is minor and no Change Order has been requested a

specific written notation thereof incorporated in or accompanying the Shop Drawing or sample review comments shall suffice as a modification. Approval by the Contracting Officer will not relieve the CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.20.3.

- 6.21.3 The DEPARTMENT shall be responsible for all DEPARTMENT review costs resulting from the initial submission and the fors resubmittal. The CONTRACTOR shall, at the discretion of the Contracting Agency, pay all review costs incurred by the DEPARTMENT as a result of any additional re-submittals.
- 6.21.4 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to the Contracting Officer's review and Approval of the pertinent submission will be the sole expense and responsibility of the CONTRACTOR.

**6.22 Maintenance During Construction:**

The CONTRACTOR shall maintain the Work during construction and until Substantial Completion, at which time the responsibility for maintenance shall be established in accordance with paragraph 13.10.

**6.23 Continuing the Work:**

The CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the DEPARTMENT. No Work shall be delayed or postponed pending resolution of any disputes, disagreements, or claims except as the CONTRACTOR and the Contracting Officer may otherwise agree in writing.

**6.24 Consent to Assignment:**

The CONTRACTOR shall obtain the prior written consent of the Contracting Officer to any proposed assignment of any interest in, or part of this Contract. The consent to any assignment or transfer shall not operate to relieve the CONTRACTOR or his Sureties of any of his or its obligations under this Contract or the Performance Bonds. Nothing herein contained shall be construed to hinder, prevent, or affect an assignment of monies due, or to become due hereunder, made for the benefit of the CONTRACTOR's creditors pursuant to law.

**6.25 Use of Explosives:**

- 6.25.1 When the use of explosives is necessary for the prosecution of the Work, the CONTRACTOR shall exercise the utmost care not to endanger life or property, including new Work and shall follow all Regulatory Requirements applicable to the use of explosives. The CONTRACTOR shall be responsible for all damage resulting from the use of explosives.
- 6.25.2 All explosives shall be stored in a secure manner in compliance with all Regulatory Requirements, and all such storage places shall be clearly marked. Where no Regulatory Requirements apply, safe storage shall be provided not closer than 1,000 feet from any building, camping area, or place of human occupancy.
- 6.25.3 The CONTRACTOR shall notify each public utility owner having structures in proximity to the site of his intention to use explosives. Such notice shall be given sufficiently in advance to enable utility owners to take such steps as they may deem necessary to protect their property from injury. However, the CONTRACTOR shall be responsible for all damage resulting from the use of the explosives, whether or not, utility owners act to protect their property.

**6.26 CONTRACTOR's Records:**

- 6.26.1 Records of the CONTRACTOR and Subcontractors relating to personnel, payrolls, invoices of materials, and any and all other data relevant to the performance of this Contract, must be kept on a generally recognized accounting system. Such records must be available during normal work hours to the Contracting Officer for purposes of investigation to ascertain compliance with Regulatory Requirements and provisions of the Contract

Documents.

6.26.2 Payroll records must contain the name and address of each employee, his correct classification, rate of pay, daily and weekly number of hours of work, deductions made, and actual wages paid. The CONTRACTOR and Subcontractors shall make employment records available for inspection by the Contracting Officer and representatives of the U.S. and/or State Department of Labor and will permit such representatives to interview employees during working hours on the Project.

6.26.3 Records of all communications between the DEPARTMENT and the CONTRACTOR and other parties, where such communications affected performance of this Contract, must be kept by the CONTRACTOR and maintained for a period of three years from Final Acceptance. The DEPARTMENT or its assigned representative may perform an audit of these records during normal work hours after written notice to the CONTRACTOR.

6.27 Load Restrictions

The CONTRACTOR shall comply with all load restrictions as set forth in the "Administrative Permit Manual", and Title 17, Chapter 25, of the Alaska Administrative Code in the hauling of materials on public roads, beyond the limits of the project, and on all public roads within the project limits that are scheduled to remain in use upon completion of the project.

Overload permits may, at the discretion of the State, be issued for travel beyond the project limits for purposes of mobilization and/or demobilization. Issuance of such a permit will not relieve the CONTRACTOR of liability for damage which may result from the moving of equipment.

The operation of equipment of such weight or so loaded as to cause damage to any type of construction will not be permitted. No overloads will be permitted on the base course or surface course under construction. No loads will be permitted on a concrete pavement, base or structure before the expiration of the curing period. The CONTRACTOR shall be responsible for all damage done by his equipment.

## **ARTICLE 7 - LAWS AND REGULATIONS**

### **7.1 Laws to be Observed**

The CONTRACTOR shall keep fully informed of all federal and state Regulatory Requirements and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or which in any way affect the conduct of the Work. The CONTRACTOR shall at all times observe and comply with all such Regulatory Requirements, orders and decrees; and shall protect and indemnify the DEPARTMENT and its representatives against claim or liability arising from or based on the violation of any such Regulatory Requirement, order, or decree whether by the CONTRACTOR, Subcontractor, or any employee of either. Except where otherwise expressly required by applicable Regulatory Requirements, the DEPARTMENT shall not be responsible for monitoring CONTRACTOR's compliance with any Regulatory Requirements.

### **7.2 Permits, Licenses, and Taxes**

- 7.2.1 The CONTRACTOR shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work. As a condition of performance of this Contract, the CONTRACTOR shall pay all federal, state and local taxes incurred by the CONTRACTOR, in the performance of this Contract. Proof of payment of these taxes is a condition precedent to final payment by the DEPARTMENT under this Contract.
- 7.2.2 The CONTRACTOR's certification that taxes have been paid (as contained in the *Release of Contract*) will be verified with the Department of Revenue and Department of Labor, prior to final payment.
- 7.2.3 If any federal, state or local tax is imposed, charged, or repealed after the date of bid opening and is made applicable to and paid by the CONTRACTOR on the articles or supplies herein contracted for, then the Contract shall be increased or decreased accordingly by a Change Order.

### **7.3 Patented Devices, Materials and Processes**

If the CONTRACTOR employs any design, device, material, or process covered by letters of patent, trademark or copyright, the CONTRACTOR shall provide for such use by suitable legal agreement with the patentee or owner. The CONTRACTOR and the Surety shall indemnify and save harmless the DEPARTMENT, any affected third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the DEPARTMENT for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement, at any time during the prosecution or after the completion of the Work.

### **7.4 Compliance of Specifications and Drawings:**

If the CONTRACTOR observes that the Specifications and Drawings supplied by the DEPARTMENT are at variance with any Regulatory Requirements, CONTRACTOR shall give the Contracting Officer prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 9.2. as determined appropriate by the Contracting Officer. If the CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Regulatory Requirements, and without such notice to the Contracting Officer, the CONTRACTOR shall bear all costs arising therefrom; however, it shall not be the CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings supplied by the DEPARTMENT are in accordance with such Regulatory Requirements.

### **7.5 Accident Prevention:**

The CONTRACTOR shall comply with AS 18.60.075 and all pertinent provisions of the Construction Code Occupational Safety and Health Standards issued by the Alaska Department of Labor.

## **7.6 Sanitary Provisions:**

The CONTRACTOR shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees and DEPARTMENT representatives as may be necessary to comply with the requirements of the State and local Boards of Health, or of other bodies or tribunals having jurisdiction.

## **7.7 Business Registration:**

Comply with AS 08.18.011, as follows: "it is unlawful for a person to submit a bid or work as a contractor until he has been issued a certificate of registration by the Department of Commerce. A partnership or joint venture shall be considered registered if one of the general partners or venturers whose name appears in the name under which the partnership or venture does business is registered."

## **7.8 Professional Registration and Certification:**

All craft trades, architects, engineers and land surveyors, electrical administrators, and explosive handlers employed under the Contract shall specifically comply with applicable provisions of AS 08.18, 08.48, 08.40, and 08.52. Provide copies of individual licenses within seven days following a request from the Contracting Officer.

## **7.9 Local Building Codes:**

The CONTRACTOR shall comply with AS 35.10.025 which requires construction in accordance with applicable local building codes to include the obtaining of required permits.

## **7.10 Air Quality Control:**

The CONTRACTOR shall comply with all applicable provisions of AS 46.03.04 as pertains to Air Pollution Control.

## **7.11 Archaeological or Paleontological Discoveries:**

When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, or paleontological remains, such as shell heaps, land or sea mammal bones or tusks, the CONTRACTOR shall cease operations immediately and notify the Contracting Officer. No artifacts or specimens shall be further disturbed or removed from the ground and no further operations shall be performed at the site until so directed. Should the Contracting Officer order suspension of the CONTRACTOR's operations in order to protect an archaeological or historical finding, or order the CONTRACTOR to perform extra Work, such shall be covered by an appropriate Contract change document.

## **7.12 Applicable Alaska Preferences:**

- 7.12.1 In determining the low bidder for State funded projects, a 5% bid preference has been given to "Alaska bidders", as required under AS 36.30.170. "Alaska bidder" means a person who:
- (1) holds a current Alaska business license;
  - (2) submits a bid for goods, services, or construction under the name as appearing on the person's current Alaska business license
  - (3) has maintained a place of business within the state staffed by the bidder or an employee of the bidder for a period of six months immediately preceding the date of the bid;
  - (4) is incorporated or qualified to do business under the laws of the state, is a sole proprietorship, and the proprietor is a resident of the state or is a partnership, and all partners are residents of the state; and
  - (5) if a joint venture, is composed entirely of ventures that qualify under (1) through (4), above.
- 7.12.2 In determining the low bidder for State funded projects, an "Alaska products" preference has been given as required under AS 36.30.326 - 36.30.332, when the bidder designates the use of Alaska products. The Bidder shall complete the Alaska Products Preference Worksheet per its instructions and submit it with the Bid

Proposal. If the successful Bidder/CONTRACTOR proposes to use an Alaska product and does not do so, a penalty will be assessed against the successful Bidder/CONTRACTOR in an amount equal to the product preference percentage granted to the successful Bidder/CONTRACTOR plus one percent multiplied by the total declared value of the Alaska products proposed but not used.

- 7.12.3 Pursuant to AS 36.15.050 and AS 36.30.322, "agricultural/wood" products harvested in Alaska shall be used in State funded projects whenever they are priced no more than seven percent above agricultural/wood products harvested outside the state and are of a like quality as compared with agricultural/wood products harvested outside the state, when such products are not utilized, the CONTRACTOR shall document the efforts he made towards obtaining agricultural/wood products harvested in Alaska and include in this documentation a written statement that he contacted the manufacturers and suppliers identified on the Department of Commerce and Economic Development's list of suppliers of Alaska forest products concerning the availability of agricultural/wood products harvested in Alaska and, if available, the product prices. The CONTRACTOR's use of agricultural/wood products that fail to meet the requirements of this section shall be subject to the provisions of paragraphs 12.6 through 12.9 relating to Defective Work.
- 7.12.4 The CONTRACTOR shall maintain records, in a format acceptable to the Contracting Officer, which establish the type and extent of "agricultural/wood" and "Alaska" products utilized. All record keeping and documentation associated with the requirements 7.12.2 and 7.12.3 of this paragraph, must be provided to the DEPARTMENT upon written request or as otherwise provided within the Contract Documents.

### **7.13 Wages and Hours of Labor:**

- 7.13.1 One certified copy of all payrolls shall be submitted weekly to the State Department of Labor and, upon request, to the Contracting Officer to assure compliance with AS 36.05.040, *Filing Schedule of Employees Wages Paid and Other Information*. The CONTRACTOR shall be responsible for the submission of certified copies of payrolls of all Subcontractors. The certification shall affirm that the payrolls are current and complete, that the wage rates contained therein are not less than the applicable rates referenced in these Contract Documents, and that the classification set forth for each laborer or mechanic conforms with the Work he performed. The CONTRACTOR and his Subcontractors shall attend all hearings and conferences and produce such books, papers, and documents all as requested by the Department of Labor. Should federal funds be involved, the appropriate federal agency shall also receive a copy of the CONTRACTOR's certified payrolls. Regardless of project funding source, copies of all certified payrolls supplied to the State Department of Labor by the CONTRACTOR shall be supplied also to the Project Manager upon request, including submittals made by, or on behalf of, subcontractors.
- 7.13.2 The following labor provisions shall also apply to this Contract:
- a. The CONTRACTOR and his Subcontractors shall pay all employees unconditionally and not less than once a week;
  - b. wages may not be less than those stated under AS 36.05.010, regardless of the contractual relationship between the CONTRACTOR or Subcontractors and laborers, mechanics, or field surveyors;
  - c. the scale of wages to be paid shall be posted by the CONTRACTOR in a prominent and easily accessible place at the site of the Work;
  - d. the DEPARTMENT shall withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the CONTRACTOR or Subcontractors the difference between
    1. the rates of wages required by the Contract to be paid laborers, mechanics, or field surveyors on the Work, and
    2. the rates of wages in fact received by laborers, mechanics or field surveyors.

- 7.13.3 Within three calendar days of award of a construction contract, the CONTRACTOR shall file a "Notice of Work" with the Department of Labor and shall pay all related fees. The Contracting Officer will not issue Notice to Proceed to the CONTRACTOR until such notice and fees have been paid to the State Department of Labor. Failure of the CONTRACTOR to file the Notice of Work and pay fees within this timeframe shall not constitute grounds for an extension of contract time or adjustment of contract price.

**7.14 Overtime Work Hours and Compensation:**

Pursuant to 40 *U.S.C.* 327-330 and AS 23.10.060 -.110, the CONTRACTOR shall not require nor permit any laborer or mechanic in any workweek in which he is employed on any Work under this Contract to work in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek on Work subject to the provisions of the *Contract Work Hours and Safety Standards Act* unless such laborer or mechanic receives compensation at a rate not less than one and one half times his basic rate of pay for all such hours worked in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek whichever is the greater number of overtime hours. In the event of any violation of this provision, the CONTRACTOR shall be liable to any affected employee for any amounts due and penalties and to the DEPARTMENT for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of this provision in the sum of \$10.00 for each Calendar Day on which such employee was required or permitted to be employed on such Work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by this paragraph.

## **ARTICLE 8 - OTHER WORK**

### **8.1 Related Work at Site:**

- 8.1.1 The DEPARTMENT reserves the right at any time to contract for and perform other or additional work on or near the Work covered by the Contract.
- 8.1.2 When separate contracts are let within the limits of the Project, the CONTRACTOR shall conduct his Work so as not to interfere with or hinder the work being performed by other contractors. The CONTRACTOR when working on the same Project with other contractors shall cooperate with such other contractors. The CONTRACTOR shall join his Work with that of the others in an acceptable manner and shall perform it in proper sequence to that of others.
- 8.1.3 If the fact that other such work is to be performed is identified or shown in the Contract Documents the CONTRACTOR shall assume all liability, financial or otherwise, in connection with this Contract and indemnify and save harmless the DEPARTMENT from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by the CONTRACTOR because of the presence and operations of other contractors.
- 8.1.4 If the fact that such other work is to be performed was not identified or shown in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work. If the CONTRACTOR believes that such performance will require an increase in Contract Price or Contract Time, the CONTRACTOR shall notify the Contracting Officer of such required increase within fifteen (15) calendar days following receipt of the Contracting Officer's notice. Should the Contracting Officer find such increase(s) to be justified, a Change Order will be executed.

### **8.2 Access, Cutting, and Patching:**

The CONTRACTOR shall afford each utility owner and any other contractor who is a party to such a direct contract with the DEPARTMENT (or the DEPARTMENT, if the DEPARTMENT is performing the additional work with the DEPARTMENT's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with the work of others. The CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work, the CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter such other work with the written consent of the Contracting Officer. The duties and responsibilities of the CONTRACTOR under this paragraph are for the benefit of other contractors to the extent that there are comparable provisions for the benefit of the CONTRACTOR in said direct contracts between the DEPARTMENT and other contractors.

### **8.3 Defective Work by Others:**

If any part of the CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor, utility owner, or the DEPARTMENT, the CONTRACTOR shall inspect and promptly report to the Contracting Officer in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to so report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or nonapparent defects and deficiencies in the other work.

### **8.4 Coordination:**

If the DEPARTMENT contracts with others for the performance of other work at the site, Contracting Officer will have authority and responsibility for coordination of the activities among the various prime contractors.

## **ARTICLE 9 - CHANGES**

### **9.1 DEPARTMENT's Right to Change:**

Without invalidating the Contract and without notice to any Surety, the DEPARTMENT may, at any time or from time to time, order additions, deletions or revisions in the Work within the general scope of the Contract, including but not limited to changes:

- 9.1.1 In the Contract Documents;
- 9.1.2 In the method or manner of performance of the Work;
- 9.1.3 In State-furnished facilities, equipment, materials, services, or site;
- 9.1.4 Directing acceleration in the performance of the Work.

### **9.2 Authorization of Changes within the General Scope:**

Additions, deletions, or revisions in the Work within the general scope of the Contract as specified in 9.1 shall be authorized by one or more of following ways:

- 9.2.1 Directive (pursuant to paragraph 9.3)
- 9.2.2 A Change Order (pursuant to paragraph 9.4)
- 9.2.3 DEPARTMENT's acceptance of Shop Drawing variations from the Contract Documents as specifically identified by the CONTRACTOR as required by paragraph 6.20.4.

### **9.3 Directive:**

- 9.3.1 The Contracting Officer shall provide written clarification or interpretation of the Contract Documents (pursuant to paragraph 3.6).
- 9.3.2 The Contracting Officer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents.
- 9.3.3 The Contracting Officer may order the Contractor to correct Defective Work or methods which are not in conformance with the Contract Documents.
- 9.3.4 The Contracting Officer may direct the commencement or suspension of Work or emergency related Work (as provided in paragraph 6.19).
- 9.3.5 Upon the issuance of a Directive to the CONTRACTOR by the Contracting Officer, the CONTRACTOR shall proceed with the performance of the Work as prescribed by such Directive.
- 9.3.6 If the CONTRACTOR believes that the changes noted in a Directive may cause an increase in the Contract Price or an extension of Contract Time, the CONTRACTOR shall immediately provide written notice to the Contracting Officer depicting such increases before proceeding with the Directive, except in the case of an emergency. If the Contracting Officer finds the increase in Contract Price or the extension of Contract Time justified, a Change Order will be issued. If however, the Contracting Officer does not find that a Change Order is justified, the Contracting Officer may direct the CONTRACTOR to proceed with the Work. The CONTRACTOR shall cooperate with the Contracting Officer in keeping complete daily records of the cost of such Work. If a Change Order is ultimately determined to be justified, in the absence of agreed prices and unit prices, payment for such Work will be made on a "cost of the work basis" as provided in 10.4

#### **9.4 Change Order:**

A change in Contract Time, Contract Price, or responsibility may be made for changes within the scope of the Work by Change Order. Upon receipt of an executed Change Order, the CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents except as otherwise specifically provided. Changes in Contract Price and Contract Time shall be made in accordance with Articles 10 and 11. A Change Order shall be considered executed when it is signed by the DEPARTMENT.

#### **9.5 Shop Drawing Variations:**

Variations by shop drawings shall only be eligible for consideration under 9.4 when the conditions affecting the price, time, or responsibility are identified by the CONTRACTOR in writing and a request for a Change Order is submitted as per 6.20.4.

#### **9.6 Changes Outside the General Scope; Supplemental Agreement:**

Any change which is outside the general scope of the Contract, as determined by the Contracting Officer, must be authorized by a Supplemental Agreement signed by the appropriate representatives of the DEPARTMENT and the CONTRACTOR.

#### **9.7 Unauthorized Work:**

The CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in this Article 9, except in the case of an emergency as provided in paragraph 6.19 and except in the case of uncovering Work as provided in paragraph 12.4.2.

#### **9.8 Notification of Surety:**

If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time) is required by the provisions of any bond to be given to a Surety, the giving of any such notice will be the CONTRACTOR's responsibility, and the amount of each applicable bond will be adjusted accordingly.

#### **9.9 Differing Site Conditions:**

9.9.1 The CONTRACTOR shall promptly, and before such conditions are disturbed (except in an emergency as permitted by paragraph 6.19), notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in the Contract, and which could not have been discovered by a careful examination of the site, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract. The Contracting Officer shall promptly investigate the conditions, and if the Contracting Officer finds that such conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or time required for, performance of this Contract, an adjustment shall be made and the Contract modified in writing accordingly. An adjustment in compensation shall be computed under Article 10.

9.9.2 Any claim for additional compensation by the CONTRACTOR under this clause shall be made in accordance with Article 15. In the event that the Contracting Officer and the CONTRACTOR are unable to reach an agreement concerning an alleged differing site condition, the CONTRACTOR will be required to keep an accurate and detailed record which will indicate the actual "cost of the work" done under the alleged differing site condition. Failure to keep such a record shall be a bar to any recovery by reason of such alleged differing site conditions. The Contracting Officer shall be given the opportunity to supervise and check the keeping of such records.

9.10 **Interim Work Authorization:**

An Interim Work Authorization may be used to establish a change within the scope of the Work; however, only a Change Order shall establish associated changes in Contract Time and Price. Work authorized by Interim Work Authorization shall be converted to a Change Order. The basis of payment shall be as stated in the Interim Work Authorization, unless it states that the basis of payment has not been established and is to be negotiated, in which case the Cost of the Work shall be documented pursuant to Article 10.4, to establish a basis for negotiating a lump sum price for the Change Order.

## **ARTICLE 10 - CONTRACT PRICE; COMPUTATION AND CHANGE**

### **10.1 Contract Price:**

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to the CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order or Supplemental Agreement.

### **10.2 Claim for Price Change:**

Any claim for an increase or decrease in the Contract Price shall be submitted in accordance with the terms of Article 15, and shall not be allowed unless notice requirements of this Contract have been met.

### **10.3 Change Order Price Determination:**

The value of any Work covered by a Change Order for an increase or decrease in the Contract Price shall be determined in one of the following ways:

- 10.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of subparagraphs 10.9.1 through 10.9.3, inclusive).
- 10.3.2 By mutual acceptance of a lump sum (fixed price) which includes overhead and profit. The lump sum (fixed price) shall be negotiated on the basis of the estimated "cost of the work" in accordance with Articles 10.4 and 10.5. The following maximum rates of cost markup (to cover both overhead and profit of the CONTRACTOR) shall be used in the negotiation of a Lump Sum Change Order:
- a. For costs incurred under paragraphs 10.4.1 and 10.4.2, the CONTRACTOR's fee shall be twenty percent;
  - b. For costs incurred under paragraph 10.4.3, the CONTRACTOR's fee shall be ten percent; and if a subcontract is on the basis of "cost of the work" plus a fee, the maximum allowable to CONTRACTOR on account of overhead and profit for itself and all Subcontractors and multiple tiers thereof shall be fifteen percent of the cost incurred by the subcontractor actually performing the work;
  - c. No fee shall be payable on the basis of costs itemized under paragraphs 10.4.4, 10.4.5 and 10.5;
  - d. The amount of credit to be allowed by the CONTRACTOR to the DEPARTMENT for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in CONTRACTOR's fee by an amount equal to twenty percent of the net decrease; and
  - e. When both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 10.3.2.a through 10.3.2.d, inclusive
- 10.3.3 When 10.3.1 and 10.3.2 are inapplicable, on the basis of the "cost of the work" (determined as provided in paragraphs 10.4 and 10.5) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 10.6).
- 10.3.4 Before a Change Order or Supplemental Agreement is Approved, the CONTRACTOR shall submit cost or pricing data regarding the changed or extra Work. The CONTRACTOR shall certify that the data submitted is, to his best knowledge and belief, accurate, complete and current as of a mutually determined specified date and that such data will continue to be accurate and complete during the performance of the changed or extra Work.

#### 10.4 Cost of the Work:

The term "cost of the work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by the DEPARTMENT, such costs shall be in amount no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in subparagraph 10.5:

- 10.4.1 Payroll costs for employees in the direct employ of the CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by the DEPARTMENT and the CONTRACTOR. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include manual workers up through the level of foreman but shall not include general foremen, superintendents, and non-manual employees. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by the DEPARTMENT.
- 10.4.2 Cost of all materials and equipment furnished and incorporated or consumed in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to the CONTRACTOR unless the DEPARTMENT deposits funds with the CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to the DEPARTMENT. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the DEPARTMENT, and the CONTRACTOR shall make provisions so that they may be obtained.
- 10.4.3 Payments made by the CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by the DEPARTMENT, CONTRACTOR shall obtain competitive quotes from Subcontractors or Suppliers acceptable to the CONTRACTOR and shall deliver such quotes to the DEPARTMENT who will then determine which quotes will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of "cost of the work" plus a fee, the Subcontractor's "cost of the work" shall be determined in the same manner as the CONTRACTOR's "cost of work" as described in paragraphs 10.4 through 10.5; and the Subcontractor's fee shall be established as provided for under subparagraph 10.6.2 clause b. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.
- 10.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, and surveyors) employed for services necessary for the completion of the Work.
- 10.4.5 Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel and subsistence expenses of the CONTRACTOR's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of the CONTRACTOR.
  - c. Rentals of all construction equipment and machinery and the parts thereof whether rented from the CONTRACTOR or others in accordance with rental agreements Approved by the DEPARTMENT and the costs of transportation, loading, unloading, installation, dismantling and removal thereof - all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

For any machinery or special equipment (other than small tools) which has been authorized by the Project

Manager, the CONTRACTOR shall receive the rental rates in the current edition and appropriate volume of the "Rental Rate Blue Book for Construction Equipment", published by Dataquest, Inc., 1290 Ridder Park Drive, San Jose, CA 95131. Hourly rental rates shall be determined as follows:

*The established hourly rental rate shall be equal to the adjusted monthly rate for the basic equipment plus the adjusted monthly rate for applicable attachments, both divided by 176, and multiplied by the area adjustment factor, plus the estimated hourly operating cost.*

The adjusted monthly rate is that resulting from application of the rate adjustment formula in order to eliminate replacement cost allowances in machine depreciation and contingency cost allowances.

Attachments shall not be included unless required for the time and materials work.

For equipment not listed in The Blue Book, the CONTRACTOR shall receive a rental rate as agreed upon before such work is begun. If agreement cannot be reached, the DEPARTMENT reserves the right to establish a rate based on similar equipment in the Blue Book or prevailing commercial rates in the area.

These rates shall apply for equipment used during the CONTRACTOR's regular shift of 10 hours per day. Where the equipment is used more than 10 hours per day, either on the CONTRACTOR's normal work or on time and materials, and either on single or multiple shifts, an overtime rate, computed as follows, shall apply:

*The hourly overtime rate shall be equal to the adjusted monthly rate for the basic equipment plus the adjusted monthly rate for applicable attachments, both divided by 352, and multiplied by the area adjustment factor, plus the estimated hourly operating cost.*

Equipment which must be rented or leased specifically for work required under this section shall be authorized in writing by the Project Manager. The CONTRACTOR shall be paid invoice price plus 15%.

When it is necessary to obtain equipment from sources beyond the project limits exclusively for time and materials, work, the actual cost of transferring the equipment to the site of the work and return will be allowed as an additional item of expense. Where the move is made by common carrier, the move-in allowance will be limited to the amount of the freight bill or invoice. If the CONTRACTOR hauls the equipment with his own forces, the allowance will be limited to the rental rate for the hauling unit plus operator wages. In the event that the equipment is transferred under its own power, the moving allowance will be limited to one-half of the normal hourly rental rate plus operator's wages. In the event that the move-out is to a different location, payment will in no instance exceed the amount of the move-in. Move-in allowance shall not be made for equipment brought to the project for time and materials work which is subsequently retained on the project and utilized for completion of contract items, camp maintenance, or related work.

Equipment ordered to be on a stand-by basis shall be paid for at the stand-by rental rate for the number of hours in the CONTRACTOR'S normal work shift, but not to exceed 8 hours per day. The stand-by rental rate shall be computed as follows:

*The hourly stand-by rate shall be equal to the adjusted monthly rate for the basic equipment plus the adjusted monthly rate for applicable attachments, both divided by 352, all multiplied by the area adjustment factor.*

Time will be recorded to the nearest one-quarter hour for purposes of computing compensation to the CONTRACTOR for equipment utilized under these rates.

The equipment rates as determined above shall be full compensation, including overhead and profit, for providing the required equipment and no additional compensation will be made for other costs such as, but not limited to, fuels, lubricants, replacement parts or maintenance costs. Cost of repairs, both major and minor, as well as charges for mechanic's time utilized in servicing equipment to ready it for use prior to moving to the project and similar charges will not be allowed.

- d. Sales, consumer, use or similar taxes related to the Work, and for which the CONTRACTOR is liable, imposed by Regulatory Requirements.
- e. Deposits lost for causes other than negligence of the CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by the CONTRACTOR in connection with the performance and furnishing of the Work provided they have resulted from causes other than the negligence of the CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and Approval of the DEPARTMENT. No such losses, damages and expenses shall be included in the "cost of the work" for the purpose of determining the CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and the CONTRACTOR is placed in charge thereof, the CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraphs 10.6.2.a and 10.6.2.b.
- g. The cost of utilities, fuel and sanitary facilities at the site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.
- I. Cost of premiums for additional bonds and insurance required because of changes in the Work and premiums for property insurance coverage within the limits of the deductible amounts established by the DEPARTMENT in accordance with Article 5.

#### **10.5 Excluded Costs:**

The term "cost of the work" shall not include any of the following:

- 10.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agency, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 10.4.1 or specifically covered by paragraph 10.4.4 all of which are to be considered administrative costs covered by the CONTRACTOR's fee.
- 10.5.2 Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.
- 10.5.3 Any part of CONTRACTOR's capital expenses including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
- 10.5.4 Cost of premiums for all bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 10.4.5.i above).
- 10.5.5 Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.
- 10.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 10.4.

#### **10.6 CONTRACTOR's Fee:**

The CONTRACTOR's fee allowed to CONTRACTOR for overhead and profit shall be determined as follows.

- 10.6.1 A mutually acceptable fixed fee; or if none can be agreed upon.
- 10.6.2 A fee based on the following percentages of the various portions of the "cost of the work":
  - a. For costs incurred under paragraphs 10.4.1 and 10.4.2, the CONTRACTOR's fee shall be fifteen percent;
  - b. For costs incurred under paragraph 10.4.3, the CONTRACTOR's fee shall be ten percent; and if a subcontract is on the basis of "cost of the work" plus a fee, the maximum allowable to CONTRACTOR on account of overhead and profit for itself and all Subcontractors and multiple tiers thereof shall be fifteen percent of the cost incurred by the subcontractor actually performing the work;
  - c. No fee shall be payable on the basis of costs itemized under paragraphs 10.4.4, 10.4.5 and 10.5;
  - d. The amount of credit to be allowed by the CONTRACTOR to the DEPARTMENT for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in CONTRACTOR's fee by an amount equal to fifteen percent of the net decrease; and
  - e. When both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 10.6.2.a through 10.6.2.d, inclusive.

#### **10.7 Cost Breakdown:**

Whenever the cost of any Work is to be determined pursuant to paragraphs 10.4 and 10.5, the CONTRACTOR will submit in a form acceptable to the DEPARTMENT an itemized cost breakdown together with supporting data.

#### **10.8 Cash Allowances:**

It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors or Suppliers and for such sums within the limit of the allowances as may be acceptable to the Contracting Officer. CONTRACTOR agrees that:

- 10.8.1 The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and
- 10.8.2 CONTRACTOR's cost for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due the CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

#### **10.9 Unit Price Work:**

- 10.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR will be made by the

DEPARTMENT in accordance with paragraph 10.10.

- 10.9.2 Each unit price will be deemed to include an amount considered by the CONTRACTOR to be adequate to cover the CONTRACTOR's overhead and profit for each separately identified item. If the "Basis of Payment" clause in the Contract Documents relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Contract Documents.
- 10.9.3 Payment to the CONTRACTOR shall be made only for the actual quantities of Work performed and accepted or materials furnished, in conformance with the Contract Documents. When the accepted quantities of Work or materials vary from the quantities stated in the bid schedule, or change documents, the CONTRACTOR shall accept as payment in full, payment at the stated unit prices for the accepted quantities of Work and materials furnished, completed and accepted; except as provided below:
- a. When the quantity of Work to be done or material to be furnished under any item, for which the total cost of the item exceeds 10% of the total Contract Price, is increased by more than 25 percent of the quantity stated in the bid schedule, or change documents, either party to the Contract, upon demand, shall be entitled to an equitable unit price adjustment on that portion of the Work above 125 percent of the quantity stated in the bid schedule.
  - b. When the quantity of Work to be done or material to be furnished under any major item, for which the total cost of the item exceeds 10% of the total Contract Price, is decreased by more than 25 percent of the quantity stated in the bid schedule, or change documents either party to the Contract, upon demand, shall be entitled to an equitable price adjustment for the quantity of Work performed or material furnished, limited to a total payment of not more than 75 percent of the amount originally bid for the item.

**10.10 Determinations for Unit Prices:**

The Contracting Officer will determine the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR. The Contracting Officer will review with the CONTRACTOR preliminary determinations on such matters before finalizing the costs and quantities on the Schedule of Values. The Contracting Officer's acknowledgment thereof will be final and binding on the CONTRACTOR, unless, within 10 days after the date of any such decisions, the CONTRACTOR delivers to the Contracting Officer written notice of intention to appeal from such a decision.

## **ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE**

### **11.1 Commencement of Contract Time; Notice to Proceed:**

The Contract Time will commence to run on the day indicated in the Notice to Proceed.

### **11.2 Starting the Work:**

No Work on Contract items shall be performed before the effective date of the Notice to Proceed. The CONTRACTOR shall notify the Contracting Officer at least 24 hours in advance of the time actual construction operations will begin. The CONTRACTOR may request a limited Notice to Proceed after Award has been made, to permit him to order long lead materials which could cause delays in Project completion. However, granting is within the sole discretion of the Contracting Officer, and refusal or failure to grant a limited Notice to Proceed shall not be a basis for claiming for delay, extension of time, or alteration of price.

### **11.3 Computation of Contract Time:**

11.3.1 When the Contract Time is specified on a Calendar Day basis, all Work under the Contract shall be completed within the number of Calendar Days specified. The count of Contract Time begins on the day following receipt of the Notice to Proceed by the CONTRACTOR, if no starting day is stipulated therein.

Calendar Days shall continue to be counted against Contract Time until and including the date of Substantial Completion of the Work.

11.3.2 When the Contract completion time is specified as a fixed calendar date, it shall be the date of Substantial Completion.

11.3.3 The Contract Time shall be as stated on form 25D-9, Proposal.

### **11.4 Time Change:**

The Contract Time may only be changed by a Change Order or Supplemental Agreement.

### **11.5 Extension Due to Delays:**

The right of the CONTRACTOR to proceed shall not be terminated nor the CONTRACTOR charged with liquidated or actual damages because of delays to the completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to the following: acts of God or of the public enemy, acts of the DEPARTMENT in its contractual capacity, acts of another contractor in the performance of a contract with the DEPARTMENT, floods, fires, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather and delays of Subcontractors or Suppliers due to such causes. Any delay in receipt of materials on the site, caused by other than one of the specifically mentioned occurrences above, does not of itself justify a time extension, provided that the CONTRACTOR shall within twenty four (24) hours from the beginning of any such delay (unless the Contracting Officer shall grant a further period of the time prior to the date of final settlement of the Contract), notify the Contracting Officer in writing of the cause of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when the findings of fact justify such an extension.

### **11.6 Essence of Contract:**

All time limits stated in the Contract Documents are of the essence of the Contract.

### **11.7 Reasonable Completion Time:**

It is expressly understood and agreed by and between the CONTRACTOR and the DEPARTMENT that the date of

beginning and the time for Substantial Completion of the Work described herein are reasonable times for the completion of the Work.

**11.8 Delay Damages:**

Whether or not the CONTRACTOR's right to proceed with the Work is terminated, he and his Sureties shall be liable for damages resulting from his refusal or failure to complete the Work within the specified time.

Liquidated and actual damages for delay shall be paid by the CONTRACTOR or his Surety to the DEPARTMENT in the amount as specified in the Supplementary Conditions for each Calendar Day the completion of the Work or any part thereof is delayed beyond the time required by the Contract, or any extension thereof. If a listing of incidents resulting from a delay and expected to give rise to actual or liquidated damages is not established by the Contract Documents, then the CONTRACTOR and his Surety shall be liable to the DEPARTMENT for any actual damages occasioned by such delay. The CONTRACTOR acknowledges that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that the DEPARTMENT will sustain by reason of delayed completion. These liquidated and actual damages are intended as compensation for losses anticipated to arise, and include those items enumerated in the Supplementary Conditions.

These damages will continue to run both before and after termination in the event of default termination. These liquidated damages do not cover excess costs of completion or DEPARTMENT costs, fees, and charges related to reprourement. If a default termination occurs, the CONTRACTOR or his Surety shall pay in addition to these damages, all excess costs and expenses related to completion as provided by Article 14.2.5.

## **ARTICLE 12 - QUALITY ASSURANCE**

### **12.1 Warranty and Guaranty:**

The CONTRACTOR warrants and guarantees to the DEPARTMENT that all Work will be in accordance with the Contract Documents and will not be Defective. Prompt notice of all defects shall be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected or accepted as provided for in this article.

### **12.2 Access to Work:**

The DEPARTMENT and the DEPARTMENT's representatives, testing agencies and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. The CONTRACTOR shall provide proper and safe conditions for such access.

### **12.3 Tests and Inspections:**

12.3.1 The CONTRACTOR shall give the Contracting Officer timely notice of readiness of the Work for all required inspections, tests or Approvals.

12.3.2 If Regulatory Requirements of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, the CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish the Contracting Officer the required certificates of inspection, testing or approval. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with DEPARTMENT's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for Approval prior to the CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all inspections, tests and approvals in addition to the above which are required by the Contract Documents shall be paid by the CONTRACTOR. The DEPARTMENT may perform additional tests and inspections which it deems necessary to insure quality control. All such failed tests or inspections shall be at the CONTRACTOR's expense.

12.3.4 If any Work (including the work of others) that is to be inspected, tested or Approved is covered without written concurrence of the Contracting Officer, it must, if requested by the Contracting Officer, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the Contracting Officer timely notice of CONTRACTOR's intention to cover the same and the Contracting Officer has not acted with reasonable promptness in response to such notice.

12.3.5 Neither observations nor inspections, tests or Approvals by the DEPARTMENT or others shall relieve the CONTRACTOR from the CONTRACTOR's obligations to perform the Work in accordance with the Contract Documents.

### **12.4 Uncovering Work:**

12.4.1 If any Work is covered contrary to the written request of the Contracting Officer, it must, if requested by the Contracting Officer, be uncovered for the Contracting Officer's observation and replaced at the CONTRACTOR's expense.

12.4.2 If the Contracting Officer considers it necessary or advisable that covered Work be observed inspected or tested, the CONTRACTOR, at the Contracting Officer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Contracting Officer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is Defective, the CONTRACTOR shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) and the DEPARTMENT shall be entitled to an appropriate decrease in the Contract Price. If, however, such Work is not found to be Defective, the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction.

**12.5 DEPARTMENT May Stop the Work:**

If the Work is Defective, or the CONTRACTOR fails to supply suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the Contracting Officer may order the CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Contracting Officer to stop the Work shall not give rise to any duty on the part of the Contracting Officer to exercise this right for the benefit of the CONTRACTOR or any other party.

**12.6 Correction or Removal of Defective Work:**

If required by the Contracting Officer, the CONTRACTOR shall promptly, as directed, either correct all Defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Contracting Officer, remove it from the site and replace it with Work which conforms to the requirements of the Contract Documents. The CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

**12.7 One Year Correction Period:**

If within one year after the date of Substantial Completion of the relevant portion of the work or such longer period of time as may be prescribed by Regulatory Requirements or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be Defective, the CONTRACTOR shall promptly, without cost to the DEPARTMENT and in accordance with the Contracting Officer's written instructions, either correct such Defective Work, or, if it has been rejected by the Contracting Officer, remove it from the site and replace it with conforming Work. If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the DEPARTMENT may have the Defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by the CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service for the benefit of the DEPARTMENT before Substantial Completion of all the Work, the correction period for that item may begin on an earlier date if so provided in the Specifications or by Change Order. Provisions of this paragraph are not intended to shorten the statute of limitations for bringing an action.

**12.8 Acceptance of Defective Work:**

Instead of requiring correction or removal and replacement of Defective Work, the Contracting Officer may accept Defective Work, the CONTRACTOR shall bear all direct, indirect and consequential costs attributable to the Contracting Officer's evaluation of and determination to accept such Defective Work (costs to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the DEPARTMENT shall be entitled to an appropriate decrease in the Contract Price. If the DEPARTMENT has already made final payment to the CONTRACTOR, an appropriate amount shall be paid by the CONTRACTOR or his Surety to the DEPARTMENT.

## **12.9 DEPARTMENT May Correct Defective Work:**

If the CONTRACTOR fails within a reasonable time after written notice from the Contracting Officer to proceed to correct Defective Work or to remove and replace rejected Work as required by the Contracting Officer in accordance with paragraph 12.6, or if the CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the DEPARTMENT may, after 7 days' written notice to the CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph the DEPARTMENT shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, the Contracting Officer may exclude the CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend the CONTRACTOR's services related thereto, take possession of the CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or approved remote storage sites or for which the DEPARTMENT has paid the CONTRACTOR but which are stored elsewhere. The CONTRACTOR shall allow the Contracting Officer and his authorized representatives such access to the site as may be necessary to enable the Contracting Officer to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of the DEPARTMENT in exercising such rights and remedies will be charged against the CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the DEPARTMENT shall be entitled to an appropriate decrease in the Contract Price. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the CONTRACTOR's Defective Work. The CONTRACTOR shall not be allowed an extension of time because of any delay in performance of the work attributable to the exercise, by the Contracting Officer, of the DEPARTMENT's rights and remedies hereunder.

## **ARTICLE 13 - PAYMENTS TO CONTRACTOR AND COMPLETION**

### **13.1 Schedule of Values:**

The Schedule of Values established as provided in paragraph 6.6 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the Contracting Officer. Progress payments on account of Unit Price Work will be based on the number of units completed.

### **13.2 Preliminary Payments:**

Upon approval of the Schedule of Values the CONTRACTOR may be paid for direct costs substantiated by paid invoices and other prerequisite documents required by the General Requirements. Direct costs shall include the cost of bonds, insurance, approved materials stored on the site or at approved remote storage sites, deposits required by a Supplier prior to fabricating materials, and other approved direct mobilization costs substantiated as indicated above. These payments shall be included as a part of the total Contract Price as stated in the Contract.

### **13.3 Application for Progress Payment:**

The CONTRACTOR shall submit to the Contracting Officer for review an Application for Payment filled out and signed by the CONTRACTOR covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents. Progress payments will be made as the Work progresses on a monthly basis.

### **13.4 Review of Applications for Progress Payment:**

Contracting Officer will either indicate in writing a recommendation of payment or return the Application for Payment to the CONTRACTOR indicating in writing the Contracting Officer's reasons for refusing to recommend payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the Application for Payment.

### **13.5 Stored Materials and Equipment:**

If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, paid invoice or other documentation warranting that the DEPARTMENT has received the materials and equipment free and clear of all charges, security interests and encumbrances and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the DEPARTMENT's interest therein, all of which will be satisfactory to the Contracting Officer. No payment will be made for perishable materials that could be rendered useless because of long storage periods. No progress payment will be made for living plant materials until planted.

### **13.6 CONTRACTOR's Warranty of Title:**

The CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to the DEPARTMENT no later than the time of payment free and clear of any claims, liens, security interests and further obligations.

### **13.7 Withholding of Payments:**

The DEPARTMENT may withhold or refuse payment for any of the reasons listed below provided it gives written notice of its intent to withhold and of the basis for withholding:

- 13.7.1 The Work is Defective, or completed Work has been damaged requiring correction or replacement, or has been installed without Approval of Shop Drawings, or by an unapproved Subcontractor, or for unsuitable storage of materials and equipment.

- 13.7.2 The Contract Price has been reduced by Change Order,
- 13.7.3 The DEPARTMENT has been required to correct Defective Work or complete Work in accordance with paragraph 12.9.
- 13.7.4 The DEPARTMENT's actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.2.1.a through 14.2.1.k inclusive.
- 13.7.5 Claims have been made against the DEPARTMENT or against the funds held by the DEPARTMENT on account of the CONTRACTOR's actions or inactions in performing this Contract, or there are other items entitling the DEPARTMENT to a set off.
- 13.7.6 Subsequently discovered evidence or the results of subsequent inspections or test, nullify any previous payments for reasons stated in subparagraphs 13.7.1 through 13.7.5.
- 13.7.7 The CONTRACTOR has failed to fulfill or is in violation of any of his obligations under any provision of this Contract.

**13.8 Retainage:**

At any time the DEPARTMENT finds that satisfactory progress is not being made it may in addition to the amounts withheld under 13.7 retain a maximum amount equal to 10% of the total amount earned on all subsequent progress payments. This retainage may be released at such time as the Contracting Officer finds that satisfactory progress is being made.

**13.9 Request for Release of Funds:**

If the CONTRACTOR believes the basis for withholding is invalid or no longer exists, immediate written notice of the facts and Contract provisions on which the CONTRACTOR relies, shall be given to the DEPARTMENT, together with a request for release of funds and adequate documentary evidence proving that the problem has been cured. In the case of withholding which has occurred at the request of the Department of Labor, the CONTRACTOR shall provide a letter from the Department of Labor stating that withholding is no longer requested.

Following such a submittal by the CONTRACTOR, the DEPARTMENT shall have a reasonable time to investigate and verify the facts and seek additional assurances before determining whether release of withheld payments is justified.

**13.10 Substantial Completion:**

When the CONTRACTOR considers the Work ready for its intended use the CONTRACTOR shall notify the Contracting Officer in writing that the Work or a portion of Work which has been specifically identified in the Contract Documents is substantially complete (except for items specifically listed by the CONTRACTOR as incomplete) and request that the DEPARTMENT issue a certificate of Substantial Completion. Within a reasonable time thereafter, the Contracting Officer, the CONTRACTOR and appropriate Consultant(s) shall make an inspection of the Work to determine the status of completion. If the Contracting Officer does not consider the Work substantially complete, the Contracting Officer will notify the CONTRACTOR in writing giving the reasons therefor. If the Contracting Officer considers the Work substantially complete, the Contracting Officer will within fourteen days execute and deliver to the CONTRACTOR a certificate of Substantial Completion with tentative list of items to be completed or corrected. At the time of delivery of the certificate of Substantial Completion the Contracting Officer will deliver to the CONTRACTOR a written division of responsibilities pending Final Completion with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties which shall be consistent with the terms of the Contract Documents.

The DEPARTMENT shall be responsible for all DEPARTMENT costs resulting from the initial inspection and the first re-inspection, the CONTRACTOR shall pay all costs incurred by the DEPARTMENT resulting from re-

inspections, thereafter.

**13.11 Access Following Substantial Completion:**

The DEPARTMENT shall have the right to exclude the CONTRACTOR from the Work after the date of Substantial Completion, but the DEPARTMENT shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

**13.12 Final Inspection:**

Upon written notice from the CONTRACTOR that the entire Work or an agreed portion thereof is complete, the Contracting Officer will make a final inspection with the CONTRACTOR and appropriate Consultant(s) and will notify the CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or Defective. The CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies. The CONTRACTOR shall pay for all costs incurred by the DEPARTMENT resulting from re-inspections.

**13.13 Final Completion and Application for Payment:**

After the CONTRACTOR has completed all such corrections to the satisfaction of the Contracting Officer and delivered all schedules, guarantees, bonds, certificates of payment to all laborers, Subcontractors and Suppliers, and other documents - all as required by the Contract Documents; and after the Contracting Officer has indicated in writing that the Work has met the requirements for Final Completion, and subject to the provisions of paragraph 13.18, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all remaining certificates, warranties, guarantees, releases, affidavits, and other documentation required by the Contract Documents.

**13.14 Final Payment:**

13.14.1 If on the basis of the Contracting Officer's observation of the Work during construction and final inspection, and the Contracting Officer's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents; and the Contracting Officer is satisfied that the Work has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the DEPARTMENT will process final Application for Payment. Otherwise, the Contracting Officer will return the Application for Payment to the CONTRACTOR, indicating in writing the reasons for refusing to process final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the final Application for Payment.

13.14.2 If, through no fault of the CONTRACTOR, Final Completion of the Work is significantly delayed, the Contracting Officer shall, upon receipt of the CONTRACTOR's final Application for Payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by the DEPARTMENT for Work not fully completed or corrected is less than the retainage provided for in paragraph 13.9, and if bonds have been furnished as required in paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the CONTRACTOR to the DEPARTMENT with the application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

**13.15 Final Acceptance:**

Following certification of payment of payroll and revenue taxes, and final payment to the CONTRACTOR, the DEPARTMENT will issue a letter of Final Acceptance, releasing the CONTRACTOR from further obligations under the Contract, except as provided in paragraph 13.17.

**13.16 CONTRACTOR's Continuing Obligation:**

The CONTRACTOR's obligation to perform and complete the Work and pay all laborers, Subcontractors, and materialmen in accordance with the Contract Documents shall be absolute. Neither any progress or final payment by the DEPARTMENT, nor the issuance of a certificate of Substantial Completion, nor any use or occupancy of the Work or any part thereof by the DEPARTMENT or Using Agency, nor any act of acceptance by the DEPARTMENT nor any failure to do so, nor any review and Approval of a Shop Drawing or sample submission, nor any correction of Defective Work by the DEPARTMENT will constitute an acceptance of Work not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents.

When it is anticipated that restarting, testing, adjusting, or balancing of systems will be required following Final Acceptance and said requirements are noted in Section(s) 01650, such Work shall constitute a continuing obligation under the Contract.

**13.17 Waiver of Claims by CONTRACTOR:**

The making and acceptance of final payment will constitute a waiver of all claims by the CONTRACTOR against the DEPARTMENT other than those previously made in writing and still unsettled.

**13.18 No Waiver of Legal Rights:**

The DEPARTMENT shall not be precluded or be estopped by any payment, measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefor, from showing the true amount and character of the Work performed and materials furnished by the CONTRACTOR, nor from showing that any payment, measurement, estimate or certificate is untrue or is incorrectly made, or that the Work or materials are Defective. The DEPARTMENT shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the CONTRACTOR or his Sureties, or both, such damages as it may sustain by reason of his failure to comply with requirements of the Contract Documents. Neither the acceptance by the DEPARTMENT, or any representative of the DEPARTMENT, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of the Contract Time, nor any possession taken by the DEPARTMENT, shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages. A waiver by the DEPARTMENT of any breach of the Contract shall not be held to be a waiver of any other subsequent breach.

## **ARTICLE 14 - SUSPENSION OF WORK, DEFAULT AND TERMINATION**

### **14.1 DEPARTMENT May Suspend Work:**

- 14.1.1 The DEPARTMENT may, at any time, suspend the Work or any portion thereof by notice in writing to the CONTRACTOR. If the Work is suspended without cause the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an Approved claim therefor as provided in Article 15. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that suspension is due to the fault or negligence of the CONTRACTOR, or that suspension is necessary for Contract compliance, or that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the CONTRACTOR.
- 14.1.2 In case of suspension of Work, the CONTRACTOR shall be responsible for preventing damage to or loss of any of the Work already performed and of all materials whether stored on or off the site or Approved remote storage sites.

### **14.2 Default of Contract:**

- 14.2.1 The Contracting Officer may give the CONTRACTOR and its surety a written Notice to Cure Default if the CONTRACTOR:
- a. fails to begin work in the time specified,
  - b. fails to use sufficient resources to assure prompt completion of the work,
  - c. performs the work unsuitably or neglects or refuses to remove and replace rejected materials or work,
  - d. stops work,
  - e. fails to resume stopped work after receiving notice to do so,
  - f. becomes insolvent (except that if the CONTRACTOR declares bankruptcy, termination will be under Title 11 US Code 362 and/or 365. The CONTRACTOR'S bankruptcy does not relieve the surety of any obligations to assume the Contract and complete the work in a timely manner.
  - g. Allows any final judgment to stand against him unsatisfied for period of 60 days, or
  - h. Makes an assignment for the benefit of creditors without the consent of the Contracting Officer, or
  - i. Disregards Regulatory Requirements of any public body having jurisdiction, or
  - j. Otherwise violates in any substantial way any provisions of the Contract Documents, or
  - k. fails to comply with Contract minimum wage payments or civil rights requirements, or
  - l. is a party to fraud, deception, misrepresentation , or
  - m. for any cause whatsoever, fails to carry on the Work in an acceptable manner.
- 14.2.2 The Notice to Cure Default will detail the conditions determined to be in default, the time within which to cure the default and may, in the Contracting Officer's discretion, specify the actions necessary to cure the default. Failure to cure the delay, neglect or default within the time specified in the Contracting Officer's written notice to cure authorizes the DEPARTMENT to terminate the contract. The Contracting Officer may allow more time to cure than originally stated in the Notice to Cure Default if he deems it to be in the best interests of the DEPARTMENT. The DEPARTMENT will provide the CONTRACTOR or its surety with a written Notice of Default Termination that details the default and the failure to cure it.
- 14.2.3 If the CONTRACTOR or its Surety, within the time specified in the above notice of default, shall not proceed in accordance therewith, then the DEPARTMENT may, upon written notification from the Contracting Officer of the fact of such delay, neglect or default and the CONTRACTOR's failure to comply with such notice, have full power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the CONTRACTOR. The DEPARTMENT may terminate the services of the CONTRACTOR, exclude the CONTRACTOR from the site and take possession of the Work and of all the CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be

used by the CONTRACTOR (without liability to the CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which the DEPARTMENT has paid the CONTRACTOR but which are stored elsewhere, and finish the Work as the DEPARTMENT may deem expedient. The DEPARTMENT may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods that in the opinion of the Contracting Officer are required for the completion of said Contract in an acceptable manner.

- 14.2.4 The Contracting Officer may, by written notice to the CONTRACTOR and its Surety or its representative, transfer the employment of the Work from the CONTRACTOR to the Surety, or if the CONTRACTOR abandons the Work undertaken under the Contract, the Contracting Officer may, at its option with written notice to the Surety and without any written notice to the CONTRACTOR, transfer the employment for said Work directly to the Surety. The Surety shall submit its plan for completion of the Work, including any contracts or agreements with third parties for such completion, to the DEPARTMENT for approval prior to beginning completion of the Work. Approval of such contracts shall be in accordance with all applicable requirements and procedures for approval of subcontracts as stated in the Contract Documents.
- 14.2.5 After the notice of termination is issued, the DEPARTMENT may take over the work and complete it by contract or otherwise and may take possession of and use materials, appliances, equipment or plant on the work site necessary for completing the work.
- 14.2.6 Rather than taking over the work itself, the DEPARTMENT may transfer the obligation to perform the work from the CONTRACTOR to its surety. The surety must submit its plan for completion of the work, including any contracts or agreements with third parties for completion, to the DEPARTMENT for approval prior to beginning work. The surety must follow the Contract requirements for approval of subcontracts, except that the limitation on percent of work subcontracted will not apply.
- 14.2.7 On receipt of the transfer notice, the surety must take possession of all materials, tools, and appliances at the work site, employ an appropriate work force, and complete the Contract work, as specified. The Contract specifications and requirements shall remain in effect. However the DEPARTMENT will make subsequent Contract payments directly to the Surety for work performed under the terms of the Contract. The CONTRACTOR shall forfeit any right to claim for the same work or any part thereof. The CONTRACTOR shall not be entitled to receive any further balance of the amount to be paid under the Contract.
- 14.2.8 Upon receipt of the notice terminating the services of the CONTRACTOR, the Surety shall enter upon the premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the Work included under the Contract and employ by contract or otherwise any person or persons to finish the Work and provide the materials therefore, without termination of the continuing full force and effect of this Contract. In case of such transfer of employment to the Surety, the Surety shall be paid in its own name on estimates covering Work subsequently performed under the terms of the Contract and according to the terms thereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.
- 14.2.9 If the Contract is terminated for default, the CONTRACTOR and the Surety shall be jointly and severally liable for damages for delay as provided by paragraph 11.8, and for the excess cost of completion, and all costs and expenses incurred by the DEPARTMENT in completing the Work or arranging for completion of the Work, including but not limited to costs of assessing the Work to be done, costs associated with advertising, soliciting or negotiating for bids or proposals for completion, and other reprocurement costs. Following termination the CONTRACTOR shall not be entitled to receive any further balance of the amount to be paid under the Contract until the Work is fully finished and accepted, at which time if the unpaid balance exceeds the amount due the DEPARTMENT and any amounts due to persons for whose benefit the DEPARTMENT has withheld funds, such excess shall be paid by the DEPARTMENT to the CONTRACTOR. If the damages, costs, and expenses due the DEPARTMENT exceed the unpaid balance, the CONTRACTOR and its Surety shall pay the difference.
- 14.2.10 If, after notice of termination of the CONTRACTOR's right to proceed under the provisions of this clause, it is determined for any reason that the CONTRACTOR was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, or that termination was wrongful, the rights and obligations of the parties shall be determined in accordance with the clause providing for convenience termination.

**14.3 Rights or Remedies:**

Where the CONTRACTOR's services have been so terminated by the DEPARTMENT, the termination will not affect any rights or remedies of the DEPARTMENT against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due the CONTRACTOR by the DEPARTMENT will not release the CONTRACTOR from liability.

**14.4 Convenience Termination:**

14.4.1 The performance of the Work may be terminated by the DEPARTMENT in accordance with this section in whole or in part, whenever, for any reason the Contracting Officer shall determine that such termination is in the best interest of the DEPARTMENT. Any such termination shall be effected by delivery to the CONTRACTOR of a Notice of Termination, specifying termination is for the convenience of the DEPARTMENT the extent to which performance of Work is terminated, and the date upon which such termination becomes effective.

14.4.2 Immediately upon receipt of a Notice of Termination and except as otherwise directed by the Contracting Officer, the CONTRACTOR shall:

- a. Stop Work on the date and to the extent specified in the Notice of Termination;
- b. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the Work as is not terminated;
- c. Terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the Notice of Termination;
- d. With the written Approval of the Contracting Officer, to the extent he may require, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable, in whole, or in part, in accordance with the provisions of the Contract;
- e. Submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory exclusive of items the disposition of which had been directed or authorized by the Contracting Officer;
- f. Transfer to the Contracting Officer the completed or partially completed record drawings, Shop Drawings, information, and other property which, if the Contract had been completed, would be required to be furnished to the DEPARTMENT;
- g. Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to the Contract which is in the possession of the CONTRACTOR and in which the DEPARTMENT has or may acquire any interest.

The CONTRACTOR shall proceed immediately with the performance of the above obligations.

14.4.3 When the DEPARTMENT orders termination of the Work effective on a certain date, all Work in place as of that date will be paid for in accordance with Article 13 of the Contract. Materials required for completion and on hand but not incorporated in the Work will be paid for at invoice cost plus 15% with materials becoming the property of the DEPARTMENT - or the CONTRACTOR may retain title to the materials and be paid an agreed upon lump sum. Materials on order shall be cancelled, and the DEPARTMENT shall pay reasonable factory cancellation charges with the option of taking delivery of the materials in lieu of payment of cancellation charges. The CONTRACTOR shall be paid 10% of the cost, freight not included, of materials cancelled, and direct expenses only for CONTRACTOR chartered freight transport which cannot be cancelled without charges, to the extent that the CONTRACTOR can establish them. The extra costs due to cancellation of bonds and insurance and that part of job start-up and phase-out costs not amortized by the amount of Work accomplished shall be paid by the DEPARTMENT. Charges for loss of profit or consequential damages shall not be recoverable except as provided above.

- a. The following costs are not payable under a termination settlement agreement or Contracting Officer's determination of the termination claim:
  - 1. Loss of anticipated profits or consequential or compensatory damages

2. Unabsorbed home office overhead (also termed "General & Administrative Expense") related to ongoing business operations
  3. Bidding and project investigative costs
  4. Direct costs of repairing equipment to render it operable for use on the terminated work
- 14.4.4 The termination claim shall be submitted promptly, but in no event later than 90 days from the effective date of termination, unless extensions in writing are granted by the Contracting Officer upon written request of the CONTRACTOR made within the 90-day period. Upon failure of the CONTRACTOR to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall thereupon pay to the CONTRACTOR the amount so determined.
- 14.4.5 The CONTRACTOR and the Contracting Officer may agree upon whole or any part of the amount or amounts to be paid to the CONTRACTOR by reason of the total or partial termination of Work pursuant to this section. The Contract shall be amended accordingly, and the CONTRACTOR shall be paid the agreed amount.
- 14.4.6 In the event of the failure of the CONTRACTOR and the Contracting Officer to agree in whole or in part, as provided heretofore, as to the amounts with respect to costs to be paid to the CONTRACTOR in connection with the termination of the Work the Contracting Officer shall determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall pay to the CONTRACTOR the amount determined as follows:
- a. All costs and expenses reimbursable in accordance with the Contract not previously paid to the CONTRACTOR for the performance of the Work prior to the effective date of the Notice of Termination;
  - b. So far as not included under "a" above, the cost of settling and paying claims arising out of the termination of the Work under subcontracts or orders which are properly chargeable to the terminated portions of the Contract;
  - c. So far as practicable, claims by the CONTRACTOR for idled or stand-by equipment shall be made as follows: Equipment claims will be reimbursed as follows:
    1. Contractor-owned equipment usage, based on the CONTRACTOR'S ownership and operating costs for each piece of equipment as determined from the CONTRACTOR'S accounting records. Under no circumstance, may the CONTRACTOR base equipment claims on published rental rates.
    2. Idle or stand-by time for Contractor-owned equipment, based on the CONTRACTOR'S internal ownership and depreciation costs. Idle or stand-by equipment time is limited to the actual period of time equipment is idle or on stand-by as a direct result of the termination, not to exceed 30 days. Operating expenses will not be included for payment of idle or stand-by equipment time.
    3. Rented equipment, based on reasonable, actual rental costs. Equipment leased under "capital leases" as defined in Financial Accounting Standard No. 13 will be considered Contractor-owned equipment. Equipment leased from an affiliate, division, subsidiary or other organization under common control with the CONTRACTOR will be considered Contractor-owned equipment, unless the lessor has an established record of leasing to unaffiliated lessees at competitive rates consistent with the rates the CONTRACTOR has agreed to pay and no more than forty percent of the lessor's leasing business, measured in dollars, is with organizations affiliated with the lessor.
- 14.4.7 The CONTRACTOR shall have the right of appeal under the DEPARTMENT's claim procedures, as defined in Article 15, for any determination made by the Contracting Officer, except if the CONTRACTOR has failed to submit his claim within the time provided and has failed to request extension of such time, CONTRACTOR shall have no such right of appeal. In arriving at the amount due the CONTRACTOR under this section, there shall be deducted:
- a. All previous payments made to the CONTRACTOR for the performance of Work under the Contract prior to termination;
  - b. Any claim for which the DEPARTMENT may have against the CONTRACTOR;
  - c. The agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the

CONTRACTOR or sold pursuant to the provisions of this section and not otherwise recovered by or credited to the DEPARTMENT; and,

- d. All progress payments made to the CONTRACTOR under the provisions of this section.
- 14.4.8 Where the Work has been terminated by the DEPARTMENT said termination shall not affect or terminate any of the rights of the DEPARTMENT against the CONTRACTOR or his Surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the DEPARTMENT due to the CONTRACTOR under the terms of the Contract shall not release the CONTRACTOR or its Surety from liability.
- 14.4.9 The CONTRACTOR's termination claim may not include claims that pre dated the notice for termination for convenience. Those claims shall be prosecuted by the CONTRACTOR under Article 15.
- 14.4.10 The CONTRACTOR'S termination claim may not exceed the total dollar value of the contract as awarded plus agreed upon change orders less the amounts that have been paid for work completed.
- a. Unless otherwise provided for in the Contract Documents, or by applicable statute, the CONTRACTOR, from the effective date of termination and for a period of three years after final settlement under this Contract, shall preserve and make available to the DEPARTMENT at all reasonable times at the office of the CONTRACTOR, all its books, records, documents, and other evidence bearing on the cost and expenses of the CONTRACTOR under his Contract and relating to the Work terminated hereunder.
  - b. Definitions. In this Subsection 108-1.09, the term "cost" and the term "expense" mean a monetary amount in U.S. Dollars actually incurred by the CONTRACTOR, actually reflected in its contemporaneously maintained accounting or other financial records and supported by original source documentation.
  - c. Cost Principles. The DEPARTMENT may use the federal cost principles at 48 CFR §§ 31.201-1 to 31.205-52 (or succeeding cost principles for fixed price contracts) as guidelines in determining allowable costs under this Subsection to the extent they are applicable to construction contracts and consistent with the specifications of this Contract. The provisions of this contract control where they are more restrictive than, or inconsistent with, these federal cost principles."

## **ARTICLE 15 - CLAIMS FOR ADJUSTMENT AND DISPUTES**

### **15.1 Notification**

- 15.1.1 The CONTRACTOR shall notify the DEPARTMENT in writing as soon as the CONTRACTOR becomes aware of any act or occurrence which may form the basis of a claim for additional compensation or an extension of Contract Time or of any dispute regarding a question of fact or interpretation of the Contract. The DEPARTMENT has no obligation to investigate any fact or occurrence that might form the basis of a claim or to provide any additional compensation or extension of Contract Time unless the CONTRACTOR has notified the DEPARTMENT in writing in a timely manner of all facts the CONTRACTOR believes form the basis for the claim.
- 15.1.2 If the CONTRACTOR believes that he is entitled to an extension of Contract Time, then the CONTRACTOR must state the contract section on which he basis his extension request, provide the DEPARTMENT with sufficient information to demonstrate that the CONTRACTOR has suffered excusable delay, and show the specific amount of time to which the CONTRACTOR is entitled. The DEPARTMENT will not grant an extension of Contract Time if the CONTRACTOR does not timely submit revised schedules under **Section 01310**.
- 15.1.3 If the matter is not resolved by agreement within 7 days, the CONTRACTOR shall submit an Intent to Claim, in writing, to the DEPARTMENT within the next 14 days.
- 15.1.4 If the CONTRACTOR believes additional compensation or time is warranted, then he must immediately begin keeping complete, accurate, and specific daily records concerning every detail of the potential claim including actual costs incurred. The CONTRACTOR shall provide the DEPARTMENT access to any such records and furnish the DEPARTMENT copies, if requested. Equipment costs must be based on the CONTRACTOR's internal rates for ownership, depreciation, and operating expenses and not on published rental rates. In computing damages, or costs claimed for a change order, or for any other claim against the DEPARTMENT for additional time, compensation or both, the CONTRACTOR must prove actual damages based on internal costs for equipment, labor or efficiencies. Total cost, modified total cost or jury verdict forms of presentation of damage claims are not permissible to show damages. Labor inefficiencies must be shown to actually have occurred and can be proven solely based on job records. Theoretical studies are not a permissible means of showing labor inefficiencies. Home office overhead will not be allowed as a component of any claim against the DEPARTMENT.
- 15.1.5 If the claim or dispute is not resolved by the DEPARTMENT, then the CONTRACTOR shall submit a written Claim to the Contracting Officer within 90 days after the CONTRACTOR becomes aware of the basis of the claim or should have known the basis of the claim, whichever is earlier. The Contracting Officer will issue written acknowledge of the receipt of the Claim.
- 15.1.6 The CONTRACTOR waives any right to claim if the DEPARTMENT was not notified properly or afforded the opportunity to inspect conditions or monitor actual costs or if the Claim is not filed on the date required.

### **15.2 Presenting the Claim**

- 15.2.1 The Claim must include all of the following:
- a. The act, event, or condition the claim is based on
  - b. The Contract provisions which apply to the claim and provide relief
  - c. The item or items of Contract work affected and how they are affected
  - d. The specific relief requested, including Contract Time if applicable, and the basis upon which it was calculated
  - e. A statement certifying that the claim is made in good faith, that the supporting cost and pricing data are accurate and complete to the best of your knowledge and belief, and that the amount requested accurately reflects the Contract adjustment which the CONTRACTOR believes is due.

**15.3 Claim Validity, Additional Information, and DEPARTMENT's Action**

- 15.3.1 The Claim, in order to be valid, must not only show that the CONTRACTOR suffered damages or delay but that it was caused by the act, event, or condition complained of and that the Contract provides entitlement to relief for such act, event, or condition.
- 15.3.2 The DEPARTMENT can make written request to the CONTRACTOR at any time for additional information relative to the Claim. The CONTRACTOR shall provide the DEPARTMENT the additional information within 30 days of receipt of such a request. Failure to furnish the additional information may be regarded as a waiver of the Claim.

**15.4 Contracting Officer's Decision**

The CONTRACTOR will be furnished the Contracting Officer's Decision within 90 days, unless the Contracting Officer requests additional information or gives the CONTRACTOR notice that the time for issuing a decision is being extended for a specified period under AS 36.30.620. The Contracting Officer's decision is final and conclusive unless, within 14 days of receipt of the decision, the CONTRACTOR delivers a Notice of Appeal to the Appeals Officer. Procedures for appeals are covered under AS 36.30.625 and AS 36.30.630.

**15.5 Fraud and Misrepresentation in Making Claims**

Criminal and Civil penalties authorized under AS 36.30.687 (including, but not limited to, forfeiture of all claimed amounts) may be imposed on the CONTRACTOR if the CONTRACTOR makes or uses a misrepresentation in support of a claim or defraud or attempt to defraud the DEPARTMENT at any stage of prosecuting a claim under this Contract.

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**Section 00760**  
**SUPPLEMENTAL REQUIREMENTS FOR DMVA / FEDERALLY FUNDED CONTRACTS**  
Competitive Sealed Proposals – AS 36.30.200(b)  
Federal-Aid Buildings

**STATE OF ALASKA, DEPARTMENT OF MILITARY AND VETERAN AFFAIRS**

**Section 801. Applicable Law.**

*The Successful Contractor will comply with the following Applicable Laws. To view any referenced Laws or Statutes in their entirety please contact the Project Manager.*

**Section 802. Governing Regulations.**

This contract and the parties involved with this contract will comply with, the provisions of 32 CFR Part 33, Uniform Administrative Requirements for Grants and Cooperative Agreements, DoD Grant and Agreement Regulations (DoDGARS) (DoD 3210.6-R) as amended, Title 2 Code of Federal Regulations (CFR) Part 225, and NGR 5-1.

**Section 803. Nondiscrimination.**

This contract and the parties involved with this contract will comply with the following national policies prohibiting discrimination:

- A. On the basis of race, color or national origin, in Title VI of the Civil Rights Act of 1964 (42 U.S.C. Section 2000d et seq.), as implemented by DoD regulations at 32 CFR Part 195.
- B. On the basis of race, color or national origin, in Executive Order 11246 as implemented by Department of Labor regulations at 41 CFR Chapter 60.
- C. On the basis of sex or blindness, in Title IX of the Education Amendments of 1972 (20 U.S.C. Section 1681, et seq.), as implemented by DoD regulations at 32 CFR Part 196.
- D. On the basis of age, in The Age Discrimination Act of 1975 (42 U.S.C. Section 6101, et seq.), as implemented by Department of Health and Human Services regulations at 45 CFR Part 90.
- E. On the basis of handicap, in Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794), as implemented by Department of Justice regulations at 28 CFR part 41 and DoD regulations at 32 CFR Part 56.

**Section 804. Lobbying.**

- A. The State covenants and agrees that it will not expend any funds appropriated by Congress to pay any person for influencing or attempting to influence an officer or employee of any agency, or a Member of Congress in connection with any of the following covered federal actions. The awarding of any federal contract; the making of any federal grant; the making of any federal loan; the entering into of any CA; and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or Cooperative Agreement.
- B. The Final Rule, New Restrictions on Lobbying, issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 28) to implement the provisions of Section 319 of Public Law 101-121 (31 U.S.C. Section 1352) is incorporated by reference and the state agrees to comply with all the provisions thereof, including any amendments to the Interim Final Rule that may hereafter be issued.

## **Section 805. Drug-Free work Place.**

This contract and the parties involved with this contract will comply with the requirements regarding drug-free workplace requirements in of 32 CFR Part 26, which implements Section 5151-5160 of the Drug-Free Workplace act of 1988 (Public Law 100-690, Title V, Subtitle D; 41 U.S.C. 701, et seq.).

## **Section 806. Environmental Protection.**

- A.** The contractor and all parties, under this contract, agree that its performance under this Agreement shall comply with:
- i.** The requirements of Section 114 of the Clean Air Act (42 U.S.C. Section 7414);
  - ii.** Section 308 of the Federal Water Pollution Control Act (33 U.S.C. Section 1318), that relates generally to inspection, monitoring, entry reports, and information, and with all regulations and guidelines issued thereunder;
  - iii.** The Resources Conservation and Recovery Act (RCRA);
  - iv.** The Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA);
  - v.** The National Environmental Policy Act (NEPA);
  - vi.** The Solid Waste Disposal Act (SWDA);
  - vii.** The applicable provisions of the Clean Air Act (42 U.S.C. 7401, et seq.) and Clean Water Act (33 U.S.C. 1251, et seq.), as implemented by Executive Order 11738 and Environmental Protection Agency (EPA) rules at 40 CFR Part 31;
  - viii.** To identify any impact this award may have on the quality of the human environment and provide help as needed to comply with the National Environmental Policy Act (NEPA, at 42 U.S.C. 4321, et seq.) and any applicable federal, state or local environmental regulation.
- B.** In accordance with the EPA rules, the party further agrees to also identify to the awarding agency (***State of Alaska \ Department of Military and Veterans Affairs \ Facilities Management Office***) any impact this award may have on:
- i.** The quality of the human environment, and provide help the agency may need to comply with the National Environmental Policy Act (NEPA, at 42 U.S.C 4321, et seq.) and to prepare Environment Impact Statements or other required environmental documentation. In such cases, the recipient agrees to take no action that will have an adverse environmental impact (e.g., physical disturbance of a site such as breaking of ground) until the agency provides written notification of compliance with the environmental impact analysis process.
  - ii.** Flood-prone areas, and provide help the agency may need to comply with the National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973 (42 U.S.C. 4001, et seq.), which require flood insurance, when available, for federally assisted construction or acquisition in flood-prone areas.
  - iii.** Coastal zones, and provide help the agency may need to comply with the Coastal Zone Management Act of 1972 (16 U.S.C. 1451, et seq.), concerning protection of U.S. coastal resources.
  - iv.** Coastal barriers, and provide help the agency may need to comply with the Coastal Barriers Resource Act (16 U.S.C. 3501 et seq.), concerning preservation of barrier resources.
  - v.** Any existing or proposed component of the National Wild and Scenic Rivers System, and provide help the agency may need to comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 et seq.).
  - vi.** Underground sources of drinking water in areas that have an aquifer that is the sole or principal drinking water source, and provide help the agency may need to comply with the Safe Drinking Water Act (42 U.S.C 300H-3).

### **Section 807. Use of United States Flag Carriers.**

- A.** The contractor and the parties involved, under this contract, agree that travel supported by U.S. Government funds under this agreement shall use U.S.-flag air carriers (air carriers holding certificates under 49 U.S.C. 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) and the inter-operative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B138942.
- B.** The contractor and the parties involved, under this contract, agree that it will comply with the Cargo Preference Act of 1954 (46 U.S.C. Chapter 553), as implemented by Department of Transportation regulation at 46 CFR 381.7, and 46 CFR 381.7(b).

### **Section 808. Debarment and Suspension.**

This contract and the parties involved will comply with the requirements regarding debarment and suspension in Subpart C of the OMB guidance in 2 CFR Part 180, as implemented by the DoD in 2 CFR Part 1125. The State agrees to communicate the requirement to comply with Subpart C to persons at the next lower tier with whom the State enters into transactions that are “covered transactions” under Subpart B of 2 CFR part 180 and the DoD implementation in 2 CFR Part 1125.

### **Section 809. Safety and Health Requirements.**

The contractor and the parties involved with this contract will comply with the provisions of the US Army Corps of Engineers EM 385-1-1 Safety and Health Requirements Manual.

### **Section 810. Buy American Act.**

The State covenants and agrees that it will not expend any funds appropriated by Congress without complying with The Buy American Act (41 U.S.C.10a, et seq.). The Buy American Act gives preference to domestic end products and domestic construction material. In addition, the Memorandum of Understanding between the United States of America and the European Economic Community (EEC) on Government Procurement, and the North American Free Trade Agreement (NAFTA), provide that EEC and NAFTA end products and construction materials are exempted from application of the Buy American Act.

### **Section 811. Uniform Relocation Assistance and real Property Acquisition Policies**

The State covenants and agrees that it will comply with CFR 49 part 24, which implements the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. Section 4601 et seq.) and provides for fair and equitable treatment of persons displaced by federally assisted programs or persons whose property is acquired as a result of such programs.

### **Section 812. Copeland “Anti-Kickback” Act.**

The State and the contractor and all parties involved with this contract covenants and agrees that it will comply with the Copeland “Anti-Kickback” Act (18 U.S.C. Section 874) as supplemented in Department of Labor regulations (29 CFR Part 3). As applied to this agreement, the Copeland “Anti-Kickback” Act makes it unlawful to induce, by force, intimidation, threat of procuring dismissal from employment, or otherwise, any person employed in the construction or repair of public buildings or public works, financed in whole or in part by the United States, to give up any part of the compensation to which that person is entitled under a contract of employment.

### **Section 813. Contract Work Hours and Safety Standards Act.**

The State and the contractor and all parties involved with this contract covenants and agrees that it will comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. Sections 3701-3708) as supplemented by Department of Labor regulations (29 CFR Part 5). As applied to this agreement, the Contract Work Hours and Safety Standards Act specifies that no laborer or mechanic doing any part of the work contemplated by this agreement shall be required or permitted to work more than 40 hours in any workweek unless paid for all additional hours at not less than 1.5 times the basic rate of pay.

### **Section 814. Central Contractor Registration and Universal Identifier Requirements.**

The contractor and all parties involved with this contract agree to comply with the Central Contractor Registration and Universal Identifier Requirements as indicated below:

#### **A. Requirement for Central Contractor Registration (CCR)**

Unless you are exempted from this requirement under 2 CFR 25.110, you as the recipient must maintain the currency of your information in the CCR until you submit the final financial report required under this award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently if required by changes in your information or another award term.

#### **B. Requirement for Data Universal Numbering System (DUNS) Numbers**

If you are authorized to make sub awards under this award, you:

- i. Must notify potential sub-recipients that no entity (see definition in paragraph C of this award term) may receive a sub-award from you unless the entity has provided its DUNS number to you.
- ii. May not make a sub-award to an entity unless the entity has provided its DUNS number to you.

#### **C. Definitions**

For purposes of this award term:

- i. Central Contractor Registration (CCR) means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the [www.sam.gov](http://www.sam.gov) Internet site.
- ii. Data Universal Numbering System (DUNS) number means the nine-digit number established and assigned by Dun and Bradstreet, Inc. (D&B) to uniquely identify business entities. A DUNS number may be obtained from D&B by telephone (currently 866-705-5711) or the Internet (currently at <http://fedgov.dnb.com/webform>).
- iii. Entity, as it is used in this award term, means all of the following, as defined at 2 CFR part 25, subpart C:
  - a. A Governmental organization, which is a State, local government, or Indian Tribe;
  - b. A foreign public entity;
  - c. A domestic or foreign nonprofit organization;
  - d. A domestic or foreign for-profit organization; and
  - e. A Federal agency, but only as a sub-recipient under an award or sub-award to a non-Federal entity.
- iv. Sub-award:
  - a. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for

- which you received this award and that you as the recipient award to an eligible sub-recipient.
- b. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see **Sec. ---.210** of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").
- c. A sub-award may be provided through any legal agreement, including an agreement that you consider a contract.
- v. Sub-recipient means an entity that:
  - a. Receives a sub-award from you under this award; and
  - b. Is accountable to you for the use of the Federal funds provided by the sub-award.

## **Section 815. Reporting Sub-awards and Executive Compensation**

The contractor agrees to comply with the Reporting Sub-awards and Executive Compensation requirements indicated below:

### **A. Reporting of first-tier sub-awards**

- i. Applicability. Unless you are exempt as provided in paragraph d. of this award term, you must report each action that obligates \$25,000 or more in Federal funds that does not include Recovery funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5) for a sub-award to an entity (see definitions in paragraph e. of this award term).
- ii. Where and when to report.
  - a. You must report each obligating action described in paragraph a.1. of this award term to <http://www.fsrs.gov>.
  - b. For sub-award information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2012, the obligation must be reported by no later than December 31, 2012).
- iii. What to report. You must report the information about each obligating action that the submission instructions posted at <http://www.fsrs.gov> specify.

### **B. Reporting Total Compensation of Recipient Executives.**

- i. Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if—
  - a. the total Federal funding authorized to date under this award is \$25,000 or more;
  - b. in the preceding fiscal year, you received—
    - i) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and sub-awards); and,
    - ii) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and sub-awards); and,
    - a) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange

Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)

- ii. Where and when to report. You must report executive total compensation described in paragraph b.1. of this award term:
  - a. As part of your registration profile at <http://www.ccr.gov>.
  - b. By the end of the month following the month in which this award is made, and annually thereafter.

### **C. Reporting of Total Compensation of Sub-recipient Executives**

- i. Applicability and what to report. Unless you are exempt as provided in paragraph d. of this award term, for each first-tier sub-recipient under this award, you shall report the names and total compensation of each of the sub-recipient's five most highly compensated executives for the sub-recipient's preceding completed fiscal year, if—
  - a. in the sub-recipient's preceding fiscal year, the sub-recipient received--
    - i) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and sub-awards); and
    - ii) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and sub-awards); and
    - iii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)
- ii. Where and when to report. You must report sub-recipient executive total compensation described in paragraph c.1. of this award term:
  - a. To the recipient.
  - b. By the end of the month following the month during which you make the sub-award. For example, if a sub-award is obligated on any date during the month of October of a given year (i.e., between October 1 and 31), you must report any required compensation information of the sub-recipient by November 30 of that year.

### **D. Exemptions**

- i. If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report:
- ii. Sub-awards; and
  - a. The total compensation of the five most highly compensated executives of any sub-recipient.

### **E. Definitions. For purposes of this award term:**

- i. Entity means all of the following, as defined in 2 CFR part 25:
  - a. A Governmental organization, which is a State, local government, or Indian tribe;
  - b. A foreign public entity;
  - c. A domestic or foreign nonprofit organization;
  - d. A domestic or foreign for-profit organization;
  - e. A Federal agency, but only as a sub-recipient under an award or sub-award to a non-Federal entity.
- ii. Executive means officers, managing partners, or any other employees in management positions.
- iii. Sub-award:
  - a. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible sub-recipient.

- b. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. --- .210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").
- iv. Sub-recipient means an entity that:
  - a. Receives a sub-award from you (the recipient) under this award; and
  - b. Is accountable to you for the use of the Federal funds provided by the sub-award.
- v. Total compensation means the cash and noncash dollar value earned by the executive during the recipient's or sub-recipient's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):
  - a. Salary and bonus.
  - b. Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.
  - c. Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.
  - d. Change in pension value. This is the change 'In present value of defined benefit and actuarial pension plans.
  - e. Above-market earnings on deferred compensation which is not tax-qualified.
  - f. Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.

**Contractor Acknowledgement and Acceptance:**

---

**Contractor Business  
Entity Name**

---

**Signature – Authorized Representative**

---

**Date**

## **HELPFUL INFORMATION FOR REGISTRATION:**

### **SYSTEM FOR AWARD MANAGEMENT (URL: <https://www.sam.gov>)**

Federal regulations require Vendors to be registered in the System for Award Management (SAM) in order to receive awards and payments on federal contracts. (FAR 52.204-7). SAM is a composite procurement system that replaces several government legacy systems, including the Central Contractor Registry (CCR), and serves as a common source of vendor data for government agencies. Registration in SAM is free, and extensive help files are available on the site to assist you with the registration process. SAM registration provides your company the added benefit of being visible to federal, state, and local agencies, as well as other contractors, searching for the products and services your company has to offer.

SAM is maintained by the General Services Administration, but personalized assistance with registration and other government procurement related matters is available through the nationwide network of Procurement Technical Assistance Centers or "PTACs." To find the PTAC office nearest you, visit the national PTAC website at: <http://www.aptac-us.org>. You can also find a listing of PTAC offices by state on the Defense Logistics Agency small business website at the following URL: <http://www.dla.mil/SmallBusiness/Pages/ptap.aspx>.

In Alaska, contact the Alaska Procurement Technical Assistance Center via their website at <http://www.ptacalaska.org>, by calling (907) 274-7232 in Anchorage, or via their statewide toll free number at 1-(800) 478-7232. Alaska PTAC staff will assist you with your SAM registration and can answer any other questions you have regarding federal, state, or local procurement opportunities and requirements.

#### 1) Vendors registered in SAM:

Please provide your business name, Data Universal Numbering System (DUNS®) number, Tax ID, and DoD issued CAGE code to enable us to pull your information for our records.

#### 2) Vendors **not** registered in SAM:

You will first need to obtain a DUNS® number from Dun & Bradstreet (DnB) before registering. A DUNS® number is required for SAM registration and is free for Vendors pursuing federal contracts. You can apply for a DUNS® number online through the DnB website at <http://www.dnb.com>; or by using the webform located at <https://fedgov.dnb.com/webform>. Issuance and activation of a DUNS® number is usually completed within 24 hours. If you need assistance with obtaining a DUNS® number, please contact your local PTAC office.

See the attached User Guide for detailed instructions on how to register your company in SAM.

**SECTION 00800**  
**SUPPLEMENTARY CONDITIONS**  
**MODIFICATIONS TO THE GENERAL CONDITIONS**  
**(DoD FEDERALLY FUNDED CONTRACTS)**

The following supplements modify, change, delete from, add to the "General Conditions of the Construction Contract for Buildings", revised December, 2011 (c) 4/96. Where any article of the General Conditions is modified, or and Paragraph, Subparagraph, or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph, of Clause shall remain in effect.

**SC-1-DEFINITIONS**

At General Conditions Article 1, add the following definitions:

**CFR:** Initials that stand for the Code of Federal Regulations.

**OWNER:** The State of Alaska.

**SC-5.4.1 – INSURANCE REQUIREMENTS**

At General Condition Article 5.4.1, delete the second to the last sentence and replace with the following: "The delivery to the DEPARTMENT of a written notice in accordance with the policy provisions is required before cancellation of any coverage or reduction in any limits of liability."

**SC-5.4.2a – WORKERS COMPENSATION INSURANCE**

At General Condition Article 5.4.2a, delete paragraph "a" in its entirety and replace with the following:

- a. Workers' Compensation Insurance: The Contractor shall provide and maintain, for all employees of the Contractor engaged in work under this contract, Workers' Compensation Insurance as required by AS 23.30.045. The Contractor shall be responsible for Workers' Compensation Insurance for any subcontractor who provides services under this contract. Coverage shall include:
1. Waiver of subrogation against the State.
  2. Employer's Liability Protection in the amount of \$500,000 each accident / \$500,000 each disease.
  3. If the Contractor directly utilizes labor outside of the State of Alaska in the prosecution of the work, "Other States" endorsement shall be required as a condition of the contract.
  4. Whenever the work involves activity on or about navigable waters, the Workers' Compensation policy shall contain a United States Longshoreman's and Harbor Worker's Act endorsement, and when appropriate, a Maritime Employer's Liability (Jones Act) endorsement with a minimum limit of \$1,000,000."

**SC-5.4.2d-BUILDERS RISK INSURANCE**

At General Conditions Article 5.4.2d, delete the subsection in its entirety.

## **SC- 6.5 MATERIALS AND EQUIPMENT**

Add the following sub-paragraph at the end of the existing text:

### **6.5.1. "Buy American Act. (Federal-Aid Contracts)**

- a. The Contractor agrees that they will not expend any funds appropriated by Congress without complying with The Buy American Act (41 U.S.C.10a et seq.). The Buy American Act gives preference to domestic end products and domestic construction material.
- b. **Buy American Certificate.** Execution and submission of the Buy American Certificate Form 25D-061, is required. If there are no exceptions to be listed on the certificate, the bidder shall enter "NONE" on the first line."

## **SC-6.9–SUBSTITUTES OR “OR-EQUAL” ITEMS**

In Paragraph 6.9.5, delete “Document 01630 – Product Options and Substitutions” and replace with “Document 01 60 00 – Material and Equipment.”

## **SC-6.13–SUBCONTRACTORS**

Add the following paragraph:

“6.13.7 The CONTRACTOR may, without penalty, replace a Subcontractor who:

1. Fails to comply with the licensing and registration requirements of AS 08.18;
2. Fails to obtain or maintain a valid Alaska Business License;
3. Files for bankruptcy or becomes insolvent;
4. Fails to execute a subcontract or performance of the work for which the Subcontractor was listed, and the CONTRACTOR has acted in good faith;
5. Fails to obtain bonding acceptable to the DEPARTMENT;
6. Fails to obtain insurance acceptable to the DEPARTMENT;
7. Fails to perform subcontract work for which the Subcontractor was listed;
8. Must be replaced to meet the CONTRACTOR’S required state or federal affirmative action requirements.
9. Refuses to agree to abide by the CONTRACTOR’S labor agreement; or
10. Is determined by the DEPARTMENT to be not responsible.

In addition to the circumstances described above, a Contractor may in writing request permission from the Department to add a new Subcontractor or replace a listed Subcontractor. The DEPARTMENT will approve the request if it determines in writing that allowing the addition or replacement is in the best interest of the state.

The contractor shall submit a written request to add a new Subcontractor or replace a listed Subcontractor to the Contracting Officer a minimum of five working days prior to the date the new Subcontractor is scheduled to begin work on the construction site. The request must state the basis for the request and include supporting documentation acceptable to the Contracting Officer.

If a CONTRACTOR violates this article, the Contracting Officer may:

1. Cancel the Contract after Award without any damages accruing to the DEPARTMENT; or
2. After notice and hearing, assess a penalty on the bidder in an amount not exceeding 10 percent of the value of the subcontract at issue.”

### **SC-7.12–APPLICABLE ALASKA PREFERENCES**

At General Condition Article 7.12, delete the text of this article in its entirety.

### **SC-7.13–WAGES AND HOURS OF LABOR**

Add new General Conditions Article 7.13.4 as follows:

- 7.13.4.** Upon completion of all work, the primary contractor shall file with the Department of Labor a “Notice of Completion Form” together with payment of any additional filing fees owed due to increased contract amounts. Within 30 days after the Department of Labor’s receipt of the primary contractor’s notice of completion, the Department of Labor shall inform the DEPARTMENT of the amount, if any, to be withheld from the final payment.

### **SC-11.8–DELAY DAMAGES**

At General Condition Article 11.8, add the following paragraphs:

The CONTRACTOR understands that if completion of the items of work identified in this contract is not attained by the applicable Substantial and/or Final Completion Dates – as the case may be – the DEPARTMENT will suffer damages which are difficult to determine. Consequently, this contract provides for an assessment of liquidated damages, which is a reasonable forecast of the damages likely to occur in the event of breach under differing circumstances.

The following are different circumstances or scenarios where Liquidated Damages will be assessed. Liquidated Damages arising under more than one circumstance identified below are cumulative; CONTRACTOR is liable for all liquidated damage accruing under this contract. DEPARTMENT may recover these damages from retained progress payments or from payment by CONTRACT or its surety.

- 11.8.1** Failure to Meet Substantial Completion Date. For each calendar day that the work is not Substantially Complete after the expiration of the Contract Time or the Substantial Completion Date has passed, the DEPARTMENT shall deduct **One Hundred Fifty Dollars** (\$150) from progress payments.
- 11.8.2** Failure to Meet Final Completion Date. The Final completion date shall be defined as the date 60 calendar days following the substantial completion date. For each calendar day that the work is substantially complete, but the project is not at Final Completion, after the Final Completion Date has passed, the DEPARTMENT shall deduct **Fifty Dollars** (\$50.00) from progress payments.

- 11.8.3** If no money is due the CONTRACTOR, the DEPARTMENT shall have the right to recover these sums from the CONTRACTOR, from the Surety, or from both. These are liquidated damages and not penalties. These charges shall reimburse the DEPARTMENT for its additional expenses incurred due to CONTRACTOR'S failure to complete the work within the time specified.
- 11.8.4** Permitting the CONTRACTOR to continue and finish the work or any part of it after the Contract time has elapsed or the completion date has passed does not waive the DEPARTMENT'S rights to collect liquidated damages under this section.

**SC-15.1-NOTIFICATION**

In Paragraph 15.1.2, delete "Section 01310" and replace with "Section 01 32 00."

**END OF SECTION**

## STATE LABORERS' AND MECHANICS' MINIMUM RATES OF PAY

State wage rates can be obtained at <http://www.labor.state.ak.us/lss/pamp600.htm>. Use the State wage rates that are in effect 10 days before Bid Opening. The Department will include a paper copy of the State wage rates in the signed Contract.

UFC 3-270-01  
21 February 2018  
Change 1, 17 March 2022

# **UNIFIED FACILITIES CRITERIA (UFC)**

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## **O&M MANUAL: ASPHALT AND CONCRETE PAVEMENT MAINTENANCE AND REPAIR**



**APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED**

**UNIFIED FACILITIES CRITERIA (UFC)**

**O&M MANUAL: ASPHALT AND CONCRETE PAVEMENT MAINTENANCE AND  
REPAIR**

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U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by \1\ ... /1/)

<b>Change No.</b>	<b>Date</b>	<b>Location</b>
1	7 March 2022	Added Chapter 22 on maintenance approach of specific areas critical to F-35B/C operations. Added Paragraph 21-3.6 Epoxy Coatings and 21-3.7 Joint Sealants. Updated third paragraph of 20-1, 21-1, 21-3, 21-3.1, 21-3.3, 21-4.4, 21-4.6, 21-5.1, and Appendix B References – Army.

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**This UFC supersedes UFC 3-270-01, dated 15 March 2001; UFC 3-270-02, dated 15 March 2001; UFC 3-270-03, dated 15 March 2001; UFC 3-270-04, dated 15 March 2001; UFC 3-250-06, dated 16 Jan 2004; Air Force ETL 96-4, dated 9 July 1996; Air Force ETL 97-2, dated 28 July 1997; Air Force ETL 02-7, dated 7 August 2002; Air Force ETL 02-8, dated 5 September 2002; Air Force ETL 11-26, dated 21 December 2011; and Air Force ETL 14-2, dated 21 November 2014.**

## FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with [USD \(AT&L\) Memorandum](#) dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: [Criteria Change Request](#). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site <http://dod.wbdg.org/>.

Refer to UFC 1-200-01, *DoD Building Code (General Building Requirements)*, for implementation of new issuances on projects.

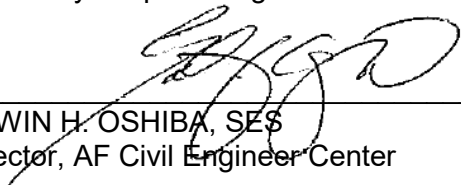
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**UNIFIED FACILITIES CRITERIA (UFC)  
NEW SUMMARY SHEET**

**Document:** UFC 3-270-01, *O&M: Asphalt and Concrete Pavement Maintenance and Repair*

**Superseding:** UFC 3-270-01, *Asphalt Maintenance and Repair*; UFC 3-270-02, *Asphalt Crack Repair*; UFC 3-270-03, *Concrete Crack and Partial-Depth Spall Repair*; UFC 3-270-04, *Concrete Repair*; UFC 3-250-06, *Repair of Rigid Pavements Using Epoxy Resin Grouts, Mortars, and Concretes*; ETL 96-4, *Temporary Joint Sealing Details and Procedures for Pavements*; ETL 97-2, *Maintenance and Repair of Rigid Airfield Pavement Surfaces, Joints and Cracks*; ETL 02-7, *Preventing Concrete Deterioration Under B-1 and F/A-18 Aircraft*; ETL 02-8, *Silicone Joint Sealant Specification for Airfield Pavements*; ETL 11-26, *Using Asphalt Surface Treatments as Preventive Maintenance on Asphalt Airfield Pavements*; and ETL 14-2, *Preventing and Repairing Concrete Deterioration Under MV-22 and CV-22 Aircraft*;

**Description:** UFCs 3-270-01, 3-270-02, 3-270-03, 3-270-04 and UFC 3-250-06 are hereby cancelled and combined into this UFC. To reflect the combination of these four UFCs into one document, the title of UFC 3-270-01 is changed from *Asphalt Maintenance and Repair* to *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair*. Many figures are updated and the document reviewed to ensure recent developments are included. In addition, the following Air Force Engineering Technical Letters (ETLs) are cancelled and incorporated into this UFC: ETL 96-4, ETL 97-2, ETL 02-7, ETL 02-8, ETL 11-26, and ETL 14-2.

**Reasons for Document:** This UFC provides engineers with information on the options for maintaining and repairing, as well as preserving and extending, the service life of pavements. It also provides information on which methods are appropriate to address observed pavement distresses. It also outlines materials, equipment, techniques, and cautions required to produce a cost-effective and durable pavement. The overlap in the five superseded UFCs and six cancelled ETLs made it difficult to ensure consistency between documents as modifications to each were added. Combining these UFCs and ETLs into one document facilitates user comprehension and maintains internal consistency during future updates.

**Impact:** These changes enhance user access to the technical guidance in the documents (one document instead of eleven). This effort reduces the cost to maintain this guidance by reducing ambiguity and reducing the number of documents. There is a potential decrease in initial and lifecycle costs due to increased options available to sustain the pavements throughout the life of the pavement and which will extend to the life of the pavement.

**Unification Issues:** There are no unification issues.

**Disclaimer:** Use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement.

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## **CHAPTER 1 INTRODUCTION**

### **1-1 PURPOSE AND SCOPE.**

This UFC contains information on materials, equipment, and procedures for repairing and maintaining hot mix asphalt (HMA) and portland cement concrete (PCC) pavements. Typical maintenance and repair (M&R) methods, and problems that might be encountered in using these methods, are discussed. Guidance is provided for using each of these M&R methods. Additional information can be found in the references listed in Appendix A.

This UFC is intended for use as a field UFC for airfield and roadway pavement repair for all U.S. Navy, Army, and Air Force pavements. The described techniques are applicable for airfields, roads, parking lots, and other pavement uses. Probable causes of pavement problems are discussed and suggested M&R measures described in order to correct pavement surface problems at the source.

Not covered in this UFC are maintenance and repairs of surface water drainage systems, pavement markings, ground lighting, and unpaved margins.

### **1-2 APPLICABILITY.**

This UFC applies to all military Service elements and contractors involved in the planning, design, and construction, maintenance, repair, or preservation of DOD pavements worldwide. This UFC is for the M&R of asphalt and concrete pavements. Follow standard practices to ensure good performance and to obtain required pavement service life. Projects where standard practices were not followed resulted in poor performance. In many cases, those providing oversight were not knowledgeable about standard practices. This UFC outlines standard practices and will result in better oversight of work and help identify problem areas during application of the M&R process.

### **1-3 GENERAL BUILDING REQUIREMENTS.**

Comply with UFC 1-200-01, *DOD Building Code (General Building Requirements)*. UFC 1-200-01 provides applicability of model building codes and government-unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, and safety. Use this UFC in addition to UFC 1-200-01 and the UFCs and government criteria referenced therein.

### **1-4 REFERENCES.**

Appendix A contains a list of references used in this UFC. The publication date of the code or standard is not included in this UFC. In general, the latest available issuance of the reference is used.

**1-5 GLOSSARY.**

Appendix C contains acronyms, abbreviations, and terms.

## CHAPTER 2 TYPES OF MAINTENANCE AND REPAIR FOR PAVEMENTS

### 2-1 INTRODUCTION.

The purpose of M&R of asphalt and concrete pavements is to extend the useful life of the pavement, maintain a smooth riding surface, reduce mission impact, and prevent water from entering the underlying soil.

#### 2-1.1 Maintenance and Repair.

Typical maintenance on asphalt and concrete pavements consists principally of the care of joints, sealing of cracks, surface treatments, replacement of random broken slab panels, full-depth and partial-depth repairs, dowel bar restoration, diamond grinding, slab-jacking, sub-sealing, petroleum, oil, and lubricant (POL) contamination removal, and the correction of minor settlement and drainage faults. Repair consists of the work required to restore a distressed pavement so it may be used at its original designed capacity and/or accommodate the current mission as provided for by applicable Service instructions.

#### 2-1.2 Pavement Management.

Use an effective pavement management and inspection system that provides timely M&R to keep a pavement in optimal condition. Identify the root cause of the pavement distress and address the underlying problem. To implement an effective pavement management and inspection program, use UFC 3-260-16FA, *Airfield Pavement Condition Survey Procedures*, and UFC 3-270-08, *Pavement Maintenance Management*. These UFCs describe all asphalt and concrete pavement distresses and severity levels.

#### 2-1.3 Quality Control.

Perform quality control, whether work is performed in-house or by contract, to obtain effective durable maintenance and repairs. Use an independent certified testing laboratory, referred to herein as the QC lab. Quality control (QC) functions are performed by the QC lab, which are necessary to monitor the work. Mix designs, soil cement design, soils analysis for compaction control, and supporting construction process monitoring are performed by the QC lab. The minimum daily monitoring requirements are described in specified UFGSSs. Submit QC lab qualifications for review and approval to the government contracting officer or their designated technical representative. The government contracting officer or their designated technical representative will review the qualifications of the laboratory and, if necessary, visit the QC lab. Include, as a minimum, local area industry standards, , ASTM C78, *Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)*, ASTM C1260, *Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)*, ASTM C1077, *Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing*

*Agency Evaluation, ASTM D3666, Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials, and respective state highway department certifications, when applicable, in evaluation criteria used to determine the suitability of the QC lab.*

Before proceeding with the work, construct a test section to demonstrate the capability to perform to the intent of the specification. Demonstrate within the test section the ability to do pavement removal, subgrade preparation, base placement, and concrete mixing, placing, and finishing for both partial- and full-depth repairs. Incorporate the construction of joints, protection of the work, and QC procedures into the test section. Use all procedures and materials used to construct an acceptable test section as the standard of evaluation for performing the work. Incorporate equipment, materials, and procedures used for the approved test section into the work.

## **2-2 PAVEMENT MATERIALS.**

### **2-2.1 Safety.**

Safety hazards, such as fire/explosion hazards, toxicity, and reactivity, are associated with pavement repair materials and equipment. Always provide a Material Safety Data Sheet (MSDS) from the manufacturer with the material. Review the MSDS for personal protective equipment (PPE) and other safety precautions before use.

### **2-2.2 Importance of Weather.**

#### **2-2.2.1 Weather Effects – Asphalt.**

**2-2.2.1.1** Preferably, perform patching or resurfacing work only during dry weather and on dry surfaces. Place courses only when the surface temperature of the underlying course is greater than 40 degrees F (4 degrees C) for course thicknesses greater than 3 inches (75 millimeters) and 45 degrees F (7 degrees C) for course thicknesses 3 inches (75 millimeters) or less. When hot asphalt mixtures are placed on cold pavements they may quickly cool, making adequate compaction difficult. Moreover, asphalt and asphalt mixtures do not bond adequately to damp surfaces.

**2-2.2.1.2** Mixtures containing emulsified or cutback asphalt require more curing time in high humidity. Low temperatures also reduce the rate of evaporation of emulsified or cutback binders during curing. Cationic emulsions generally are less affected by the weather than anionic emulsions. As a result, many agencies specify cationic emulsions for M&R work. Cutback asphalts are now seldom used due to environmental concerns; however, cutback asphalt may be encountered outside of the US.

**2-2.2.1.3** Moisture affects seal coats and other surface treatments in the first few hours after placement. Rainfall prior to the time the liquid asphalt solidifies allows the leaching away or separation of asphalt from the aggregate. This results in the loss of some or all of the applied surface treatments.

**2-2.2.1.4** Repairs cannot always be made in warm, dry weather. Therefore, QC, quality assurance (QA), equipment, and procedures are required when repairs are made during poor weather conditions as the repairs are less likely to perform satisfactorily. Sometimes mission requirements take precedent, which requires repairs as soon as practical even though they may only be temporary. Further, delaying repairs may allow small surface defects to become major failures.

### **2-2.2.2 Weather Effects – Concrete.**

**2-2.2.2.1** Weather conditions at a job site, hot or cold, windy or calm, dry or humid, may be vastly different from the optimum conditions assumed at the time a concrete mix is specified, designed, or selected. Concrete can be placed in hot or cold weather conditions, provided adequate precautions are taken to alleviate the negative impacts of high or low ambient temperatures.

**2-2.2.2.2** The precautions required to ensure a quality end product will vary depending on the actual conditions during concrete placement and the specific application for which the concrete will be used. Do not place concrete when the air temperature is below 40 degrees F (4 degrees C) in the shade. When the air temperature is likely to exceed 90 degrees F (32 degrees C), use concrete having a temperature not exceeding 90 degrees F (32 degrees C) when placed. Keep the surface of placed concrete damp with a water fog until the approved curing medium is applied.

In general, if the temperature at the time of concrete placement will exceed 77 degrees F (25 degrees C) or below 50 degrees F (10 degrees C), develop a plan to negate the effects of temperatures.

### **2-2.2.3 Hot Weather Effects on Concrete.**

Any operation of concreting done at atmospheric temperature above 77 degrees F (25 degrees C) is termed hot weather concreting. The effect of hot weather may be as follows:

- A higher temperature of fresh concrete results in a more rapid hydration and leads to reduced workability/accelerated setting. This reduces the handling time of concrete.
- Concrete mixed, placed, and cured at higher temperature typically develops higher early strength than concrete produced and cured at normal temperature, but at 28 days or later the strength is generally lower.
- Rapid evaporation may cause plastic shrinkage and cracking and subsequent cooling of hardened concrete will introduce tensile stresses.
- Rapid drying of the existing repair surface will lead to premature failure due to poor or failed bond.

#### **2-2.2.4 Cold Weather Effects on Concrete.**

Any concreting operation done at a temperature below 50 degrees F (10 degrees C) is termed cold weather concreting. In the absence of special precautions, the effect of cold weather concreting may be as follows:

- When the temperature is falling to about 50 degrees F (10 degrees C) or below, the development of strength of concrete is retarded compared with development at normal temperature. Thus, the time period for removal of form work has to be increased as well as the time to allow for traffic.
- Permanent damage may occur when the concrete in fresh stage is exposed to freezing temperatures before hardening. Concrete may suffer irreparable loss in its properties to an extent that compressive strength may get reduced to 50 percent of what could be expected for normal temperature concrete.
- Large temperature differentials within the concrete member may promote cracking and adversely affect its durability.

#### **2-2.2.5 Precautions.**

Precautions may include some or all of the following for hot weather placement:

- Moisten subgrade, steel reinforcement, and form work prior to concrete placement.
- Erect temporary wind breaks to limit wind velocities and sunshades to reduce concrete surface temperatures.
- Cool aggregates and mixing water added to the concrete mixture to reduce its initial temperature. The effect of hot cement on concrete temperature is only minimal.
- Use a concrete consistency that allows rapid placement and consolidation.
- Protect the concrete surface during placement with plastic sheeting or evaporation retarders to maintain the initial moisture in the concrete mixture.
- Provide sufficient labor to minimize the time required to place and finish the concrete, as weather conditions substantially affect the times to initial and final set.
- Consider fogging the area above the concrete placement to raise the relative humidity and satisfy moisture demand of the ambient air.
- Provide appropriate curing methods as soon as possible after the concrete finishing processes have been completed.

- In extreme conditions, consider adjusting the time of concrete placement to take advantage of ambient temperatures, such as early morning or night time placement.

**Note:** With proper planning and execution, concrete can be successfully placed and finished to produce high-quality, durable concrete at hot or cold temperatures.

### **2-2.3 Asphalt Pavement Materials.**

Asphalt concrete, commonly called asphalt, blacktop, or pavement, is a composite material commonly used to surface roads, parking lots, and airfields. It consists of mineral aggregate bound together with asphalt, laid in layers, and compacted. The terms "asphalt (or asphaltic) concrete," "bituminous asphalt concrete," and "bituminous mixture" are typically used in engineering and construction, which define concrete as any composite material composed of mineral aggregate adhered with a binder. The abbreviation "AC" is sometimes used for "asphalt concrete" but can also denote "asphalt content" or "asphalt cement," referring to the liquid asphalt portion of the composite material. A variety of specialty asphalt concrete mixtures have been developed to meet specific needs, such as stone-matrix asphalt, which is designed to ensure a very strong wearing surface, or porous asphalt pavements, which are permeable and allow water to drain through the pavement for controlling storm water. Mixing of asphalt and aggregate is accomplished in one of several ways described below.

#### **2-2.3.1 Hot Mix Asphalt Concrete (HMAC).**

Hot mix asphalt concrete (commonly abbreviated as HMAC or HMA) is produced by heating the asphalt binder to decrease its viscosity and drying the aggregate to remove moisture prior to mixing. Mixing is generally performed with the aggregate at about 300 degrees F (roughly 150 degrees C) for virgin asphalt, 330 degrees F (166 degrees C) for polymer modified asphalt, and asphalt cement at 200 degrees F (93 degrees C). Perform paving and compaction while the asphalt is sufficiently hot. In many countries, paving is restricted to summer months because in winter the compacted base will cool the asphalt too much before it is able to be packed to the required density. HMAC is the form of asphalt concrete most commonly used on high-traffic pavements such as those on major highways and airfields.

#### **2-2.3.2 Superpave Mix Design.**

One of the principal results from the Strategic Highway Research Program (SHRP) was the Superpave mix design method. Superpave, short for "superior performing asphalt pavement," is a pavement system designed to provide longer-lasting roadways. The Superpave mix design method was designed to replace the Hveem and Marshall methods. The volumetric analysis common to the Hveem and Marshall methods provides the basis for the Superpave mix design method. The Superpave system ties asphalt binder and aggregate selection into the mix design process, considers traffic and climate as well, and evaluates the finished product. The compaction devices from

the Hveem and Marshall procedures have been replaced by a gyratory compactor and the compaction effort in mix design is tied to expected traffic.

### **2-2.3.3 Marshall Mix Design.**

The basic concepts of the Marshall mix design method were originally developed by Bruce Marshall of the Mississippi Highway Department around 1939 and then refined by the U.S. Army. Currently, the Marshall method is used in some capacity by about 38 states. The Marshall method seeks to select the asphalt binder content at a desired density that satisfies minimum stability and range of flow values. The Marshall method continued to be refined through the 1950s, with various tests on materials, traffic loading, and weather variables. Today, the Marshall method, despite its shortcomings, is probably the most widely used mix design method in the world. It has become so widely used because it was adopted and used by the U.S. military all over the world during and after WWII and it is simple, compact, and inexpensive.

### **2-2.3.4 Stone Mastic Asphalt (SMA).**

SMA can be used as wearing course for roads, paths, and other traffic surfaces. It is a standard method of construction on motorways, federal roads, and city streets with heavy and very high demand traffic. For maintenance of traffic surfaces, SMA is especially suited for thin layers. One of SMA's special advantages is that, within limits, it can be paved in different thicknesses to even out a surface without worrying about possible differences in post compaction.

Wearing courses made with SMA are especially stable and durable. They have proven their superior performance even in areas with heavy traffic and independent of any climatic influence. A wearing course made from SMA with the correct design and mix production as well as proper paving shows the following characteristics due to the high chippings content together with the mastic-like mortar:

- Better resistance to permanent deformation
- High-wearing resistance
- Less cracking due to cold or mechanical stress
- Coarse surface texture
- Good macro roughness
- Good long-term behavior

### **2-2.3.5 Porous Friction Course (PFC).**

Porous or permeable friction courses (PFC) are HMA mixtures placed at the surface of a pavement structure in a thin layer to produce several benefits for the traveling public in terms of safety, economy, and the environment. It is a sacrificial wearing course

consisting of an aggregate with relatively uniform grading, little or no fines and mineral filler, and it is designed to have a high air void content compared to dense-graded mixtures. Special repair procedures specifically applicable to these porous friction surfaces are presented and discussed in Chapter 10.

#### **2-2.3.6 Warm Mix Asphalt (WMA) Concrete.**

Warm mix asphalt concrete (commonly abbreviated as WMA) is produced by adding either zeolites, waxes, asphalt emulsions, or sometimes even water to the asphalt binder prior to mixing. This allows significantly lower mixing and laying temperatures and results in lower consumption of fossil fuels, thus releasing less carbon dioxide, aerosols, and vapors. Not only are working conditions improved, but the lower laying-temperature also leads to more rapid availability of the surface for use, which is important for construction sites with critical time schedules. The use of these additives in HMA (2.2.3.1 above) may afford easier compaction and allow cold weather paving or longer hauls. Use of WMA is rapidly expanding.

#### **2-2.3.7 Cold Mix Asphalt Concrete.**

Cold mix asphalt concrete is produced by emulsifying the asphalt in water with (essentially) soap prior to mixing with the aggregate. While in its emulsified state, the asphalt is less viscous and the mixture is easy to work and compact. The emulsion will break after enough water evaporates and the cold mix will, ideally, take on the properties of cold HMAC. Cold mix is commonly used as a patching material and on lesser-trafficked service roads.

#### **2-2.3.8 Cut-back Asphalt Concrete.**

Cut-back asphalt concrete is produced by dissolving the binder in kerosene or another lighter fraction of petroleum before mixing with the aggregate. While in its dissolved state the asphalt is less viscous and the mix is easy to work and compact. After the mix is laid down the lighter fraction evaporates. Because of concerns with pollution from the volatile organic compounds in the lighter fraction, cut-back asphalt has been largely replaced by asphalt emulsion.

#### **2-2.3.9 Mastic Asphalt Concrete.**

Mastic asphalt concrete or sheet asphalt is produced by heating hard-grade blown bitumen (oxidation) in a green cooker (mixer) until it has become a viscous liquid, after which the aggregate mix is then added. The bitumen aggregate mixture is cooked (matured) for around six to eight hours and, once it is ready, the mastic asphalt mixer is transported to the work site where experienced layers empty the mixer and either machine or hand lay the mastic asphalt contents on to the road. Mastic asphalt concrete is generally laid to a thickness of around 0.75 to 1.1875 inch (20 to 30 millimeters) for footpath and road applications, and around 0.375 inch (10 millimeters) for flooring or roof applications. In addition to the asphalt and aggregate, additives, such as polymers, and antistripping agents may be added to improve the properties of the final product.

Natural asphalt concrete can be produced from bituminous rock, found in some parts of the world, where porous sedimentary rock has been impregnated with upwelling bitumen.

**2-2.4 Grading System for Asphalt Emulsions.**

Most asphalt surface treatments contain an emulsified binder. Do not use solvent-based or cutback materials unless approved by the local environmental authority. Use emulsions appropriate for local conditions to ensure proper break and set time. Coal tar emulsions, usually used only as fuel-resistant sealers, are not discussed in this UFC.

Emulsions are classified (ASTM D977, *Standard Specification for Emulsified Asphalt*), on the basis of how quickly the asphalt droplets coalesce, resulting in “breaking” of the emulsion. RS, MS, QS, and SS refer to rapid-setting, medium-setting, quick-setting, and slow-setting, respectively. The breaking time increases from RS to SS. RS emulsions cannot be combined with aggregate. MS emulsions can only be mixed with coarse aggregate. QS and SS emulsions can be mixed with any aggregate. Designations 1 and 2 in emulsion nomenclature refer to the viscosity of the emulsion, with 2 being more viscous. The h designation refers to a base asphalt that is harder (lower penetration). Some emulsions have a HF designation, referring to high float. HF emulsions can provide a thicker asphalt film on aggregates, which is thought to enhance durability. Emulsions suspended by cationic surfactants are designated with a C. No designation refers to emulsions with anionic surfactants. Table 2-1 gives common emulsion grades for different types of surface treatments.

**Table 2-1 Common Asphalt Emulsion Grades**

<b>Surface Treatment</b>	<b>Typical Asphalt Emulsion Grade Used</b>
Liquid fog seal	RS-1, MS-1, HFMS-1, SS-1, SS-1h, CRS-1, CSS-1h, CQS-1h
Liquid and sand spray seal	RS-1, RS-2, HFRS-2, HFRS-2h, MS-1, HFMS-1, CRS-1, CRS-2, CRS-2h
Slurry seal	SS-1h, CSS-1h, CQS-1h
Microsurfacing	CQS-1h

**2-2.4.1 Emulsion Breaking and Curing.**

Breaking an asphalt emulsion refers to separating water from the asphalt and the evaporation of water. Some emulsions break when sufficient water has evaporated. Others break through chemical means. Breaking time is reduced by adding chemicals.

Curing asphalt emulsions involves the development of mechanical properties as the asphalt particles coalesce and the water is removed through evaporation. Typical

curing times range from 30 minutes to 24 hours. Cure times are a function of environmental conditions, application rate, substrate properties, and product dilution ratios. Follow the manufacturer's recommendations for closing the pavement to traffic.

#### **2-2.4.2 Shelf Life.**

Some asphalt materials have a limited shelf life; therefore, give particular attention to the manufacturer's recommended shelf life when selecting a material. Shelf life typically ranges from three months to two years and depends on storage conditions, such as temperature, humidity, and packaging.

#### **2-2.5 Concrete Pavement Materials.**

A concrete pavement consists of a surface layer of concrete placed over a base (granular or stabilized) and subbase (typically granular) over the subgrade, which may incorporate a fill material. Concrete is a mixture of paste and aggregates. The paste, composed of cementitious materials and water, coats the surface of the fine and coarse aggregates. Through a chemical reaction called hydration, the paste hardens and gains strength to form concrete. The cementitious material primarily consists of portland cement but may also incorporate fly ash, slag cement (ground granulated blast furnace slag), silica fume (not common), or proprietary materials. Concrete is made with or without additives (e.g., air entraining, water-reducing) to achieve the required workability, strength, and durability properties. Concrete generally achieves its initial set within about one hour after water is added and will become fairly hard within six to eight hours of placement. Normal concrete will achieve about 90 percent of its long-term strength within about 30 days and will continue to gain strength at an ever-decreasing rate for many years as long as moisture is retained within the consolidated concrete mass and there is no adverse chemical reaction either internally or due to external action. Normal concrete is typically designed to achieve about 4,000 pounds per square inch (psi) (27.5 megapascals) compressive strength at 28 days. Rapid-set or high-early-strength concrete can be designed to achieve strengths of about 2,500 to 3,000 psi (17.2 to 20.7 megapascals) within 12 to 24 hours to allow for early opening of repair areas to traffic. Many rapid-set materials include proprietary cementitious materials.

##### **2-2.5.1 Portland Cement Concrete (PCC).**

PCC is generally accepted as the most appropriate material for the partial-depth repair of existing concrete pavements. Typical mixes combine Type I, Type II, or Type III portland cement with aggregate not larger than one-half the minimum repair thickness. Use a material that is a low-slump mixture of air-entrained concrete having a water-to-cement ratio not exceeding 0.44. Type I or Type II PCC can be used when the patch material can be protected from traffic for at least 24 hours. For faster-setting materials such as Type III cements, patches can be opened as soon as the material can withstand loads without plastic deformation. Type I or Type II portland cement, with or without admixtures, is more widely used than most other materials because of its

relatively low cost, availability, and ease of use. In cooler weather, insulating layers can be used to retain the heat of hydration and reduce curing time.

Several proprietary portland cement-based repair materials are also available to achieve high early strength and can be used for partial-depth repairs.

#### **2-2.5.2 Gypsum-Based Concrete.**

Gypsum-based concrete (calcium sulfate) repair materials gain strength rapidly and can be used in any temperature above freezing. However, gypsum concrete may not perform well when exposed to moisture and freezing weather. Additionally, the presence of free sulfates in the typical gypsum mixture may promote corrosion of reinforcing steel in pavements.

#### **2-2.5.3 Magnesium Phosphate Concrete.**

Magnesium phosphate concretes set very rapidly and produce a high-early-strength, impermeable material that will bond to clean, dry surfaces. However, this type of material is extremely sensitive to water, either on the substrate or in the mix (even very small amounts of excess water can reduce strength). Furthermore, magnesium phosphate concrete is very sensitive to aggregate type (for example, some limestone aggregates are not acceptable). In hot weather (i.e., above 90 degrees F [32 degrees C]), many commonly available mixes experience short setting times (e.g., 10 to 15 minutes).

#### **2-2.5.4 Calcium Aluminate Cement.**

Calcium aluminate cements gain strength rapidly, have good bonding properties (on a dry surface), and very low shrinkage. However, due to a chemical conversion that occurs in calcium aluminate cement, particularly at high temperatures during curing, strength loss over time is likely to occur; consequently, these materials are not recommended for use as a patching material.

#### **2-2.5.5 Polymer-based Concrete.**

Polymer-based concretes are formed by combining polymer resin, aggregate, and an initiator. Aggregate is added to the resin to make the polymer concrete more thermally compatible with the existing concrete (which would otherwise lead to debonding), to provide a wearing surface, and for economy. The main advantage of polymers is that they set much quicker than most of the cementitious materials. However, they are expensive and can be quite sensitive under certain field conditions. Polymers used for pavement repairs can be classified into four categories: epoxies, methacrylates, polyester-styrenes, and urethanes.

When using polymeric materials for partial-depth repairs, use spall repair materials in accordance with TSPWG M 3-270-01.08-4, *Testing Protocol for Polymeric Spall Repair Materials*.

#### **2-2.5.5.1 Epoxy Concrete.**

Epoxy concrete repair materials are impermeable and have excellent adhesive properties. When used, it is important that the epoxy concrete be compatible with the concrete in the pavement. Differences in the coefficients of thermal expansion (CTE) between the repair material and the concrete can cause repair failures, but the use of thermally compatible aggregate increases the volume stability and helps reduce the likelihood of debonding. Place deep epoxy repairs in multiple lifts to control heat buildup.

#### **2-2.5.5.2 Methyl Methacrylate (MMA) Concrete.**

MMA concretes and high molecular weight methacrylate (HMWM) concretes have long working times, high compressive strengths, and good adhesion. Furthermore, they can be placed over a wide range of temperatures, from 40 to 130 degrees F (4 to 54 degrees C). MMA is manufactured with either an ultra-low viscosity, which is used as a penetrating crack sealer or to fortify extremely porous concrete substrates, or a medium viscosity, which is used as a neat mortar for grouting or thin patches and can be filled with pre-packaged coarse aggregate and used for partial or full-depth patching in a single pour. However, many methacrylates are volatile and may pose a health hazard to those exposed to the fumes for prolonged periods.

#### **2-2.5.5.3 Polyester-styrene Polymers.**

Polyester-styrene polymers have many of the same properties as MMA, except that they have a much slower rate of strength gain, which limits their usefulness as a rapid repair material. Polyester-styrene polymers generally cost less and are used more widely than MMA.

#### **2-2.5.5.4 Polyurethane Resin**

Polyurethane repair materials generally consist of a two-part polyurethane resin mixed with aggregate. Polyurethanes are generally very quick-setting (90 seconds), which makes a very quick repair. Some polyurethanes claim to be moisture-tolerant; that is, they can be placed on a wet substrate with no adverse effects. These types of materials have been used for several years with variable results.

#### **2-2.5.6 Rapid-set Cement and Polymers.**

There are a number of other polymeric materials available for partial-depth repairs, most of which exhibit rapid strength gain and a high degree of impermeability. Furthermore, some of these materials exhibit certain elastic properties that allow them to be placed across a joint without the need for an insert to maintain the joint.

Use rapid-set proprietary patching materials in compliance with the manufacturer's recommendations. This includes bonding, placing, time required before opening to traffic, and temperature ranges. Evaluate epoxy mortar and epoxy concrete

mix designs in the laboratory before use. Precondition the epoxy resin catalyst before blending to produce a liquid blended between 75- and 90-degrees F (24- and 32-degrees C). Mix the epoxy components in compliance with the manufacturer's recommendations prior to adding aggregate. Blend the material in a suitable mixer until homogenous. Mix only the quantity of material that can be used within one hour (dependent on materials and air temperature, may be less than one hour) in each batch.

When using rapid-set cement and polymeric materials for partial-depth repairs, use spall repair materials in accordance with TSPWG M 3-270-01.08-2, *Testing Protocol for Rapid Setting Rigid Repair Material*.

**Caution: Use repair materials that are thermally compatible with the existing concrete. When an aggregate is used to extend the repair material, use aggregate that is thermally compatible with the aggregate in the existing concrete; otherwise, the risk of debonding will be high.**

#### **2-2.5.7 Bonding Grout.**

Bonding grout may be used when using cement-based repair material. The grout consists of one-part portland cement to one-part sand by volume with sufficient water to produce a mortar with a creamy consistency. The grout is applied as a light coat to the patch area. Place the concrete before the grout dries. If the grout dries or hardens prior to placement of this concrete, remove it by sandblasting. Do not place patches using normal-set concrete when the air temperature is below 50 degrees F (10 degrees C). At temperatures below 55 degrees F (13 degrees C), a longer curing period and/or insulation mats may be required. If the grout cannot be applied correctly, it is preferable not to use the grout and instead lightly dampen the repair area with water, including the vertical sides, just before application of the grout material in the repair area.

For rapid-set proprietary materials, follow the manufacturer's instructions regarding the use or non-use of the bonding grout. Remove all sandblasting residue using oil-free air-blowing equipment just prior to placing the bonding grout, if used. Apply the bonding grout using a stiff bristle brush and scrub into the patch area. Apply evenly in a thin coat (approximately 0.0625 inch [2 millimeters] thick).

**Caution: Irrespective of the type of bonding grout used, always apply it to a clean surface and never allow it to puddle or get dry before application of the repair material. If water is used to dampen the repair surfaces, the water is not allowed to pond on the repair surface.**

#### **2-2.5.8 Recycled Concrete Pavement Material**

Recycled concrete pavement material has many potential uses, which are addressed in UFC 3-250-07, *Standard Practice for Pavement Recycling*. When using recycled concrete pavement materials, consider testing the recycled materials to mitigate

potential detrimental risks associated with harmful reactivity such as alkali-silica reaction (ASR), alkali-carbonate reaction (ACR), or sulfate attack.

## **2-2.6 Concrete Pavements Types.**

### **2-2.6.1 Jointed Plan Concrete Pavement (JPCP).**

JPCP may be doweled or not doweled at transverse joints; however, these pavements are always doweled along longitudinal construction joints. Transverse joint spacing used on airfields in the past ranged from about 15 feet (4.5 meters) to about 25 feet (7.5 meters), depending on slab thickness. Currently, the design joint spacing ranges from about 10 feet (3 meters) to about 20 feet (6 meters).

### **2-2.6.2 Jointed Reinforced Concrete Pavement (JRCP).**

JRCP incorporates steel reinforcement and has longer transverse joint spacing, ranging from about 40 to 60 feet (12 to 18 meters) or longer. One or more transverse cracks may develop in each panel and the reinforcement keeps these cracks tight. The transverse joints are doweled. These pavements are not widely used anymore.

### **2-2.6.3 Continuously Reinforced Concrete Pavement (CRCP).**

CRCP has not been widely used by the military. A higher level of reinforcement is used and transverse joints are not provided, except near structures. Use of the high level of reinforcement leads to the development of closely spaced cracking at about 3 to 6 feet (1 to 2 meters) and the steel holds the crack very tight.

### **2-2.6.4 Jointed Concrete Pavement.**

Joints are created in jointed concrete pavements to control cracking locations and provide for unrestrained expansion and contraction of the concrete panels. If the panel contraction is restrained as a result of locked joints during service or improper joint-forming during construction, mid-panel cracking can develop. If the panel expansion is restrained during hot weather, joint spalling can develop and, in extreme cases, joint blow-up may result. Therefore, it is important to make sure that any joint repair activity does not restrict the contraction and expansion of the slab panels.

## **2-2.7 Cement Standards.**

To ensure a level of consistency between cement-producing plants, certain chemical and physical limits are placed on cements. These chemical limits are defined by a variety of standards and specifications. For instance, portland cements and blended hydraulic cements for concrete in the U.S. conform to ASTM C150, *Standard Specification for Portland Cement*, ASTM C595, *Standard Specification for Blended Hydraulic Cement*, or ASTM C1157, *Performance Specification for Hydraulic Cements*.

**Table 2-2 Cement Classification Standards**

In the US, three separate standards may apply, depending on the category of cement. For portland cement types, ASTM C150 describes:	
Cement Type	Description
Type I	Normal
Type II	Moderate sulfate resistance
Type II (MH)	Moderate heat of hydration (and moderate sulfate resistance)
Type III	High early strength
Type IV	Low heat hydration
Type V	High sulfate resistance
For blended hydraulic cements (specified by ASTM C595) the following nomenclature is used:	
Cement Type	Description
Type IL	Portland-limestone cement
Type IS	Portland-slag cement
Type IP	Portland-pozzolan cement
Type IT	Ternary blended cement
However, with an interest in the industry for performance-based specifications, ASTM C1157 describes cements by their performance attributes:	
Cement Type	Description
Type GU	General use
Type HE	High early-strength
Type MS	Moderate sulfate resistance
Type HS	High sulfate resistance
Type MH	Moderate heat of hydration
Type LH	Low heat of hydration

### **2-2.7.1 Concrete Pavement Performance.**

A concrete pavement provides a relatively long service life when properly designed, constructed, and maintained. In general, the service life of a pavement ends when, under the effects of traffic, weather, and/or lack of proper maintenance, the pavement breaks into small unstable sections, surface and joint problems develop, and extensive maintenance is required on a regular basis.

Properly designed and constructed concrete pavements do not exhibit significant distresses (e.g., cracking, joint faulting) for at least 15 years. As distresses develop, the service life of concrete pavements can be extended by timely maintenance, especially at joints and cracks. Maintaining the joints and cracks to minimize the infiltration of water and prevent the entry of incompressible material into the joint or crack is essential for long pavement service life. Frequent aircraft loadings greater than those for which the pavements were designed will cause early structural failure of the pavement.

### **2-2.7.2 Concrete Pavement Rigidity.**

Concrete pavements are classified as rigid pavements. Concrete pavements bridge small, soft, or settled areas of a subgrade through their slab action or resistance to bending. Overloading of pavements can result from applied loads being greater than the design load, more passes than assumed in the design, or the foundation support being reduced as a result of pumping, excessive moisture, or settlement due to poor construction. Usually, once cracks develop in a panel, continued loading will cause additional cracking and/or panel breaks until the pavement is no longer functional.

### **2-2.7.3 Concrete Pavement Strength.**

Military airfield and roadway concrete pavement design is based on limiting the concrete tensile stresses produced by aircraft or highway truck loads. Flexural strength of concrete is used in the design of concrete pavements. Loads applied to the pavement surface cause bending, with tensile stresses developing at the slab bottom (mid-slab locations) or at the slab top (corner locations, typically) and compressive stresses at the corresponding opposite surface. Since compressive strength of concrete is typically eight to ten times greater than the tensile or flexural strength, the ratio of load-induced tensile stresses at the bottom of the slab to the flexural strength of the concrete typically controls the structural behavior and performance of jointed concrete pavements.

The strength and durability of concrete is directly affected by:

- Quality of cementitious materials
- Water quality
- Cleanliness, durability, strength, and gradation of the aggregates
- Water-cementitious materials ratio
- Density (consolidation) of concrete

- Amount and types of admixtures
- Proportioning and mixing of materials
- Placement, finishing, and curing methods

## **2-3 PAVEMENT DISTRESSES.**

Pavement distresses include items such as cracking, rutting, raveling, or other types of surface deterioration which indicate a decline in the pavement's surface condition or structural load-carrying capacity. Pavement distresses are discussed in detail in UFC 3-260-16FA. Having a pavement distress dictionary will improve communications within the pavement community by fostering more uniform and consistent definitions of pavement distress. Highway agencies, airports, parking facilities, and others with significant investment in pavements will benefit from adopting a standard distress language.

### **2-3.1 Asphalt Concrete (AC) Pavement Distresses.**

1. Cracking
  - a. Alligator or fatigue cracking
  - b. Block cracking
  - c. Edge cracking
  - d. Joint reflection cracking
  - e. Longitudinal cracking
  - f. Slippage cracking
2. Patching and potholes
  - a. Patching and utility cut patching
  - b. Potholes
  - c. Railroad crossing
3. Surface deformation
  - a. Bumps and sags
  - b. Corrugation
  - c. Depression
  - d. Rutting
  - e. Shoving
  - f. Swell

4. Surface defects
  - a. Bleeding
  - b. Polished aggregate
  - c. Raveling
  - d. Weathering
5. Miscellaneous distresses
  - a. Lane/shoulder drop-off

### **2-3.2 Portland Cement Concrete (PCC) Pavement Distresses.**

1. Cracking
  - a. Corner break
  - b. Divided slab
  - c. Linear cracking
  - d. Shrinkage cracking
  - e. Spalling, corner
  - f. Spalling, joint
2. Joint/crack related
  - a. Faulting
  - b. Joint/crack spalling
  - c. Blowup/buckling
  - d. Pumping
  - e. Railroad crossing
3. Material related
  - a. Alkali-silica reactivity (ASR)
  - b. Durability ("D") cracking
4. Surface distress
  - a. Polished aggregate
  - b. Popouts
  - c. Patching, large and utility cuts
  - d. Patching, small
  - e. Scaling

5. Miscellaneous distresses
  - a. Lane/shoulder drop-off

## **2-4 TYPES OF MAINTENANCE AND REPAIR.**

A considerable investment is made in the construction of asphalt and concrete pavements and the vehicles/aircraft that use these surfaces. Therefore, costs decrease dramatically for every additional year of pavement use that does not cause vehicle/aircraft damage or require repeated patching or other repair activity. Routine periodic inspections and rapid pavement repair are essential for reducing the lifecycle costs of these pavements and maintaining the facility in an operation-ready status. A properly constructed and maintained pavement can last for many years and effectively meet the needs of the military.

The primary purposes of sealing cracks, repairing spalls, applying surface treatments, and carrying out other repairs in asphalt and concrete pavements is to reduce the costs associated with vehicle/aircraft damage due to foreign object damage (FOD), to extend the service life of the pavement, and to reduce the lifecycle costs for the pavement structure. Usually, there are multiple options for repairing a distress. First, determine the root cause of a distress then select a repair method to best resolve the cause. Do not apply repair options following pre-established intervals without taking the pavement's condition into consideration. Pavement M&R is grouped into three categories;

### **2-4.1 Global Preventive Maintenance (PM).**

Global PM is used to retard or slow pavement deterioration on a large scale, usually covering more than one section. Generally, global PM is effective at the beginning of pavement life and/or when the climatic-caused distresses have not started or the severity is low. Global PM may be performed periodically like localized PM, but is more commonly performed on a recurring schedule (i.e., at set time intervals).

### **2-4.2 Localized Preventive Maintenance (PM).**

Localized PM consists of M&R actions performed on individual distresses to slow down the rate of pavement deterioration.

### **2-4.3 Operational Maintenance.**

Also referred to as safety maintenance, stop-gap maintenance, and breakdown maintenance, operational maintenance is performed to mitigate distresses on pavements that are below the critical pavement condition index (PCI) to keep them operationally safe for use.

There are numerous types of M&R methods for asphalt and concrete pavements, which include patching, crack sealing, and surface treatments. This UFC presents basic M&R procedures along with relevant distresses. Overlays and new construction are covered under the UFC 3-250-XX pavement series. M&R procedures presented in this UFC include the following:

#### **2-4.3.1 Summary of Asphalt Pavement Repairs.**

The following concrete pavement repairs are discussed in this UFC:

- Chapter 3: Full-Depth Asphalt Patches
- Chapter 4: Procedural Steps (Partial-Depth Patch)
- Chapter 5: Sprayed Asphalt Surface Treatments
- Chapter 6: Bituminous Surface Treatment
- Chapter 7: Double Bituminous Surface Treatment
- Chapter 8: Asphalt Slurry Seals and Microsurfacing
- Chapter 9: Asphalt Crack Sealing
- Chapter 10: Porous Friction Surfaces
- Chapter 11: Diamond-Grinding Asphalt Concrete Pavements

Each of the above repair methods addresses specific distresses. Some of the repairs may be performed in combination.

#### **2-4.3.2 Summary of Concrete Pavement Repairs.**

The following concrete pavement repairs are discussed in this UFC:

- Chapter 12: Concrete Pavement Crack Sealing
- Chapter 13: Partial-Depth Repair of Concrete Pavements
- Chapter 14: Full-Depth Repair of Concrete Pavements
- Chapter 15: Concrete Pavement Slab Jacking
- Chapter 16: Subsealing Jointed Concrete Pavements
- Chapter 17: Concrete Pavement Diamond Grinding
- Chapter 18: Concrete Pavement Load Transfer Restoration
- Chapter 19: Concrete Pavement Retrofitted Edge Drainage
- Chapter 20: Maintenance of Heat-Resistant Concrete
- Chapter 21: Repair of PCC Damaged by POL

Each of the above repair methods addresses specific distresses. Some of the repairs may be performed in combination. Materials-related distresses, such as ASR and D-cracking, are not addressed in this UFC.

## **2-5 PAVEMENT REPAIR EQUIPMENT.**

Inspect all equipment employed in the pavement repair operations before and during the repair project to ensure safe operation and proper application. Follow proper safety procedures in accordance with OSHA guidelines and standard practices for the protection of all project personnel. Make hand tools available for working in areas where machinery is not practical or allowed.

### **2-5.1 Equipment Inspection.**

Inspect all repair equipment before and during actual construction. Inspection will determine if the equipment is being properly maintained, if all of the required safety devices are present, if the equipment and technique being used is damaging the pavement, and if the equipment is being operated correctly and safely.

### **2-5.2 Equipment.**

Pavement repair equipment includes the following:

#### **2-5.2.1 Router.**

A router is used to create a sealant reservoir by enlarging meandering cracks to the desired depth and width. A vertical spindle router with a diamond bit is recommended to minimize damage to the pavement. However, an impact router may be used if it is equipped with carbide-tipped vertical-sided bits. Do not use impact routers not equipped with carbide-tipped bits or those equipped with V-shaped bits because they tend to chip and damage the pavement. When using a vertical spindle router, use a belt-driven router bit to help prevent injury to the operator and damage to the pavement if the bit jams in the crack. If damage to the pavement is observed, discontinue work until corrective action is taken. Such corrective action may require replacing worn router bits, changing operators, or replacing the equipment.

#### **2-5.2.2 Concrete Saw.**

A concrete saw with a water-cooled diamond blade or abrasive disk can be used to widen straight cracks to the desired width and depth. Concrete saws may be used in place of a router if the blade has a diameter of 6 inches (150 millimeters) or less. The 6-inch (150-millimeter) diameter blade allows the saw to follow slightly meandering cracks. However, a saw blade does not follow the meandering crack as well as a router. If a saw is used to widen the crack, a high-pressure water stream can be used to remove the debris created by the saw. Use care to avoid damaging the adjacent pavement when the saw is used.

### **2-5.2.3 Cold Milling.**

Pavement milling (cold planing, asphalt milling, or profiling) is the process of removing at least part of the surface of a paved area such as a road, bridge, or parking lot. Milling removes anywhere from just enough thickness to level and smooth the surface to a full-depth removal. There are a number of different reasons for milling a paved area instead of simply repaving over the existing surface. Recycling of the road surface is one of the main reasons for milling a road surface. Milling is widely used for pavement recycling, where the pavement is removed and ground up to be used as the aggregate in new pavement. For asphalt surfaces, the product of milling is reclaimed asphalt pavement (RAP), which can be recycled in hot mix asphalt (HMA) (pavement) by combining with new aggregate and asphalt cement (binder) or a recycling agent. This reduces the impact that resurfacing has on the environment.

Milling can also remove distresses from the surface, providing a better driving experience and/or longer roadway life. Milling can remove the following issues:

- Raveling: Aggregate becoming separated from the binder and loose on the road
- Bleeding: The binder (asphalt) coming up to the surface of the road
- Rutting: Formation of low spots in pavement along the direction of travel, usually in the wheel path
- Shoving: A washboard-like effect transverse to the direction of travel
- Ride quality: Uneven road surface, such as swells, bumps, sags, or depressions
- Damage: Resulting from accidents and/or fires

It can also be used to control or change the height of part or all of the road. This can be done to control heights and clearances of other road structures, such as curb reveals, manhole and catch basin heights, shoulder and guardrail heights, and overhead clearances. It can also be done to change the slope or camber of the road or for grade adjustments, which can help with drainage.

### **2-5.2.4 Dimond Grinding.**

Diamond grinding is one of the most cost-effective concrete pavement restoration (CPR) techniques. It consists of “grinding” 0.1875 to 0.25 inch (5 to 7 millimeters) of the surface of JPCP using closely spaced diamond saw blades. The result is a level, smooth, and generally quieter riding surface. The closely spaced grooves left after grinding give the riding surface excellent texture and frictional properties. The same technique and equipment is used for diamond grooving; however, while the purpose of grinding is mainly to restore ride quality and texture, grooving is generally used to reduce hydroplaning and accidents by providing escape channels for surface water. In

terms of design, the main difference between grinding and grooving is in the distance between the grooves—about six times higher in the case of grooving. Diamond grinding can also be performed on asphalt pavement.

#### **2-5.2.5 Water Blasting.**

The water blasting equipment includes a trailer-mounted water tank, pumps, high-pressure hose, and wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. Provide and use the water tank and auxiliary resupply equipment of sufficient capacity to permit continuous operations. Provide and use hoses, wands, and nozzles capable of cleaning the crack faces and the pavement surface on both sides of the crack for a width of at least 0.5 inch (13 millimeters). Provide and use a pressure gauge mounted at the pump that shows the pressure in psi (kPa) at which the equipment is operating.

#### **2-5.2.6 Hot Compressed Air (HCA) Heat Lance.**

The HCA heat lance is used to warm, dry, and clean the crack when performing the sealing operation in less-than-desirable conditions. Such conditions occur following rain or when the pavement temperature is below 50 degrees F (10 degrees C). The heat lance can also be used to remove small amounts of vegetation from cracks. Heat lances are capable of producing heated air at 3,000 degrees F (1,650 degrees C) at velocities of up to 3,000 feet per second (915 meters per second); therefore, use extreme care or the asphalt adjacent to the crack can be damaged. Do not remain stationary with the heat lance over one spot but keep moving to ensure the asphalt is not overheated. Overheating will cause the pavement to become charred and brittle, resulting in premature sealant bond failure. Do not heat the cracks using direct flame methods. It is important to remove all debris from the crack but over-blasting could cause the pavement to ravel or create voids in the crack face.

#### **2-5.2.7 Compressed Air.**

Compressed air can be employed for the final cleaning phase of the project. Provide and use an air source that produces sufficient pressure and contains no oil that may foul the surface prior to sealing. Some compressors have in-line sources for the constant lubrication of air tools. Remove these devices along with the oil-coated pressure hoses. Install in-line oil and water traps to provide clean air for the air-blasting operation.

#### **2-5.2.8 Sandblasting Equipment.**

Sandblasting equipment is used to remove residue left by a saw, loosened aggregate left by a router, vegetation, and other debris. If debris is left in the crack, the sealant will not bond adequately to the asphalt, causing premature failure. Equipment for sandblasting consists of an air compressor, hoses, and a venturi-type nozzle with an opening not to exceed 0.25 inch (6 millimeters). Equip the air compressor with traps that keep the compressed air free of oil and moisture. Use a compressor capable of supplying air at 150 cubic feet per second (4 cubic meters per second) and maintaining

a line pressure of 90 psi (620 kilopascals). Exercise caution to prevent over-blasting the crack. It is important to remove all debris from the crack but over-blasting could cause the pavement to ravel or create voids in the crack face. One disadvantage of sandblasting is the requirement to clean the debris after blasting. This cleaning can be difficult and time-consuming.

#### **2-5.2.9 Hot-applied Sealant Applicator (Melter).**

Use equipment to heat and install the hot-applied sealant that consists of a double-boiler, agitator-type kettle. The heat transfer medium in the outer space is an oil with a high flash point. The double-boiler helps eliminate hot spots in the heating kettle and the agitator provides mixing for uniform heating of the sealant. Do not allow use of a direct-heating kettle. Transfer the sealant from the kettle to the crack by means of a direct-connected pressure-type extruding device (hose) with a nozzle that will insert into the crack. Heat the hose or the sealant recirculated. Design equipment to allow the sealant to be circulated back into the inner kettle when sealing is not being performed. Positive temperature devices are used to control the temperature of the oil bath and measure the temperature of the sealant. Recording-type thermometers are useful for monitoring the temperature of the sealant in the kettle as work progresses. Recording-type thermometers are not normally installed on the equipment at the manufacturer but can be installed by the contractor. Position thermometers so they are easy to read.

#### **2-5.2.10 Cold-applied Sealant Applicator.**

The necessary equipment for application of cold-applied sealants depends on whether the sealant is a single-component or a two-component mix and whether the material is hand-mixed or machine-mixed. Two-component machine mixers, recommended for larger crack-sealing projects, consist of an extrusion pump, air compressor, and the associated hoses to dispense the components through separate nozzles and mixed in a 50:50 ratio with less than  $\pm 5$  percent error just prior to discharge from the nozzle. Hand-mixing equipment for two-component sealants is generally a slow-speed electric drill with a paddle mixer or an air-powered mixer. Mix single-component sealants to overcome any segregation before they are applied to the pavement. Small hand-held caulking guns can also be employed for small jobs.

#### **2-5.2.11 Wire Brushes.**

Wire brushes are helpful in removing debris and vegetation from shallow cracks, but they do not easily remove debris, such as saw residue, from the walls of the cracks. Debris on the crack faces will cause the sealant to lose adhesion with the pavement and prematurely fail. Do not use worn brushes to clean the cracks because they will not effectively remove residual debris. Take care when wire brushes are used to clean cracks that have been previously sealed; the brushes will have a tendency to smear the old sealant residue on the crack wall instead of removing it.

#### 2-5.2.12 Power Brooms.

To remove debris from the pavement surface and reduce the potential for FOD, use a vacuum-type power broom.

#### 2-5.2.13 Jackhammers.

For large patching operations where full-depth repairs are needed, use a 30-pound (13.6-kilogram) jackhammer model. For smaller jobs, use a 10- to 15-pound (4.6- to 6.8-kilogram) model. Equip the jackhammer with a chipping hammer and work at an angle of between 45 and 90 degrees relative to the pavement surface. Take special care not to damage the layer of concrete under the spall repair area or cause microcracking around the crack. For partial-depth repairs, do not use a jackhammer that is larger than 30 pounds (13.6 kilograms).

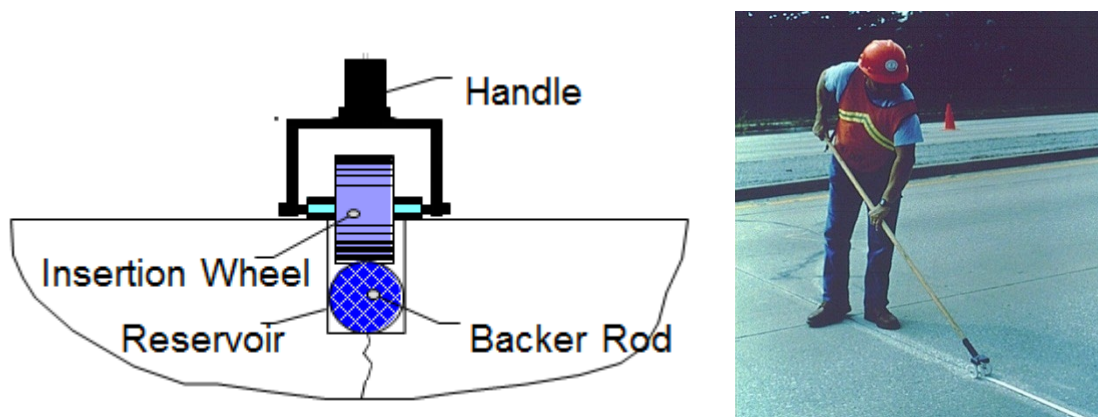
#### 2-5.2.14 Mixers.

Drum or mortar mixers are usually employed for most patching operations. Use a bucket with a hand-held, electric drill-powered (or pneumatic), paddle-wheel mixer for smaller operations.

#### 2-5.2.15 Backer Rod Installation Equipment.

Backer rod may be placed by hand (not recommended, except for short length placement) and many contractors have constructed their own hand-held equipment for this operation. Devices are also available that place the backer rod at a consistent depth without undue stretching or tearing of the backer materials (Figure 2-1).

Figure 2-1 Installation of Backer Rod



#### 2-5.2.16 Sealant Applicators Not Recommended.

Pouring pots or gravity-fed sealant applicators are not recommended for sealing cracks. These applicators have a tendency to trap air in the sealant as it is applied into the crack, creating voids in the sealant. When spot repairs are made to cracks that have

been sealed, it may not be feasible to use the hot-applied sealant applicator as described above and pour pots may be used. Equip the pour pot with a nozzle that will fit inside the crack in the same manner as the nozzle of the hot-applied sealant applicator.

**2-5.2.17 Hand Tools.**

Due to the meandering nature of cracks, hand tools are required to insert the backer rod materials in cracks deeper than 0.75 inch (19 millimeters). Do not twist, cut, or damage the backer rod material with these tools. Ensure the tool is capable of placing the material to the proper depth. When approved by the contracting officer, use hand tools used for repairing or cleaning cracks or removing old crack sealant. Examine the tools to ensure they will not damage the pavement in any manner when properly used.

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## CHAPTER 3 FULL-DEPTH ASPHALT PATCHES

### 3-1 INTRODUCTION.

A full-depth patch repairs distresses of medium to high severity, such as alligator cracking, corrugation, depression, oil spillage, rutting, swelling, edge cracking, bumps and sags, and existing patches. A partial-depth patch is used to maintain/repair distresses of low and medium severity, such as corrugations, depressions, rutting, shoving, slippage cracking, swelling, and existing patches.

Full-depth repairs involve removal of the complete pavement down to the subgrade or to an intermediate base or subbase layer that is intact. Partial-depth repairs usually involve removing the failed asphalt surface, excluding the base course, and replacing the surface layer with hot asphalt plant mix.

Procedural steps for partial-depth patches are in Chapter 4.

### 3-2 PROCEDURAL STEPS (FULL-DEPTH PATCH).

Place full-depth patches using the following steps:

#### 3-2.1 Mark Repair Area.

Use a string line or straightedge to mark straight lines around the repair area. Clearly mark the lines so they are easily visible when sawing the pavement. Mark repair areas to form a square or rectangle with at least 12 inches (300 millimeters) beyond the distressed area.

#### 3-2.2 Make Saw Cut Through Pavement.

Use a concrete saw equipped with a diamond-tip or abrasive blade (Figures 3-1 and 3-2, respectively) to saw the pavement. Saw the perimeter of the patch since milling tends to leave a rough edge. Overlap saw cuts so that a vertical and square corner is formed (Figure 3-3). Since diamond-tip blades usually require water, completely dry the repair area before placing the prime or tack coat. However, there are some types of diamond-tip blades designed to dry-cut asphalt pavements. The abrasive saw blade is less costly and does not require water when sawing, but they tend to wear quickly. Always confirm the saw blade is the correct diameter to allow cutting to the full pavement depth. Make sure the saw blade is rated for the revolutions per minute (rpm) of the saw; otherwise, the blade could shatter during sawing due to the mismatch.

Figure 3-1 Diamond Tip Saw Blade



Figure 3-2 Abrasive Blade



Figure 3-3 Damaged Pavement Removed by Sawing



### 3-2.3 Removal of Defective Material.

Remove the defective material by milling, backhoe, or with a jackhammer. Small areas are sometimes removed with a backhoe, small milling head, or jackhammer, while large areas are usually removed with a milling machine or milling head attachment (Figure 3-4). Saw-cut the perimeter of the patch as vertical as possible, regardless of the method used to remove material.

Use an asphalt bit in the jackhammer. Start the jackhammer from the middle of the repair area and work outward toward the edges. Making an additional saw cut a few inches from the border will allow the cut edges to remain square when removing the asphalt mixture. (Do not rock the hammer near the edge—this will damage the vertical face.) After completing the removal of material, remove and discard the loose material.

**Figure 3-4 Small Milling Head Attachment**



### 3-2.4 Remove, Replace, and Compact the Base.

When performing a full-depth patch, inspect the base to ensure adequate material conditions. Remove all unacceptable base, subbase, or subgrade and replace the poor-quality material with acceptable material that can be satisfactorily compacted. If subgrade material is removed, crushed stone or other suitable base material may be used to backfill to the top of the subgrade. Place new materials in 2- to 3-inch (50- to 75-millimeter) lifts, with each lift compacted to the required density. When removing the entire thickness of asphalt pavement, the base material is always disturbed; therefore, reshape and recompact the base material prior to performing the next step. After removal of material, make provision to remove any water that enters the resulting hole.

### 3-2.5 Apply Tack Coat (and Prime Coat, If Used).

Apply a thin tack coat to the edges and bottom of the patch. This coating provides an improved bond between the old and new materials. Ensure the patch area edges are clean, dry, and free of any dust so the tack coat will bond to the edges. Use tack coat materials that are cutback grades RC-70 or RC-250, or emulsion grades RS-1, MS-1, SS-1, SS-1h, CSS-1, or CSS-1h. The same grade of asphalt binder used in the asphalt mix can also be used as a tack coat, but this is difficult in small areas. If used, apply it hot and apply the patch material hot enough to soften the asphalt cement to obtain the required bond.

Use a prime coat can by spraying the sides and bottom of the hole to be patched with hot-asphalt plant mix if a tack coat is not used. Prime coat materials cutback grades RC-70, MC-30, MC-70, or SC-70, or emulsion grades SS-1, SS-1h, CSS-1, or CSS-1h. Applying too much material can cause bleeding. Allow prime coats time to penetrate the base material. They are usually absorbed into the underlying material within two to three hours and fully cured in less than 48 hours. Use a prime coat application rate of 0.05 to 0.2 gallon per square yard (0.23 to 0.90 liter per square meter), depending on the porosity of the material treated. Use a tack coat application rate of 0.05 to 0.10 gallon per square yard (0.23 to 0.45 liter per square meter). Use a hand-spray wand to apply the tack coat at the bottom and sides of the patch (Figure 3-5) if the area is large enough. If a wand is not available or if the area is too small, use a stiff brush. To prevent bleeding, do not apply excess tack to the patch areas.

**Figure 3-5 Hand-spraying Edge of Cut**



### 3-2.6 Place the Patch Material.

Use good-quality HMA to fill the patch. Place and compact the material in 2- to 3-inch (50- to 75-millimeter) lifts. In order for the patch to be level with the surrounding pavement, overfill the patch area to allow for compaction (Figure 3-6). When placing by hand, a good rule of thumb is to overfill by 40 percent thicker than the desired compacted thickness, depending on the mix; e.g., 3 inches (76 millimeters) compacted = 4.25 inches (108 millimeters) uncompacted. Do not overwork patch material with a lute, shovel, or rake since this tends to segregate materials and creates additional mixture cooling. When placing with an asphalt paver, a good rule of thumb is to place the asphalt mixture about 20 to 25 percent thicker to allow for compaction.

**Figure 3-6 Overfill Prior to Compaction**



### 3-2.7 Compact the Patch Area.

Compact the mix to the proper level using methods described in UFC 3-250-03, *Standard Practice Manual for Flexible Pavements*. It is important to ensure that sufficient material was provided to the patch so adequate density is obtained. The size of the patch determines which type of compactor to use. For a very small patch area or areas, a hand tamper can be used. Larger areas require a vibratory plate tamper (Figure 3-7), a steel-wheel roller (Figure 3-8), or similar compactor. To ensure the required compaction, use the proper equipment as dictated by the patch size. Always compact the edges of the patch first, followed by compaction of the remaining patch area in the direction of traffic. Overlap previous compaction lanes by approximately 6 inches (150 millimeters) across the patch area (Figure 3-8). When the patch is completely compacted, ensure its level is no higher or lower than 0.125 inch (3 millimeters) above or below the surrounding surface (Figure 3-9). Good oversight and density and smoothness testing are required to achieve a good patch.

**Figure 3-7 Vibratory Plate Compactor**



**Figure 3-8 Steel Wheel Roller**



**Figure 3-9 Check Level of Patch Surface**



### 3-2.8 Ensure Surface of Patch is Watertight.

If performed satisfactorily, the tack coat material applied to the side of the prepared hole is a good sealer between the existing edge and the patch. However, if the surface appears open at the edge of the patch or the surface of the patch is open then additional sealing may be needed on the surface. If the edge is open, seal it with a sand emulsion mix to give it the texture of a slurry seal (Figure 3-10). Refer to the International Slurry Surfacing Association guidelines (<https://slurry.org/guidelines>) for additional information. Ensure the edge seal is no more than 2 inches (50 millimeters) wide. If the entire surface is open then seal the entire surface with the slurry seal. Apply this material with a small brush for small sections or with a broom or small squeegee for larger sections.

Figure 3-10 Seal the Edges



### 3-2.9 Problem Areas.

Adequate compaction and obtaining satisfactory smoothness are major challenges when constructing patches. Use care in removing material to ensure the edges and bottom of the repair are square. Remove all unsatisfactory material when patching. It is critical that the underlying material is compacted before applying the patch. Compaction lifts less than 3 inches (75 millimeters) work best. If a spray wand is used to apply tack coat, perform a test on an adjacent area to ensure the correct application rate. Use care when applying tack coat to the edges. For best results, follow recommended best practices for spray nozzles, equipment settings, and other operations.

**Note:** If using cutback asphalts as a tack coat, comply with local environmental regulations.

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## **CHAPTER 4 PROCEDURAL STEPS (PARTIAL-DEPTH PATCH).**

### **4-1 INTRODUCTION.**

Partial-depth patch procedural steps are identical to full-depth patch (Chapter 3). The one exception is that when saw cutting the pavement, control the patch depth to only allow cutting to the depth required for the repair. Furthermore, removal of the material in the area is usually performed with a cold milling or cold planing device. If the material has delaminated from the layer below, a light-weight jackhammer (10 to 17 pounds [4.5 to 7.7 kilograms]) and/or a shovel or equipment bucket may be used to remove the material from the repair area.

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## CHAPTER 5 SPRAYED ASPHALT SURFACE TREATMENTS

### 5-1 INTRODUCTION.

Use a sprayed asphalt surface treatment at an appropriate time to provide beneficial preventive maintenance. Placing a surface treatment too soon can prevent the surface of the asphalt mix from becoming sufficiently stiff to resist deformations under traffic. Delaying treatments too long will limit the treatment's ability to provide preventive maintenance. Severely weathered or cracked pavements are candidates for maintenance by replacement and will not significantly benefit from surface treatments. Do not place surface treatments on runway pavements unless approved by the Pavements Discipline Working Group (DWG) or their designated representative since they can cause FOD and reduce friction.

### 5-2 PRIME COAT.

A prime coat is a spray application of bituminous material applied to the surface of a base course that is to be covered with an asphalt pavement layer. The primary purpose of the prime coat is to waterproof the unbound material until it can be covered with asphalt mixture. The prime coat can also help prevent damage to the base during construction. Materials that can be used for prime coats are described in paragraph 3-2.5.

#### 5-2.1 Procedural Steps (Prime Coat).

Conduct the following steps to apply a prime coat:

##### 5-2.1.1 Prepare the Surface.

Ensure the surface is free of all loose material such as dirt, clay, dust, or any other undesirable material. Use a light brooming to remove these undesirable materials. If the base is excessively dry, lightly sprinkle with water prior to application of the prime coat to improve penetration of the material into the underlying layer.

##### 5-2.1.2 Apply the Prime.

Use a distributor if the area to be primed is large. Use a hand spray wand to apply prime coat applications on smaller areas. Prime coat application rates are 0.05 to 0.2 gallon per square yard (0.23 to 0.9 liter per square meter). Coat the entire area. Since the primary purpose of a prime coat is to protect the underlying layer from rain until it is covered, the prime coat is sometimes omitted in patched areas when the surface can be covered with HMA prior to rainfall.

##### 5-2.1.3 Allow Prime to Cure.

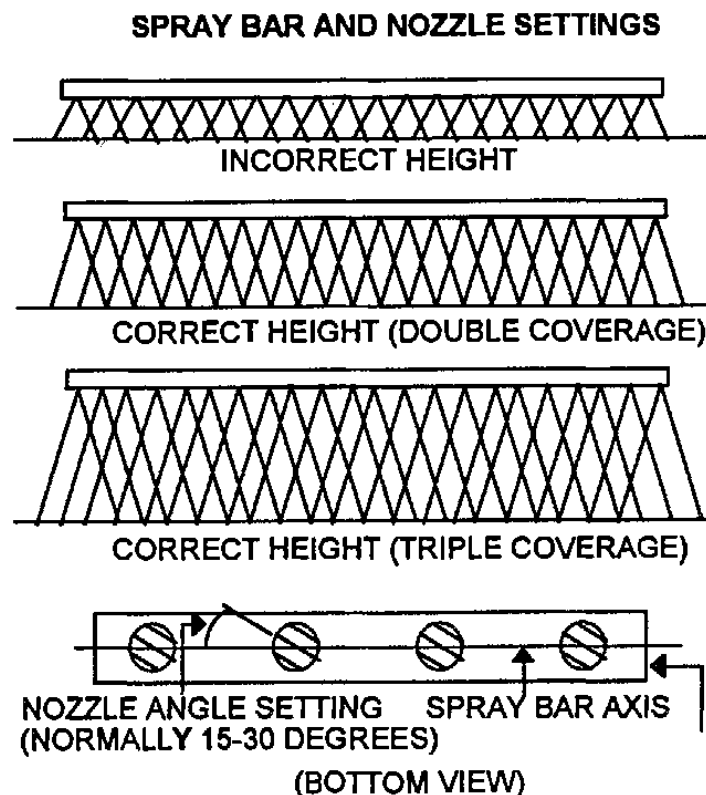
Cure prime coats for as long as necessary. Required curing time is typically 48 hours but satisfactory curing will likely occur in less time, especially in hot, windy conditions.

Blot with fine sand or mineral dust if there is excess prime on the surface after penetration into the underlying materials is complete.

### 5-2.2 Problem Areas (Prime Coat).

A major potential problem is applying too much prime coat material so there is excess on the surface. Test application rates prior to priming. Determine application rates in accordance with ASTM D2995, *Practice for Determining Application Rate for Bituminous Distributors*. Check proper nozzles and settings on the distributor spray bar or hand-wand. Use nozzles with openings that are the same size. Check nozzles to ensure they are not plugged and are set at the proper angle and height (Figure 5-1). Comply with local environmental regulations when using RC-70 or other cutbacks as a prime coat.

Figure 5-1 Spray Bar and Nozzle Settings



### 5-3 TACK COAT.

The tack coat is applied to an existing pavement surface before it is overlaid with a new asphalt overlay. The tack coat provides a bond between the old and new pavement. Guidance for materials is provided in paragraph 2-2.

### **5-3.1 Procedural Steps (Tack Coat).**

Conduct the following steps to apply a tack coat:

#### **5-3.1.1 Prepare the Surface.**

Clean and dry the surface and ensure it is free of dust, loose dirt, and other debris. Clean the surface around and inside the patch with brooms, air, and water.

#### **5-3.1.2 Apply the Tack.**

Use a distributor to apply tack coats over large areas. Use a hand-wand for small patches and hard-to-apply areas. If a wand is not available, apply the tack coat to patch edges with a stiff brush. Apply the tack coat at a proper application rate in an even and uniform coat over the entire area. Apply no more tack material than can be covered by the end of a working day. Application rates for tack coats range from 0.05 to 0.1 gallon per square yard (0.23 to 0.45 liter per square meter).

#### **5-3.1.3 Allow Tack to Cure.**

Allow the tack coat to cure before placing the overlay or patch material. Cure times will vary according to the type of tack material used and climatic conditions but typically it is a few minutes up to one or two hours. When asphalt cement is used as a tack coat, no cure time is required.

### **5-3.2 Problem Areas (Tack Coat).**

An excessive application of tack will cause bleeding and slippage; therefore, apply at the proper application rate. Test application rates in accordance with ASTM D2995 prior to spraying the tack material. Check nozzles and settings on the distributor spray bar or hand-wand to ensure they are proper. Check nozzles to ensure they are not plugged and adjust nozzles to the proper angle and height. Clean and dry areas prior to tack coating. Comply with local environmental regulations when using RC-70 or other cutbacks as a tack coat. Overlay material that is tacked on the same day; however, as long as traffic is kept off of the surface and it remains clean, the tack may be effective for several days. It may be necessary to slightly increase the tack coat application if it has been in place for too long.

## **5-4 FOG SEALS AND REJUVENATORS.**

Consider surface treatments for use when non-load-associated surface distresses such as non-structural cracking or raveling first begin. The recommended sealer process, once non-structural cracking and/or raveling is first observed, is a fog seal (except for runways). Continue application of the fog seal on an approximately three-year cycle, depending on pavement condition, as long as surface friction is maintained and texture depth is at least 0.03 inch (0.8 millimeter) when tested according to the grease smear

test (FAA AC 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-Resistant Airport Surfaces*).

A fog seal is a spray application of a diluted asphalt or tar emulsion. Emulsions used for fog seals are SS-1, SS-1h, CSS-1, or CSS-1h.

Rejuvenators are commercially available products used to restore oxidized pavement surfaces. Rejuvenators do not solve raveling issues (unless raveling is very minor) or reduce cracking problems (unless cracking is very minor hairline cracking). Often, rejuvenators can cause pavement surfaces to be slippery for up to a year; therefore, choose areas and application rates with extreme care. Since there are numerous commercially available products, a list of rejuvenators is not presented in this UFC. Fog seals and rejuvenators are normally used as preventive maintenance procedures on roads and only on airfield shoulders and overruns. Do not apply over airfield pavements without approval of the Pavements DWG or their designated representative.

#### **5-4.1 Procedural Steps (Fog Seals and Rejuvenators).**

Apply fog seals and rejuvenators using the following steps:

##### **5-4.1.1 Prepare the Surface.**

Thoroughly clean the surface prior to application of fog seals or rejuvenators. Repair distresses before application of fog seal or rejuvenator.

##### **5-4.1.2 Determine Proper Application Rate.**

The application rate will vary according to the quantity of material the pavement absorbs and the texture of the surface; therefore, spray small field test sections with different application rates to determine the best rate to apply. Adjust the rate so the treated surface has good friction, is not unstable, and does not contain excess material remaining on the surface after 12 to 24 hours of curing.

##### **5-4.1.3 Dilute the Material.**

The material can be used undiluted but is usually diluted. Dilution rates can be as high as 1 part emulsion to 10 parts water, with an average rate of 1 part emulsion to 4 parts water. Follow the manufacturer's dilution directions. Diluting the rejuvenator with water requires a higher application rate.

##### **5-4.1.4 Apply the Material.**

Apply the material with a calibrated asphalt distributor (Figure 5-2). The calibration of the distributor is critical. Important procedures are discussed in paragraph 5-2. To avoid excessive reduction in friction, apply the asphalt material in multiple applications over

the entire area so each small increase in application rate can be evaluated for its effectiveness prior to adding another application.

**Figure 5-2 Asphalt Distributor**



**5-4.1.5 Cure Time.**

Fully cure the fog seal before allowing traffic on the treated pavement. Cure time is usually 12 to 24 hours.

**5-4.2 Problem Areas (Fog Seals and Rejuvenators).**

Calibrate, adjust, and clean the distributor as discussed in paragraph 5-2.2 to avoid problems with coverage. Do not apply rejuvenator on airfields without prior approval from the AFCEC Pavements subject matter expert (SME), USACE Pavements SME, NAVFAC Pavements SME, or USACE/TSMCX pavement engineer. Follow proper application and dilution rates to avoid potential problems with excessive material application. Conduct preliminary tests on small test sections to determine the proper application and dilution rates.

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## **CHAPTER 6 BITUMINOUS SURFACE TREATMENT**

### **6-1 INTRODUCTION.**

Single and double bituminous surface treatments (SBST and DBST, respectively) consist of sprayed asphalt applications followed immediately by one or more layers of aggregate. These treatments are used to retard deterioration of raveling, improve skid resistance, seal small cracks, and waterproof the surface. Do not use SBST or DBST on airfield pavements except for overruns and not within 200 feet (61 meters) of the threshold, but SBST or DBST can be used on light-traffic roads, parking lots, and overruns. Another type of bituminous surface treatment, sandseal, is presented in Chapter 7. A variation of SBST to repair bleeding is presented and consists of applying hot sand followed by rolling.

### **6-2 SINGLE BITUMINOUS SURFACE TREATMENT (SBST).**

Use the following bituminous materials for SBST: cutback (RC-250, RC-800, or RC-3000) or emulsion (RS-1, RS-2, CRS-1, or CRS-2). MS and SS asphalt emulsions and medium-curing (MC) cutback asphalt can be used in some cases; however, these materials are not typically recommended because the time for cure is extended and this may result in the treatment being tender for an extended period of time. Use of any other material is prohibited without the approval of the Pavements DWG or their designated representative.

#### **6-2.1 Procedural Steps (SBST).**

Place SBST using the following steps:

##### **6-2.1.1 Prepare the Area (SBST).**

Repair all failed areas prior to applying an SBST and thoroughly clean all surfaces prior to treatment. Apply prime and/or tack coats in accordance with the procedures in Chapter 5.

##### **6-2.1.2 Apply the Binder Material (SBST).**

Apply the binder (asphalt material) with an asphalt distributor. Calibrate the distributor prior to each use. Use the same precautions as discussed for sprayed asphalt treatments in Chapter 5. An asphalt emulsion changes in color from brown to black as it breaks and cures. Apply the aggregate before the binder material has broken and turned black. Provide materials meeting one of the gradations in Table 6-1. Apply the binder and aggregates using the application rates shown in Table 6-2. Do not use Gradation 1, which is a coarse grading for SBST.

**6-2.1.3 Apply the Aggregate (SBST).**

Apply the aggregate immediately after binder material is applied. Apply the aggregate with tailgate spreaders on dump trucks or by self-propelled hopper-type spreaders (Figures 6-1 and 6-2, respectively). Calibrate spreaders to ensure uniformity of the aggregate at the required rate. Use only aggregate that is clean, dry, and free of dust or other undesirable material. A slightly damp aggregate can be used and works best with emulsions since this small amount of moisture will ensure better coating of the aggregate. Use aggregates that are hard, angular, and abrasion-resistant. Lightweight aggregates are sometimes used to improve friction properties. Construct a test section to ensure the resulting surface is satisfactory prior to large scale or production applications. Construct a test section when making adjustments to the treatment as necessary to provide a satisfactory surface.

**Table 6-1 Aggregate Gradations for SBST**

<b>% Passing by Weight, Gradation Designation</b>			
<b>Sieve Size</b>	<b>No. 1 SBST</b>	<b>No. 2 SBST</b>	<b>No. 3 SBST</b>
1 in. (25.4 mm)	100	—	—
0.75 in. (19.1 mm)	90 - 100	100	—
0.5 in. (12.7 mm)	20 - 55	90 - 100	100
0.375 in. (9.5 mm)	0 - 15	40 - 70	85 - 100
No. 4 (4.8 mm)	0 - 5	0 - 15	10 - 30
No. 8 (2.4 mm)	—	0 - 5	0 - 10
No. 16 (1.2 mm)	—	—	0 - 5

**Table 6-2 SBST Binder and Aggregate Application Rates**

<b>Gradation No.</b>	<b>Binder Application Rates gal/yd<sup>2</sup> (l/m<sup>2</sup>)</b>	<b>Aggregate Application Rates lb/yd<sup>2</sup> (kg/m<sup>2</sup>)</b>
1 SBST	0.40–0.50 (1.81–2.26)	40–50 (22–27)
2 SBST	0.30–0.45 (1.36–2.04)	25–30 (14–16)
3 SBST	0.20–0.35 (0.91–1.58)	20–25 (11–14)

**Figure 6-1 Applying Aggregate with Tailgate Spreader on Dump Truck**



**Figure 6-2 Applying Aggregate with Self-Propelled Hopper-type Spreader**



#### **6-2.1.4 Roll the Aggregate (SBST).**

Roll the aggregate immediately after application. Use a pneumatic-tire roller with tire pressures of 60 to 80 psi (414 to 552 kilopascals) and tire loads (weights) equal to the largest tire load that will operate on the surface. Use a pneumatic-tire roller to avoid crushing the aggregate. If approved by the contracting officer, a steel-wheel roller can be used; however, use a weight that is heavy enough to seat the aggregate but not so heavy as to crush the aggregate. The steel wheel will bridge over low spots and may not properly seat the aggregate. Continue to roll the treatment area until all aggregate particles are properly seated.

#### **6-2.1.5 Sweep the Area (SBST).**

Allow the treated area to cure for at least 24 hours before brooming to remove loose particles. Broom during the coolest portion of the day to prevent dislodging aggregate. Use only enough pressure on the broom to remove the loose particles and not dislodge seated aggregate.

#### **6-2.2 Problem Areas (SBST).**

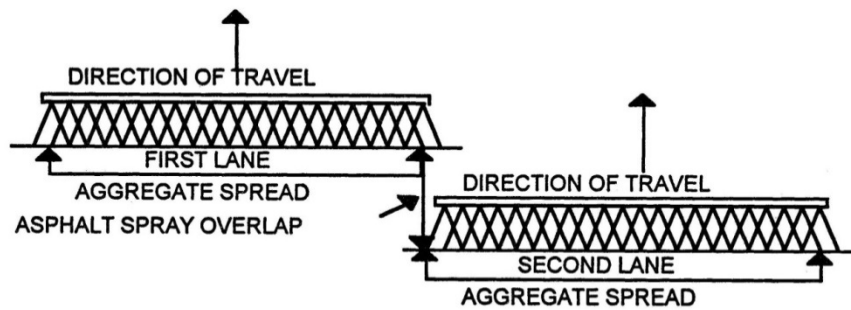
Calibrate all equipment before material placement. Use a test section to ensure all equipment is calibrated and working properly. Use building paper where the spreading of the binder and aggregate begins and ends to make clean and straight transverse joints (Figure 6-3). Remove the paper after application to form a straight edge. Do not spread the aggregate beyond the area of full binder thickness to prevent a buildup of aggregate along the longitudinal joint (Figure 6-4). This distance varies according to the spray width of the nozzle, but it is usually about 6 to 8 inches (150 to 200 millimeters) from the edge of the spray. On the adjacent pass, apply aggregate from the edge of the aggregate on the first pass to about 6 to 8 inches (150 to 200 millimeters) from the edge of the asphalt spray on the opposite side. After completing the work and opening the treated area to traffic, post for 3 days speed limits of no more than 20 miles per hour (32 kilometers per hour). This will ensure that the asphalt is fully cured, help to ensure better seating of the aggregate, and minimize dislodging of additional aggregate.

Figure 6-3 Use Paper for Straight Edge



Figure 6-4 Aggregate and Sprayed Asphalt Spread Pattern

AGGREGATE AND ASPHALT SPREAD PATTERN  
FOR SPRAYED ASPHALT SURFACE SEALS  
WITH AGGREGATE



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## CHAPTER 7 DOUBLE BITUMINOUS SURFACE TREATMENT.

### 7-1 INTRODUCTION.

This treatment is essentially the same as the SBST, except that more than one application of binder and aggregate is used. The most common treatment is the DBST. The same bituminous materials used for SBST can also be used for DBST. Aggregate gradations and application rates to be used are shown in Tables 7-1 and 7-2.

#### 7-1.1 Procedural Steps (DBST).

Place DBST using the following steps:

##### 7-1.1.1 Prepare the Area.

Follow the SBST procedures (Chapter 6).

##### 7-1.1.2 Apply the Binder Material.

Follow the SBST procedures (Chapter 6), except two applications of binder and aggregate are placed using rates shown in Tables 7-1 and 7-2.

**Table 7-1 Aggregate Gradations for DBST**

Sieve Size	% Passing by Weight, Gradation Designation			
	No. 1 DBST	No. 2 DBST	No.3 DBST	No. 4 DBST
1 in. (25.4mm)	100	---	---	---
0.75 in. (19.1 mm)	90 - 100	100		---
0.5 in. (12.7 mm)	20 - 55	90 - 100	100	---
0.375 in. (9.5 mm)	0 - 15	40 - 70	85 - 100	100
No. 4 (4.8 mm)	0 - 5	0 - 15	10 - 30	85 - 100
No. 8 2.4 mm)	---	0 - 5	0 - 10	10 - 40
No. 16 (1.2 mm)	---	---	0 - 5	0 - 10
No. 50 (300 μm)	---	---	---	0 - 5

**Table 7-2 DBST Binder & Aggregate Application Rates**

<b>First Application</b>		
<b>Gradation No.</b>	<b>Bituminous Material* gal/yd<sup>2</sup> (l/m<sup>2</sup>)</b>	<b>Aggregate lb/yd<sup>2</sup> (kg/m<sup>2</sup>)</b>
1 DBST	0.20–0.30 (0.91–1.36)	40–50 (22–27)
2 DBST	0.15–0.20 (0.68–0.91)	25–30 (14–16)
<b>Second Application</b>		
<b>Gradation No.</b>	<b>Bituminous Material** gal/yd<sup>2</sup> (l/m<sup>2</sup>)</b>	<b>Aggregate lb/yd<sup>2</sup> (kg/m<sup>2</sup>)</b>
3 DBST	0.30–0.45 (1.36–2.04)	20–25 (11–14)
4 DBST	0.20–0.30 (0.91–1.36)	15–20 (8–11)
<p>* If an emulsion is used, increase the application rate by 10 percent.  ** Ensure the second application is approximately 50 percent greater than first application.  <b>Note:</b> Use gradations in pairs. If gradation 1 is used for the first application then use gradation 2 for the second application and the same for gradations 3 and 4.</p>		

**7-1.1.3 Apply the Aggregate.**

Use the SBST procedures (paragraph 6-2.1.3).

**7-1.1.4 Roll the Aggregate.**

Use the SBST procedures (paragraph 6-2.1.4).

**7-1.1.5 Sweep the Area.**

Use the SBST procedures (paragraph 6-2.1.5).

**7-1.1.6 Apply Second Application.**

To apply the second application of binder and aggregate, the same steps are followed as for the first application.

**7-1.2 Problem Areas (DBST).**

DBST applications suffer from the same problems as SBST (paragraph 6-2.2). Remedy or mitigate these problems using the same procedures.

**7-1.3 Sandseal (DBST).**

Sand seal can be used to address a bleeding pavement surface or provide a thin sealer. When used to address bleeding, do not apply asphalt binder before the sand seal is placed since the primary purpose is to blot up the excess binder on the surface. Use sand with the gradations in Table 7-3. Use gradation 2 for a thinner application of sand. Potential problems include difficulty in getting an even application of sand and difficulty in treating a non-uniform surface underneath. Hence, it is possible that excessive sand will be placed in some areas and not enough in others. When binder is used, select the binder similar to that for SBST (Chapter 6).

**Table 7-3 Aggregate Gradations for Sandseal (SS)**

Sieve Size	% Passing by Weight, Gradation Designation	
	No. 1 SS	No. 2 SS
0.5 in. (12.7 mm)	—	—
0.375 in. (9.5 mm)	100	—
No. 4 (4.8 mm)	85 - 100	100
No. 8 (2.4 mm)	10 - 40	10 - 40
No. 16 (1.2 mm)	0 - 10	0 - 10
No. 50 (300 µm)	0 - 5	0 - 5

**7-1.4 Sand Application and Rolling.**

Use the following steps when treating a pavement with bleeding problems:

**7-1.4.1 Apply Hot Sand.**

Heat the sand to above 275 degrees F (135 degrees C) and spread the sand with a tailgate or box spreader, or by hand. Apply at a rate of 10 to 15 pounds per square yard (5 to 8 kilograms per square meter).

**7-1.4.2 Roll the Sand.**

Immediately roll the sand with a pneumatic roller after spreading.

**7-1.5 Sweep Excess Material.**

Sweep the area with a vacuum sweeper after the treated area has sufficiently cooled to remove excess sand.

**7-1.5.1 Aggregates.**

Use clean, angular, and durable aggregate in a slurry seal or microsurfacing. The minimum sand equivalent value for aggregate used in a slurry seal is 45 (ASTM D2419, *Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate*, AASHTO T176, *Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test*) and a maximum Los Angeles abrasion test value of 35 in the parent rock (ASTM C131, *Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine*, AASHTO T96, *Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine*).

Ensure the aggregate used in microsurfacing has a minimum sand equivalent value of 65 and a maximum Los Angeles abrasion test value of 30 in the parent rock. In addition, limit the maximum soundness value of aggregates for slurry seals and microsurfacing to 15 percent in the parent rock using Na<sub>2</sub>SO<sub>4</sub> (sodium sulfate) or 25 percent using MgSO<sub>4</sub> (magnesium sulfate) testing (ASTM C88, *Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate*, AASHTO T104, *Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate*).

**7-1.6 Problem Areas.**

Table 7-4 lists the impacts for each type of surface treatment. Many problems associated with surface treatments occur after its service life has passed. Actual service life depends on the product, application method, application rate, and pavement surface preparation. Some surface treatments are only intended to last a few years while others remain effective in excess of eight years.

**Table 7-4 Potential Negative Impacts of Surface Treatments to Airfields**

<b>Surface Distress</b>	<b>Liquid Spray Seal</b>	<b>Liquid and Sand Spray Seal</b>	<b>Slurry Seal</b>	<b>Microsurfacing</b>
Decreased friction	H	H	P	N
Debonding	N	P	H	P
Raveling	N	P	P	P

N - Not a significant concern

P - Potential for minor impact

H - High potential for impact

## CHAPTER 8 ASPHALT SLURRY SEALS AND MICROSURFACING

### 8-1 INTRODUCTION.

A slurry seal is a mixture of asphalt emulsion, aggregate, water, and mineral filler. Slurry seals are used to seal and protect worn, weathered, and cracked pavement from the effects of further weather and traffic. Another use is to improve friction properties. A special form of slurry seal has been used in high-traffic areas up to and including interstate highways. Microsurfacing is a heavy-duty slurry seal and includes the use of a polymer-modified asphalt binder. This product has been used to fill ruts on high-volume roadways. In traffic areas, use microsurfacing or slurry seals a maximum of two times between overlays and consider on five- to seven-year cycles. Do not use a slurry seal or microsurfacing on airfield pavements or other high-traffic areas without approval from the contracting officer or Pavements DWG or their designated representative.

### 8-2 MIXTURE MATERIALS.

#### 8-2.1 Emulsions.

Use one of the following emulsions in a slurry seal: SS-1, SS-1h, CSS-1, or CSS-1h. Use a polymer-modified asphalt binder for microsurfacing. Some microsurfacing mixtures are proprietary products.

#### 8-2.2 Aggregate.

Use clean, angular, and durable aggregates in slurry seals or microspheres. Slurry seals and microsurfacing use well-graded aggregates and are classified according to the gradation of the aggregate used. Use aggregates with a minimum sand equivalent value of 45 (ASTM D2419, AASHTO T176) and a maximum Los Angeles abrasion test value of 35 in the parent rock (ASTM C131, AASHTO T96) in slurry seals. Use aggregates with a minimum sand equivalent value of 65 and a maximum Los Angeles abrasion test value of 30 in the parent rock in microspheres. In addition, limit the maximum soundness value of aggregates for slurry seals and microsurfacing to 15 percent in the parent rock using Na<sub>2</sub>SO<sub>4</sub> (sodium sulfate) or 25 percent using MgSO<sub>4</sub> (magnesium sulfate) testing (ASTM C88, AASHTO T104).

Use the aggregate gradations in Table 6-1 and application rates in Table 6-2 when slurry sealing or microsurfacing. The gradations typically include 0.5 to 3.0 percent mineral filler. Use only Type II and Type III gradations for airfield applications. Aggregate gradations to be used are shown in Table 8-1.

#### 8-2.3 Filler.

Use portland cement or hydrated lime if a filler is needed in the slurry. The filler tends to improve the stability of the mixture. If stability or segregation problems occur, use

mineral filler at 0.4 to 0.5 percent of the total mixture. Water is the primary control for workability of the mixture; therefore, use only potable water.

**Table 8-1 Aggregate Gradations for Microsurfacing and Slurry Seals**

Sieve Size	% Passing by Weight, Gradation Designation		
	Type 1	Type 2	Type 3
3/8 in. (9.5 mm)	100	100	100
No. 4 (4.8 mm)	100	90 - 100	70 - 90
No. 8 (2.4 mm)	90 - 100	65 - 90	45 - 70
No. 16 (1.2 mm)	65 - 90	45 - 70	28 - 50
No. 30 (600 µm)	40 - 65	30 - 50	19 - 34
No. 50 (300 µm)	25 - 42	18 - 30	12 - 25
No. 100 (150 µm)	15 - 30	10 - 21	7 - 18
No. 200 (75 µm)	10 - 20	5 - 15	5 - 15
<b>Application Rate (lb/yd<sup>2</sup> dry aggregate)</b>	8 - 12	12 - 20	18 - 30

### **8-3 SLURRY SEAL PROCEDURAL STEPS.**

Place a slurry seal using the following steps:

#### **8-3.1 Prepare the Surface.**

Remove all loose material (including any loose or flaking paint), dirt, and vegetation from the surface. Seal cracks greater than 0.125 inch (3 millimeters) wide. Place the sealant 0.125 to 0.25 inch (3 to 6 millimeters) below the surface during crack sealing. After sealing all cracks and cleaning the surface, spray a very light tack coat at a rate of 0.05 to 0.10 gallon per square yard (0.23 to 0.45 liter per square meter) and allow to fully cure.

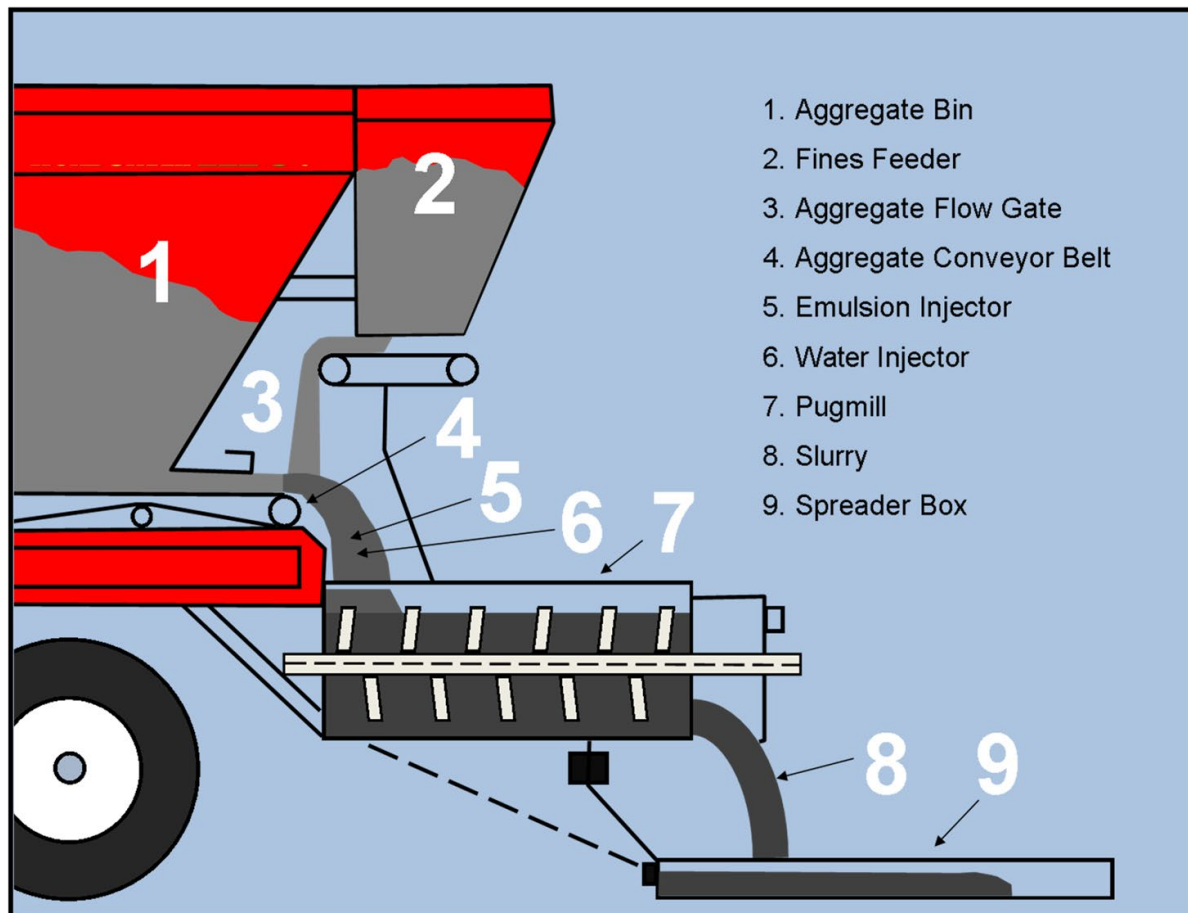
#### **8-3.2 Apply the Slurry.**

Apply a fog spray of water to the surface with the spray bar on the slurry machine immediately before applying the slurry. Ensure there is no standing water after the spray. Adjust the spray to compensate for temperature, surface texture, humidity, and

dryness of the surface. Apply the slurry with a slurry machine (Figure 8-1). The slurry machine is a self-propelled, continuous-flow mixing unit. Provide and use a device that is capable of delivering the proper amount of aggregate, water, mineral filler, and emulsion to the mixing unit. The mixing unit is either a single or double pugmill mixer. The mixing unit discharges the material into the spreader box that is equipped with flexible squeegees and width adjustment. Other parts of the machine include the spray bar for wetting the pavement and an aggregate prewetting device.

Use a burlap drag behind the spreader box to improve the joints and improve the texture and appearance of the mixture. Apply the slurry from 0.125 inch (3 millimeters) up to but no more than 0.25 inch (6 millimeters) thick in one pass. If more than one pass is applied, fully cure the previous layer before applying the second application.

**Figure 8-1 Slurry Seal Spreader Machine**



### 8-3.3 Rolling the Slurry.

A slurry seal is not always rolled but rolling does provide improved performance. Roll the slurry to reduce voids, limit surface imperfections, and increase the slurry's

resistance to water. Roll the slurry after it has cured enough to support the roller without removing any of the slurry mixture. Use a 5-ton (4,540-kilogram) pneumatic-tire roller with tire pressures of 50 pounds per square inch (345 kilopascals) to roll the slurry.

Cure the Slurry.

The time to allow for curing will vary according to the application rate of the emulsion and aggregate and weather conditions. The slurry cures by evaporation of water from the surface, by deposition of asphalt on the aggregate which frees the water, or by a combination of these. The material at the top will typically cure faster than the material at the bottom. Fully cure the slurry seal before opening the treated area to traffic.

### **8-3.4 Problem Areas.**

Construct a test strip to ensure proper slurry machine calibration and correct mixture. Do not overwork the slurry when hand-applying the slurry; overworking causes the emulsion to break prematurely. Apply the second lane while the edge of the previous lane is still fluid and workable, if possible. If the previous lane's edge is not workable then allow the slurry material to cure enough for the spreader box to not damage the previous lane. Keep the burlap drag clean and replace when necessary. Material buildup on the burlap drag causes streaking and gouging. Inspect the flexible lining of the spreader box for wear or accumulation of cured slurry. Replace the lining when worn. Remove any cured slurry from the lining.

#### **8-3.4.1 General Rule.**

Do not place surface treatments on asphalt concrete pavements during the first year of service without approval of the Pavements DWG or their designated representative.

#### **8-3.4.2 Fog Seal Consideration.**

Do not apply a fog seal over a slurry seal or microsurface without approval of the Pavements DWG or their designated representative.

#### **8-3.4.3 Slurry Seal Consideration.**

Do not use slurry seals on airfield pavements where frequent ice/snow removal occurs without approval of the Pavements DWG or their designated representative. Ice/snow removal equipment can potentially tear the slurry from the underlying pavement.

#### **8-3.4.4 Surface Treatments and Fuel Spillage.**

Do not use these surface treatments in areas prone to fuel spillage without approval of the Pavements DWG or their designated representative. Alternative fuel-resistant sealers are appropriate for these areas.

#### **8-3.4.5 Surface Treatments and Crack Sealing.**

The use of surface treatments does not negate the need for routine crack sealing. Crack sealing is an additional maintenance procedure required to extend the life of asphalt concrete pavements. Using a slurry seal or microsurfacing results in smaller cracks being sealed but larger cracks will continue to need sealing.

#### **8-3.5 Negative Impacts.**

Table 7-4 lists the potential negative impacts for each type of surface treatment. Many problems associated with surface treatments occur after its service life is passed. Actual service life depends on the product, application method, application rate, and pavement surface preparation. Some surface treatments are only intended to last a few years, while others remain effective in excess of eight years.

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## CHAPTER 9 ASPHALT CRACK SEALING

### 9-1 INTRODUCTION.

The purpose of sealing cracks in asphalt pavements is to protect the pavement structure from premature failure. The use of proper crack preparation and sealing techniques can extend the effective life of the sealant, thereby increasing the life of the pavement and reducing maintenance costs. Unsealed cracks allow water intrusion and debris retention in the crack opening. Water intrusion in the cracks penetrates into the base and subbase materials, creating the potential for a loss of strength in these materials. The weakened pavement structure can result in load-related failures such as alligator cracking (Figure 9-1). The debris retention can cause the pavement to “push up” at the edges of the crack when the pavement expands due to thermal changes. This decreases the rideability of the pavement surface. These failures and deficiencies increase the lifecycle cost of the pavements by requiring increased maintenance.

**Figure 9-1 Alligator Cracking**



### 9-2 WHEN TO SEAL.

#### 9-2.1 Field Evaluations.

Conduct field evaluations at least twice a year, once during the summer months and once during the winter months. Seasonal evaluations will enable a determination of the number and size of cracks and allow performance evaluations of any existing sealant when the cracks are at their smallest and largest width. Consider sealing when cracks have become approximately 0.25 inch (6 millimeters) wide. Do not seal cracks less than 0.25 inch (6 millimeters) wide unless they cover a large percentage of the pavement.

Use a surface treatment such as seal coating or overlay on pavements that have many cracks less than 0.25 inch (6 millimeters) wide or smaller.

### 9-2.2 Schedule.

Plan and schedule crack sealing in accordance with field evaluations. Make spot repairs to sealed cracks where the sealant material has failed. Figures 9-2 and 9-3 show typical areas in need of sealing. Consider a major resealing project when a large percentage of the area has failed sealant or cracks with no sealant at all.

**Figure 9-2 Reflective Cracking**



**Figure 9-3 Longitudinal Cracking**



### 9-2.3 Climatic Conditions.

Schedule crack sealing projects during the normal construction season. A normally low rainfall period in the spring or fall is preferred. Do not seal crack(s) until the temperature

of the pavement is 50 degrees F (10 degrees C) and rising. Do not seal crack(s) until the crack is free of moisture and debris.

#### **9-2.4 Porous Friction Surfaces.**

The guidelines for sealing cracks in a porous friction surface (PFS) are different from a normal asphalt surface. Use the procedures in Chapter 10 for sealing cracks in a PFS.

### **9-3 SPECIFICATIONS.**

#### **9-3.1 ASTM.**

Use crack sealant conforming to ASTM D6690, *Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements*. When selecting a sealant, consider climatic regional temperature performance. Also consider sealant characteristics in high-volume pedestrian traffic where some materials have a tendency to track onto the pavement and stick to the soles of shoes.

#### **9-3.2 Other Specifications.**

Rubberized asphalt sealants that are not covered by the above specifications can be used only on roads and only when an appropriate state department of transportation (DOT) or local municipality material specification is available and after the sealant has been approved by the AFCEC Pavements SME, NAVFAC Pavements SME, or USACE Transportation Systems Center (TSMCX) pavement engineer. The DOT and local specifications will often be modified to account for the temperature variations of the region. Asphalt cements that contain synthetic fibers have been used successfully on a limited basis as a crack sealant. Use state or municipality specifications for these materials but only after the sealant has been approved by the Pavements DWG or their designated representative.

#### **9-3.3 Testing.**

Test the crack sealant material by a government-approved independent laboratory for specification conformance before it is used on a project. If the quantity of sealant for the project is less than 500 pounds (227 kilograms) then the manufacturer's certificate of compliance may be accepted in place of testing. Evaluate local field performance data from past sealing projects, if available, to determine which type of sealant to seal the cracks.

### **9-4 CRACK SEALING PROCEDURAL STEPS.**

#### **9-4.1 Crack Size Guidelines.**

Procedures for sealing will vary depending upon the size of the crack. Use the following steps as a guide:

#### **9-4.1.1 Hairline Cracks (Less Than 0.25 Inch [6 Millimeters]).**

See Figure 9-4. It is very difficult to successfully insert sealant material into a crack that is less than 0.25 inch (6 millimeters). Typically, these cracks are not sealed unless they cover 80 percent or more of the pavement area. If the cracks do require sealing, a surface treatment could be the most effective method. The surface treatment used will depend upon the area being treated and the predicted future traffic. A SBST or DBST could be satisfactory for a roadway or parking lot but not for an airfield. Surface treatments and slurry seals are not recommended for airfields that will encounter jet and high-tire-pressure aircraft because the surface treatment or slurry seal will normally deteriorate quickly. Consider options such as an asphalt overlay or pavement recycling for airfield pavements. For additional information on various types of surface treatments, see UFGS 32 12 36.13, *Asphaltic Seal and Fog Coats*, UFGS 32 12 11, *Bituminous Surface Treatment*, and UFC 3-250-03.

#### **9-4.1.2 Small and Medium Cracks (0.25 to 2 Inches [6 to 50 Millimeters]).**

See Figures 9-5 and 9-6. Widen small cracks to a nominal width of 0.125 inch (3 millimeters) greater than the existing nominal or average width. Widening the cracks 0.125 inch (3 millimeters) will help eliminate the potential for raveling of the pavement along the edges of the crack and will provide a sealant reservoir with vertical faces. After the crack has been cleaned and inspected, it is ready for sealing. The depth of the cracks to be sealed is determined and, if the depth is greater than 0.75 inch (19 millimeters), a backer rod material is inserted. If the depth of the crack is not deep enough to accommodate the backer rod and maintain a sealant depth of 0.5 to 0.75 inch (13 to 19 millimeters) then the crack can be routed or the backer rod material omitted.

#### **9-4.1.3 Large Cracks (Greater Than 2 Inches [50 Millimeters]).**

See Figure 9-7. Fill cracks that are 2 inches (50 millimeters) and larger with a sand asphalt or fine-graded asphalt mix and compacted. The procedures and equipment used are identical to those used to repair potholes. Cut or route the edges vertical and clean the cracks to obtain a patch that meets the specified requirement. The asphalt material could prematurely fail if the proper cleaning and patching procedures are not followed. Square by sawing, fill with asphalt mix, and compact the cracks. Refer to TM 5-624/NAVFAC MO-102/AFJMAN 32-1040, *Maintenance and Repair of Surface Areas*, for additional information.

#### **9-4.1.4 Cracks in Pavements to be Overlaid.**

Small and medium cracks in pavements to be overlaid are usually not filled prior to overlay. Also, if milling occurs, it is very difficult to locate these small cracks so sealing will be very difficult. However, many designers require these cracks to be filled with an emulsion, a sand emulsion mixture (Figure 9-9), or one of the types of sealants previously mentioned. Recess the material in the crack a minimum of 0.25 inch (6 millimeters) to prevent the material from “bleeding” through the overlay. Bleeding occurs

when the asphalt cement in the crack sealant material is drawn to the surface of the overlay. Bleeding causes the pavement above the crack to become soft and a crack or bump in the overlay is usually the end result.

#### **9-4.2 Crack Widening.**

Use a router to widen meandering cracks. Use a saw with a small-diameter blade to widen straight cracks. When a saw is used, clean the crack with a high-pressure water stream or a sandblaster to remove debris created by the saw. The recommended procedure is to use a router since water would not be required. When resealing, remove all of the old sealant from the crack. After the crack has been widened or the existing sealant has been removed, clean the crack to prevent any debris from contaminating the crack.

#### **9-4.3 Initial Crack Cleaning.**

Use the sandblasting equipment, water-blasting equipment, HCA heat lance, or wire brushes to clean cracks. Information about this equipment follows:

##### **9-4.3.1 Sandblasting.**

When sandblasting equipment is used, establish a technique that enables both faces of the crack to be sandblasted. Use a multiple-pass technique consisting of positioning the sandblaster nozzle approximately 1 inch (25 millimeters) above the pavement surface, sandblasting the entire length of one crack face then sandblasting the entire length of the opposite crack face. Sandblast approximately 1 inch (25 millimeters) of the pavement surface on both sides of the crack to remove debris. Do not over-blast the cracks. Over-blasting can damage the pavement, causing raveling and premature bond failure of the sealant. Demonstrate the cleaning technique on 5 feet (1.5 meters) of cracks in an area not subject to direct wheel traffic to ensure proper techniques are used.

##### **9-4.3.2 Water Blasting.**

Water-blast the crack faces and pavement surfaces extending a minimum of 0.5 inch (13 millimeters) from the crack edges. Use a multiple-pass technique until the surfaces are free of dust, dirt, old sealant residue, or foreign debris that might prevent the sealant material from bonding to the asphalt pavement. After final cleaning and immediately prior to sealing, blow out the cracks with compressed air and leave them completely free of debris and water. Excessive water pressure can cause damage to the asphalt adjacent to the crack and result in loss of material. If the pressure is too low then the joint will not be properly cleaned. Demonstrate the cleaning technique on 5 feet (1.5 meters) of cracks in an area not subject to direct wheel traffic to ensure proper techniques are used.

#### **9-4.3.3 HCA Heat Lance.**

Use the HCA heat lance when the pavement is wet and/or cold (pavement temperature below 50 degrees F [10 degrees C]). Use extreme care to ensure the crack faces do not become overheated or burned. Overheating the crack faces will greatly reduce the life expectancy of the seal and adjacent pavement. Adhesion failure of the sealant or additional cracking of the pavement between the area that was overheated and the remainder of the pavement is expected.

#### **9-4.3.4 Wire Brushes.**

Wire brushes are sometimes used during sealing projects; however, wire brushes are not always capable of removing debris from the crack faces and this debris can cause adhesion failures. Inspect the wire brushes to ensure they are not worn. Inspect the cleaned crack to ensure all debris and dust have been removed.

#### **9-4.4 Debris Removal.**

Remove debris from the crack after water-blasting or sandblasting. This method normally removes the debris more effectively with less chance of pavement damage.

#### **9-4.5 Final Crack Cleaning.**

Once the old sealant and debris have been removed from the crack, clean the crack with compressed air. The compressed air is blown into the crack to remove sand or any debris that was loosened during the initial cleaning. The compressed air also helps remove moisture.

#### **9-4.6 Inspection.**

Inspection is the final phase of crack preparation. Inspect the crack for cleanliness and dryness. It is essential for the crack to be clean and dry so the sealant will adhere to the pavement. One method to check for cleanliness is to rub one's finger along the crack face. If a dusty residue is left on the finger, re-clean the crack. If there is no residue, the crack is ready for sealing.

#### **9-4.7 Crack Cleaning Summary.**

The cleanliness of the crack is one of the most important factors in crack preparation that affects the life of the sealant. It is not the only important factor, but it is one that can be controlled. After the crack has been inspected and approved for cleanliness, the crack is ready to be sealed (Figure 9-8).

**Figure 9-4 Hairline Crack**



**Figure 9-5 Small Crack**



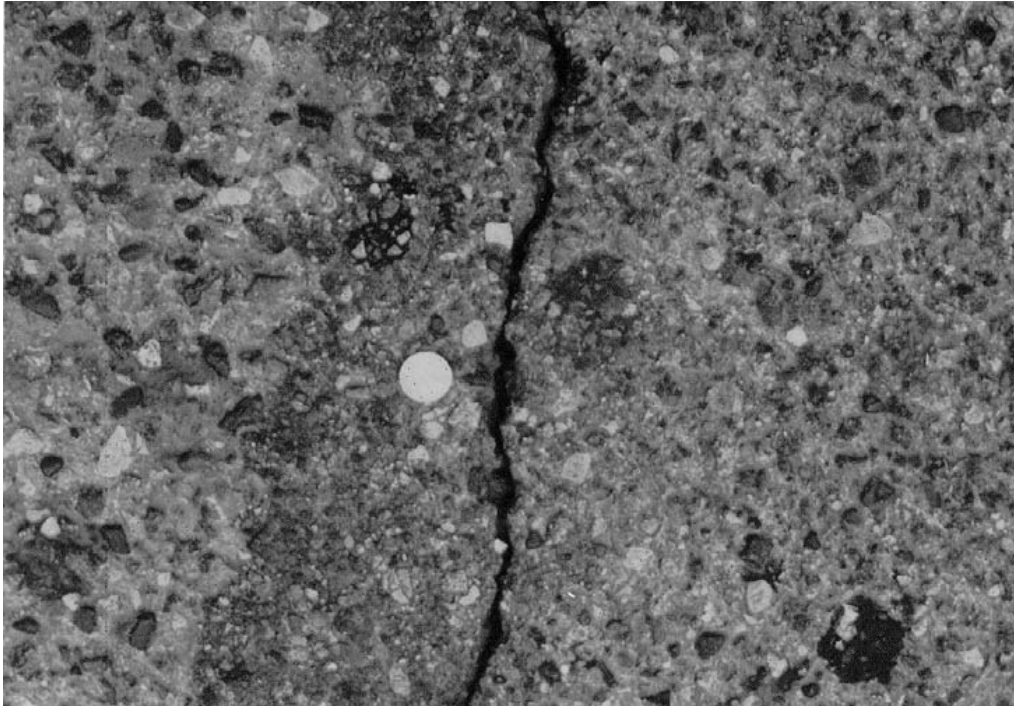
**Figure 9-6 Medium Crack**



**Figure 9-7 Large Crack**



**Figure 9-8 Crack After Cleaning**



**Figure 9-9 Filling Crack with Sand Emulsion Mixture**



#### **9-4.8 Backer Rod Material.**

The backer rod (Figure 9-10) is a compressible, non-shrinking, non-absorptive material. Provide and use backer rods whose melting point is higher than the pouring temperature of the sealant. Provide and use backer rod that is approximately 25 percent wider in diameter than the nominal width of the crack. The larger size will enable the sealant to be inserted without dislodging the backer rod. Place the backer rod to a depth that will provide a shape factor (depth-to-width ratio) of approximately 1 for petroleum-based sealants. However, do not place the top of the backer rod deeper than 0.75 inch

(19 millimeters). This will provide a reservoir for the sealant that will minimize the internal stresses in the sealant. High internal stresses can create cohesion failure, split the material, or dislodge loose aggregate from the pavement, damaging the effectiveness of the seal. However, if the shape factor is too small, adhesion failure can occur; therefore, it is important to maintain the proper shape factor.

**Figure 9-10 Examples of Backer Rod Materials**



#### **9-4.9 Inspection Prior to Sealing.**

Inspect the cracks immediately prior to sealing. Ensure the backer rod is at the specified depth and that debris has not been blown into the crack. Clean cracks are essential in obtaining adhesion between the sealant and the crack face.

#### **9-4.10 Sealant Temperature and Application.**

Check the temperature of the sealant to ensure it is at the manufacturer's recommended application temperature. Insert the nozzle of the application equipment into the crack and seal the crack from the bottom to the top (Figure 9-11). Sealing in this manner minimizes bubbling of the sealant due to entrapped air. Recess the sealant approximately 0.125 to 0.25 inch (3 to 6 millimeters) below the pavement surface to prevent tracking. Remove excess sealant with a squeegee or similar equipment.

**Figure 9-11 Sealing the Crack**



**9-4.11 Crack Sealing Delays.**

Blow out with compressed air before sealing any cracks that are not sealed the same day they are prepared. Clean and dry cracks again if rain delays the sealing operation to remove any debris that may have been washed into the crack by rain. Use the sandblaster, wire brushes, or HCA heat lance, but not by using only compressed-air cleaning to remove debris washed in by the rain.

**9-4.12 Inspection After Sealing.**

Inspect the sealant to ensure the sealant is bonding to the pavement and that the cracks were not overfilled after the cracks have been sealed (Figure 9-12). Overfilled material can track onto the pavement surface and/or stick to pedestrians' shoes. Inspect the sealant to ensure the proper sealant recess has been obtained. Sealants that are not properly recessed will be pushed above the pavement surface as the pavement expands and become damaged by traffic. Cracks that have been under-filled can have additional crack sealant applied.

**Figure 9-12 Crack After Sealing**



## **9-5 PROBLEM AREAS.**

### **9-5.1 Categories of Problems.**

Many problems that arise during a sealing project can be divided into three categories: crack sealant materials, crack preparation, and crack sealant application. The following information is presented for these three sealing problems:

#### **9-5.1.1 Materials.**

One of the main problems associated with sealant materials is nonconformance to the required specification. Test the sealant through an independent laboratory to minimize this problem. Another problem is a combination between materials and application that involves the sealant not setting up or curing after it has been applied to the crack. This problem is often caused by overheating the sealant before it is applied to the crack. The overheating can be caused by heating the sealant at too high a temperature or heating it at the recommended pouring temperature for a longer period of time than recommended by the manufacturer.

Most sealants used to seal cracks in asphalt concrete pavements are asphalt cement-based materials and overheating causes the light volatiles to “cook off” or evaporate. This causes the sealant to become brittle, resulting in premature failure of the sealant. Monitor the temperature of the sealant in the application equipment and discard any material that is overheated or heated for longer than four hours to eliminate this problem. Discard the sealant remaining in the equipment and thoroughly clean the equipment after each day’s work has been completed.

### **9-5.1.2 Preparation.**

The main problem associated with crack preparation is the cleanliness of the crack. The crack sealant will not adequately bond to the pavement if there is oil, dust, debris, or loose aggregate remaining in the crack. Damaging the pavement during the routing process can also be a problem. Prevent jamming in the crack by following each crack and controlling the speed of the equipment. Dry the crack prior to placing sealant to prevent the moisture from vaporizing when the sealant is placed, which will result in loss of bond to the crack wall.

#### **9-5.1.2.1 Dust and Debris.**

Checking for dust and debris in the crack is a relatively simple procedure: rub a finger along the crack; if the finger gets dusty, the crack is dirty. Checking for moisture is more of a judgment decision. There is no test for checking the moisture of a crack except by observation or feeling with one's hand. It is important that the crack is dry at the time of sealant application so the sealant will bond to the pavement.

#### **9-5.1.2.2 Crack Preparation Methods.**

An additional problem dealing with crack preparation is deciding which method to use. This is a problem because most cracks are not uniform in size and the surrounding pavement will have varying degrees of deterioration. Make adjustments as work progresses. The main consideration for crack preparation is that the crack be cleaned without damaging the surrounding pavement.

### **9-5.1.3 Application.**

There are two major problems associated with crack sealant application. The first problem is brittleness of the sealant material due to overheating or prolonged heating. Brittleness is a materials problem because some sealant materials are more susceptible to overheating than others, but it is also an application problem because it can be corrected by implementing a good quality control program. Monitor the temperature of the sealant and discard any material that is overheated or heated for longer than four hours to eliminate this problem. Discard the sealant remaining in the equipment and clean the equipment thoroughly after each day's work has been completed.

The second problem is overfilling the crack. The sealant can be tracked onto the pavement and abraded if the crack is overfilled. Reduce, if not eliminate, overfilling the crack by vigilant quality control measures and inspection. Remove excess sealant with a squeegee or similar object before the sealant cools. Fill from the bottom up to prevent entrapped air.

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## CHAPTER 10 POROUS FRICTION SURFACES.

### 10-1 INTRODUCTION.

A porous friction surface (PFS) is an open-graded asphaltic concrete wearing surface containing a large amount of air voids that allow water to drain vertically and laterally through the pavement structure (Figure 10-1). These surfaces are usually 0.75 to 1 inch (19 to 25 millimeters) thick and the large void content provides a means to prevent hydroplaning at high speeds. The surface texture of the PFC provides excellent skid resistance and decreases tire spray under wet conditions. Several procedures to repair a PFS are presented in the following paragraphs.

**Figure 10-1 View of a Porous Friction Surface (PFS)**



### 10-2 SEALING CRACKS.

The guidelines for sealing cracks in a PFS are different from a normal asphalt surface. The materials used for sealing cracks on a PFS are the same as for a normal asphalt pavement. Use the following steps for sealing cracks on a PFS:

#### 10-2.1 Prepare the Crack.

To prepare the crack, remove all loose material and ensure the crack is free of dust and dirt.

#### 10-2.2 Seal the Crack.

Follow the same sealant placement procedures as for an asphalt surface (Chapter 9). Do not seal cracks 0.25 inch (6 millimeters) wide or less unless loose debris is causing a FOD problem. Seal cracks from 0.25 to 0.75 inch (6 to 19 millimeters) if they are raveling and causing a FOD problem. Fill cracks greater than 0.75 inch (19 millimeters)

wide with a PFS asphalt mixture and rolled with a steel-wheel roller. Only seal longitudinal cracks when regular sweeping methods no longer remove all loose aggregate from the surface. The loose aggregate can block internal drainage. Seal transverse cracks except those perpendicular to the water flow. In any case, do not seal the joint if it will interfere with water drainage.

### **10-2.3 Patching PFS.**

If correctly performed, a PFS patch is indistinguishable from the remainder of the surface. Patch PFS using the following steps:

#### **10-2.3.1 Remove Defective PFS.**

Do not saw PFS when patching. Only use a milling machine to remove any defective PFS. Mill the full depth and extent of PFS damage.

#### **10-2.3.2 Clean and Tack Repair Area.**

Remove the defective material and, if necessary, repair the underlying pavement. Thoroughly clean the repair area before placing the tack coat. Apply a light tack coat to the bottom of the repair area. Do not apply tack coat to the edges of the repair areas as this will clog or interfere with the flow of water through the PFS.

#### **10-2.3.3 Place Patch Material.**

Provide and use repair material that conforms to the existing PFS. Roll the repair material using the same method as the original construction after material is placed. A cold-mix asphalt can be used for a temporary repair.

### **10-2.4 Raveling Control.**

Apply a very light spray of asphalt emulsion to help control raveling of the PFS until replacement of the area can be completed. If this procedure is performed, do not apply so much as to hinder drainage of the PFS.

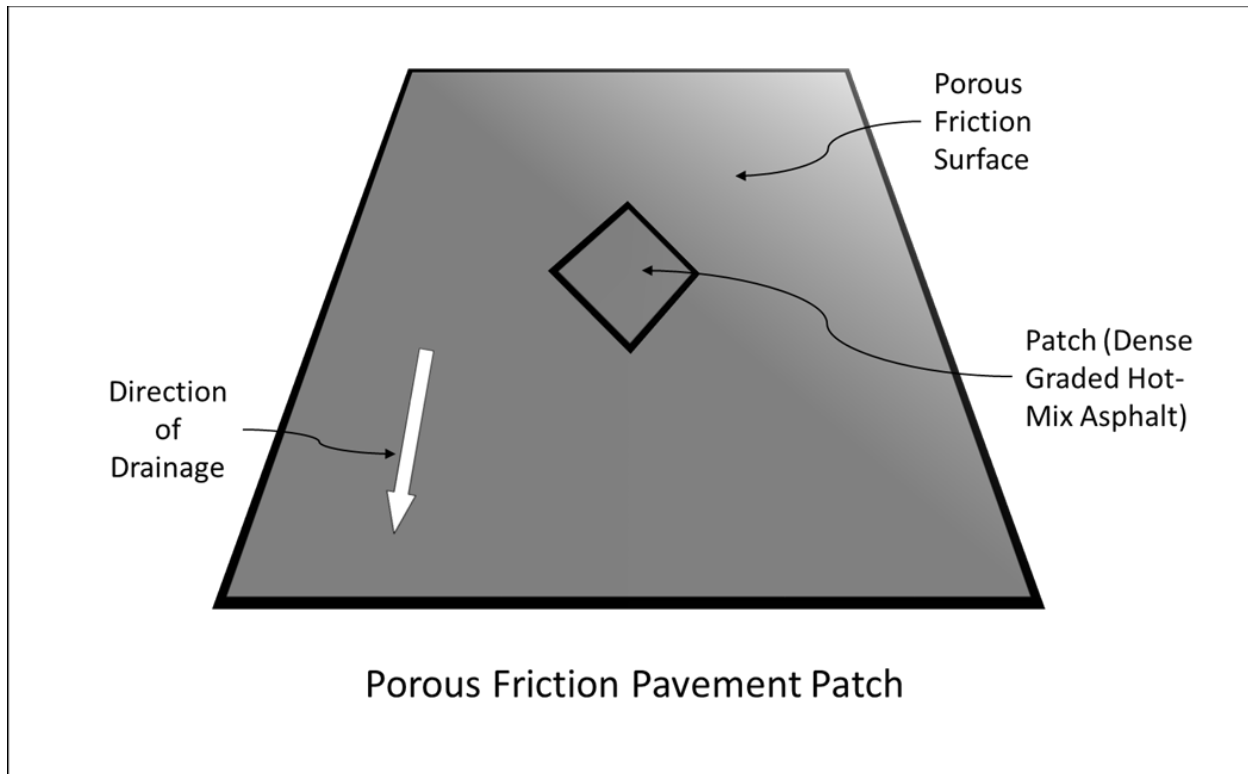
### **10-2.5 Patching Using Standard Hot Asphalt Plant Mix.**

If a standard hot asphalt plant mix is used to repair a PFS, employ the following steps:

#### **10-2.5.1 Mark the Repair Area.**

Lay out and mark the boundaries of the repair for saw cutting. Shape the patch as a diamond with a point of the diamond at the highest elevation (Figure 10-2). This will allow water to flow around the patch area.

Figure 10.2. Porous Friction Pavement Using Hot-Asphalt Plant Mix



**10-2.5.2 Remove Defective PFS.**

Saw the area to the thickness of the porous friction surface. Remove defective material. Do not damage the edges of the patch.

**10-2.5.3 Place Patch Material.**

Apply tack coat to the sides and bottom of the patch area. Do not over-apply the tack coat. After the tack coat has cured, place and compact a well-graded hot asphalt plant mix.

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## CHAPTER 11 DIAMOND-GRINDING ASPHALT CONCRETE PAVEMENTS

### 11-1 INTRODUCTION.

Diamond grinding, using closely spaced diamond saw blades mounted on a rotating shaft, removes a thin layer of the concrete surface to correct for faults at joints and crack locations and correct for surface defects, such as wheel path rutting. As such, diamond grinding results in re-profiling the pavement and improves the pavement's ride quality.

Diamond grinding removes bumps, re-profiles pavements, removes surface defects, and restores the pavement to a smooth surface. Because the hardness of the aggregate will influence the grinding operation, identify the type of aggregate in the asphalt pavement when the work is to be contracted. Limit grinding to small, localized areas. Do not grind more than 10 percent of the surface area without prior approval of the Pavements DWG or their designated representative.

### 11-2 NEED FOR GRINDING.

Consider diamond grinding when a pavement has bumps in excess of 0.125 inch (3 millimeters), roughness in excess of 0.125 inch (3 millimeters) in a 10-foot (3-meter) length, or rutting up to 0.375 inch (10 millimeters). If skid resistance is to be examined, examine skid resistance on the areas not scheduled for grinding for any of the previously mentioned defects. **[caution missing as in Ch. 17]**

### 11-3 GRINDING PROCESS.

The diamond-grinding process results in less impact than milling. The pavement grinder is similar to a wood plane. The front wheels are designed to pass over a fault or bump, the cutting head shaves it off, and the rear wheels ride in a smooth path left by the cutting head. Diamond grinding requires heavy, specially designed equipment (Figure 11-1) that uses diamond saw blades gang-mounted on a cutting head. Spacers are placed between the saw blades to reduce the amount of cutting to be done. This combination of saw blades and spacers gives the pavement the characteristic corduroy texture that improves skid resistance.

**Figure 11-1 Diamond Grinding Equipment**



**11-4 TEST SECTION.**

Before work begins, use the equipment in a test section to ensure that proper blade spacing is being used for the specific aggregate on the project. The width of the spacers between the saw blades varies depending on the hardness of the aggregates. The harder the aggregate, the thinner the spacing between the blades. When grinding aggregate susceptible to polishing, use a wider spacing.

**11-5 GRINDING PROCEDURE.**

When areas have been identified as being too rough, set a level of restoration and grind sections having excess roughness. Test the roughness again following the grinding. Test using a California profilograph (Figure 11-2), Mays Ride Meter, or 12-foot (3.7-meter) straightedge. Establish the grade prior to grinding. Do not use the old pavement surface as the reference unless a long beam or skid is used. Grinding a sag will not remove roughness.

Skid resistance can be improved by grinding. Only grind those lanes needing improved friction. Feather the edges of the ground areas into the adjoining pavement to eliminate a sharp drop-off. Grind the pavement in the longitudinal direction. Produce a uniform finished surface and provide positive lateral surface drainage. Continuously remove the

slurry residue resulting from the grinding operation. Do not permit the grinding slurry to flow across adjacent lanes into gutters or flow into other drainage facilities.

**Figure 11-2 California Profilograph**



**11-6 ACCEPTANCE TESTING.**

Test the pavement for smoothness after completing the grinding and texturing. Accept only those pavement surfaces that meet the surface tolerance for a new pavement as required by the specifying agency. Use the same test equipment and procedure used in the initial evaluation for the acceptance testing. Do not reduce the nominal load-carrying capacity of the pavement through grinding without prior approval of the Pavements DWG or their designated representative.

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## **CHAPTER 12 CONCRETE PAVEMENT CRACK SEALING**

### **12-1 INTRODUCTION.**

Concrete pavement cracking is a result of tensile stress in the concrete slab exceeding the tensile strength of the concrete at the time of cracking. The cracking may develop soon after concrete placement or develop after some time. The cracking may be due to a number of factors such as marginal pavement design, poor construction practices, environmental conditions, and repeated traffic loading (fatigue related). The cracking may include the following types of cracks: transverse cracking, longitudinal cracking, corner cracking, or randomly oriented cracking.

Crack sealing, together with joint resealing, is the most commonly performed pavement maintenance activity. It reduces the amount of moisture that can infiltrate a pavement structure, thus reducing moisture-related distresses such as pumping, crack faulting, base and subbase erosion, and corner breaks at crack locations. It also prevents the intrusion of incompressible materials so compression-related distresses such as crack spalling, blowups, and slab shattering are minimized. The compression-related damage typically occurs at or along cracks oriented in the transverse direction; however, joint spalling can be of concern for cracks oriented in other directions.

Crack sealing is most effective when performed on concrete pavements that exhibit low-severity structural deterioration and when the cracks are full-depth but relatively narrow, with minimal spalling. Crack sealing may be used on cracks of low or medium severity where the crack width is 0.5 inch (13 millimeters) or less. If load transfer restoration (LTR) or partial-depth patching at the crack location is to be applied, seal cracks after these activities have been completed. If the cracks have deteriorated and exhibit a high degree of spalling, consider full-depth patching.

### **12-2 KEY STEPS.**

The key steps in performing effective crack sealing include the following:

- Old sealant removal, if any
- Crack sawing/routing to specified depth and width
- Crack reservoir cleaning by sandblasting, water-blasting, and air-blasting
- Backer rod installation to control depth of sealant
- New sealant installation, typically hot-poured or cold-poured

### **12-3 GENERAL PRACTICE.**

The general practice is to make only small sections of repair at a time to prevent the sawed or routed crack faces from being exposed to weather for more than 24 hours. If the cracks are wet, dry them with a high-pressure air compressor before placing the sealant and backer rod.

### **12-4 TEST SECTION.**

Saw or route a test section of approximately 200 linear feet (60 meters) of cracks. Do not begin the full crack-sealing project until the contracting officer has approved a successful test section. Re-accomplish the test section until it meets requirements and is approved. Use the same procedures and materials in the full project that were used and approved in the approved test section. Demonstrate that crack sawing or routing does not cause spalling exceeding 0.25 inch (6 millimeters) in width or depth. Demonstrate cleaning of the crack faces before placement of any sealant. For two-component sealants, demonstrate and verify the mixing ratio is within a specified tolerance according to the manufacturer's specifications for that particular sealant. If using hot-applied sealants, use calibrated thermometers to verify correct application temperatures. Demonstrate that all equipment is in good working condition.

Use sealant that conforms to UFGS 32 01 19, *Field Molded Sealants for Sealing Joints in Rigid Pavements*, or the applicable ASTM specifications and is approved for use at a particular facility by the base engineer.

### **12-5 CRACK SEALANTS.**

Concrete crack repair sealants are essentially the same as joint sealants. Crack sealants mitigate two problem areas: moisture intrusion into the pavement base and debris retention in the crack opening. Crack sealants are either hot-applied thermoplastic materials or cold-applied thermosetting materials.

#### **12-5.1 Hot-Applied Sealants.**

Hot-applied thermoplastic sealant materials are bitumen-based materials that typically soften upon heating and harden upon cooling, usually without a change in chemical composition. These sealants vary in their elastic and thermal properties and are affected by weathering to some degree. Thermoplastic sealants are typically applied in a heated form and include the following:

- Rubberized asphalt: Self-leveling (most commonly used)
- Polymeric materials: Self-leveling
- Elastic materials: Jet fuel-resistant
- Elastomeric polyvinyl chloride (PVC) coal tar: Jet fuel-resistant

### 12-5.2 Cold-Applied Sealants.

Cold-applied thermosetting sealant materials are typically one- or two-component materials that either set by the release of solvents or cure through a chemical reaction. These sealants cost more than the commonly used rubberized asphalt sealants. Liquid oxygen (LOX) is a one-component cold-applied thermosetting compatible sealant. Thermosetting sealants include the following:

- Silicone (most widely used):
  - Non-sag, toolable, low modulus
  - Self-leveling, low modulus
  - Self-leveling, ultra-low modulus
- Polysulfide and polyurethane: Self-leveling, low modulus
- Two-component elastomeric polymer: Jet fuel-resistant
- W.R. Meadows Poly-Jet LOX

**Caution:** The performance of sealant material is sensitive to crack reservoir moisture and cleanliness. Do not use expensive sealant materials unless good sealant installation practices can be assured at the job site.

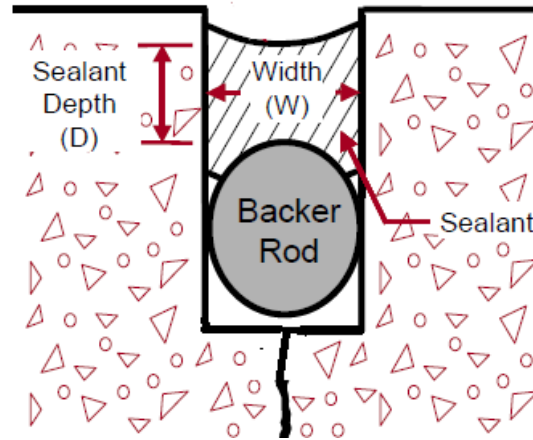
### 12-5.3 Fuel- and Blast-Resistant Sealants.

Additional considerations for crack repair material are jet fuel and jet blast resistance. The crack to be repaired may be located in an area where fuel or lubricating or hydraulic fluid spillage may occur or in an area subjected to high temperature from jet blast or exhaust from auxiliary power units (APU). Use repair materials that conform to UFGS 32 01 19 or ASTM specifications designated for joint and crack sealants for use in these areas.

### 12-6 SEALANT SHAPE FACTOR.

For crack sealing to be effective over the long term, route or saw the crack to the designated width and depth for the particular type of sealant employed in the crack repair. The dimensions of a typical crack reservoir (Figure 12-1) are defined by a shape factor,  $S$ , that is the ratio of the depth of the sealant ( $D$ ) to its width ( $W$ ). Shape factors generally range from 0.5 to 2.0, with 1.0 being most common; however, these dimensions may be specific to the type of sealant employed in the repair operation and a recommended value will be supplied by the sealant manufacturer. The depth of the sealant is controlled by use of a backer rod, as shown in Figure 12-1.

Figure 12-1 Crack Sealant Reservoir Shape Factor



Silicone sealants require a shape factor of approximately 0.5. For example, if the width (W) of the sawed crack is 0.5 inch (13 millimeters), saw the crack to a minimum depth of 1.25 inches (30 millimeters) to accommodate a backer rod of 0.625 inch (16 millimeters). The top of the backer rod will be 0.5 inch (13 millimeters) below the pavement surface. This allows for a depth (D) of 0.25 to 0.375 inch (6 to 9 millimeters) of silicone sealant on top of the crown of the backer rod to keep the sealant at 0.125 to 0.25 inch (3 to 6 millimeters) below the pavement surface.

## 12-7 BACKER ROD AND SEPARATING MATERIALS.

### 12-7.1 Backer Rod Materials.

The backer rod is placed in the sawed or routed crack to minimize excess stress on the sealant material from an improper shape factor and to prevent three-sided adhesion that would inhibit the ability of the sealant to expand and compress under thermal stress. Use a backer rod material that is chemically inert to prevent reaction with the sealant, flexible to conform to the shape of the crack path, non-absorptive to prevent water retention, non-shrinkable, and compressible to allow for easy installation.

Typical backer rod materials are polychloroprene, polystyrene, polyurethane, and polyethylene closed-cell forms. Do not use paper, rope, or cord. Use a backer rod material with a melting temperature that is at least 25 degrees F (14 degrees C) higher than the sealant application temperature to prevent damage during sealant placement.

Provide and use a backer rod with an uncompressed diameter at least 25 percent larger than the sealant reservoir width to ensure it remains in position during the sealing operation. Use a backer rod when repairing cracks by sealing.

### **12-7.2 Separating Materials.**

A separating tape may be used when the sealant reservoir dimensions correspond to that for the proper shape factor for the sealant material to be used and the use of a backer rod would lead to an incorrect shape factor for that sealant material. The separating material is usually a thin adhesive tape or a flexible plastic strip employed to prevent three-sided adhesion of the sealant. Use materials that are flexible enough to deform with the sealant as the concrete expands and contracts. However, only use this repair method when the crack has been sawed to provide a reservoir of the proper depth and width.

## **12-8 CRACK PREPARATION.**

### **12-8.1 Introduction.**

One essential element of the crack-sealing operation is proper preparation of the crack and the crack face. If the prepared crack faces are dirty or wet, the sealant will not adhere to the concrete surface and eventually will separate from the crack wall. Schedule the crack-sealing operation such that the prepared cracks are sealed as soon as possible to prevent contamination of the crack faces before sealant application. If vegetation is growing in the cracks, remove it and use a hot lance or a water-based herbicide to kill the weeds within the cracks. Oil-based herbicides can leave a residue that may prevent adhesion of the sealant to the crack face.

Route or saw the cracks to the proper depth and width according to the shape factor previously discussed or designated by the manufacturer's recommendations for the particular sealant being used. The random orientation of most concrete pavement cracks makes it difficult to create a uniform sealant reservoir directly over the crack.

After completing the sawing or routing operation, clean the crack face to remove laitance, sawing debris, and other foreign material. Perform cleaning with a multiple-pass technique in which one side of the sawed crack face is cleaned, followed by the other face. Sand or water-blast the pavement surface directly adjacent to the sawed crack to remove any debris or material that may cause problems during crack sealing.

### **12-8.2 Cleaning.**

The importance of proper cleaning of the crack faces cannot be over-emphasized. Surface dust, debris, and laitance remaining in the sawed crack can prevent adhesion of the crack sealant to the prepared crack face. Follow the initial cleaning operation with final cleaning using high-pressure air to remove material remaining in the sawed cracks. Do not use water blasting for final cleaning as it will require additional time to dry out the crack faces. Repeat this cleaning process immediately prior to placing the sealant in the sawed reservoir if the sealant is not placed within three hours of the cleaning. Use a vacuum sweeper, shop vacuum, power broom, or hand broom to remove sand and dust adjacent to the crack to prevent the sand and dust from reentering the crack.

## **12-9 CRACK SEALING PROCEDURES.**

### **12-9.1 Introduction.**

Only seal cracks when the air and the pavement temperatures are above 50 degrees F (10 degrees C) and rising. Constantly monitor application temperatures for hot-applied crack sealants to ensure they are in the correct range.

### **12-9.2 Process.**

Ensure the crack faces are clean and free of moisture. If moisture is present, use compressed air to dry the crack face before sealing. Seal the crack using the following steps:

1. Fill the crack from the bottom up to prevent air from becoming trapped under the sealant and bubbling.
2. Fill the crack from beginning to end in one smooth operation whenever practical.
3. Fill the crack to a depth of 0.25 inch (6 millimeters) below the surface of the pavement
4. Do not open the sealed pavement to traffic until the sealant has adequately cooled or cured so as not to be picked up by vehicle tires.
5. Remove all excess sealant application or spills and any other debris from the sealant application work and properly dispose of it.
6. For hot-applied sealants, remove and discard sealant remaining in the pot at the end of a day's work. Do not reheat and use the sealant unless the sealant supplier allows reheating and use.

### **12-9.3 Cautions.**

Comply with the following precautions:

- For crack resealing, completely remove the old sealant.
- Do not start sealing cracks if rain is imminent or within 10 miles and moving toward the worksite.
- Do not begin, continue, or apply sealant if there is any sign of moisture on the surface adjacent to the crack or along the prepared crack faces.
- Follow the sealant manufacturer's installation instructions.
- Avoid getting voids or bubbles in the applied sealant.
- Do not apply sealant that rises above a point that is 0.25 inch (6 millimeters) below the pavement surface or rises over the pavement surface as it will be picked up by traffic or it will be pushed above the

pavement surface during hot weather and make the sealing process ineffective.

- Provide and use equipment with all safety mechanisms and guards in place and functioning properly during the crack sawing or routing and cleaning operations. Do not permit operators to use equipment without the proper use of required personal protective gear.

## **12-10        TEMPORARY CRACK/JOINT SEALING PROCEDURES FOR PCC.**

### **12-10.1      Introduction.**

Short-term performance (less than two years) of pavement joint and crack repairs is acceptable in circumstances identified by the contracting officer or engineer in charge. Example: The pavement is scheduled to be abandoned in two years but is maintained due to FOD potential from spalling. This guidance provides standard procedures and details for temporarily sealing joints and cracks in rigid pavements.

### **12-10.2      Repair Procedures Neoprene Compression Seal (NCS) Joints.**

#### **12-10.2.1    Compression Seal Removal Procedures.**

See Figures 12-2 and 12-3. Perform the following key steps when removing seals:

1. Remove compression seal.
2. Remove all loose and poorly bonded concrete from the joint and joint walls.
3. Sandblast joint walls and bottom.
4. Air blow reservoir to remove debris and dry joint.
5. Install separating tape along joint bottom.
6. Prime joint reservoir walls if recommended by sealant manufacturer's published installation procedures.
7. Fill reservoir to within 0.375 inch (9 millimeters),  $\pm$  0.125 inch (3 millimeters) of slab surface.

Figure 12-2 Existing Spalled NCS Joint

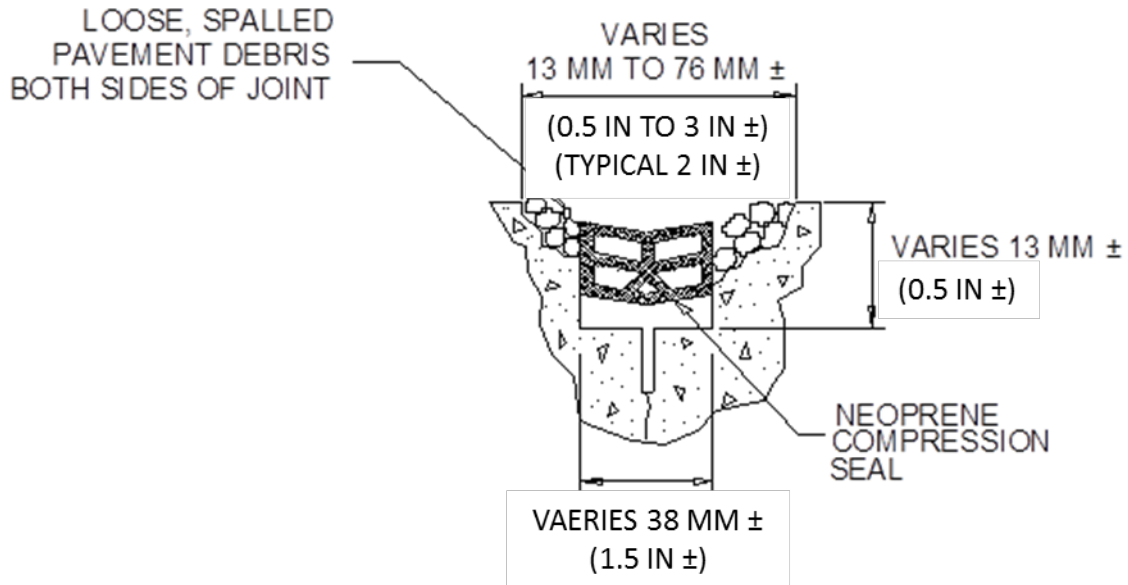
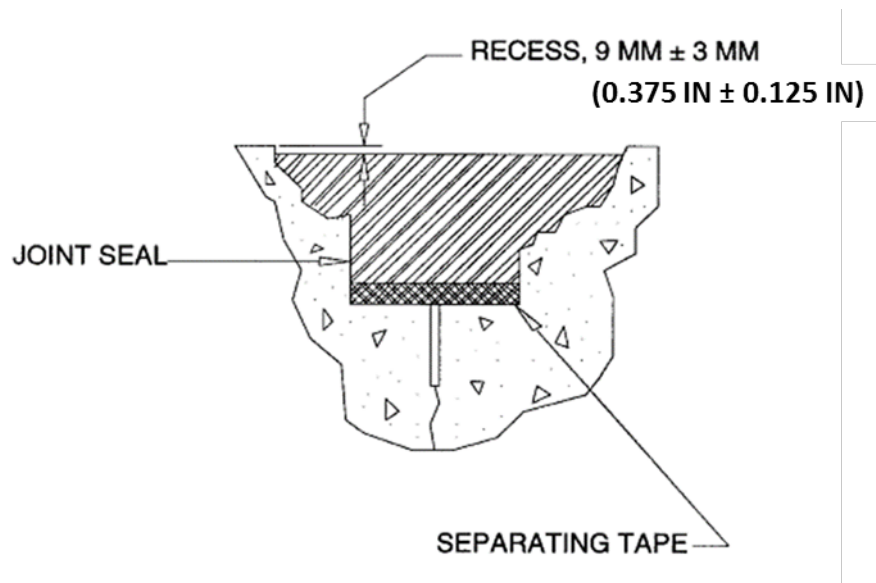


Figure 12-3 Repaired NCS Joint, Compression Seal Removed



### 12-10.2.2 Compression Seal in Place Procedures.

See Figures 12-4 and 12-5. The key steps in performing effective seal in place include the following:

1. Remove loose or delaminated concrete by hand, chisel, or other tool as required.
2. Air-blast to a clean condition.
3. Fill with sealant to top of existing compression seal.

Figure 12-4 Existing NCS Random Spall Area

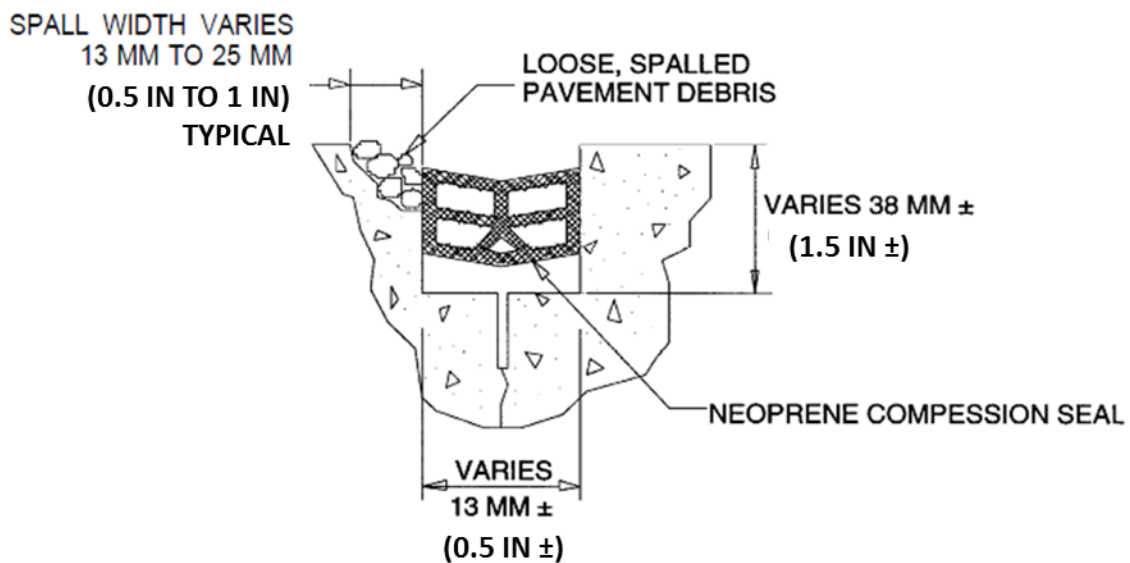
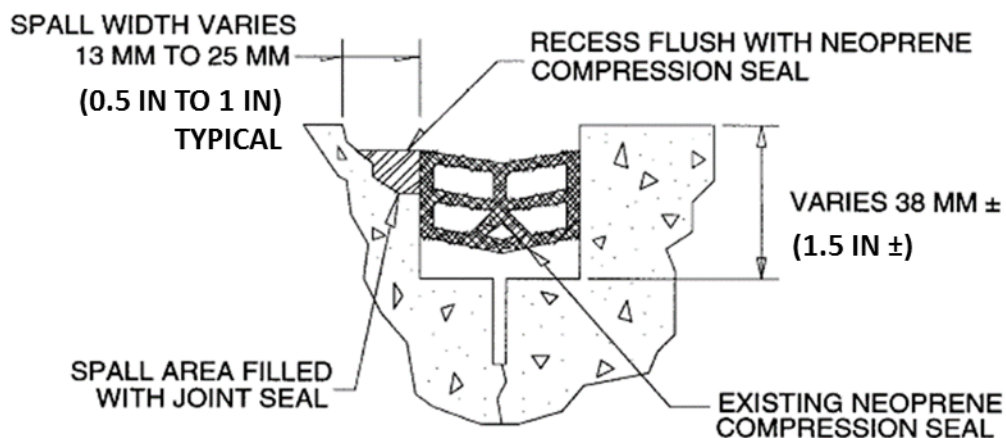


Figure 12-5 Repaired NCS Random Spall Area, Compression Seal in Place

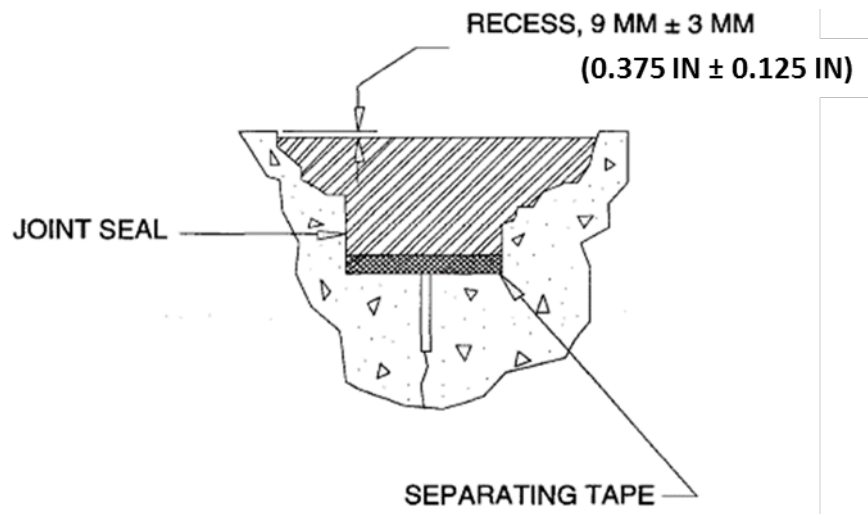


### 12-10.2.3 Section of Compression Seal Removed.

See Figures 12-6. The key steps in performing effective seal removal include the following:

1. Cut and remove neoprene compression seal.
2. Remove all loose, poorly bonded, and delaminated concrete from joint and joint walls.
3. Sandblast joint walls and bottom.
4. Air-blow reservoir to remove debris and dry joint.
5. Install separating tape along joint bottom.
6. Prime joint reservoir walls if recommended by sealant manufacturer's published installation procedures.
7. Fill reservoir to within 0.375 inch (9 millimeters),  $\pm$  0.125 inch (3 millimeters) of slab surface.

**Figure 12-6 Repaired NCS Random Spall Area, Section of NCS Removed**



### 12-10.3 Random Cracks.

See Figures 12-7 and 12-8. The key steps in performing effective random crack sealing include the following:

1. Rout crack with vertical spindle router or crack chasing saw. Width of cut: 0.5 inch (13 millimeters), minimum; depth of cut: 0.625 inch (17 millimeters), minimum. Use a vertical spindle router where crack chasing saw kerf (0.5-inch [13 millimeters] width) will not remain over cracks.

2. Flush crack seal reservoir with high-pressure water only if wet sawing of crack reservoir is used.
3. Remove all loose, poorly bonded, and delaminated concrete debris from crack seal reservoir (walls and bottom) by chipping with hammer or chisel.
4. Sandblast both walls and bottom of crack seal reservoir.
5. Air-blow reservoir to remove debris and dry joint.
6. Install separating tape in bottom of crack seal reservoir.
7. Prime joint reservoir walls if recommended by sealant manufacturer's published installation procedures.
8. Fill reservoir to within 0.125 to 0.25 inch (3 to 6 millimeters) of slab surface.

**Figure 12-7 Existing Random Crack**

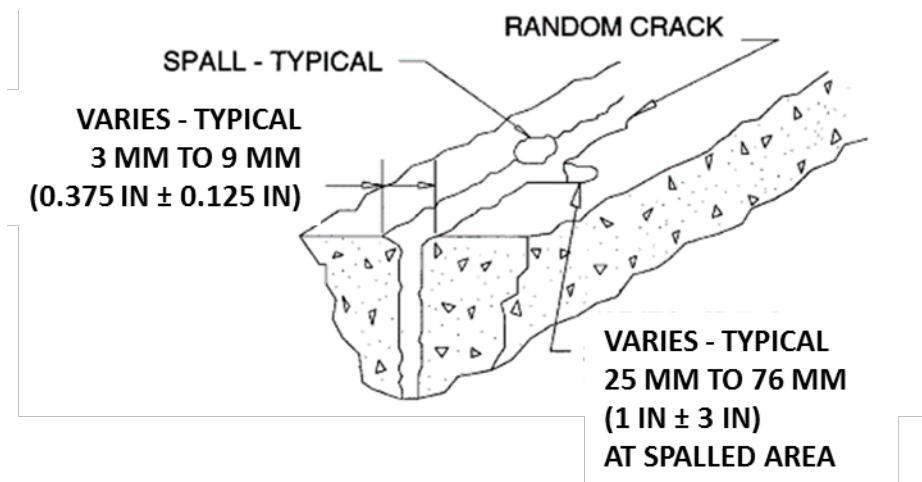
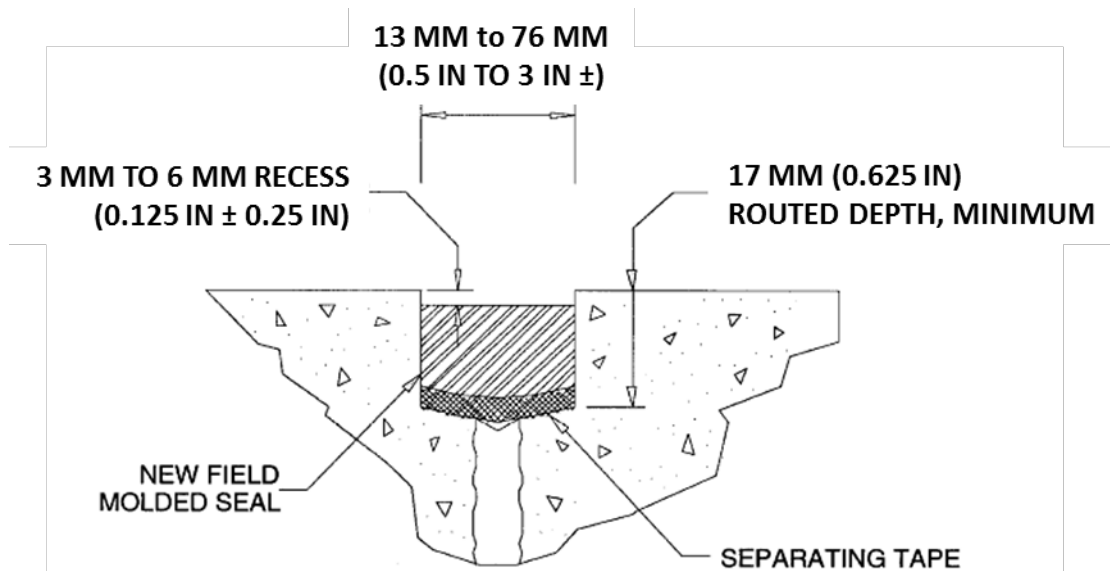


Figure 12-8 Repaired Random Crack



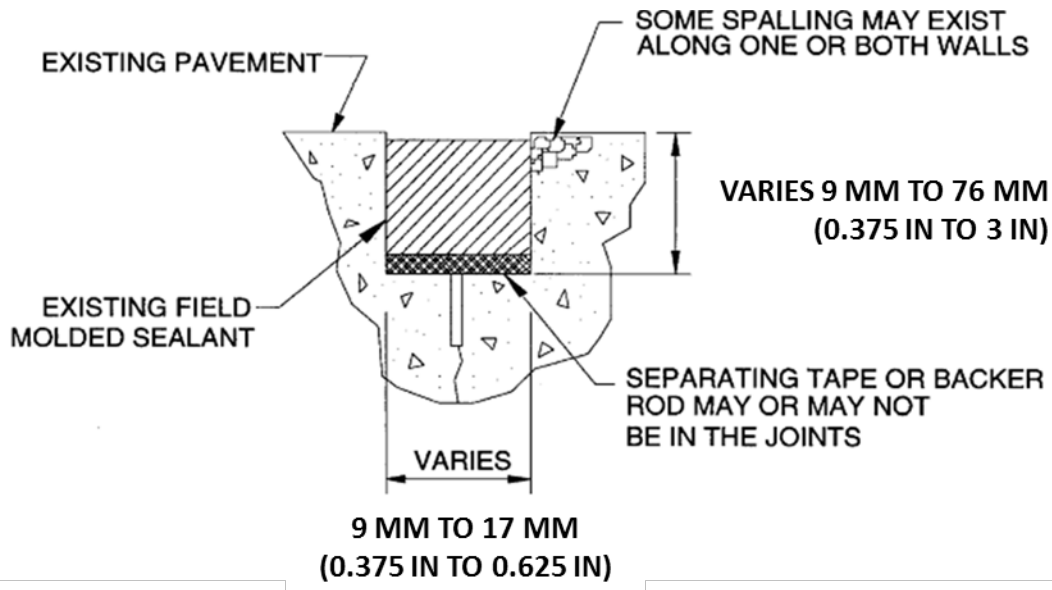
#### 12-10.4 Field Molded Joints.

See Figures 12-9, 12-10, and 12-11. The key steps in performing effective field molded crack sealing include the following:

1. Remove existing seal by saw-cutting with gang of saw blades. Width of cut: one saw blade width greater than existing joint width (excluding spalls); depth of cut: 0.625 inch (17 millimeters), minimum. For joints with backer rod, remove to bottom of backer rod. Existing joint seal or expansion board below saw-cut may remain in bottom of joint. Where spalling has widened the joint reservoir, saw-cut width need not be expanded beyond width required for unspalled condition.
2. Flush joint seal reservoir with high-pressure water only if it was wet sawed.
3. Remove all loose, poorly bonded, and delaminated concrete debris from joint seal reservoir (walls and bottom) by chipping with a hammer or chisel.
4. Sandblast both walls and bottom of joint seal reservoir.
5. Air-blow reservoir to remove debris and dry joint.
6. Install separating tape or backer rod in bottom of joint seal reservoir. See details for proposed repair of joints.

7. Prime joint reservoir walls if recommended by sealant manufacturer's published installation procedures.
8. Fill reservoir to within 0.125 to 0.25 inch (3 to 6 millimeters) of slab surface.

**Figure 12-9 Existing Spalled Field Molded Joint**



**Figure 12-10 Resealed Field Molded Joint with Separating Tape**

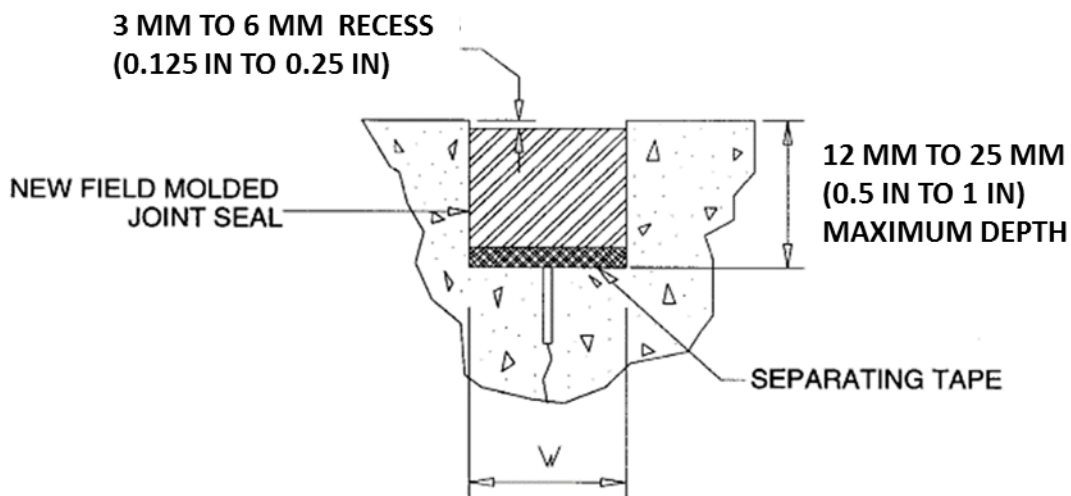
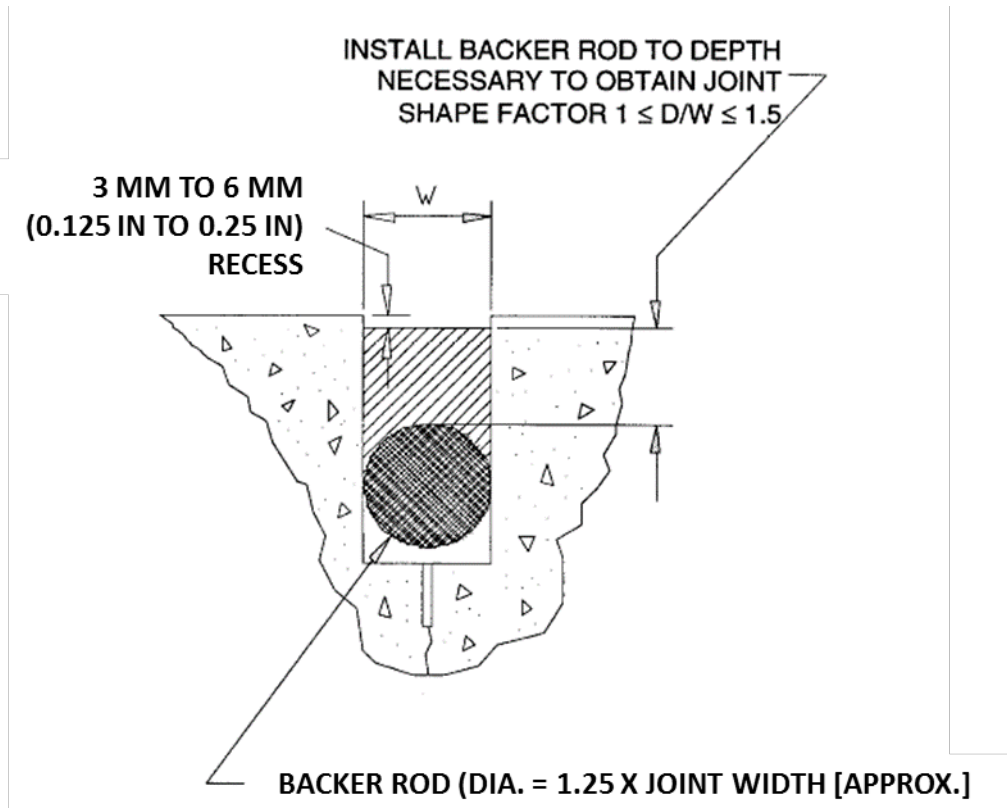


Figure 12-11 Resealed Field Molded Joint with Backer Rod



### 12-10.5 Partial-depth Joints.

See Figures 12-12 and 12-13. The key steps in performing effective partial-depth crack sealing include the following:

1. Make vertical saw-cut 2 inches (51 millimeters) deep, approximately 3 inches (76 millimeters) from distressed area. Overlap corner saw-cuts by 1 inch (25 millimeters), minimum.
2. Remove all concrete and loose material within the sawed area to sound concrete (3 inches [76 millimeters] minimum depth).
3. Use a separating medium to maintain and protect joints.
4. Use bonding agent to insure good contact between the pavement and patch as recommended by manufacturer's instructions.
5. Apply patch.
6. Apply curing compound to the patch surface if recommended by manufacturer's instructions.
7. After patch has cured, clean joint and apply joint sealant.

Figure 12-12 Existing Partial-depth Spalled Joint

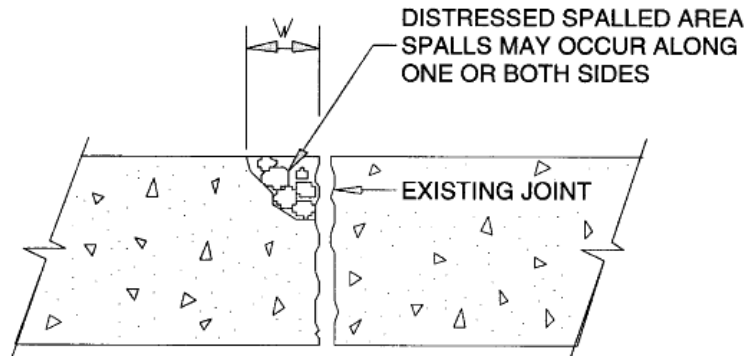
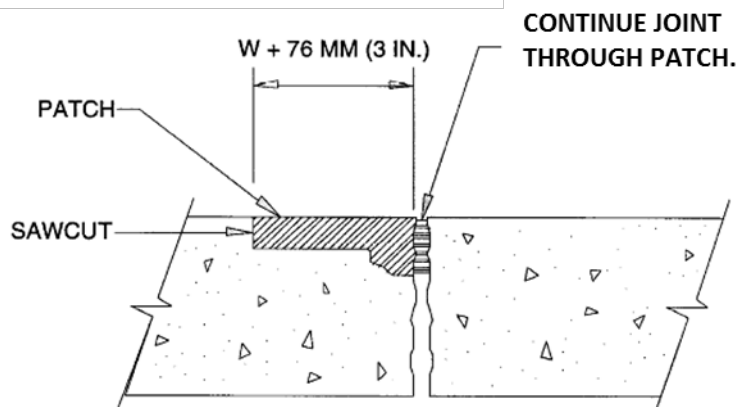


Figure 12-13 Repaired Partial-depth Joint with Backer Rod



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## CHAPTER 13 PARTIAL-DEPTH REPAIR OF CONCRETE PAVEMENTS

### 13-1 INTRODUCTION.

The purpose of partial-depth repairs is to correct localized areas of concrete pavement distress. Repair of this type restores rideability, deters further deterioration, reduces FOD potential, and provides proper edges so joints can be effectively resealed. Spalling can be a significant distress for airfield pavements because spalling leads to loose material, which results in FOD. Timely spall repairs can extend the service life of the pavement. Partial-depth repairs of spalled joint areas also restore a well-defined uniform joint sealant reservoir prior to joint resealing.

Partial-depth repairs perform well when installed correctly; however, partial-depth repair can exhibit premature failures due to improper installation techniques.

### 13-2 NEED FOR PARTIAL-DEPTH REPAIR.

Partial-depth repair is typically used to repair spalling either at pavement joints and cracks (Figure 13-1) or at mid-slab locations. In this chapter, reference is made to joint spalling repair only; however, the discussion is also applicable to crack spalling repair. Spalling is typically a localized distress and therefore warrants a localized repair.

If several severe spalls are present along one joint, it may be more economical to place a full-depth repair along the entire joint than to repair individual spalls. Also, if the spall depth is greater than one-third of the slab thickness, use full-depth patching.

#### 13-2.1 Joint Spalling.

Spalling along a joint can occur when unsealed joints are filled with incompressible materials that prevent expansion of the slab in hot weather and result in breakage of the concrete (Figure 13-2). Other causes of spalling at joints include keyway failures (of oversized, poorly designed keyways), poor construction, poor repairs, dowel bar lockup, improperly located dowels, and dowels in reamed-out sockets. Minor spall at joints may also be caused by snowplows.

#### 13-2.2 Mid-slab Spalling.

Spalling at mid-slab is generally caused by reinforcement that is too close to the surface and foreign matter or poor surface finish in the original PCC. Spalls create a rough ride and can accelerate deterioration.

**Figure 13-1 Pavement Joint Spall**



**Figure 13-2 Incompressible Causing Spalling at a Joint or Crack**



### **13-2.3 Partial-depth Repair Key Steps.**

The key steps in performing a partial-depth spall repair include the following:

1. Selection of repair boundaries
2. Removal of existing unsound concrete
3. Cleaning the repair area
4. Joint preparation for joint spall repair
5. Selection of the patch (repair) material
6. Placement of the patch material
7. Finishing activities

8. Treatment of saw-cut runouts and patch/slab vertical interface
9. Patch curing
10. Joint resealing

### 13-3 SELECTION OF REPAIR BOUNDARIES.

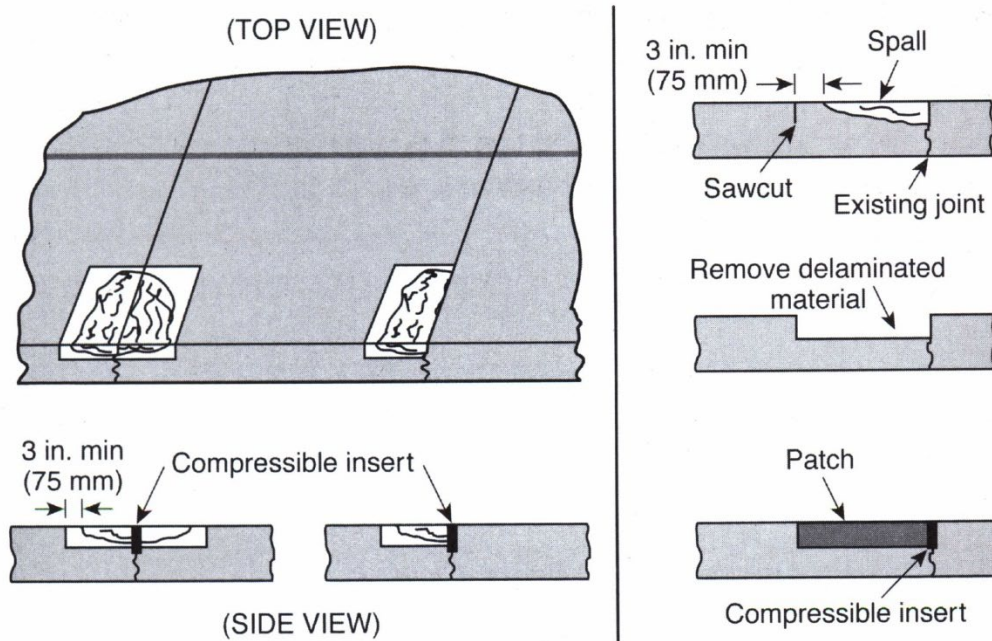
Prior to commencing work, survey the pavement to determine areas of unsound or delaminated concrete to establish the repair boundaries. During the survey, use a sounding technique to identify all areas of unsound concrete or delamination. Sounding the pavement to find delamination and spall removal areas is accomplished by striking the existing concrete surface with a steel rod or carpenter's hammer (Figure 13-3). Delaminated or unsound concrete will produce a dull or hollow thud, while sound concrete will produce a sharp metallic ring. Locate and remove all weak and deteriorated concrete to ensure the repair is effective.

Extend the repair boundaries beyond the detected delaminated or spalled area by 3 inches (75 millimeters) to assure removal of all unsound concrete (Figure 13-4). Keep the repair boundaries square or rectangular in line with the jointing pattern to avoid irregular shapes; irregular shapes may cause cracks to develop in the repair material. Consider combining repair areas along a joint if they are closer than 24 inches (600 millimeters) apart. This will help reduce costs and eliminate numerous small patches.

**Figure 13-3 Sounding with a Hammer**



Figure 13-4 Typical Spall Repair Boundaries



It is good practice to use rectangular-shaped repairs for all partial-depth spall repairs. The minimum length and width of the rectangular saw-cut boundary around a joint spall is 6 inches (150 millimeters). For corner spalls, do not make the rectangular saw-cut boundaries closer than 6 inches (150 millimeters) from the joint corner.

### 13-4 REMOVAL OF EXISTING CONCRETE.

#### 13-4.1 Sawing and Chipping.

To remove concrete by sawing and chipping, make a minimum 2-inch (50-millimeter) -deep saw cut (in a rectangular pattern at least 3 inches [76 millimeters] outside all visible deterioration) around the perimeter of the repair area. This will provide a vertical face of sufficient depth to provide stability to the patch (Figure 13-4). Additional saw-cuts may be made within the repair area to speed chipping. A saw cut 2 inches (50 millimeters) away from joints might reduce the possibility of damaging the opposite joint face. A saw cut along the opposite joint face made by skimming the blade along the joint face will remove sealant residue and leave a clean vertical joint face. Remove concrete within the repair area to the bottom of the saw cuts or to 0.5 inch (13 millimeters) into visually sound and clean concrete, whichever is deeper, with light pneumatic tools (Figure 13-5). It is important that the proper tools are used. The recommended maximum size of the chipping hammer for partial-depth repairs is 30 pounds (13.6 kilograms).

**Figure 13-5 Repair Boundary Sawing and Use of Chipping Hammer**

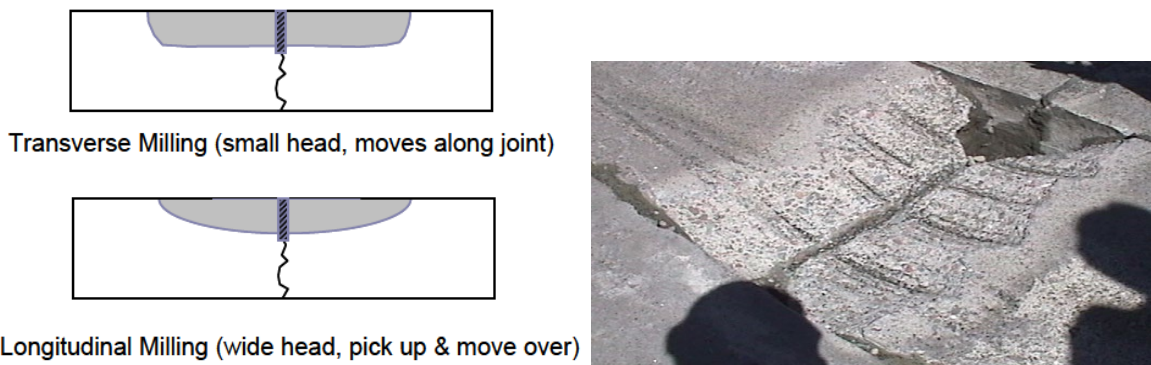


**13-4.2 Milling Process.**

Concrete within the repair area can also be removed by carbide-tipped cold milling equipment. Cold milling is especially effective where the repair area extends over the majority of the slab width (Figure 13-6) or along a long length of a longitudinal joint. Equip milling machines with a device for stopping at a preset depth to prevent excessive removal or damage to existing dowel bars or reinforcement.

After removal of the concrete in the repair area, survey by sounding the pavement again to ensure all unsound or delaminated concrete has been removed.

**Figure 13-6 Milling Techniques**



**13-4.3 Partial Versus Full-depth Repair.**

Occasionally, surface spalling will actually extend through the full slab depth or for more than one-third the slab depth. Do not attempt partial-depth repair at such locations. Mark the area and perform a full-depth repair. Make full-depth repairs if the concrete below one-third the slab depth is damaged during chipping or if dowel bars or reinforcing are encountered during removal.

**Caution:** Do not, under any circumstances, rest/place partial-depth repair material directly upon dowel bars or reinforcement. Typically, if a dowel bar is exposed within the repair area, it would indicate that the depth of repair is not acceptable. Completely expose steel reinforcement that is encountered in spall areas by removing at least 0.5 inch (13 millimeters) of concrete around the steel bars and the bars cleaned and covered with the patch material.

### 13-5 CLEANING.

Prior to patching, clean the exposed faces, bottom of the patch area, and any exposed steel to remove all loose particles, oil, dirt, dust, asphaltic concrete, rust, and other contaminants. As a minimum, air-blow with compressed air, wash with high-pressure water, and air-blow again (Figure 13-7). Check the prepared surface prior to placing the new patch material. Thoroughly clean the area with a power broom, vacuum sweeper, or hand broom to prevent debris from reentering the repair zone. Any contamination of the surface will reduce the bond between the patch material and the existing concrete.

**Figure 13-7 Cleaning Repair Area (Sandblasting/Water Blasting, and Air Blowing)**



### 13-6 JOINT PREPARATION.

When placing a partial-depth patch along a joint, do not allow the repair patch to bond to the joint face of the adjacent concrete and do not allow the repair material to penetrate into the joint. The most frequent cause of failure of partial-depth repairs at joints is excessive compressive stresses on the repair material abutting the adjacent concrete joint face. Partial-depth repairs placed directly against transverse joints will be crushed by the compressive forces created when the slabs expand and insufficient room is provided for the thermal expansion. Failure may also occur when the repair material is allowed to infiltrate the joint opening along the sides of the repair area and below the

bottom of the repair, resisting slab movement and thereby preventing the joint from functioning.

### 13-6.1 Joint Bond-Breaking.

Elimination of bond between the patch and the adjacent concrete face can be accomplished by using a compressible insert. Styrofoam, asphalt-impregnated fiberboard (Figure 13-8), and plastic joint inserts are commonly used along the joint prior to placing the patch material. Patches that abut working joints or cracks that penetrate the full depth of the slab require a compressible insert or other bond-breaking medium to reform the joint or crack and prevent the repair material from flowing into the side and bottom of the joint areas undergoing repair. Use of an insert will form a uniform face against which the joint or crack can be properly sealed and will separate the patch from the adjacent slab.

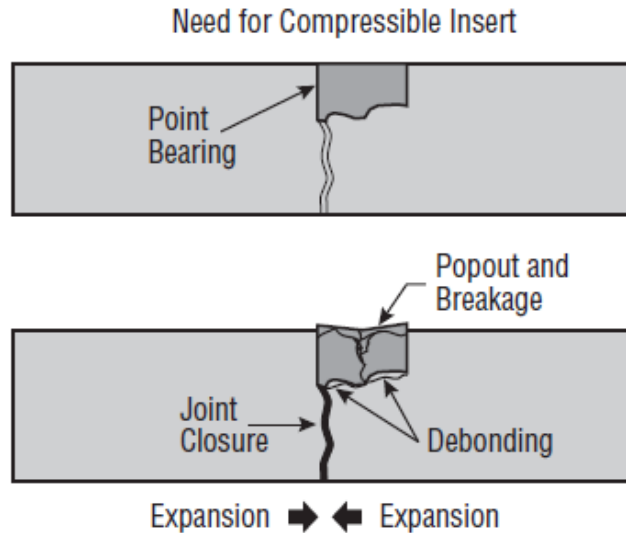
**Figure 13-8 Compressible Insert**



### 13-6.2 New Joint/Crack Width.

Ensure the new joint or crack width adjacent to the repair is equal to or more than the width of the existing joint or crack. Failure to reform the joint or crack as described can result in point bearing stress at the repair area and failure by blowup, delamination, or new shear planes, sometimes in the adjacent slab (Figure 13-9).

Figure 13-9 Failure Due to Non-use of Compressible Insert



### 13-6.3 Shoulder Joints.

When placing a partial-depth patch along a shoulder joint, place a piece of joint material along the slab edge even with the surface to prevent the patch material from penetrating the open shoulder interface. A wooden form may also be used for this purpose. Otherwise, the material may restrict longitudinal movement of the slab in response to thermal changes and result in damage to the repair or the shoulder.

### 13-7 PLACEMENT OF PATCH MATERIALS.

The volume of material required for a partial-depth repair is usually less than 2 cubic feet (0.056 cubic meter); therefore, mix cement-based patching material onsite in a small mobile drum or paddle mixer. Transit mix trucks and other large equipment cannot efficiently produce such small quantities since maximum mixing times for a given temperature may be exceeded, decrease the quality, and result in waste of material. Slightly overfill the repair area to compensate for consolidation. Tamp the repair to consolidate the repair material. The patch material also may be consolidated by small spud vibrators to eliminate voids at the interface of the patch and the existing concrete. Vibrators greater than 1 inch (25 millimeters) in diameter are not recommended for this work. On very small repairs, hand tools are sufficient to work the repair and attain adequate consolidation.

When using premixed or proprietary materials, follow the vendor's instructions related to patch material placement. If the patch material packaging is damaged, do not use the patch material.

### 13-8 FINISHING.

Finish the patch area flush to the cross-section of the existing pavement without leaving excess material on the adjacent pavement surface (Figure 13-10). The recommended finishing procedure is to screed from the center of the patch area to the patch boundaries. By moving the screed toward the patch boundaries, the material is pushed toward the vertical interface to increase the potential for high bond strength. After finishing, give the patch a burlap drag or broom finish to approximately match the surface finish of the existing adjacent concrete pavement unless a grinding operation is to follow.

**Figure 13-10 Finished Patches**



### 13-9 TREATMENT OF SAW-CUT RUNOUTS AND PATCH/SLAB INTERFACE.

Use the paste portion of the repair material to fill any saw-cut runouts that extend beyond the patch perimeter at patch corners. This will prevent any spalling at these locations.

If the repair material is properly placed in the patch area there will not be any need to place any sealer type material along the perimeter of the patch surface. However, if within a few days or few weeks, the patch material appears to be pulling away from the existing concrete, seal the patch/slab interface with a cement grout or an epoxy material. Use of a joint sealant for this purpose is not recommended.

### 13-10 CURING.

Proper curing of cement-based partial-depth repairs is very important due to the large surface of small patches compared to the volume of patch material, as well as the fact that concrete gains bond strength much slower than it gains compressive strength. Proper curing requires the application of curing compound at the time bleed water, if any, has evaporated from the surface of the patch. Because curing is critical for cement-based patches, for the first 24 hours wet-cure with burlap or a similar material and apply a curing compound after that period. In hot or dry climates, cure the patches for three

days with a double mat of saturated burlap covered with polyethylene sheeting over which plywood or lumber is placed. Remove the covering and re-saturate the burlap as often as is necessary, but at a minimum of once a day, and the covering re-placed.

For premixed and proprietary repair materials, follow the manufacturer's directions regarding curing. Some rapid strength material may not require curing application and can be opened to traffic within four hours.

### **13-11           JOINT/CRACK RESEALING.**

Resealing the repaired joint is extremely important because it will help prevent moisture and incompressible materials from entering the joint or crack and causing further damage. It is important that the new transverse and longitudinal joints constructed within the patch area be formed or sawed to provide the proper joint seal reservoir and match surrounding joints. Ensure the joint faces are clean and dry for good sealant performance.

## CHAPTER 14 FULL-DEPTH REPAIR OF CONCRETE PAVEMENTS

### 14-1 INTRODUCTION.

When normal maintenance procedures can no longer correct the deteriorated concrete pavements, full-depth repair may become necessary to restore damaged areas to their original condition and extend the service life of the pavement. Full-depth repairs are generally necessary when slabs have been shattered (Figure 14-1) or have deteriorated to such an extent that the safe support of the required load is no longer possible. Full-depth repairs are an effective means of restoring the rideability and structural integrity of deteriorated concrete pavements and, therefore, extending their service life.

### 14-2 NEED FOR FULL-DEPTH REPAIR.

There are several types of distress that occur at or near transverse joints that may require full-depth repair when classified as medium- or high-severity level distress. Comprehensive distress manuals (ASTM D6433, *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*, and ASTM D5340, *Standard Test Method for Airport Pavement Condition Index Surveys*) are available that define distress types and severity levels.

#### 14-2.1 Rigid Pavement Distress Types.

Types of distress that occur in rigid pavements that may justify full-depth repair when classified as medium- or high-severity distresses include:

- Blowup
- Corner break
- Durability (“D”) cracking
- Patch deterioration
- Shattered slab (a slab broken into four or five pieces with some or all cracks of high severity or a slab broken into six or more pieces with over 15 percent of the cracks of medium or high severity) (Figure 14-1)
- Spalling (if spalling extends to greater than one-third the slab thickness)
- Punchout
- Railroad crossing distress

**Figure 14-1 Shattered Slabs**



#### **14-2.2 Other Rigid Pavement Concerns.**

Concrete pavements may also exhibit spalling and faulting at intermediate cracks. This deterioration may be caused by repeated heavy traffic loads, failure of doweled joints to function properly, and/or the intrusion of incompressible materials in the open cracks. If the spalling extends to greater than one-third the slab thickness or if the faulting is in excess of 0.5 inch (12 millimeters), full-depth repair at the crack locations may be considered.

#### **14-2.3 Full-Depth Repair Key Steps.**

The key steps in performing a full-depth repair include the following:

1. Selection of repair boundaries
2. Sawing of repair boundaries
3. Removal of existing concrete
4. Restoring the repair area support (subgrade and base preparation)
5. Dowel bar and tie-bar placement
6. Replacing reinforcement, if any
7. Restoring expansion joints, if any
8. Use of filler material at joints
9. Dowel bar placement
10. Concrete placement
11. Concrete finishing and texturing
12. Curing

13. Joint sealing
14. Opening to traffic.

**Caution:** Successful performance of full-depth repairs requires proper restoration of the base and subgrade and provision of effective load transfer across trafficked joints, other than thickened edge slip joints. Also, full-depth repairs are not effective over the long-term if the existing pavement exhibits materials-related distress, such as D-cracking or ASR.

#### **14-2.4 Selection of Repair Boundaries.**

First, conduct a detailed survey to accurately identify the required repair areas so all significant underlying distresses are identified and corrected. Quite often, and particularly in freeze-thaw climates, the deterioration near joints and cracks is greater at the bottom of the slab than is apparent from the top of the slab.

In both plain jointed and reinforced jointed concrete pavement, partial-slab replacement is acceptable where the distresses are within one-half of the slab length. Full-width slab patching is required if the original slab width is less than 20 feet (6 meters) or full-depth cracks are located within the interior area of the slab. A minimum slab length is required to avoid rocking and pumping of the repair. General experience indicates that 10 feet (3 meters) is a minimum length for airfield applications. For roadways with 11- to 14-foot (3.4- to 4.3-meter) -wide lanes, the repair area needs to be full lane width with a minimum length of 6 feet (1.8 meters). If the repair extends over half the length of the panel, consider full panel replacement.

##### **14-2.4.1 Saw Cut.**

Saw cut will be a minimum of 3 feet (900 millimeters) from a joint and the minimum patch length will be 6 feet (1.8 meters). Saw cut in lines forming rectangles parallel with or perpendicular to the jointing pattern.

##### **14-2.4.2 Patch Boundary.**

Extend the patch boundary to the joint(s) if the length of the patch is greater than half the length of the panel.

##### **14-2.4.3 Utility Cut.**

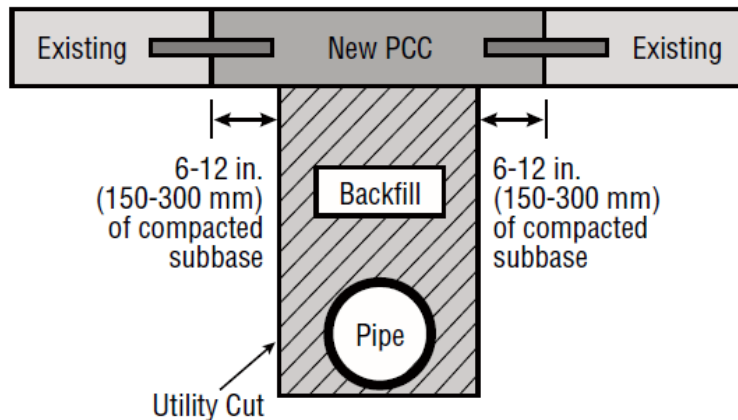
If the patch is a utility cut, make cut about 12 inches (300 millimeters) beyond limits of the excavation and any sloughing of the trench. This saw cut limit of the excavation area allows the repair concrete to extend beyond the excavation. (Figure 14-2)

##### **14-2.4.4 Continuously Reinforced Concrete.**

For continuously reinforced concrete, position the patch area so the distressed portion is in the middle of the patch area. Patch at least 6 feet (1.8 meters) in length if

reinforcing steel is to be tied, and at least 4 feet (1.2 meters) long if welded or if mechanical splices are used to connect reinforcing steel.

**Figure 14-2 Utility Cut**



#### **14-2.5 Sawing Cutting Repair Boundaries.**

The repair boundaries of mesh-reinforced, plain doweled, and plain undoweled jointed concrete pavement are typically cut full-depth using diamond blade sawing (Figure 14-3). Sawing is the recommended method.

##### **14-2.5.1 Hammer Use.**

Do not use hammers to outline the area. The rough joint formed by hammers typically spalls in service and it is difficult to lift out the concrete within the repair boundaries or break it up with large pavement breakers.

##### **14-2.5.2 Partial-Depth Cuts.**

The use of the partial-depth saw cut is not recommended. The partial-depth saw cut does provide some aggregate interlock due to a rough face but micro-cracking will develop at the bottom of the repair area and the bottom of the slab may spall when using a large pavement breaker to shatter the concrete within the repair boundaries.

##### **14-2.5.3 Full-Depth Cuts.**

Full-depth saw cuts will completely separate the concrete that is to be removed, leaving undamaged vertical faces, and eliminate damage at the bottom of the remaining slab.

##### **14-2.5.4 Warm Weather.**

On warm days, a double saw cut method may be necessary to prevent binding of the sawing blade.

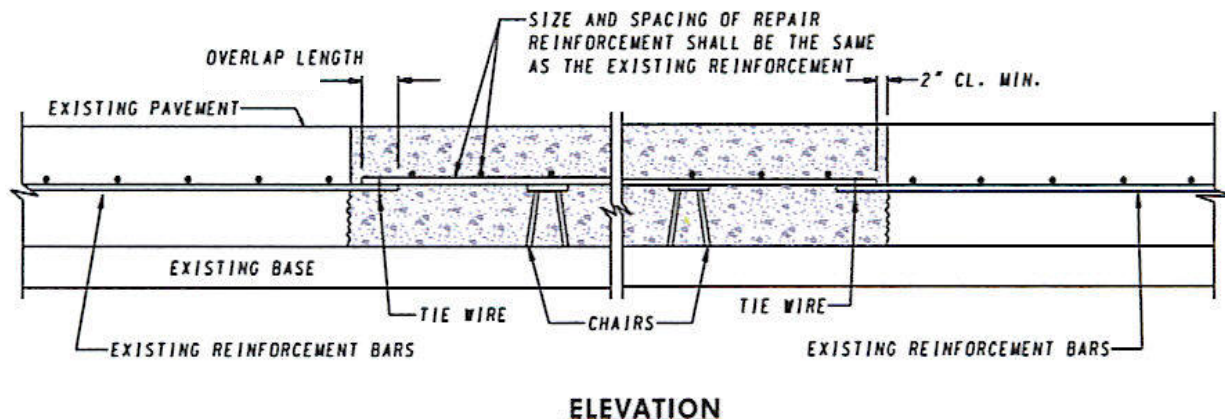
Figure 14-3 Diamond Blade Sawing



#### 14-2.5.5 Continuously Reinforced Concrete (CRC).

The repair boundaries of CRC pavement are provided by sawing full depth at the repair boundaries. Partial-depth saw cuts above the reinforcing steel are then provided at a distance (typically about 20 inches [500 millimeters]) required by the lap length of the reinforcement) from the repair boundaries (Figure 14-4). Locate the partial-depth saw cuts at least 18 inches (450 millimeters) from the nearest tight crack and do not saw across an existing crack. If any of the reinforcing steel is cut during partial-sawing, extend the repair area by the required lap length of the reinforcement.

Figure 14-4 CRC Pavement Full-depth Repair Layout



#### 14-2.5.6 Matching Joints.

Matching joints in adjacent lanes (typically for roadways) is not necessary as long as a debonding material (e.g., fiberboard) has been placed along the longitudinal joint to separate the lanes. However, if the distressed areas in both lanes are similar and both

lanes are to be repaired at the same time, it is a good practice to align repair boundaries to avoid small offsets and maintain continuity.

#### **14-2.6 Removal of Existing Concrete.**

Do not use procedures for removal that spall or crack adjacent concrete or significantly disturb the base or subgrade. There are two basic methods to remove concrete pavement, as discussed below.

##### **14-2.6.1 Breakup and Cleanout Method.**

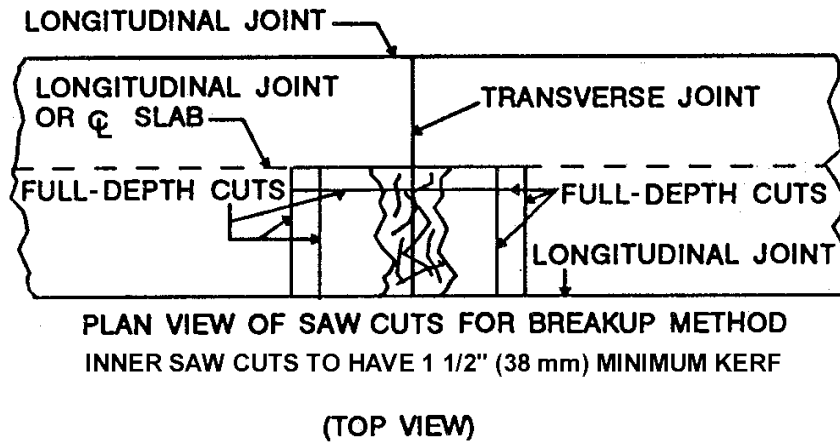
Concrete breakup is accomplished using a pavement breaker with removal by a backhoe (Figure 14-5). This method disturbs the base and requires base replacement or filling with concrete. It also has the potential to damage the adjacent slab if proper sawing procedures are not followed. This is not a preferred method for concrete removal.

After the repair is isolated by full-depth saw cuts, additional saw cuts using a wheel saw with at least 1.5-inch (38-millimeter) kerf, are made within the repair area, parallel and approximately 1.5 feet (450 millimeters) from each perimeter saw cut or joint (Figure 14-6). Begin breakup in the center of the removal area within the inner saw cuts. After breakup of the inner area, a backhoe can be used to gently pull the outer region free of the adjacent slab, or this strip can be broken up with light hand-held jackhammers.

**Figure 14-5 Concrete Removal Using Backhoe**



Figure 14-6 Additional Saw Cuts (Breakup Method)



#### 14-2.6.2 Lift-out Method.

This is a recommended practice as it results in little damage to the base and the subgrade. This procedure is accomplished using a crane or front-end loader to lift the deteriorated concrete from its in-place position (Figure 14-7). Closely control lift-out operations to prevent accidents. After the repair area is isolated by full-depth saw cuts, holes are drilled through the slab and fitted with lift pins and the slab is then lifted in one or more pieces. If it is necessary to decrease the load, the slab may be saw cut into smaller pieces.

Figure 14-7 Lift-out Method

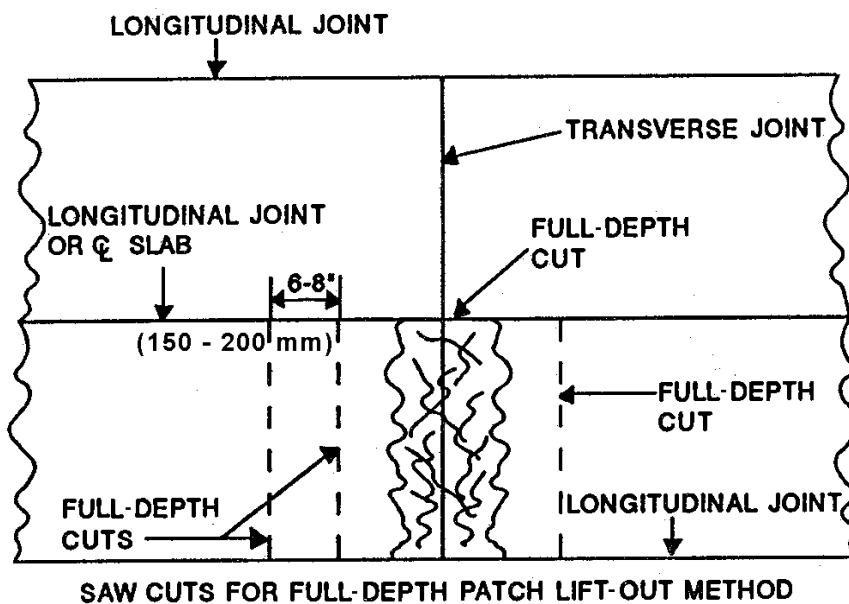


During hot weather, the sawing equipment may bind during initial transverse sawing procedures. It may be necessary to perform sawing at night when the

temperatures are lower and the slabs are contracting. Another solution is to use a carbide-tipped wheel saw to provide a pressure relief cut within the patch area prior to the perimeter sawing (Figure 14-8). It is strongly recommended that the carbide-tipped wheel saw cut be made no closer than 6 to 8 inches (150 to 200 millimeters) from the proposed patch boundary due to the possibility of damage and micro-cracking in adjacent concrete. The same procedures may be used for the removal of CRC. Carefully remove concrete in the two reinforcing lap areas by jackhammering so as not to damage the reinforcing.

For CRC pavements, after the concrete between the two full-depth saw cuts is removed, remove the concrete between the full-depth saw cuts and the partial-depth saw cuts by jack-hammering to expose the steel reinforcement.

**Figure 14-8 Pressure Relief Cuts for Lift-out Method**



(TOP VIEW)

#### 14-2.7 Subgrade and Base Preparation.

After the deteriorated and loose concrete has been removed, examine the base course. Remove all excess disturbed material. Compact the patch area using a plate compactor (Figure 14-9). If excessive moisture exists in the repair area, remove it or dry the repair area before re-grading and compacting the base. It is difficult to adequately compact granular material along the perimeter and the corner areas of the patch, which may result in settlement of the patch under future traffic loading. Replacing some or all disturbed base material with lean concrete or flowable fill is a very good alternative for critical operational areas.

**Figure 14-9 Patch Area Compaction**



#### **14-2.8 Dowel and Tie-Bar Placement.**

In full-depth repair of jointed concrete pavements, good load transfer across the transverse repair joints is a critical factor affecting the performance of the full-depth repairs. Load transfer is best achieved by properly installed dowel bars of sufficient size and number. For dowel bar size and spacing, follow the recommendations provided in Table 18-1.

Deformed tie-bars along longitudinal joints in new construction are used to restrict movement at these joints. These bars are typically #5 or #6 in size and spaced at about 30 inches (750 millimeters). For roadway full-depth repairs, tie-bars along interior joints (e.g., centerline joint) are necessary for repair lengths exceeding 40 feet (12 meters) to prevent drifting of the full-depth patch.

For full-depth repair of airfield pavements, incorporate dowel bars along longitudinal joints within the patch and dowel all edges to the existing pavement (longitudinal and transverse).

##### **14-2.8.1 Smooth Dowel Bars.**

Use of smooth dowel bars at the joints provide load transfer across these joints while allowing the joint to open and close as the surrounding pavement expands and contracts in response to temperature and moisture changes.

### 14-2.8.2 Deformed Dowel Bars.

In contrast to smooth dowel bars, deformed dowel bars are used along certain repair joints to provide both load transfer and prevent movement at the specific joints. Since in repair both smooth and deformed dowel bars have a load transfer role, select their dimensions and spacing based on the design loading for that facility.

### 14-2.9 Drilling Dowel and Tie-Bar Holes.

Installation of smooth or deformed dowel bars and deformed tie-bars requires drilling holes at specified locations into the exposed (saw cut) face of the existing slab. Gang drills are available to drill multiple holes simultaneously (Figure 14-10). The gang drill maintains the drills in a rigid frame to prevent the drill bits from wandering and holds them in a horizontal position at the correct height (typically, one-half the slab thickness). Make the depth of the holes approximately one-half the length of the dowel or tie-bar. Do not use hand-held drills to drill holes for dowel bars as the required dowel alignment cannot be easily achieved.

**Figure 14-10 Drilling Multiple Holes at Mid-depth for Dowel Bars**



Hole diameters exceeding the bar diameter by 0.125 inch (3 millimeters) or less are recommended when using epoxy materials. Clean the drilled holes using air blasting before injecting the epoxy grout into the hole. Take care during the drilling to ensure that spalling around the drilled hole at the joint face is kept to a minimum. Ensure spalling does not exceed the diameter of the retainer ring used to keep the epoxy from flowing out of the drilled hole. In case of such minor spalling, the epoxy is used to patch the spalls. For larger spalls around the drilled holes, the spalled area needs to be repaired before installing the dowel bars.

### 14-2.10 Dowel and Tie-Bar Installation.

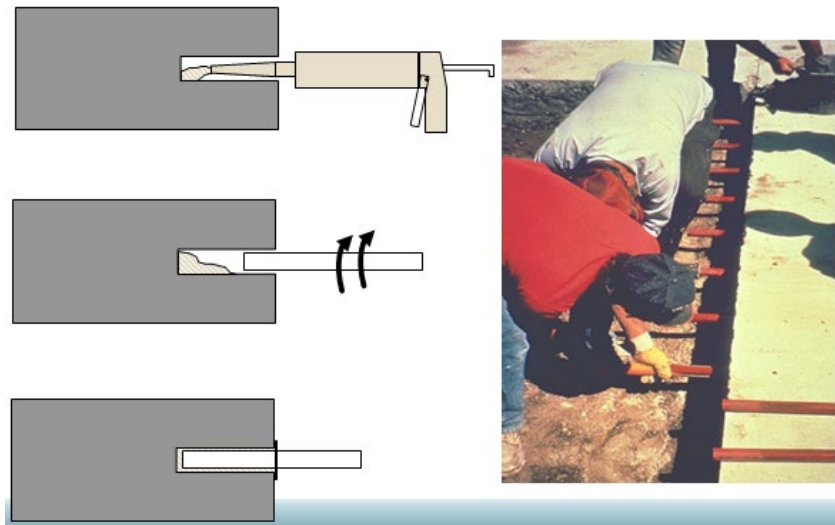
Use dowels, tie-bars, or reinforcement that are clean and free of flaking rust. Specify appropriate sizes of dowels (at least matching the size of dowel bars used in the

existing pavement) for different thicknesses of pavements (refer to UFC 3-260-02, *Pavement Design for Airfields*, for required sizes). Exercise care in epoxy grouting dowels or tie-bars to ensure complete coverage and support of the bars. Use grout retention devices that fit tightly over the dowel or tie-bar and seal the hole to prevent loss of epoxy. The steps for correctly installing dowel bars after air-blasting the holes are illustrated in Figure 14-11.

The proper installation of the smooth dowel bars is very important. Misaligned dowels can lead to early joint failure (spalling around the dowel bars) or cracking in the slab panel adjacent to the joint. The smooth dowels allow movement of the adjoining slabs. Oil or treat with a debonding material the portion of the bars that extend into the repair when using dowels to prevent bonding of the bars with the repair concrete. Cap one end of dowels used at expansion joints, in addition to oiling or treating with a debonding material, to permit further penetration of the dowels into the concrete when these joints close during warm weather.

Deformed tie-bars with surface ridges provide a locking anchorage with surrounding concrete. These tie-bars are placed in joints that are not intended to have movement.

**Figure 14-11 Dowel Bar Installation**



- A. Injecting the epoxy into the back of the hole in sufficient amount to ensure full coverage around the inserted dowel bars
- B. Inserting dowel bars into the hole with a slight twisting motion
- C. Using a retainer ring to stop the epoxy from flowing out of the hole

#### **14-2.11 Continuous Reinforced Concrete (CRC) Pavement Repair.**

Successful performance of CRC pavements requires good load transfer across all transverse cracks and repair joints. Failure to provide adequate load transfer will cause the repair and the surrounding pavement to fail due to excessive deflection at the joints.

For conventional full-depth repair of CRC pavements, the longitudinal reinforcing is generally carried through the repairs by carefully removing the old concrete to allow the appropriate length of steel (lap length) from the existing pavement to extend into the repair area. This steel is then tied, welded, or mechanically connected to new reinforcing steel that extends through the repair area. When replacing reinforcing steel in the patch area, match the original rebar in size (diameter), grade, and number. Place the new bars on bar supports to ensure proper position and cover. Do not extend bars closer than 2 inches (51 millimeters) to the patch/slab interface.

##### **14-2.11.1 Tied Splices.**

Lap tied splices the proper length that provides full bar strength. The recommended lap length for tying longitudinal steel is a minimum of 25 times the diameter of the steel bars.

##### **14-2.11.2 Welded Splices.**

Use the proper length for the welding procedure chosen when using welded splices. Lap bars at the center of the repair area to avoid the potential buckling of bars on hot days.

##### **14-2.11.3 Mechanical Splices.**

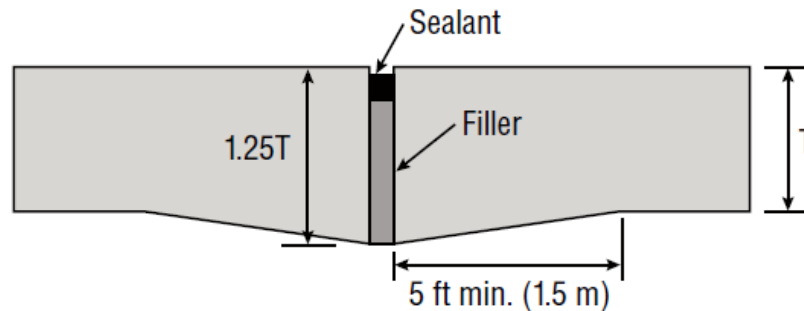
Use mechanical splices in accordance with the supplier's instructions.

#### **14-2.12 Expansion Joints.**

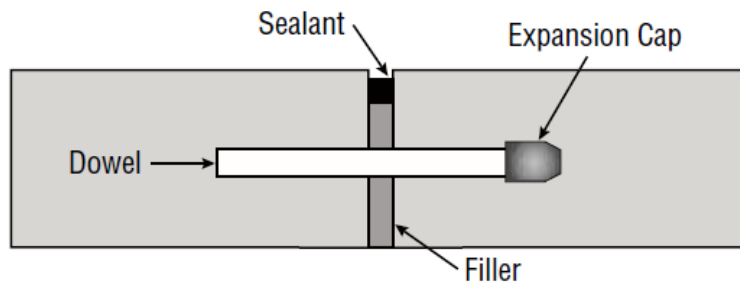
Expansion joints are placed in concrete pavements to provide relief for expansion of the concrete pavement due to temperature changes. Generally, expansion joints are installed at all intersections of pavements with structures or when a pavement ends near a structure but are rarely required within pavement features.

Expansion joints may be required if longer-length full-depth repairs are made during cool weather when adjacent concrete is in a contracted state or crushing and spalling of concrete at the joints may occur during subsequent hot weather when the concrete expands. Keep expansion joints in pavements to the minimum necessary to minimize future maintenance issues. The types of expansion joints commonly used by the military are the thickened-edge expansion joint (Figure 14-12) and the doweled type expansion joint (Figure 14-13).

**Figure 14-12 Thickened-edge Expansion Joint**



**Figure 14-13 Doweled Expansion Joint**



#### **14-2.12.1 Thickened-edge Longitudinal Expansion Joint (Without Dowels).**

The thickened-edge type is suggested for longitudinal expansion joints (slip joints) within airfield pavements. Dowels are not used in thickened edge longitudinal expansion joints because differential expansion and contraction parallel with the joints may develop undesirable localized stresses and possibly failure of the existing concrete or the full-depth patch, especially near the corners of existing slabs at transverse joints.

#### **14-2.12.2 Thickened-edge Isolation Joint (Without Dowels).**

The thickened-edge isolation joint (without dowels) is the expansion joint best suited to surround or separate any structure that projects through, into, or against the pavement (approaches to buildings, drainage inlets, roadway bridges, and hydrant refueling outlets).

#### **14-2.12.3 Doweled Transverse Expansion Joints.**

Use doweled transverse expansion joints within roadway pavements. However, at the angular intersection of pavements, it might be desirable to allow some slippage in the transverse joint to prevent the expansion of one pavement from distorting the other. In such instances, design the transverse expansion joint as a thickened-edge expansion joint.

#### **14-2.13 Filler Material.**

Use non-extruding type material for filler material for the thickened-edge and doweled-type expansion joint. The type and thickness of the filler material will depend upon the particular project. Usually, a preformed material of 0.75-inch (20-millimeter) thickness will be adequate, but in some instances a greater thickness may be required, depending on the geometric design of the facility and temperature at the time of full-depth repair. Use a heavy coating of bituminous material not less than 0.25 inch (6 millimeters) in thickness or a standard non-extruding type material not less than 0.25 inch (6 millimeters) in thickness for filler material for thickened-edge slip joints.

Filler material at expansion joints where dowels are used require that the dowels be securely placed and properly aligned. Drill or punch the non-extruding filler material to the exact diameter at the location of the dowels. Furnish it in lengths equal to the width of the placement. When more than one length of the filler board is used along a joint, hold the abutting ends of the filler in alignment. Hold the filler boards firmly in place and extend downward completely to the bottom of the slab and hold the top edge about 0.5 inch (13 millimeters) below the surface of the pavement. Protect the top edge of the filler material while the concrete is being placed. Use a zip strip to accomplish this, where available.

#### **14-2.14 Concrete Placement.**

Conventional concrete is typically used for full-depth repairs. The concrete mixture selection depends on the curing time available to reach required strength before the repair area is opened to traffic. If it is acceptable for the concrete to cure for several days (similar to new construction), regular concrete mixtures using Type I or Type II cement can be used. If an earlier opening time (12 hours to 3 days) is needed, a high early-strength concrete, incorporating a higher volume of Type I or Type II cement or using Type III cement, can be used. However, carefully consider the use of a higher volume of cement in areas subject to ASR in concrete. Follow standard concrete placement procedures, including concrete consolidation procedures.

Place the concrete when the ambient temperature is between 40 and 90 degrees F (4 and 32 degrees C).

##### **14-2.14.1 Vibration Adjacent to Edge.**

Give extra attention to ensure that the concrete is vibrated well around the edges and beneath the reinforcement.

##### **14-2.14.2 Rapid-set Proprietary Cementitious Materials.**

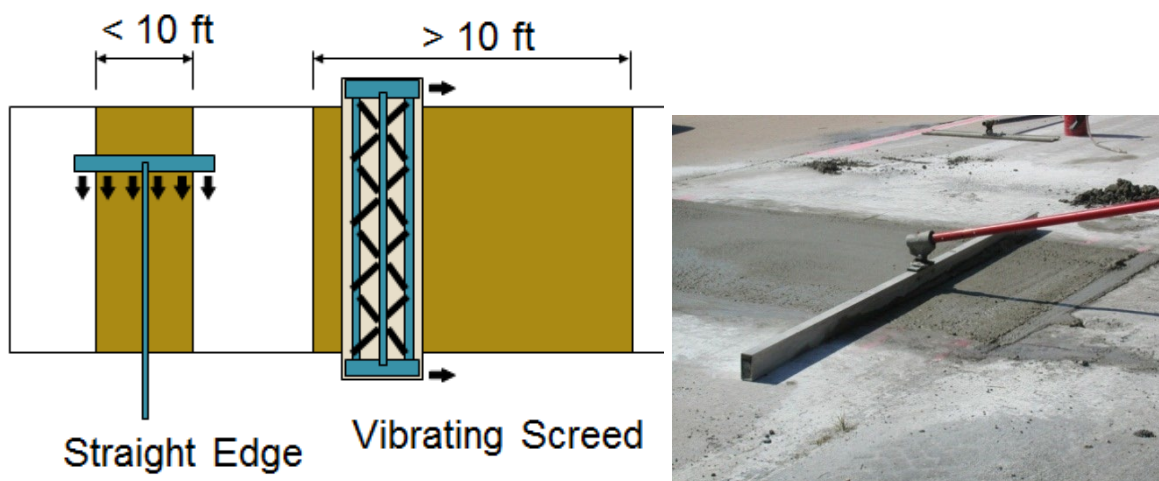
Rapid-set proprietary cementitious materials that attain sufficient strength for opening to traffic in as little as four hours are available. Use rapid-set proprietary materials in compliance with the manufacturer's recommendations. These recommendations

typically include mixture proportioning, placing, consolidation, curing, time required before opening to traffic, and allowable placement temperature ranges.

#### 14-2.15 Concrete Finishing and Texturing.

Follow standard procedures when finishing. For repairs less than 10 feet (3.048 meters) in length, strike off the surface of the concrete with the screed parallel to the centerline of the pavement. For repairs more than 10 feet (3 meters) in length, strike off the surface with the screed perpendicular to the centerline of the pavement. Give extra attention to ensure the concrete is not over-finished. Before the concrete becomes non-plastic, give the surface a burlap drag or broom finish to approximately match the surface finish of the existing adjacent concrete pavement unless a grinding operation is to follow the repair work. Typical finishing techniques are illustrated in Figure 14-14.

Figure 14-14 Typical Finishing Techniques for Full-depth Repairs



#### 14-2.16 Curing.

There are many ways to cure concrete. Wet burlap (with or without sand) or white pigmented curing membranes are commonly used for full-depth repairs. Although ponding and constant spraying are the best curing methods, it is generally not practical to do so. Use of white pigmented curing membrane is better for indication of proper coverage and minimizes heating from solar radiation on warm, sunny days. Start curing as soon as the concrete has set sufficiently and the bleed water, if any, has evaporated, but typically no later than 45 minutes after concrete finishing. In hot weather conditions, curing may need to be initiated earlier to minimize the risk of plastic-shrinkage cracking. Proper concrete curing is crucial to achieving a good repair.

#### 14-2.17 Joint Sealing.

Seal any longitudinal or transverse joints around the perimeter of the repair area and any intermediate joints within the repair area. This reduces the entry of water, which

may cause pumping and faulting, and reduces the incidence and severity of spalling along the joints. Saw, do not form, the transverse and longitudinal joint sealant reservoirs at the repair area.

#### **14-2.17.1 Inspection of Saw Cuts.**

After joint sawing for sealing purposes, inspect the saw cuts for spalling. Repair spalls that extend more than 0.25 inch (6 millimeters) horizontally from the sidewall of the saw cuts. Patch void areas caused by honeycombing of the concrete to provide a solid joint sidewall for the sealant to bond.

#### **14-2.17.2 Cleaning Joints.**

Following the sawing operation, clean the joint by sandblasting to remove laitance, sawing dust, and other foreign debris from the joint sidewalls and from the pavement surface adjacent to the joint to a width of approximately 1 to 2 inches (25 to 50 millimeters). A multiple-pass technique has proven very successful in removing foreign debris. When using the multiple-pass technique, the nozzle is directed at one of the joint faces and that face is sandblasted the entire length of the slab. After one face has been completed, the nozzle is directed at the other joint face and it is sandblasted for the entire length of the slab. The pavement surface adjacent to the joint is then sandblasted to remove all surface debris. If water-blasting is used instead of sandblasting, employ a multiple-pass technique and dry the joints before starting the sealing operation. Cleaning the joint is one of the most important steps in obtaining high-quality sealed joints. If the joints are not clean and dry before the sealant is installed, the sealant will usually prematurely fail.

After the joint has been cleaned by sandblasting, clean it again with compressed air to remove any remaining sand or dust. However, complete the final air cleaning of the joint immediately before sealing to prevent sand and dust from blowing back into the joint. A vacuum sweeper can be used to clean around the joints, which will help reduce the amount of debris that blows back into the joints.

#### **14-2.17.3 Installing Backer Rod.**

After the joint is cleaned, install the backer rod or separating material. Do not leave the backer materials in the joint for an extended period of time before sealing. These materials may work loose and move up or down in the joint or may even come completely out. Do not twist, stretch, or otherwise damage these materials when they are installed in the joint. Damaging the backer material can cause sealant failure or a poor-quality finished product. Inspect the backer rod or separating material after installation to ensure it has been placed at the proper depth and has not been damaged. After installation of the backer or separating material, the joint is ready for the sealant material. However, seal the joint only if all steps have been properly performed.

#### **14-2.17.4 Sealant Specifications.**

Special considerations for the sealant material are jet fuel and jet blast resistance. The full-depth repair may be located in an area where fuel or lubricating or hydraulic fluid spillage may occur or in an area subjected to high temperature from jet blast or exhaust from APUs. Provide and use sealant material that conforms to UFGS 32 01 19 or to ASTM specifications designated for joint and crack sealants for use in these areas.

### **14-3            PRECAUTIONS.**

Comply with the following precautions when performing full-depth repairs:

- Avoid undercutting spalled areas at bottom of remaining existing slab; saw back into adjacent slab until sound concrete is encountered.
- Avoid damaging remaining concrete when lifting out damaged concrete pieces.
- Keep repair areas dry before concrete application.
- Ensure dowel bars are properly aligned.

Although not a common practice for roadway full-depth repairs, consider reinforcement (about 0.2 percent of the cross-sectional area) along the long direction of the full-depth patch at the mid-width location for airfield applications. The reinforcement will keep any crack that may develop tight.

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## CHAPTER 15 CONCRETE PAVEMENT SLAB JACKING

### 15-1 INTRODUCTION.

The purpose of slab jacking is to raise one or several adjacent slabs in place permanently as a result of settlement of the support under the pavement. Concrete pavement settlements sometimes occur in areas of poor foundation support. Such settlements not only provide riding discomfort, they also can create large stresses in the slab that can lead to cracking and shattered slabs.

**Caution:** Slab jacking involves injection of a grout or polyurethane foam under the settled slab and raising the slabs slowly under pressure to the desired elevation. Use only experienced contractors to perform the slab jacking work due to the complexity and specialized equipment required for the work. The risk of over-stressing the slab being raised is high if the work is not performed with care. Slab jacking is not recommended for repairing faulted joints. Correct faulted joints using a combination of subsealing and diamond grinding of the faulting. Subsealing is also called slab sealing, slabsealing, slab subsealing, slab stabilization, undersealing, and pavement grouting.

### 15-2 NEED FOR SLAB JACKING.

Consider slab jacking for any condition that has resulted in slab settlement, such as embankment settlement, settlement of approach slabs, settlement over culverts or utility cuts, voids under the pavements, differences in elevation of adjacent pavements, and pavement slabs that rock under traffic.

The effectiveness of slab jacking is highly dependent on closely monitoring the amount of lift being performed at any one location. It is very important that the slab not be lifted more than 0.25 inch (6 millimeters) at a time to prevent the development of excessive stresses in the slab. Care is required to get the slab to initially move as the grout applied under pressure can cause the slab to move unexpectedly and more than intended. Where careful monitoring during the uplift has been conducted, slab jacking has been effective at leveling out isolated depressed areas

### 15-3 SLAB JACKING GROUT MATERIALS.

A variety of grout materials have been successfully used for slab jacking and subsealing (Chapter 16). These materials include the following:

#### 15-3.1 Cement-Fly Ash Grout.

The grout typically consists of one-part portland cement (typically Type I or Type II cement) three parts Class F or Class C fly ash, three to seven parts fine aggregates, water in sufficient amount to produce the desired consistency, and wetting agents or other additives may also be used to increase the flowability. The use of a wetting agent

lubricates the grout, permitting runs of up to 6 feet (1.8 meters). It also tends to reduce “pyramiding.” (A stiff grout may form a pyramid under the slab, leaving unfilled cavities.)

Use a repeated and consistent method of proportioning the grout mixture to ensure uniform consistency. The proper consistency to be used for any given condition is best determined by experience. Generally, a mix of stiff consistency is used to raise the pavement slabs. Check the consistency by a flow cone (CRD-C-611, *Test Method for Flow of Grout Mixtures (Flow-Cone Method)*, ASTM C939, *Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)*) at least twice each day. Typical flow-cone times vary between 16 to 30 seconds, depending on the type of materials used in the grout mix. Specify strength requirements of the grout mixture consistent with the location of the grout and the design loads on the pavement. A common requirement is 600 psi (4,134 kilopascals) at seven days as determined by ASTM C39, *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens*. The grout mixing equipment is shown in Figure 15-1.

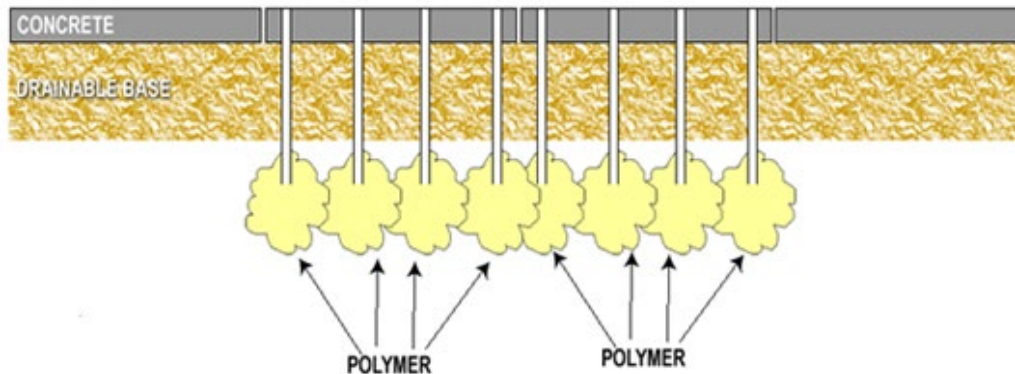
**Figure 15-1 Grout Mixing Equipment**



### **15-3.2 High-density Polyurethane Polymer Deep Injection.**

High-density polyurethane polymer materials are made of two specially formulated liquid chemicals that combine to form a strong, light-weight, foam-like substance. After being injected beneath the pavement into the soil mass, the low-viscosity polymer flows into the voids and weak zones in the soil mass. As the polymeric reaction occurs, the expanding polymer compacts the surrounding soils (Figure 15-2). As more polymer material is injected, the compacted soil mass lifts upwards and raises the profile of the settled slab. The polymer injection process is controlled to ensure the desired uplift of the slab. Because of the complexity of the operation, only use a qualified contractor to perform this process. When using this process, store, proportion, and blend all material within a self-contained pumping unit. Handle and use these materials in accordance with the material manufacturer’s instructions and specifications.

**Figure 15-2 The Polymer Deep Injection Process**



In this chapter, only the generic process using the cement-fly ash grout is presented. Information on the polymer injection process is not presented here because of the proprietary nature of the process. Information can be obtained from contractors on a project-by-project basis.

#### **15-4 INJECTION HOLE LOCATIONS.**

Identify the location of injection holes in the field. The slab jacking crew superintendent normally locates the holes, taking into consideration the size or length of the pavement area to be raised, the elevation differences, subgrade and drainage conditions, location of joints or cracks, and the manner in which the slabs will be tilted or raised.

As a general rule, do not place holes less than 12 inches (300 millimeters) or more than 18 inches (450 millimeters) from a transverse joint or slab edge. Do not place the holes more than 6 feet (1.8 meters) center to center so that not more than approximately 25 to 30 square feet (2.33 to 2.79 square meters) of slab is raised by pumping any one hole. Additional holes may be required if the slab is cracked. Where the pavement has settled and the slabs are in contact with the subbase, a single hole located in the middle of the panel may be sufficient.

#### **15-5 DRILLING INJECTION HOLES.**

Holes that are 1.25 to 2 inches (32 to 50 millimeters) in diameter are drilled by pneumatic drills, core drills, or other devices capable of drilling grout injection holes through the concrete pavement and base material. Provide and use equipment that is in good condition and operated in such a manner that the holes are vertical and round. Do not exceed 200 psi (1,379 kilopascals) of down-feed pressure. Where the concrete pavement is tight against the base material, the use of an airline or blow pipe may be necessary to form a cavity under the pavement slab for the grout pressure to take effect.

Where the pavement is placed and bonded to a cement-treated or other stabilized base material, drill grout holes completely through the base material. Inject

the grout below the base material rather than between the pavement and base material. Do not leave grout holes ungrouted overnight and grout holes within four hours.

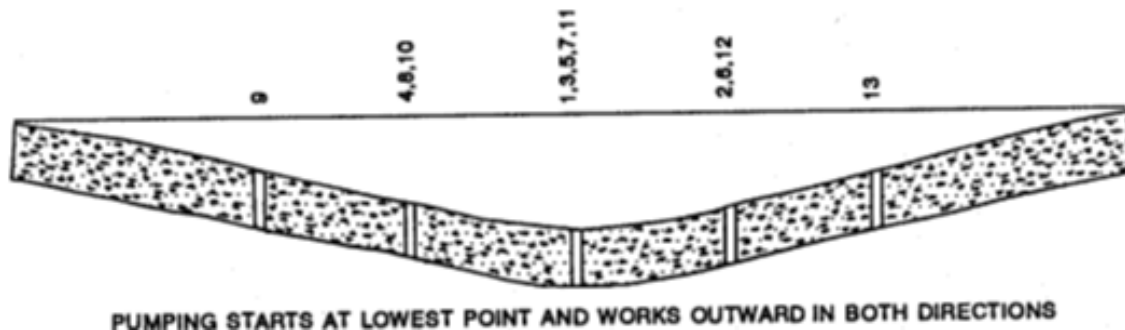
### 15-6 GROUT PUMPING.

Start pumping and jacking operations at the lowest point in a depressed area and work outward in both directions (Figure 15-3). Pumping progresses by lowering into successive holes an injection pipe connected to the discharge hose of the grout pump. An expanding rubber packer is used to seal the open space between the pipe and the drill hole. Do not extend the injection pipe below the bottom of the pavement. Provide and use an injection pipe equipped with a return line to circulate the grout while no grout is being placed. Lift in increments of about 0.25 inch (6 millimeters), with frequent changes in injection locations to minimize slab stresses and avoid cracking.

Use a rate of grout injection that is uniform and as slow as possible, usually a minimum of 0.5 cubic foot (0.014 cubic meter) per minute to a maximum of 2 cubic feet (0.056 cubic meter) per minute. Initial pumping is normally at the lower rate and is increased as lifting progresses. As the desired elevation is approached, reduce the lifting rate. When grout is extruded from joints, cracks, or from the pavement edge before the target elevation is reached, regrouting in new drill holes and additional slab jacking will be necessary. Applied pressures for slab jacking are normally in the range of 75 to 200 psi (517 to 1,379 kilopascals), with short pressure surges up to 600 psi (4,134 kilopascals) to initiate lifting of bonded slabs.

Constant observation and monitoring of the applied pressure is the most important single factor affecting the successful application of slab jacking. A rapid increase in the applied pressure can signal a stoppage of flow that could be followed by excessive lifting of the slab and slab cracking if pumping continues. A sudden reduction of pressure could indicate a loss of lift due to subsurface leakage of the grout.

Figure 15-3 Grout Pumping

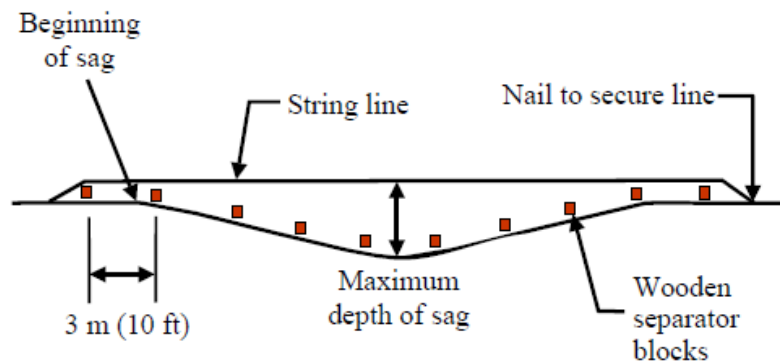


### 15-7 ELEVATION CONTROL DURING SLAB JACKING.

Before slab jacking operations are started, establish a method of controlling the amount the slab is to be raised and establish the finished elevation of the pavement. For short

dips up to approximately 50 feet (18.3 meters) in length, a tight string line is adequate, provided the joints are true and plane with those of the adjacent pavement (Figure 15-4). For dips in excess of 50 feet (18.3 meters) in length, use an engineer's level and rod or a laser-based elevation control system to check the profile well beyond the dip; this will avoid building a localized bulge into the pavement.

Figure 15-4 Elevation Control

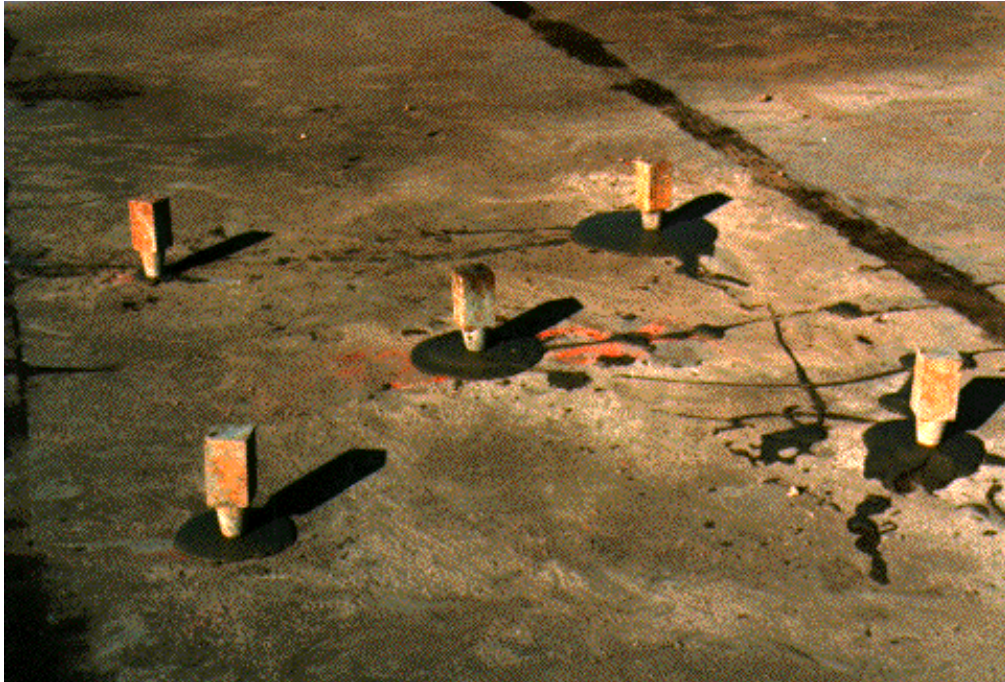


#### 15-8 PLUGGING AND CLEANUP.

After completing slab jacking at a hole and the discharge pipe is removed, plug the hole immediately. Place temporary tapered wooden plugs into the injection hole to retain the grout pressure and stop any mixture return flow (Figure 15-5). Once the slab is jacked to the desired elevation, the temporary plugs are removed and the injection holes are filled with a stiff one-part-water, three-part-cement grout, or an approved concrete mixture, or a proprietary patching product. These areas are then finished flush with the existing pavement surface. Keep surfaces adjacent to the grouting operation clean of excess grout and other materials. Broom and wash off grout on the pavement to avoid unsightly discoloration and to remove the grout before it bonds to the concrete surface.

**Caution:** The primary concern with slab jacking is excessive raising of the slab, which can induce stress concentrations in the slab and produce cracking. Therefore, it is critical to raise the slab slowly and no more than 0.25 inch (6 millimeters) at a time when pumping grout at each hole.

Figure 15-5 Temporary Plugs



## CHAPTER 16 SUBSEALING JOINTED CONCRETE PAVEMENTS

### 16-1 INTRODUCTION.

The purpose of subsealing is to stabilize the pavement slab by restoring support under the slab, typically at joint and crack locations. Subsealing is also called slab sealing, slabsealing, slab subsealing, slab undersealing, slab stabilization, undersealing, and pavement grouting. Pumping at joints and cracks with subsequent loss of support under the slab can occur beneath concrete pavements due to the presence of an erodible base or subbase, presence of moisture under the pavement, or significant slab deflections due to heavy traffic loadings.

Poor support conditions can lead to joint or crack faulting and corner breaks. Loss of support (voids) is indicated by signs of pumping at joints or by means of nondestructive deflection testing at joints. Subsealing involves the injection of a cementitious grout through holes drilled in the slab. The cementitious grout will, without raising the slab, fill the voids under it, displace water from the voids, and reduce the damaging pumping action caused by excessive pavement deflections. Subsealing reduces deflections at joints and cracks and retards the development of additional pavement deterioration.

### 16-2 NEED FOR SUBSEALING.

For jointed concrete pavement, accomplish subsealing as soon as significant loss of support is detected at slab corners. Symptoms of loss of support include increased deflections under vehicular loading, transverse joint faulting, corner breaks, and the accumulation of fines in or near joints or cracks on traffic lanes or shoulders. Consider subsealing at all existing repairs that show evidence of pumping or settlement. To be effective, perform subsealing before the voids become so large that they cause pavement failure.

**Caution:** To be most effective, it is important that slab undersealing be performed prior to the onset of pavement damage due to loss of support. Also, before considering undersealing of the slabs exhibiting loss of support, it is important that the cause(s) of the condition that led to the slab loss of support be addressed. This may require improving subsurface drainage conditions and/or restoration of load transfer at joints and cracks. Undersealing slabs where loss of support does not exist may be detrimental to pavement performance.

### 16-3 PAVEMENT SUBSEALING KEY STEPS.

The key steps for effective undersealing include the following:

1. Void (loss of support) detection
2. Selecting the grout material

3. Establishing the grout hole pattern
4. Drilling holes
5. Grout injection
6. Testing effectiveness of grouting
7. Grinding, if necessary, to restore profile at affected joint and crack location

#### **16-4 SUBSEALING GROUT MATERIALS.**

A variety of grout materials have been successfully used for slab jacking and subsealing. These materials are described in paragraph 15-3. The difference between slab jacking and subsealing is that when subsealing, the cementitious or polymer injection process is stopped at the point where all voids are filled to ensure there is no raising of the slab.

##### **16-4.1 Polyurethane Polymer Subsealing.**

The application of high-density polyurethane polymer material is similar to the application using cementitious grout. The polymer is injected directly into the void under the slab so as to fill the void with the high-density polymer foam (Figure 16-1).

**Figure 16-1 Polymer Subsealing Process**



In this chapter, only the generic processes using the cement-fly ash grout and polymer foam to directly fill the voids are presented. Information on the polymer deep injection process is not presented here because of the proprietary nature of the process. Information can be obtained from contractors on a project-by-project basis. Also note that in the past, asphaltic materials were used to underseal concrete pavements. This practice is no longer widely used and therefore not discussed.

## **16-5 VOID DETECTION.**

Conduct a comprehensive survey to determine void locations beneath concrete pavement. Take void detection measurements during the preliminary evaluation and the repair process. Void detection can be a complicated process as natural wetting and drying cycles and thermal variations can cause slab curling. Interpretation of field conditions by experienced personnel is always desirable. Suggested methods follow.

### **16-5.1 Visual Inspection.**

The simplest method is a visual inspection of the pavement to locate areas of distress. The presence of ejected subgrade or base material, staining of pavement surfaces adjacent to joints, excessive vertical movement at joints or cracks under traffic, and faulting of joints are evidence of possible voids under the slab.

### **16-5.2 Proof Rolling.**

A common method of determining the presence of voids is called “proof rolling.” In this procedure a heavily loaded vehicle (minimum 18,000-pound [80-kilonewton] axle load) drives slowly over a transverse joint while observing deflection of the slabs. If deflection is visually observed, under-seal the joint. Deflections during proof rolling can be measured by devices equipped with sensitive dial gauges that contact the pavement. Gauges are attached to a firm base located off the pavement or at a sufficient distance from the test locations. The dial gauges are read visually or recorded electronically. Under-seal any slab showing deflection in excess of 0.015 inch (0.38 millimeter).

### **16-5.3 Nondestructive Deflection Testing.**

On large critical projects, the most effective method to locate voids under the pavement slab is the falling-weight deflectometer (FWD). The device measures deflections at a joint under several load levels and the deflection data is analyzed to determine the extent of void at the test location (Figure 16-2).

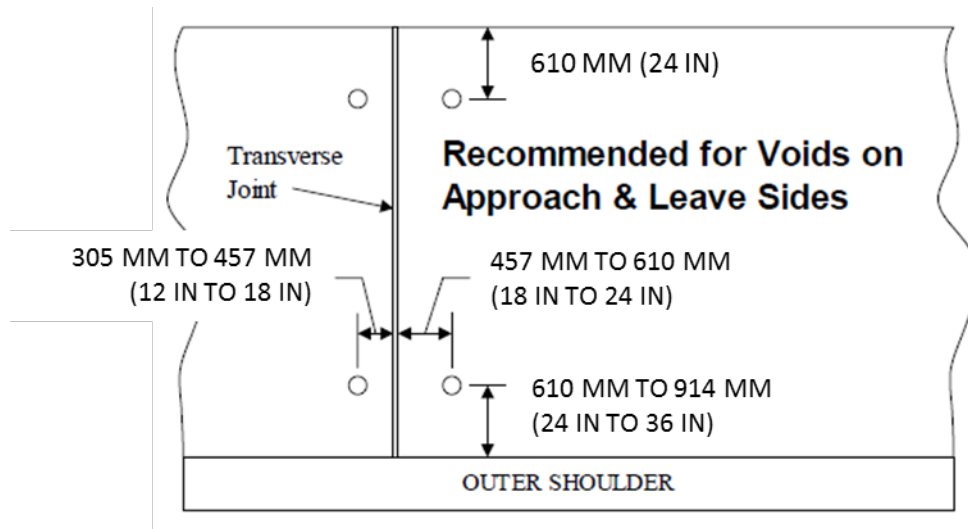
**Figure 16-2 Falling Weight Deflectometer**



**16-6 INJECTION HOLE LOCATIONS.**

Subsealing injection hole locations are similar to slab jacking (paragraph 15-4), the exception being to locate subsealing at pavement joints where the most common hole pattern is a four-hole pattern with two holes on each side of a transverse joint. The holes are located in the wheel tracks, with the approach slab holes nearer the joint than the leave slab holes. Typical distances from the joint are 12 to 18 inches (305 to 457 millimeters) for the approach slab and 18 to 24 inches (457 to 610 millimeters) for the leave slab (Figure 16-3). It is noted that in some cases the slab undersealing may be needed only on the leave (exhibiting void) side of the joint. Also, additional holes may be required for voids under the longitudinal joints or along the shoulder edge.

**Figure 16-3 Four-hole Pattern at Joint for Grout Injection**



#### **16-7 DRILLING HOLES.**

Drilling holes is identical to paragraph 15-5.

#### **16-8 GROUT INJECTION.**

Grout injection proceeds by lowering into successive holes a pipe connected to the discharge hose of the grout pump. The grout hole is sealed by a device called a packer. Two types are commonly used, as described below. The drive packer consists of a tapered pipe tapped into and out of the grout hole. Drive packers are used with 1-inch (25-millimeter) -diameter holes, and the expanding rubber packer consists of a threaded inner pipe, a thin-walled steel outer sleeve, and a short rubber sleeve at the bottom. This type of packer is used with 1.5-inch (33-millimeter) -diameter and larger holes.

Monitor movement (uplift) of the slabs during the grouting operation. To properly monitor movement of the slabs, gauges capable of reading movement of 0.001 inch (0.025 millimeter) must be used. Place the base for the gauge 3 to 4 feet (0.91 to 1.22 meters) off the slab being monitored. The gauges are set up at the joint corner locations and are not moved until grouting of the joint is completed. Typical pumping pressure are in the range of 40 to 60 psi (275 to 413 kilopascals) range. Always start grout injection with a low pumping rate and pressure. Stop pumping if the slab begins to rise or when no material is being injected at the maximum allowable pressure of 100 psi (689 kilopascals). Pumping of short surges up to 200 psi (1,378 kilopascals) are allowable for the grout to penetrate the void structure. If grout returns through an adjacent hole, stop pumping and insert the packer into another hole. If water or diluted grout is observed flowing from joints or cracks in the pavement, continue pumping until undiluted grout is observed.

Generally, when pumping the four-hole pattern at a joint, begin pumping first at the centerline and then continue with the holes closest to the shoulder. This sequence will drive any trapped water to the outside of the slab and through the transverse and shoulder joints. Where there is also void along the shoulder and extra holes are required, the sequence of grout injection becomes more complicated. Usually, the shoulder joint locations are pumped last.

**Caution: To ensure that the slab is not raised, place straightedges with gauges attached over the slab to measure any upward movement of the slab. At the first indication of movement, stop the grout-injecting procedure. If the slab is raised, high slab stresses may develop, leading to slab cracking.**

#### **16-9 RETESTING SLAB CORNERS.**

After a minimum of 24 hours has elapsed following completion of subsealing, test the grouted slabs for stability at the same points as previously tested. Conduct this testing using the same procedure used for the pre-grouting test. Include other joints that were not grouted in this test for use as a control. If loss of support still exists after grouting,

re-grout the slab. In each regrouting, new holes will be needed. It is recommended that if voids are still present after three attempts to stabilize the slab, do not attempt any further regrouting and consider other repair methods such as full-depth repair in lieu of regrouting.

**16-10 PLUGGING AND CLEANUP.**

Plugging and cleanup is identical to paragraph 15-8.

## CHAPTER 17 PCC PAVEMENT DIAMOND GRINDING

### 17-1 INTRODUCTION.

Diamond grinding, using closely spaced diamond saw blades mounted on a rotating shaft, removes a thin layer of the concrete surface to correct for faults at joints and crack locations and correct for surface defects, such as wheel path rutting. Diamond grinding results in re-profiling the pavement and improves the pavement's ride quality.

Note that diamond grinding is a different process than diamond grooving. Diamond grooving is a process in which parallel grooves in the transverse direction are cut into new airfield runway pavements using diamond saw blades with a typical center-to-center blade spacing of 0.75 inch (19 millimeters). The principal objective of grooving is to provide escape channels for surface water, thereby reducing the incidence of hydroplaning that can cause wet weather crashes. Diamond grooving is typically not used for roadway pavements except at sharp curves.

### 17-2 NEED FOR GRINDING.

Consider diamond grinding when a pavement survey reveals surface defects such as faulted joints and cracks in excess of 0.125 inch (3 millimeters), roughness in excess of 0.125 inch (3 millimeters) in a 10-foot (3-meter) length, or rutting up to 0.375 inch (10 millimeters). If skid resistance is to be examined, examine it on the areas not scheduled for grinding for any of the previously mentioned defects. If a large area requires grinding to improve skid resistance, economics may favor grinding the entire pavement surface.

**Caution: Note that diamond grinding primarily improves the pavement's ride quality and does not directly improve the structural condition of the pavement. Diamond grinding is frequently used in combination with other concrete pavement repair techniques that improve the structural condition of the pavement. Diamond grinding may not be effective over the long term if the pavement exhibits significant deterioration or if causes of faulting are not addressed. Do not consider diamond grinding for pavements exhibiting concrete materials-related distress, such as D-cracking and ASR. Perform any partial-depth and full-depth patching before grinding.**

### 17-3 GRINDING PROCESS.

The diamond grinding process is free of impact and does not damage joints. The pavement grinder is similar to a wood plane. The front wheels are designed to pass over a fault or bump, the cutting head shaves off the fault or bump, and the rear wheels ride in a smooth path left by the cutting head.

Diamond grinding requires heavy, specially designed equipment (Figure 17-1) that uses diamond saw blades gang-mounted on a cutting head (Figure 17-2). Spacers are placed between the saw blades to reduce the amount of cutting to be done. This

combination of saw blades and spacers gives the pavement the characteristic corduroy texture that also improves skid resistance (Figure 17-3).

Because the hardness of the aggregate will influence the grinding operation, identify the type of aggregate in the PCC pavement when contracting the work. Grinding a pavement with extremely hard aggregate (such as trap rock, river gravel, or quartzite) takes more time and effort than grinding a pavement with a softer aggregate (such as limestone) and will cost more.

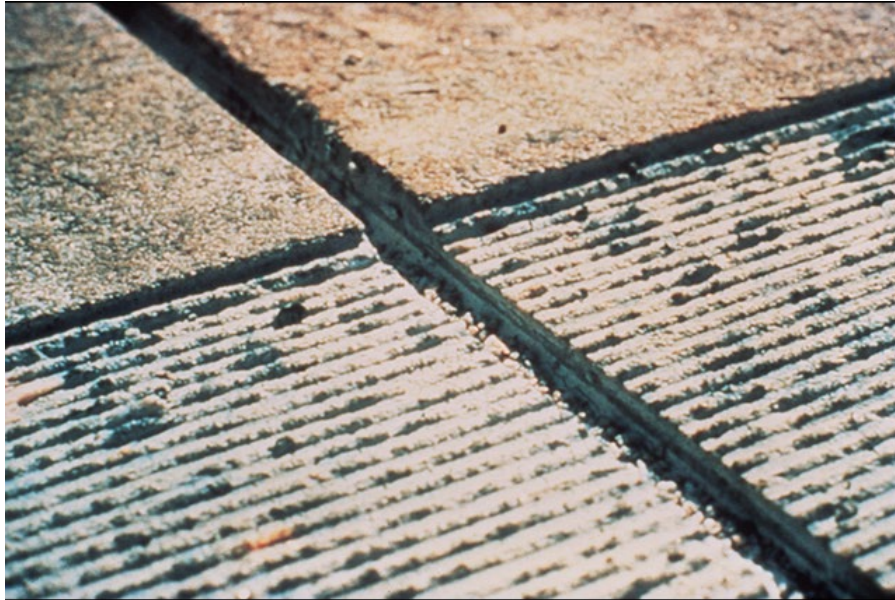
**Figure 17-1 Grinding Equipment**



**Figure 17-2 Gang-mounted Diamond Saw Blades**



**Figure 17-3 Diamond-ground Surface**



**17-4 TEST SECTION.**

Before work begins, test the equipment on a small section of the pavement to ensure that proper blade spacing is being used for the specific aggregate on the project. The width of the spacers between the saw blades is varied depending on the hardness of the aggregates. Use a thinner (smaller) spacing between the blades with harder aggregate. As the diamond grinding head cuts the surface of the pavement, thin fins of concrete are left between the cutting blades. These fins typically break off during the grinding process. If these fins do not break off, use a grinding head with thinner spacers. When grinding aggregate susceptible to polishing, provide more area between the blades.

Use a fin depth (land area thickness) measured at the thickest point of 0.08-inch (2-millimeter) minimum and have an average thickness of 0.1 inch (2.5 millimeters). For harder aggregates not subject to polishing, use a minimum fin depth of 0.065 inch (1.7 millimeters) and an average thickness of 0.08 inch (2 millimeters).

**17-5 GRINDING PROCEDURE.**

Grinding equipment uses diamond blades mounted in series on a cutting head. The cutting head typically has a width ranging from 48 to 50 inches (1.22 to 1.27 meter). The desired corduroy texture is produced using a spacing of 50 to 60 blades per foot (164 to 197 blades per meter). New, improved grinding machines and grinding blades have greatly increased the capability to provide extremely smooth profiles. Always start and end grinding perpendicular to the pavement centerline and consistently maintain the grinding parallel to the centerline.

The grinding and grooving operation produces slurry consisting of ground concrete and the water used to cool the blades. This slurry is picked up by onboard wet-vacuums. Continuously remove the slurry residue. Do not permit grinding slurry to flow across adjacent lanes into gutters or other drainage facilities. Dispose of grinding slurry in accordance with local environmental regulations.

The following grinding procedures are for roughness and fault removal.

### **17-5.1 Roughness Removal.**

For areas identified as being too rough, establish a level of restoration and grind the nominated sections. Following grinding, test the roughness again. Testing is typically accomplished using equipment such as the California profilograph (Figure 17-4). Prior to grinding, establish the grade. Do not use the old pavement surface as the reference unless using a long beam or skid. Where sags in the pavement are encountered, first remove the sags by slabjacking. Grinding at a sag point will not remove roughness. Reinvestigate the pavement following slabjacking to revise the grinding requirements, if necessary.

**Figure 17-4 California Profilograph**



### **17-5.2 Fault Removal.**

Prior to grinding the faulted joints (and cracks), underseal the slabs to prevent the fault from recurring. Cut in to the faulted joint during grinding to produce smoother joints and a more efficient operating surface. Feather the fault back some distance into the slab. The distance required depends on the allowable roughness. The American Concrete Pavement Association has a general guideline of 1 foot (300 millimeters) for every 0.1 inch (2.5 millimeters) of faulting. This is slightly rougher than 0.125 inch (3 millimeters) in 10 feet (3 meters). Feathering distances necessary to meet straight-edge requirements of 0.125 inch (3 millimeters) in 10 feet (3 meters) are shown in Table 17-1. If the entire slab is to be ground, feather out the depth of the cut to the next joint to remove the fault.

**Table 17-1 Feathering Distances**

<b>Fault Height Inches (Millimeters)</b>	<b>Feathering Distance Feet (Meters)</b>
0.125 (3)	2.5 (0.76)
0.25 (6)	5.0 (1.52)
0.375 (10)	7.5 (2.29)
0.5 (13)	10.0 (3.04)
0.625 (16)	12.5 (3.81)
0.75 (19)	14.0 (4.27)

**17-5.3 Skid Resistance.**

Grinding can improve skid resistance. Grind only those lanes needing treatment. Feather the edges of the ground areas into the adjoining areas to eliminate a sharp drop-off. Grind the pavement in a longitudinal direction that begins and ends at a line marked perpendicular to the pavement centerline. A successful grinding operation produces a uniformly finished surface that is free of joint or crack faults and provides positive lateral surface drainage.

**17-6 ACCEPTANCE TESTING.**

After completing grinding and texturing, test the pavement for smoothness. Accept only pavement which meets the surface tolerance for a new pavement as required by the specifying agency. Specify use of the same test equipment in the acceptance testing as used in the initial evaluation along with the procedures to be followed in acceptance testing. Do not reduce the thickness of the pavement through grinding by an amount that reduces the nominal load-carrying capability of the pavement without prior approval of the Pavements DWG or their designated representative.

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## CHAPTER 18 CONCRETE PAVEMENT LOAD TRANSFER RESTORATION

### 18-1 INTRODUCTION.

New pavement joints typically exhibit good load transfer, particularly if the joints are doweled. However, repeated heavy loads over time can cause an elongation of the dowel sockets and result in dowel looseness and a reduction of load transfer efficiency. As the load transfer efficiency decreases, the load-related deflections along the joints, especially at corner locations, increase. This can accelerate the development of joint-related distresses, such as pumping, spalling, faulting, and slab corner cracking. For non-doweled concrete pavements, aggregate interlock at joints is relied upon to provide load transfer across a joint. However, under traffic loading and due to concrete drying shrinkage over time, aggregate interlock becomes less effective. If the non-doweled pavement continues to carry heavy traffic, the non-doweled joints may be good candidates for load transfer restoration (LTR).

For many years, the typical way to transfer shear at a construction joint was with a keyed joint. Many steel bulkhead forms are available with a keyed profile. However, most experts no longer recommend keyed joints since they seldom stay tight enough to provide positive shear transfer. In accordance with ACI 360R-10, *Guide to Design of Slabs-on-Ground*, the male and female components lose contact when the joint opens due to drying shrinkage, which can lead to breakdown of the joint edges and failure of the top side portion of the key.

Restoration of load transfer is used to retard further deterioration of the concrete pavement by reducing the potential for joint-related distresses. Restoration of load transfer can improve pavement performance by reducing pumping, faulting, and corner breaks, and also by retarding the deterioration of transverse cracks. In most instances, the pumping and faulting distresses can be corrected by installing joint load transfer devices. Diamond-grinding the pavement surface is often done in conjunction with LTR to restore rideability.

**Caution: LTR is not used for heavily trafficked airfield concrete pavements. The shear stresses caused by the heavy loading may be greater than the bond strength between the slot patch material and the existing concrete. This can cause dowel bars in the slots to break out of the slots under repeated aircraft loadings.**

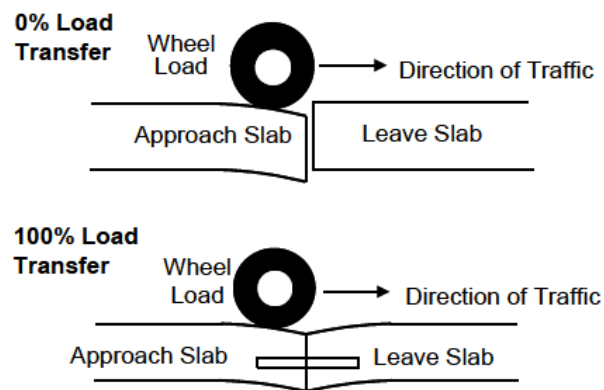
### 18-2 NEED FOR LOAD TRANSFER RESTORATION.

Transverse joints or cracks that would benefit from improved load transfer can be identified by measuring the existing load transfer efficiency using a nondestructive deflection testing device such as the FWD. Conduct these tests during periods of cooler temperatures (less than about 80 degrees F [27 degrees C]) when the slab joints and cracks are not tightly closed. Consider LTR for joints or cracks having a measured load

transfer efficiency (ratio of the deflection on the unloaded side of a joint or crack divided by the deflection of the loaded side) of less than 50 percent.

For thicker airfield pavements being considered for LTR, use the heavier version of the FWD, commonly called the heavy weight deflectometer (HWD). The HWD can apply loading up to 50,000 pounds-force (222 kilonewtons) that better simulates the loading of the heavier aircraft. For concrete pavements 12 inches (300 millimeters) or less in thickness, a standard FWD meets the testing needs and test loads of up to 20,000 pounds-force (89 kilonewtons) can be applied. The concept of load transfer at a joint is illustrated in Figure 18-1. Take deflection measurements as near as possible to the joint or crack. Take deflection measurements in the center of the load plate, positioned tangentially along the joint, and at 12 inches (300 millimeters) across the joint (from the center of the load plate).

**Figure 18-1 Load Transfer at a Joint**



### **18-3 LOAD TRANSFER RESTORATION (LTR) KEY STEPS.**

The key steps in performing LTR include the following:

1. Correct causes of poor load transfer
2. Create slots at the joints being treated by saw-cutting and chipping concrete
3. Place load transfer devices, typically dowel bars, into the slots and properly align the bars
4. Use compressible inserts
5. Place repair material into the slots, ensuring good coverage under the dowel bars
6. Restore the joint at the slot locations and seal the joints
7. Grind at joint locations or over the full pavement width and length to improve ride quality

**18-4 CORRECTION OF DEFICIENCIES.**

Before load transfer devices are installed, it is necessary to determine the cause of the joint or crack distress. Attempt to correct the cause(s) of these deficiencies prior to LTR. Slabs exhibiting extensive distress along a joint may require portions of or the entire slab to be replaced. Also, successful installation of load transfer devices requires sound concrete adjacent to the joint or crack. If the concrete near the joint or crack is significantly deteriorated, perform full-depth repair (with provisions for load transfer) in lieu of LTR. Perform the following additional work if required prior to LTR. Subsealing (essential if loss of support exists) to fill voids in the pavement structure and to restore support to the pavement slabs, and full-depth and spall repairs to replace highly distressed joints and slabs with corner breaks, “D” cracking, etc.

**18-5 DOWEL LOAD TRANSFER RESTORATION (LTR) PROCESS.**

Installing round dowel bars is the primary method of restoring load transfer at existing joints or cracks. In the past, use of proprietary devices was attempted but has fallen out of favor because of cost and uneven performance in the field. Field experience indicates that round dowel bars can effectively transfer loads across joints and cracks.

**18-5.1 Dowel Size Requirement.**

Specify different size dowels for different thicknesses of pavements. Dowel size and spacing for construction, contraction, and expansion joints are shown in Table 18-1.

**Table 18-1 Dowel Size Requirements**

<b>Pavement Thickness, inches (millimeters)</b>	<b>Dowel Length, inches (millimeters)</b>	<b>Dowel Spacing, inches (millimeters)</b>	<b>Dowel Bar Diameter, inches (millimeters)</b>
8 to 11.5 (200 - 290)	16 (400)	12 (300)	1 (25)
12 to 15.5 (300 -395)	18 (450)	15 (380)	1.25 (32)
16 to 20.5 (400 - 520)	20 (500)	18 (450)	1.5 (38)
21 to 21.5 (530 - 550)	24 (600)	18 (450)	2 (50)
>26 (660)	30 (762)	18 (450)	3 (75)

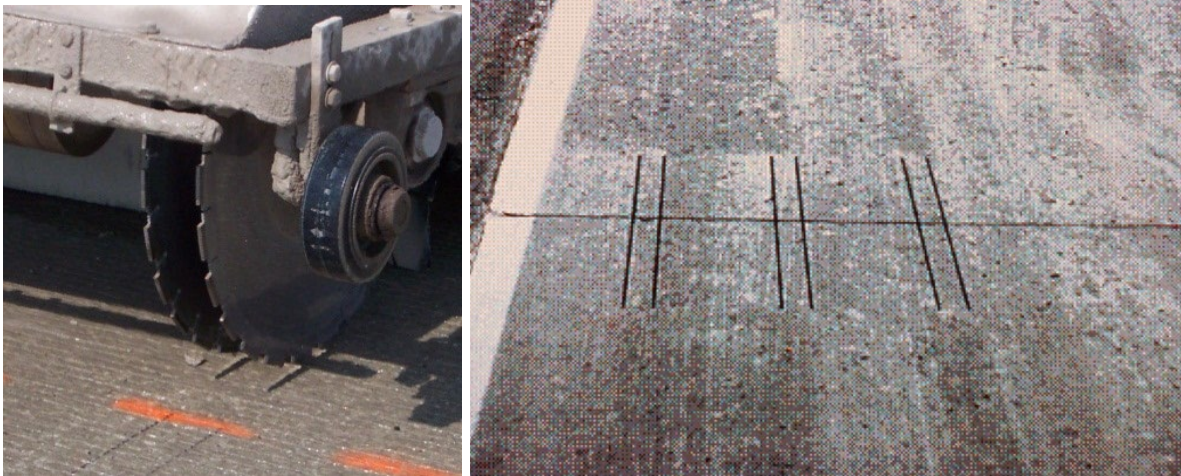
For roadway pavements, four dowel bars are typically used for each wheel path. The bars are typically spaced at 12 inches (300 millimeters).

**18-5.2 Cutting Slots for Dowel Installation.**

Slots for installing dowels are cut using diamond-blade saws. Gang-mounted multiple blade saws are recommended to speed operations (Figure 18-2). Cut the slots so the

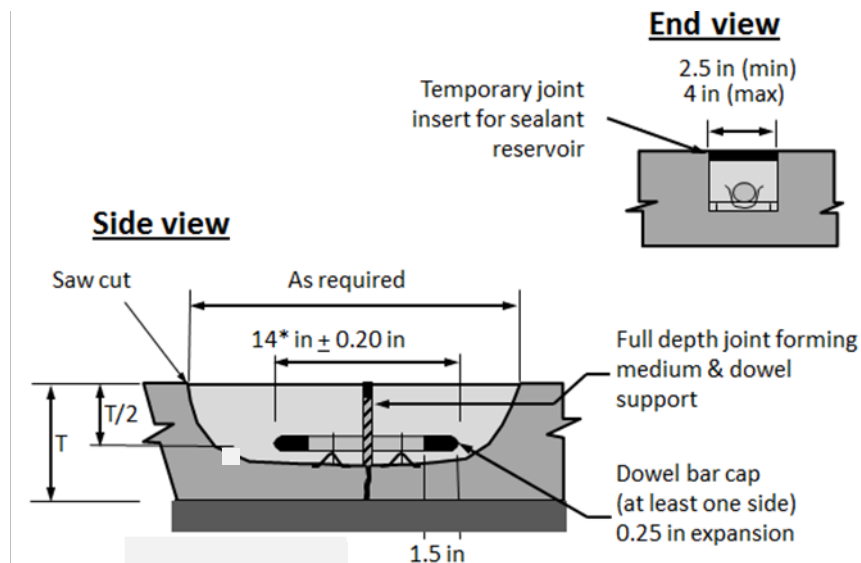
dowels can be placed horizontally parallel to the pavement surface, perpendicular to the joint, and at mid-depth of the slab (Figure 18-3).

**Figure 18-2 Gang-Mounted Multiple Saw Blades for Slot Cuts**



Where slab movement at the crack/joint location is required, cut slots to allow dowel placement parallel to the pavement surface at mid-depth and perpendicular to the orientation of the crack/joint.

**Figure 18-3 Dowel Placement in Slot**



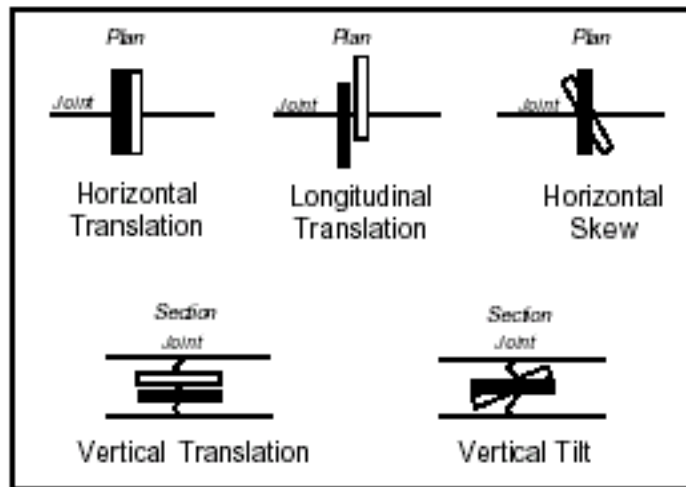
\* Actual dowel bar length is dependent on design load

Take care to ensure the dowel bars are correctly aligned in the slots. Poor dowel alignment, as shown in Figure 18-4, can cause joint locking (or a working crack), spalling in the patch material, and poor load transfer efficiency.

**Figure 18-4 Types of Dowel Bar Misalignment and Effect on Performance**

Type of Misalignment	Effect on Spalling	Cracking	Load Transfer
Horizontal Translation	—	—	yes
Longitudinal Translation	—	—	yes
Vertical Translation	yes	—	yes
Horizontal Skew	yes	yes	yes
Vertical Tilt	yes	yes	yes

Categories of dowel misalignment are illustrated below.



*Misalignment categories.*

### 18-5.3 Concrete Removal & Dowel Installation.

Light-weight (10 to 17 pounds [4.5 to 7.7 kilograms]) chipping hammers are used to remove the concrete within the saw cuts (Figure 18-5). Take care not to punch through the slot bottom. The slot is then cleaned by sandblasting or any method that will ensure removal of all sawing residue, dirt, or oil that may prevent bonding of the patch material to the slot faces.

**Figure 18-5 Use of Chipping Hammers to Remove Concrete**



Each dowel is placed upon a support chair to allow the patch material to surround the dowel. One end of the dowel is oiled and painted and an expansion cap placed at the end of the dowel bars (Figure 18-6). Provide and use the dowels with a filler board or Styrofoam material at mid-length to prevent intrusion of the patch material into the joint or crack (causing point bearing and compression failure during warm weather) and to form the joint in the slot (Figure 18-6).

Before installing the dowel bar, caulk the perimeter of the joint within each slot to prevent the intrusion of the patch material into the joint (Figure 18-6).

**Figure 18-6 Use of Compressible Insert**



#### 18-5.4 Patching Material.

High early-strength concrete or proprietary cementitious materials extended with small-sized aggregate have been used to fill the slot at most installations to date. The patch material used with load transfer devices is a critical factor in performing this technique. It is necessary to ensure there is thermal compatibility between the patch material and the existing concrete; therefore, use aggregates in the patch material that have a coefficient of thermal expansion (CTE) property similar to that of the aggregates used in the existing concrete.

It is important that a laboratory evaluation be made of any patch material utilized for patching the slots. Evaluate the following key factors: working time, rapid early-strength gain, thermal compatibility with existing concrete, and shrinkage property.

#### 18-5.5 Placing Patch Material.

After properly cleaning the patch area, apply a bonding agent if required by the patching material manufacturer. The type of bonding agent depends on the bond development requirements for opening to traffic and type of patching material used. Follow the manufacturer's recommendations with all patching materials. Use bonding agents recommended by the manufacturer for the placement conditions. Bonding agents or grouts may not be needed when using high-early-strength concrete.

Place and consolidate the patch material to eliminate all voids at the interface of the patch and the existing concrete and at the load transfer device and the patch material (Figure 18-7). Each slot requires two to four short, vertical penetrations of a small-diameter spud vibrator. Place the patch material flush with the adjacent concrete and take care to prevent intrusion of the patch material into the adjacent joint areas. However, the patch material is finished slightly "humped" (no more than 0.125 inch [3.175 millimeters]) if diamond grinding is to be employed.

**Figure 18-7 Placing and Consolidating Patch Material**



After consolidation and finishing, place a curing compound on the patching material to minimize rapid patch material shrinkage. Depending upon the type of repair material, the pavement may be opened to traffic in as little as a few hours. The minimum compressive strength required to open a repair to traffic is about 2,000 psi (13.7 megapascals) for slabs 8 inches (200 millimeters) or thicker.

#### **18-5.6 Finishing Activities.**

LTR may result in increased roughness at joint locations if the patch materials are not properly finished. This is typically due to differences in elevation between the finished repair area and the existing pavement, or perhaps due to shrinkage or settlement of the repair material. Consequently, the joint locations or the entire pavement project being rehabilitated is often diamond-ground to provide a smooth-riding surface. Complete grinding as soon as is feasible after the patch material has attained the specified strength, typically 4,000 psi (27.4 megapascals) compressive strength.

After the patch material has cured and the surface diamond-ground, re-establish the transverse joint at the affected joints by sawing over the length of the joints and through the filler board then prepare and seal the joint.

#### **18-6 KEYED JOINTS LOAD TRANSFER RESTORATION PROCESS.**

Although not recommended for new construction, keyed construction joints (Figure 18-8) are still found in existing airfield pavements. In addition to the loss of load transfer due to shrinkage, the female keyed flanges are prone to spalling. For this reason, keyed joints are recommended to be removed and replaced with a doveled joint.

**Figure 18-8 Keyed Joint**



### **18-6.1 Keyed Joint Key Steps.**

Restoration of keyed joints is identical to full-depth repair of concrete pavements (Chapter 14), with the following exceptions.

#### **18-6.1.1 Keyed Joint Concrete Removal.**

Depending on the joint stress severity, remove the complete keyed joint for the entire edge of the slab. The male end of the keyed joint needs to be removed with a concrete saw, leaving the joint flush, vertical, and ready to accept new dowels. The female end needs to be cut far enough back to allow the use of a dowel drill. This can be as much as 4 feet (1.2 meters) for the typical gang-operated concrete dowel drill (Figure 18-9).

**Figure 18-9 Gang-operated Dowel Drill**



#### **18-6.1.2 Dowel Bar Placement and Installation.**

Install dowels along the face where the keyed joint male end has been removed. Place and install the dowel bars in accordance with paragraph 18-5.

#### **18-6.1.3 Tie Bar Placement and Installation.**

Secure the newly cut joints other than the existing keyed joint with tie bars. Install tie bars in the same manner as the dowel bars (paragraph 14-2.10), but both ends are permanently secured.

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## **CHAPTER 19 CONCRETE PAVEMENT RETROFITTED EDGE DRAINAGE**

### **19-1 INTRODUCTION.**

The presence of moisture under pavement, if not removed quickly, leads to poorly performing pavement or failure. One of the most critical considerations for pavement design is how to control water entering the pavement. The primary source of water under the pavement is rainwater that infiltrates into the pavement due to poorly sealed transverse and longitudinal joints and cracks. Many older concrete pavements have non-drainable bases and subbases with no provision to quickly remove water from the pavement system. The infiltration of water through the pavement causes saturation of the base and subbase. Without drainable layers, traffic loads cause pumping at joints and crack locations. Over time, repeated traffic loading leads to a loss of support along joints and cracks, resulting in high deflections and slab cracking.

### **19-2 NEED FOR PAVEMENT-EDGE DRAINAGE.**

- The following conditions may warrant the addition of pavement-edge drainage:
- Inadequate surface drainage facilities (shallow ditches or absence of ditches)
- Water table may rise within the pavement system
- Surface water entering the pavement system at joints or cracks, surface edges, or percolating through the shoulders
- Water in the subgrade rising vertically via capillary action

### **19-3 DRAINAGE SYSTEM CLASSIFICATIONS.**

Pavement drainage is grouped into two major classifications: surface and subsurface. When both types are required for efficient maintenance and protection of the pavement, it is generally a good practice for each system to function independently.

#### **19-3.1 Surface Drainage.**

Surface drainage keeps surface water (rain) out of the pavement system, typically by incorporating adequate cross-slopes and longitudinal grades and properly designed and maintained ditches.

#### **19-3.2 Subsurface Drainage.**

Subsurface drainage quickly removes water that has entered the pavement system. These systems are designed so the outflow capacity is greater than the long-term maximum inflow into the pavement system. These systems may consist of drainage

layers discharging to daylight or in conjunction with built-in edge drains. One way to provide for subsurface drainage for an existing system without an effective subsurface drainage system is to retrofit edge drainage along the shoulder.

#### **19-4 EDGE DRAINAGE REQUIREMENTS.**

Edge drainage in an existing pavement is required where seasonal fluctuations of ground water are expected to rise in the subgrade water table to less than 1 foot (0.305 meter) below the bottom of the base course or seeping water in a pervious stratum will raise the ground water table to a depth of less than 1 foot (0.305 meter) below the bottom of the base course.

#### **19-5 EDGE DRAINAGE CANDIDATES.**

A good candidate project for retrofitted edge drainage is a pavement showing early signs of moisture-related damage. Additionally, projects with acceptable surface geometrics (longitudinal grades and transverse cross-slopes) and adequate depth and condition of roadside ditches are good candidates for retrofitted edge drainage.

Retrofitted edge drainage is not effective at extending the service life of concrete pavements already experiencing significant moisture-related deterioration. Concrete pavements in which the following conditions are present are poor candidates for retrofitted edge drainage:

- More than 15 percent of the slabs exhibit full-depth cracking, all of which require extensive corrective work to return the pavement to an adequate level of service
- A high number of transverse joints are spalled
- Pumping has occurred
- A cement-treated base exists that is no longer intact
- The existing base contains greater than 15 percent fines (material passing the 0.075-millimeter [No. 200] sieve). Base materials with these characteristics may be too impermeable for effective use of a retrofitted edge drainage system.

##### **19-5.1 Edge Drainage Key Steps.**

The key steps in providing retrofitted edge drainage include the following:

1. Select edge drainage system and materials
2. Locate the edge drainage
3. Dig a trench

4. Place edge drainage material (e.g., filter fabric [geotextile], perforated flexible drainage pipe [or fin drain], backfill filler material, outlet pipes)
5. Finish the surface of the edge drainage system

**Note:** Consider retrofitting edge drainage by itself or in combination with other repair techniques, such as full-depth repairs and dowel bar retrofit.

## 19-6 EDGE DRAINAGE MATERIALS.

While this chapter discusses edge drainage systems using perforated pipes, most of the steps discussed are also applicable to fin drain systems. Edge drainage systems require the following materials:

### 19-6.1 Drainage Pipe.

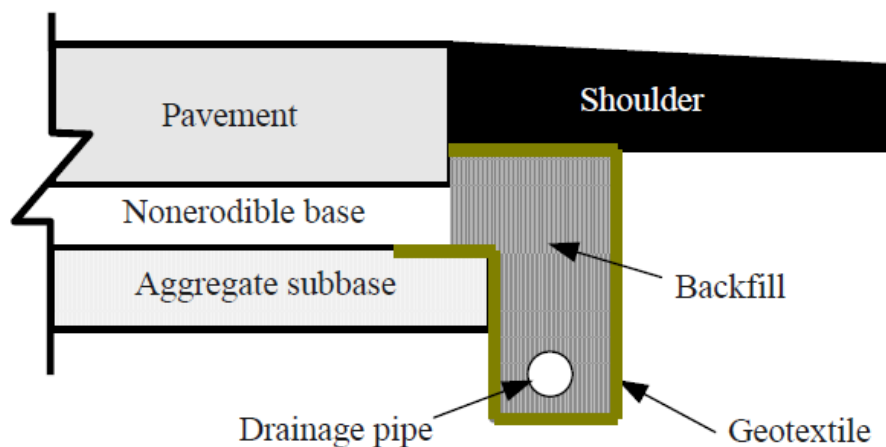
Although in the past several different types of pipe of various materials, lengths and diameters have been used in edge drainage systems, the pipe that is currently widely used is the perforated corrugated plastic pipe. These pipes are flexible. Select the type of pipe based on local requirements, such as the condition of the soil, loading and amount of cover, cost, and availability of pipe. Most highway agencies use flexible, corrugated polyethylene (CPE) adhering to AASHTO M252, *Standard Specification for Corrugated Polyethylene Drainage Pipe*.

### 19-6.2 Perforated Drainage Pipe.

A typical retrofitted edge drainage system is illustrated in Figure 19-1. Such an edge drainage system incorporates a perforated drainage pipe.

Aggregate trench drains (drainable aggregate material) constructed along pavement edges are not generally recommended because they have poor stability, a relatively low hydraulic capacity, and are difficult to maintain.

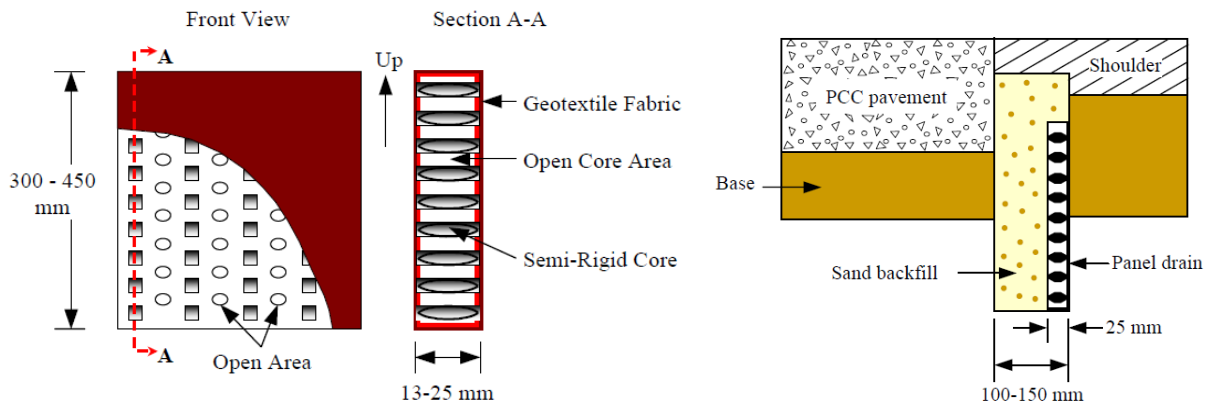
**Figure 19-1 Typical Retrofitted Edge Drainage System**



### 19-6.3 Fin Drains.

Fin (geocomposite) drains are another acceptable type of edge drainage system. This system comprises an extruded plastic drainage core wrapped with a geotextile filter. Figure 19-2 shows details of a typical geocomposite edge drain and recommended installation details. Geocomposite edge drains are typically 0.5 to 1 inch (13 to 25 millimeters) thick and manufactured in long strips coiled into rolls.

**Figure 19-2 Geocomposite Edge Drain Features & Installation Details**



### 19-6.4 Filter Material.

**19-6.4.1** When possible, for economic reasons, use locally available processed sands and gravels. Use filter material that is more permeable than the material being drained. Provide and use only filter materials with a grain size curve that is smooth (no gap grading) and parallel to or flatter than that of the protected material. Standard concrete aggregates can be used as a filter, but provide and use aggregates that meet the filter criteria. Provide and use filter material fine enough to prevent infiltration of the material from which drainage is occurring. To avoid contamination of the filter by fines by the material in the layer being drained, the required ratio of  $d_{15}$  percent passing size of filter material /  $d_{85}$  percent passing size of material being drained is  $< 5$ , where  $d_{15}$  is the equivalent grain diameter (millimeters) at which 15 percent of the material is finer by weight and  $d_{85}$  is the equivalent grain diameter (millimeters) at which 85 percent of the material is finer by weight. The required ratio of  $d_{50}$  percent passing size of filter material /  $d_{50}$  percent passing size of material being drained is  $< 25$ , where  $d_{50}$  is the equivalent grain diameter (millimeters) at which 50 percent of the material is finer by weight. Use these criteria when protecting all soils, except for nondispersive lean clay (CL) or fat clay (CH) soils without sand or silt particles, whereupon disregard the  $d_{50}$  percent size relationship.

**19-6.4.2** It is essential to use well-graded filter material. The required coefficient of uniformity equates to  $d_{60}$  percent passing size of filter material /  $d_{10}$  percent passing size of filter material having a value less than or equal to 20, where  $d_{60}$  is the equivalent grain diameter (millimeters) at which 60 percent of the material is finer by

weight and  $d_{10}$  is the equivalent grain diameter (millimeters) at which 10 percent of the material is finer by weight.

**19-6.4.3** To prevent clogging of perforated pipe or screens, the required ratio of  $d_{85}$  percent passing size of filter material / slot width or hole diameter slot or hole diameter is  $> 1.2$ .

**19-6.4.4** To prevent clogging of the openings in porous pipe the ratio of  $d_{15}$  percent passing size of aggregate in porous pipe /  $d_{85}$  percent passing size of filter material is  $< 5$ .

### **19-6.5 Dispersive Clays.**

If dispersive clays are encountered, obtain the services of a geotechnical expert having experience detecting and determining the best way to handle these clays. Dispersive clays normally deflocculate when exposed to water with a low salt content. This behavior is the opposite of aggregated clays that remain flocculated in the same soil-water systems. Generally, dispersive clays are highly erosive, are subject to high shrink-swell potential, and have lower permeability rates than aggregated clays.

### **19-6.6 Filter Fabrics.**

The use of woven or nonwoven geotextile materials meeting the requirements of AASHTO M288, *Standard Specification for Geotextile Specification for Highway Applications*, are widely accepted as filters in pavement edge drainage systems. In some instances, these materials may replace one or more components of a graded filter. Filter fabrics may be used to wrap the collector pipe, thus permitting use of a relatively fine backfill material; or line the trench (most common), allowing use of a relatively coarse backfill material. Filter fabrics are rarely used without the entire granular backfill. The only instance where a geotextile can completely replace a granular system is when the subgrade soil is a clean, granular material.

#### **19-6.6.1 Filter Fabric-wrapped Collector Pipe.**

When a geotextile is used to wrap the collector pipe, the required ratio of  $d_{85}$  percent passing size of granular filter material (millimeters) / apparent opening size (AOS) of geotextile (millimeters) is  $> 1.0$ , where apparent opening size is a property that indicates the approximate largest particle that will effectively pass through the geotextile. This is for a gradient ratio  $< 3$ , where gradient ratio is the ratio of the hydraulic gradient through a soil-geotextile system to the hydraulic gradient through the soil alone. For woven geotextiles, do not use a cloth with an open area that is less than 4 percent or greater than 36 percent of the total area. Where these criteria are met, the criteria given for perforated pipe or screens are no longer applicable.

#### **19-6.6.2 Filter Fabric-lined Drainage Trench.**

Where geotextiles are used to line a drainage trench and the geotextile adjacent to granular materials containing 50 percent or less by weight of fines (minus No. 200 materials) the required ratio of d85 percent size of the material (millimeters) / apparent opening size (AOS) (millimeters) is  $> 1$  and a gradient ratio  $< 3$ . For woven geotextiles, do not use cloth with an open area that is less than 4 percent or greater than 36 percent.

#### **19-6.6.3 Filter Fabric and All Other Soil Types.**

For geotextiles adjacent to all other types of soil and an AOS no larger than the opening in U.S. Standard Sieve No. 70 and gradient ratio  $< 3$ , do not use cloth with an open area that is less than 4 percent or greater than 10 percent. Where these criteria are met, the criteria for stability and permeability are no longer applicable and the backfill may be selected based on the criteria for perforated pipe or screens.

#### **19-6.6.4 Filter Fabric Clogging.**

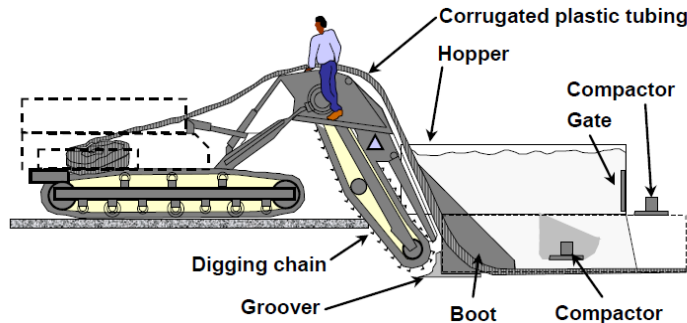
To reduce the possibility of clogging, specify no geotextile with an AOS smaller than the openings of U.S. Standard Sieve No. 100. When possible, it is preferable to specify a geotextile with openings as large as allowed by the above criteria. Do not use geotextiles for soils with 85 percent or more passing the No. 200 sieve.

Methods for determining the AOS and gradient ratio of geotextiles are given in ASTM D4751, *Test Method for Determining Apparent Opening Size of a Geotextile*, and ASTM D5101, *Standard Test Method for Measuring the Filtration Compatibility of Soil-Geotextile Systems*, respectively. Percent open area is defined as the summation of the open areas divided by the total area of the geotextile (refers to woven geotextiles only).

### **19-7 SUBSURFACE DRAIN INSTALLATION.**

Subsurface drains are typically installed using trenchers or other suitable equipment (Figure 19-3). Grade control and elevations are normally obtained from the pavement surface. A minimal slope of 0.15 foot (0.04 meter) in 100 feet (30.4 meters) is recommended for subsurface drains. Cap or plug the upstream end of drainage pipes not terminating in a structure.

Figure 19-3 Trenching Equipment for Installing Pipe Edge Drains



#### 19-7.1 Filter Material Placement.

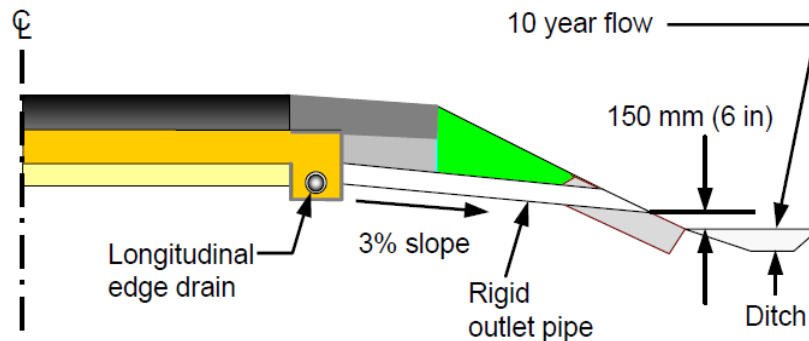
Place a minimum thickness of 6 inches (152 millimeters) of filter material around all types of subsurface drains. Place the backfill material using chutes or other means to avoid dumping the material onto the pipe from the top of the trench. To prevent displacement of drainage pipes during compaction, do not compact the filter material until the trench is backfilled above the level of the top of the pipes. Do not allow the filter material to become segregated or contaminated prior to, during, or after installation. Segregation results in zones of material too fine to meet the permeability requirements and other zones too coarse to meet the stability requirements. Contamination can clog voids in the material and render the drainage system useless. Nominally compact filter material in trenches and cover up with an appropriate material.

#### 19-7.2 Drainage Pipe Outlets.

Where practicable, feed outlets from drainage pipes into existing storm drainage manholes. Protect outlets 12 inches (304 millimeters) in diameter and smaller, not terminating in a manhole with rodent screens, and locate them to prevent surface water from entering the system. The outlet pipe is typically a 4-inch (100-millimeter) -diameter stiff, non-perforated, smooth-walled PVC or high-density polyethylene (HDPE) pipe,

installed with minimum slope of about 3 feet in 100 feet (0.03 meter/meter) (Figure 19-4). Good compaction control of the backfill below, around, and above the outlet pipe is required to avoid transverse shoulder sags. Place the outlet end at least 6 inches (150 millimeters) above the 10-year ditch flow line and protect with a headwall and splash block that is blended into the slope. Mark the outlet end (headwall) to prevent damage by mowers or other equipment.

**Figure 19-4 Outlet Pipe Design**



### 19-7.3 Drainage Pipe Access.

Provide manholes or other access points for inspection and cleaning approximately every 250 to 500 linear feet (75 to 150 linear meters), depending on grades, and at the upper ends of runs. If elbows are used instead of manholes, provide and use pipes with a radius and diameter of the pipe of sufficient size to allow cleaning and inspection equipment to pass.

### 19-7.4 Caution.

**Caution:** Take care to ensure that construction equipment does not track over the completed edge drainage system as it can damage the drain pipe. Also, monitor the drainage system regularly by checking the functioning of the drains at outlet ends or by using a video-based pipe inspection system. A damaged edge drainage system that retains water within the trench is more damaging to pavement performance than having no edge drainage system.

## CHAPTER 20 MAINTENANCE OF HEAT-RESISTANT CONCRETE

### 20-1 INTRODUCTION.

Concrete pavement damage resulting from high temperatures of jet blast includes spalling, delamination, aggregate popouts, scaling, cracking, and loss of joint sealant (Figure 20-1). Such damage can result in FOD that can damage aircraft engines.

**Figure 20-1 Heat-damaged Concrete**



**Spalling and Scaling**

**Delamination and Blistering**

Conventional PCC rapidly loses free moisture around 212 degrees F (100 degrees C) and starts to lose its chemically combined water at around 250 degrees F (121 degrees C). The highest rate of dehydration occurs around 350 degrees F (177 degrees C). At temperatures above 350 degrees F (177 degrees C), pavement damage increases exponentially. In accordance with this UFC and UFGS 32 13 13.43, *High Temperature Concrete for Airfields with Applied Pavement Temperatures of 482 Degrees C (900 Degrees F) or Higher Using Lightweight and Traprock Aggregates*, use of high-temperature concrete is mandatory where operations apply temperatures at the surface of the concrete from 900 degrees F to 1700 degrees F (482 degrees C to 926 degrees C), even for durations of a fraction of a second. Operations that apply temperatures at the surface of the concrete from 300 degrees F to 900 degrees F (148 degrees C to 482 degrees C) for longer durations may use this UFC and UFGS 32 13 11. If using UFGS 32 13 11, modify the specification to require only traprock for the coarse aggregate for durations greater than 1 minute.

High-temperature concrete (HTC) has been used in vertical landing zones (VLZ), aprons, forward arming and refueling pads (FARP), taxiway hold points, trim pads, and engine warm-up or run-up pads. The pads are usually associated with the operations of \1\ V-22 /1/, F-35B, and AV-8 aircraft but have also been used in parking areas affected by APUs on B-1 and F-18 aircraft.

## **20-2 MAINTENANCE AND REPAIR.**

Material and construction requirements are intended to provide the longest performance available. Periodic maintenance is required at installations subject to high heat scenarios as described below.

### **20-2.1 Pavement Markings.**

Commonly available pavement marking paints are not expected to maintain a bond or survive repeated heat applications from vertical landing (VL) operations from aircraft on the high-temperature range. Markings are on the perimeter of the VL pad so they will experience damage only when aircraft land near the safety zone. Paint may not adhere to pavement surfaces coated with sodium silicate. Avoid over spraying areas treated with surface sealers.

### **20-2.2 VL Pad Surface Grinding.**

Tests indicate the HTC used for the VL pad may need 0.125 to 0.25 inch (3.2 to 6.4 millimeters) ground off the surface after about 500 landings in the same location. The time required for 500 landings in the exact same location is a function of the operational tempo of the VL pad and landing accuracy. It is reasonable to expect that grinding will be required every three to seven years to reduce spalling and potential FOD. Grinding removes damaged HTC and maintains the slope for required surface drainage. Add an additional 0.5 inch (12.7 millimeters) to the VL pad design thickness to allow future grinding.

### **20-2.3 Frequency and Depth.**

Visually determine frequency and depth of grinding by examining the VL pad pavement surface. Do not exceed 2 inches (50 millimeters) total depth of grinding during the lifetime of the VL pad pavement. Beyond this depth, the concrete cover over the continuous reinforcement is too thin for proper performance. Distresses (e.g., additional cracking or spalling) may begin to develop. The surface area to be ground includes the VL pad plus a limited portion of the adjacent safety zone. Grinding of the remainder of the safety zone or the shoulder areas is not required. Pavement markings and the isolation joint sealant will need to be replaced in areas affected by grinding.

### **20-2.4 Diamond Grinding Procedures.**

#### **20-2.4.1 Pre-Planning.**

Prior to grinding, consult the as-built drawings to determine the surface grades and better plan the grinding depth and area to maintain drainage. In the absence of as-built drawings, field-survey the pad using conventional survey equipment. A survey grid of 10 feet by 10 feet (3 meters by 3 meters) is adequate; however, use a grid that matches the width of the grinding machine cutting head for enhanced control of final surface elevations.

#### **20-2.4.2 Diamond Grinding Equipment.**

Use concrete grinding machines, not milling machines with hardened teeth. Provide and use grinding machine saw blades impregnated with an industrial diamond abrasive. Assemble saw blades in a cutting head mounted on a machine designed specifically for diamond grinding, which will produce the required texture and smoothness level without damage to the concrete pavement or joint faces.

Provide and use saw blades 0.125 inch (3 millimeters) wide, with a minimum of 60 blades per 12 inches (300 millimeters) of cutting head width, depending on the hardness of the aggregate. Provide and use machines capable of cutting a path 3 feet to 4 feet (0.9 meter to 1.2 meters) wide. Grinding equipment that causes ravels, aggregate fractures, spalls, or disturbance to the joints is prohibited. Ensure finished surfaces are free of raised slivers (commonly referred to as “fins”).

#### **20-2.5 Water Cutting.**

It may be possible to remove the recommended 0.125 to 0.25 inch (3 to 6 millimeters) using special high-pressure water-cutting machines fitted to pavement surface scrubbers. These are substantially more advanced machines than a conventional pressure washer, and are typically trailer-mounted with a pressure rating of approximately 10,000 psi (68.9 megapascals). This procedure requires validation by USACE (CEMP-ET), the AFCEC pavements SME, or NAVFAC EXWC for up-to-date guidance.

#### **20-2.6 Surface Sealing.**

Re-apply sodium silicate solution after grinding. Prior to application, clean the VLZ concrete areas (including the VL pad and safety zone, at a minimum) using a rotary power washer/scrubber. To remove tire rubber and, to the extent possible, fuel and oil spills, use a rotary power washer/scrubber. Apply the sealer as described for a new installation. Ensure all joint seals are in good condition prior to any application of surface sealers. Replace any damaged, cracked, debonded, or missing joint seals in accordance with UFC 3-250-08FA, *Standard Practice for Sealing Joints and Cracks in Rigid and Flexible Pavements*, before applying any surface sealer.

#### **20-2.7 HTC Patching and Materials.**

Do not design or construct partial-depth patches on areas subject to vertical take-off or landing or short take-off operations of the F-35B or located on a VLZ without prior approval of the Pavements DWG. Partial-depth patches are allowed on pavement that is continuously reinforced in both directions provided the partial-depth patching uses hydro-demolition to remove material within 2 inches (50 millimeters) of the rebar and the bottom of the repair is at least 2 inches (50 millimeters) below the bottom of the rebar. If the remaining concrete is cracked or less than 2 inches (50 millimeters), continue to remove all the concrete and treat as a full-depth repair. Patches of areas not subject to

vertical take-off or landing or short take-off operations of the F-35B and not located on VLZs can be design and constructed as a partial-depth repair when full-depth cracks are not present in the repair area. Otherwise, a full-depth patch must be designed and constructed in these areas.

Design and construct partial-depth patches with a minimum 3 inches (75 millimeters) deep,  $\pm 0.25$  inch ( $\pm 6$  millimeters), instead of the standard 2-inch (50-millimeter) minimum used for conventional concrete pavements. Shallower repairs separate from the rest of the pavement due to thermal expansion cycles. Partial-depth patches deeper than 3 inches (75 millimeters) in reinforced areas are not recommended, as the depth of cover of the longitudinal reinforcement is 4 inches (100 millimeters) unless hydro-demolition is used to excavate the patch area at least 2 inches (50 millimeters) below the bottom of the rebar.

Provide and use materials for patching HTC surfaces that match the materials used to originally construct the pad. If the original HTC materials are not available, specify and use only materials that will survive high-temperature applications and are approved by the contracting officer or for in-house work by the Pavements DWG. Some prepackaged rapid-repair materials that will survive high-temperature applications are available on the GSA schedule at the time of the publication of this UFC.

#### **20-2.8 PCC Patching.**

Applying high temperatures to a PCC safety area may generate spalling. The surface sealer may allow the PCC to survive a few landings per location. Landing on PCC may also result in very thin delamination, which can be corrected by brooming and resealing with sodium silicate. Repeated landings at the same PCC location or over-exposure to high temperatures generates more severe spalling. Repair the PCC with HTC patching materials or conventional PCC. Do not use rapid spall repair materials (e.g., epoxy-based or activated fly-ash products) if sited near the VL pad due to the risk of future high-temperature exposures.

#### **20-3 SUMMARY OF MITIGATION TIPS.**

##### **20-3.1 Water/Cement Ratio.**

Use concrete with a low water/cement ratio (below 0.42). Properly cure the concrete. Leaner concrete mixes (low cement to aggregate ratio) perform better than richer mixes.

##### **20-3.2 PCC Mix.**

Use of hydrated portland cement that has lower calcium hydroxide content is preferable to those with higher calcium hydroxide content for high-temperature applications. For temperatures of 1,500 degrees F (816 degrees C) or more, high alumina cement provides superior performance.

**20-3.3 Construction Quality.**

Proper consolidation of concrete and proper finishing is critical. Minimize the amount of paste on the surface to minimize scaling.

**20-3.4 Proper Material.**

Aggregate selection is the most important single material-related factor; however, there is no standard specification for heat-resistant aggregate. Aggregates with low coefficients of thermal expansion (CTE) are desirable. The optimal aggregate is formed at a temperature higher than the expected exposure temperature, such as igneous trap rock. Lightweight aggregates, such as expanded shale and expanded slate, tend to perform better than conventional natural concrete aggregates subject to high temperature. Air-cooled slag aggregates also provide good results.

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## **CHAPTER 21 REPAIR OF PCC DAMAGED BY POL**

### **21-1 INTRODUCTION.**

Engine exhaust combined with petroleum, oil, and lubricant (POL) contamination can damage ordinary PCC pavements. Damage occurs in the form of scaling or spalling of the top 1 to 2 inches (25 to 50 millimeters) of the pavement. Pavement fragments from these surface scales can cause FOD to aircraft engines. High exhaust temperatures, coupled with spilled fluids (POL), damage ordinary PCC airfield pavements. Damage occurs progressively to the pavement surface under repeated thermal cycling and chemical reaction of the spilled aircraft fluids with the cement paste.

PCC surface treatments reduce or eliminate spalling, scaling, and other surface damage caused by heat and POL. These treatments are suitable for repairing PCC damaged by POL and heat from B-1, F-18, F-35, \1\ V-22 /1/ operations. Apply these treatments prior to POL contamination, where possible. When in doubt as to the length or number of operations, treat the affected area.

Do not use this UFC to deny or restrict operations of any aircraft, including \1\ V-22s /1/. Use it to identify and establish projects and protocols to effectively support air operations.

\1\ When selecting a pavement surface treatment, consider the pavement condition, duration and frequency of operations, and any scheduled maintenance/repair work.

Most concrete coatings only work on clean, uncontaminated concrete. On pavement with petroleum, oil and lubricant (POL) stains, coatings slow, but do not eliminate, degradation. Contaminated concrete slabs fail below the coating and the coating delaminates.

For newly replaced or pavement in otherwise good condition free of POL contamination, supporting daily operations that require long-term performance, use Epoxy Coatings per Paragraph 21-3.6 and High Temperature Aggregates per Paragraph 21-4.6. /1/

### **21-2 PRIMARY DAMAGE MECHANISMS.**

Testing has revealed three primary damage mechanisms: thermal fatigue, vapor pressure, and chemical degradation. Thermal fatigue has produced failures without the presence of POL. Vapor pressure damage has been observed when the water vapor pressure cannot be relieved fast enough during the heating phase. Chemical degradation results in a significant loss of strength—up to 50 percent in some cases—which accelerates failure. Chemical degradation by itself can result in raveling of the concrete, which has been observed under APUs for the B-1 and F-18; it does not produce scaling, but accelerates scaling.

### **21-3 REPAIR TECHNIQUES/MATERIALS.**

The following techniques can reduce damage from combined exhaust heat and POL.

\1\ Repair and treat effected area larger than the area subject to damage directly under each Nacelle. Repair and treat the surface all concrete slabs (the entire slab) which have any portion of the slab within 20 feet from the vertical nacelle of the parked aircraft or asphalt within 20 feet of the nacelle.

Repair and treat areas where aircraft are likely to release POL and expose the contaminated pavement to heat from the nacelles for more than two to five minutes in the same location.

Repair and treat any locations used as a FARP. If a FARP is asphalt instead of PCC, use a fuel resistant asphalt inlay per UFGS 32 12 17.19 Fuel Resistant Asphalt Paving For Airfields - Surface Course or protect with a fuel resistant micro surface such as Grip-flex. /1/

### **21-3.1 Sodium Silicate Application.**

\1\ Recommend limiting sodium silicate application to use as a surface hardener. Sodium silicate solutions are ineffective as waterproofing sealers since they have a limited depth of penetration and are unable to stop or reduce hydrostatic pressure.

Sodium silicate treatments do not eliminate the degradation under the V-22 Nacelles. The sodium silicate slows, but does not stop POL penetration and may suffice for transient aircraft, but not for permanently assigned aircraft. Apply surface treatment prior to any POL contamination. Allow a minimum of 70 days prior to applying sodium silicate coating to a surface after the PCC curing compound removal. /1/

### **21-3.2 Multifilament Fibers.**

Multifilament polypropylene fibers at a dosage of 3 pounds per cubic yard (1.8 kilograms per cubic meter) of concrete further improves concrete durability when subjected to exhaust heat.

### **21-3.3 Polymer Coatings.**

The US Army Corps of Engineers, Engineering Research and Development Center Geotechnical and Structures Laboratory performed laboratory test and field demonstrations with two polymer coats which, when combined with a sealer, provided results equal to or greater than coal tar emulsions. If polymer coatings are used on the airfield pavements, specify or use materials and methods recommended in ERDC/GSL Technical Report TR 03-24. Do not specify or use any materials or methods other than those included in this report without prior approval of the Pavements DWG. Do not specify or use polymer coating on any areas used for landing or take-off of jet, turbo-prop, \1\ or V-22 /1/ aircraft. These products have been used on parking aprons and FARPs.

#### **21-3.4 Surface-Applied Penetrating Chemically Reactive Silicates.**

Surface-applied penetrating water-soluble, chemically reactive silicates migrate through micropores and chemically bond with calcium hydroxide and calcium chlorides in cements to form calcium silicates which inhibit hydrolysis with POL esters. They also fill micropores, reducing the permeability of concrete. If surface-applied penetrating water-soluble, chemically reactive silicates are used on the airfield pavements, specify or use materials and methods that do not leave a surface film or coating and cannot be scraped or removed from the surface using mechanical means. Specify and use only those products and methods that reduce the chloride ion penetration in PCC by at least 60 percent, as determined by ASTM C1202, AASHTO T277, or AASHTO T259, and that penetrate at least 0.75 inch (19 millimeters) into the surface of the concrete. Materials and methods proven effective on airfield pavements are documented in "Auxiliary Power Unit (APU) Resistant Concrete: State-Of-The-Art," by Anderson, John R., et al, 1 March 2000. Do not specify or use any materials or methods other than those included in this report without prior approval of the Pavements DWG.

#### **21-3.5 Magnesium Phosphate Cement (MPC)**

MPC is a different cement formulation than conventional PCC. MPC is less sensitive to reaction with acids than PCC. It can be extended with any normal aggregate; however, for applications under B-1 aircraft, using aggregate that is not reactive with acids (limestone is reactive) is necessary. MPC is a fast-setting cement that reaches high strength (above 5000 psi [34.5 megapascals]) in less than one hour, with an ultimate strength after several hours of approximately 8000 psi (55.1 megapascals). It is more resistant to the types of aviation fluids that have caused damage to pavement under Navy F/A-18 Hornet fighter aircraft (TDS NAVFAC EXWC-CI-1403, *Mitigating Concrete Damage Caused by Engine Exhaust Surface Temperature Below 500 °F*).

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#### **21-3.6 Epoxy Coatings**

The US Army Corps of Engineers, Engineering Research and Development Center Geotechnical and Structures Laboratory performed laboratory testing on and field demonstrations with multiple coatings. Two epoxy coatings identified as suitable for protecting clean concrete surfaces from POL penetration that support aircraft traffic are Epoxy-A Addagrip 1000 System, and Mod Epoxy-1 PolySpec Thiokol FEC 2234. If using epoxy coatings on newly placed airfield concrete pavement, specify or use materials and methods recommended in Transportation Research Record TRR 20-07019, Full Scale Evaluation of Surface Treatments for Airfield Concrete Pavement Repair, 26 April 2021, <https://journals.sagepub.com/doi/full/10.1177/03611981211008882>. Using any materials or methods other than those included in this technical report requires prior Pavements DWG approval. Do not specify or use epoxy coating on any area used by jet, turbo-

prop, or V-22 aircraft for landings or take-offs. Only use these products on parking aprons free from POL contamination.

THIOKOL Primer and Polysulfide Sealant are elastomeric joint sealants and are not suitable for V-22 Parking Aprons. Do not use; Transpo T-70 (HMW MMA) or TK Products epoxy (TK-2110) as they do not adequately adhere.

### **21-3.7 Joint Sealant**

Engine exhaust from the V-22 deteriorates standard joint seal material in concrete pavements. During ground operations with inoperative exhaust deflectors, applying moderately high power settings or ground power assurance checks can cause surface spalling.

Use Silicones joint seals in accordance with ASTM D5893 for general applications where the V-22 does not take-off vertically or perform ground runs. Use Chloroprene (Neoprene) or fluorocarbon adhesive joint seals in accordance with ASTM D2628 for locations where the V-22 takes-off vertically or performs ground runs for operations or training. Neoprene shows good chemical resistance and heat resistance up to 550°F. Fluorocarbon adhesive shows excellent chemical and heat resistance up to 750°F.

Plan to reapply joint sealant every five to 10 years. Preventing POL contamination of PCC is the key to long-term performance. This requires cleaning and resealing the joints when there is any joint seal failure. Plan to reseal the joints when re-sealing the surface even if not failed. For damaged surface coatings (i.e. chipped or cracked), or if the underlying PCC cracks along with the surface seal, decontaminate the area and reseal before re-contamination with POL. /1/

## **21-4 REQUIREMENTS.**

### **21-4.1 Cleaning.**

Before applying surface sealants, remove all contaminants such as POL, dust, curing compound, and moisture. If water is used to clean the pavement, dry the pavement and keep it dry for at least 24 hours prior to any surface application.

### **21-4.2 When to Seal.**

Initiate steps to protect the pavement within six months of commencing operations; however, apply surface sealants, such as sodium silicate, no earlier than 70 days after placing pavement.

For locations subject to less than two operations per week, this time may be extended to 12 months. Surface treatments are most effective when placed prior to the application of heat loads and prior to any contamination by POL. Damage to PCC has

been observed as early as six months and as late as 60 months after operations commence.

#### **21-4.3 Distress Repairs.**

When possible, repair the following distresses within the treatment area prior to the placement of surface treatments: damaged joint and crack seals, spalls, and medium- and high-severity patches as defined by ASTM D5340. Surface treatments can be applied before completing these repairs; however, retreatment of the surface within 6 inches (150 millimeters) of the repair area is recommended after completing the repairs. If the repair includes the placement of concrete or magnesium phosphate-based cements, do not reseal the surface of the repair during the first 70 days after placement.

#### **21-4.4 Existing Distress Effects.**

There are some distresses that, if present, reduce the effectiveness of the surface treatment; therefore, if you have shattered slabs, medium- or high-level durability cracking (D cracking), medium- or high-severity scaling, or medium- or high-level ASR as defined in ASTM D5340, the surface treatment can be omitted because they are not effective. In rare cases where older pavements have had their entire surfaces scaled and additional scaling or surface cracking has ceased, surface treatments can increase the life span of the pavement and can be effectively applied. Parking/operating the \1\ V-22 /1/ on pavements with these types and levels of distresses increases the rate of deterioration under the nacelles. Applying surface treatments to pavements with low-severity distresses of these types increases the service life of the pavement.

#### **21-4.5 Where to Seal.**

Seal those areas most susceptible to POL and direct exhaust, a circular area with a minimum 15-foot (4.5-meter) radius, centered where the engine exhaust is directed at parking, maintenance, and preflight check areas, including parking/maintenance ramps, forward area refueling points (FARP), and hot refuel/re-arm pads.

#### **21-4.6 High-Temperature Aggregates.**

If constructing new or replacing existing pavement to support \1\ V-22 /1/, or F-35A/B parking, maintenance, FARP, or hot refuel/re-arm operations, a high-temperature aggregate such as an igneous trap rock, expanded shale, or expanded slate may be used as the coarse aggregate in the concrete mix design. Unlike a concrete mix for a vertical landing pad, the fine aggregate can be a natural sand. If the cost of the pavement using high-temperature aggregates is more than twice the cost of standard \1\ airfield /1/ PCC then construct/repair the pavement using standard \1\ airfield /1/ PCC. Apply sodium silicate. However, do not apply the sealant any earlier than 70 days after placement of the concrete repair material. Where practical, include multifilament polypropylene fibers at a dosage of 3 pounds per cubic yard (1.8 kilograms per cubic meter) of concrete in any PCC or PCC with high-temperature aggregates.

## **21-5 PCC SODIUM SILICATE SURFACE SEALING.**

The sodium silicate surface sealer is absorbed into the top 0.125 inch (3 millimeters) of the concrete, providing resistance to high exhaust temperatures and POL stains. Sodium silicate requires reapplication if surface wear occurs. Do not apply sodium silicate surface sealers to asphalt pavement.

### **21-5.1 Sodium Silicate Solution.**

Provide and use a sodium silicate surface sealer that is a colorless, water-based solution containing 9 percent sodium silicate. While many manufacturers provide a product with this concentration, it often comes in 40 percent solutions. Higher-concentration products can be diluted to 9 percent sodium silicate. The 9 percent sodium silicate provides optimum concrete penetration with three applications. In order to dilute a 40 percent solution of sodium silicate to 9 percent, add 3.5 parts of water to 1 part of the 40 percent solution, i.e., for every gallon of 40 percent solution add 3.5 gallons of water. The sodium silicate sealer is applied to PCC subject to heat and POL, such as from F-35B, V-22 /1/ engines. Use of concentrations higher than 9 percent results in an excess buildup that will bubble and discolor under the heat load of the nacelles. If this occurs, remove the excess material by washing the area with warm water. Use a scrub brush and/or a high-pressure pump to speed removal. In extreme cases, use ultra-high-pressure rubber removal equipment. The portion of the sodium silicate that has combined with the concrete surface remains in place.

### **21-5.2 Surface Cleaning.**

Before application, clean the concrete with a rotary power washer/scrubber to remove tire rubber, curing compound, and POL. If heavy POL contamination is present or if the sodium silicate will not penetrate the surface, follow the procedures in paragraph 21-6 before applying the pavement sealant.

### **21-5.3 When to Seal.**

Do not apply the sodium silicate earlier than 70 days after the pavement has been placed. Testing has determined that sodium silicate applications prior to 70 days result in surface flaking of the PCC. Ensure all curing compound has been removed prior to sealing the PCC.

### **21-5.4 Joint Sealing.**

Properly seal the pavement joints before applying the sodium silicate. If the joint seals are not in good condition then repair or replace them before applying the sodium silicate.

### **21-5.5 Paint Markings.**

Ensure all paint markings (including shadow markings) are in place, in good condition, and contain no cracks or chips before applying the sodium silicate. Repair or replace damaged markings before applying the sodium silicate.

#### **21-5.6 Environmental Conditions.**

Do not apply the sodium silicate until the concrete surface has been dry for at least 24 hours and the pavement markings have been applied. Do not apply the sodium silicate until the air temperature is 40 degrees F (4.4 degrees C) or higher and relative humidity is 80 percent or less, both during application and for 48 hours after application. It is acceptable to apply the sodium silicate over pavement markings and glass beads.

#### **21-5.7 Surface Seal Application.**

Apply three coats of the sodium silicate solution with low-pressure airless spraying equipment to ensure uniform application or use a roller with a 0.25-inch to 0.5-inch (6-millimeter to 13-millimeter) nap. Start applying the solution at the highest point in the pavement and continue downgrade. Each coat will cover no more than 200 square feet per gallon (4.9 square meters per liter). Avoid excessive application, as it may cause efflorescence and reduce friction. Allow the sodium silicate to penetrate for two hours then wash off any visible excess (ponded) solution. Allow the area to dry for at least 24 hours between each coat.

#### **21-5.8 Final Evaluation.**

After allowing the last coat to dry for 24 hours, evaluate the surface for any excess silica or dusting. Wash off any excess silica or dusting as needed. Protect the application from any pedestrian or vehicular traffic until the last coat has dried.

### **21-6 CLEANING POL CONTAMINATION FROM PCC AND PCC JOINTS.**

#### **21-6.1 Stains.**

If POL stains are present, treat the entire stain before sealing the pavement. Several methods to remove POL stains and, in the case of POL stains on joints, improve the bond to the joint surface are described below. Most stains require several applications and may require the use of more than one treatment method. By implementing all of these steps maximum removal will be achieved; however, one or more of the steps can be omitted to achieve acceptable results. Steam may be used; however, steam alone will provide some cleansing of the immediate surface but not penetrate deep enough to provide a long-term result. Properly collect and dispose of any POL-contaminated water, paste, or solids.

#### **21-6.2 Dawn (or Simple Green) Dishwashing Detergent and Hot Water.**

Apply to the stained area and scrub to develop a thick lather. Let set for five minutes then rinse with warm/hot water. Use of steam to pretreat the area and rinse may aid removal.

#### **21-6.3 Tri-Sodium Phosphate (TSP).**

TSP (also called sodium orthophosphate) is available in hardware stores.

**Note:** Some states have banned this product because phosphate can cause problems with waterways. Check with the environmental office before using.

Mix one measure of TSP with six measures of water. Apply over the stain with a paintbrush and allow to dry completely before scraping off the dried paste. Rinse the surface and scrub with a stiff brush and clean water.

**Caution: DO NOT MIX TSP WITH ANY ACID! A violent reaction can occur and release noxious gas. You can use both products but use them separately, with a thorough rinsing with water between applications.**

Alternate application method: Dissolve 1 pound, 6 ounces of TSP in a gallon of water. Add enough finely ground calcium carbonate (also called whiting or agricultural lime) to make a thick paste. Agricultural lime is available at garden supply stores. Spread the paste over the stain and allow it to dry for a day, if possible. Brush off the dry paste with a stiff brush and scrub the concrete with water. Provide and use PPE and keep the paste away from aircraft due to the high pH of the paste. If it is windy, protect the treated area until the area is cleaned and rinsed to keep the caustic material from blowing around the apron.

#### **21-6.4 Sodium Hydroxide.**

If TSP is not available or not allowed, use sodium hydroxide. Prepare and use a solution of 5 percent sodium hydroxide (caustic soda: NaOH). Apply it over the stain with a paintbrush and allow to dry for at least 24 hours. Rinse and scrub with clean water then repeat as required. Provide and use PPE and keep the solution away from aircraft due to the high pH of the solution. If it is windy, protect the treated area until the area is cleaned and rinsed to keep the caustic material from blowing around the apron.

#### **21-6.5 Super Washing Soda.**

Washing Soda or Super Washing Soda, sodium carbonate, can be used as a substitute for TSP or sodium hydroxide; however, it does not work as well and may take more applications to remove the POL. Apply in accordance with manufacturer directions. Rinse well with water. This is an organic salt. If it is windy, protect the treated area until the area is cleaned and rinsed to keep the salt from blowing around the apron.

**21-6.6 Phosphoric Acid Cleaner.**

Apply phosphoric acid cleaner in accordance with manufacturer directions. Rinse well with water and sodium carbonate (washing soda or soda ash) to neutralize the pH then rinse with clear water. This product will etch the concrete so do not leave it on too long and ensure the area is rinsed well to ensure no acid is left on the concrete. Acid deteriorates ordinary Portland cement.

**21-6.7 Bacteria and Enzymes that Remove Oil Stains in Concrete.**

Biological materials (bacteria and enzymes) that consume POL can also help to remove stains. Use a biologic product as a final treatment prior to sealing. The bacteria stay in the concrete and help eliminate any remaining POL over time. Follow the product directions.

**21-6.8 Replacement.**

If the contamination is too extensive, consider removal/repair.

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## CHAPTER 22 F-35B AND C CRITICAL AREAS

### 22-1 BACKGROUND.

This chapter provides guidance concerning maintenance and repair of rigid and flexible pavements with regard to F-35 variant critical areas. Critical areas include, but are not limited to, areas designated for short take-off, flight carrier landing practice, and vertical landing and take-off operations which are further defined in 22-6 Definition of Critical Areas. Because of the asymmetrical external pressures of the F-35 variants, it is necessary to maintain an elevated maintenance policy for pavement within the critical areas the F-35 perform their operations.

### 22-2 ASPHALT CONCRETE PAVEMENT.

#### 22-2.1 Distresses in Asphalt Concrete Pavement.

Certain asphalt pavement distresses, as described in UFC 3-260-16 *O&M Manual: Standard Practice for Airfield Pavement Condition Surveys*, are especially susceptible to asymmetrical applications of the F-35 variant exhaust pressures. Asphalt pavements that exhibit the distresses of; block cracking, corrugation, swelling, and slippage of all severities, joint reflection cracking, and longitudinal and/or transverse cracking, of medium and high severities and shoving of all severities are all distresses that put asphalt pavements in critical areas at risk of partial or full depth delamination or "erosion". Many of the distresses listed are found in concrete to asphalt transitional areas.

#### 22-2.2 Maintenance of Asphalt Concrete Pavement.

Maintenance of asphalt pavement in critical areas must be considered as stop-gap maintenance only until reconstruction with concrete can be contracted. For the purposes of stop-gap maintenance, the distresses of block cracking, corrugation, swelling, and slippage of all severities require full depth asphalt concrete patching in the critical areas. The distresses of joint reflection cracking, and longitudinal and transverse cracking of medium and high severities require shallow depth asphalt concrete patching in the critical areas. Lastly, the distress of shoving of all severities require shallow depth asphalt concrete patching in the critical areas. The definitions of pavement distresses and severity levels and stop-gap maintenance recommendations are described in reference UFC 3-260-16 *O&M Manual: Standard Practice for Airfield Pavement Condition Surveys*. The critical areas are defined in 22-6 *Definition of Critical Areas*. Perform all repairs in accordance with UFC 3-270-01 *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair*, Chapter 3 *Full-Depth Asphalt Patches* and Chapter 4 *Procedural Steps (Partial-Depth Patch)*. The required asphalt pavement stop-gap maintenance in the critical areas is cost prohibitive over time; therefore, consideration must be made to either limit the mission or convert these pavements to plain jointed concrete pavements.

## **22-3 PLAIN JOINTED CONCRETE PAVEMENT.**

### **22-3.1 Distresses in Plain Jointed Concrete Pavement.**

Concrete pavement distresses, as described in UFC 3-260-16 *O&M Manual: Standard Practice for Airfield Pavement Condition Surveys*, are also susceptible to asymmetrical impacts of the F-35 variant exhaust pressures. Concrete pavements that exhibit full depth corner breaks, full depth linear cracking, joint sealant damage, joint and corner spalls, and partial depth repairs in critical areas, as described in 22-6 *Definition of Critical Areas*, can result in failure by separation or “erosion”. Distresses that diminish mechanical restraint (aggregate interlock or bond) are especially susceptible to failure and include joint and corner spalls, and debonded partial depth concrete repairs.

### **22-3.2 Maintenance of Plain Jointed Concrete Pavement.**

The following are distress repairs required within critical areas as defined in 22-6 *Definition of Critical Areas*: Existing partial depth repairs (small and large patches) of all severities require full depth concrete repairs. Joint and Corner spalls of medium and high severity require full depth concrete repairs. Joint Sealant damage of medium and high severity requires localized joint sealant replacement. Full depth concrete repairs must include dowels to ensure repairs are mechanically fixed in place. Any linear cracking or corner breaks that exhibit lack of aggregate interlock require full depth repairs. If linear cracking and corner breaks are mechanically fixed by dowels and aggregate interlock, then only crack sealing per UFC 3-270-01 *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair, Chapter 12 Concrete Pavement Crack Sealing* is necessary. Due to the requirement of full depth repairs, if slabs have multiple distresses it may be more economical to replace the entire slab. The definitions of pavement distresses and severity levels can be found in UFC 3-260-16 *O&M Manual: Standard Practice of Airfield Pavement Condition Surveys*. Perform all repairs in accordance with UFC 3-270-01 *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair, Chapter 14 Full-Depth Repair of Concrete Pavements*.

## **22-4 MAINTENANCE OF CONTINUOUSLY REINFORCED CONCRETE PAVEMENT**

Refer to UFC 3-270-01 *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair, Chapter 20 Maintenance of Heat-resistant Concrete* for maintenance of continuously reinforced concrete pavements. The partial depth repair methods described for heat resistant concrete can be applied for use in conventional concrete.

## **22-5 REQUIRED MATERIAL FOR MAINTENANCE AND REPAIR**

Cementitious material used for full depth patches must be like parent concrete material to be repaired. Conventional concrete must be used in non-heat resistant concrete critical areas. Heat-resistant concrete is required in heat resistant concrete critical

areas. Due to the temperatures of the F-35 variant exhaust only use ASTM D5893/D5893M silicone joint sealant.

## **22-6 DEFINITION OF CRITICAL AREAS**

### **22-6.1 Short Take-off (STO) Areas**

The critical area boundaries for STO operations is defined as the full width of the runway, and 457 meters (1,500 feet) in length (122 meters (400 feet) behind and 355 meters (1,100 feet) in-front of the F-35B engine). It is necessary that field operations designate a starting position for this operational maneuver. Refer to Figure 22-1 *STO Critical Area Scenario 1* and Figure 22-2 *STO Critical Area Scenario 2*.

### **22-6.2 Flight Carrier Landing Practice (FCLP) Critical Areas**

The critical area boundaries for FCLP operations is defined as to the runway edge left of the centerline and 50 feet right of the centerline, and 396 meters (1,300 feet) in length (91.5 meters (300 feet) from runway threshold to 488 meters (1,600 feet) from runway threshold). Refer to Figure 22-3 *FCLP Critical Areas*.

### **22-6.3 Vertical Landing Pad (VLP) Critical Areas**

The critical area boundaries for a VLP is defined as the Vertical Landing Pad and the 61 meter by 61 meter (200 foot by 200 foot) Safety Zone UFC 3-260-01 *Airfield and Heliport Planning and Design*, Figure 8-23 *Vertical Landing (VL) Pad Facility Outline with Safety Zones*.

### **22-6.4 LHD STOVL Critical Areas**

The critical area boundaries for a LHD STOVL Facilities is defined as Area A and Area D per UFC 3-260-01 *Airfield and Heliport Planning and Design*, Figure 8-21 *LHD Pavement Surface Types* and Figure 8-22 *LHD Pavement Surface Types Detail*.

22-7 FIGURES

FIGURE 22-1 STO CRITICAL AREA SCENARIO 1

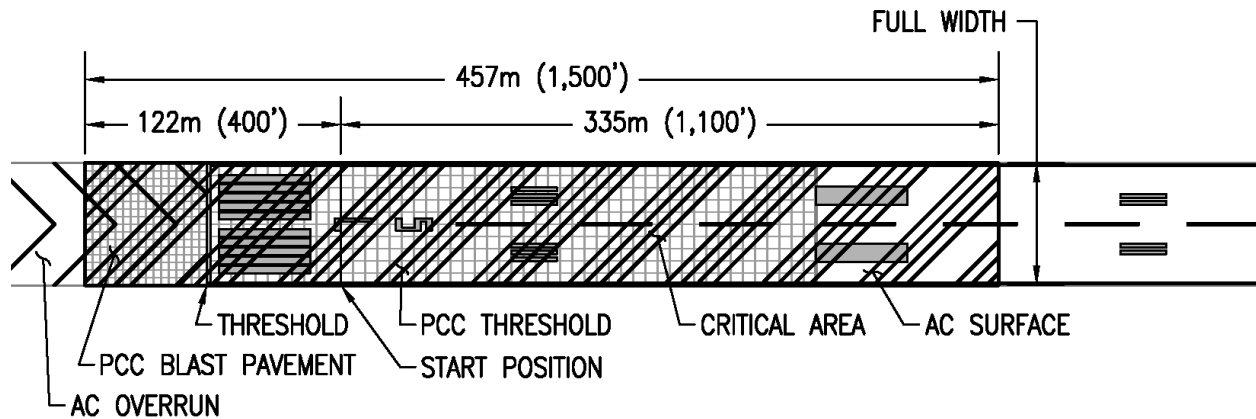


FIGURE 22-2 STO CRITICAL AREA SCENARIO 2

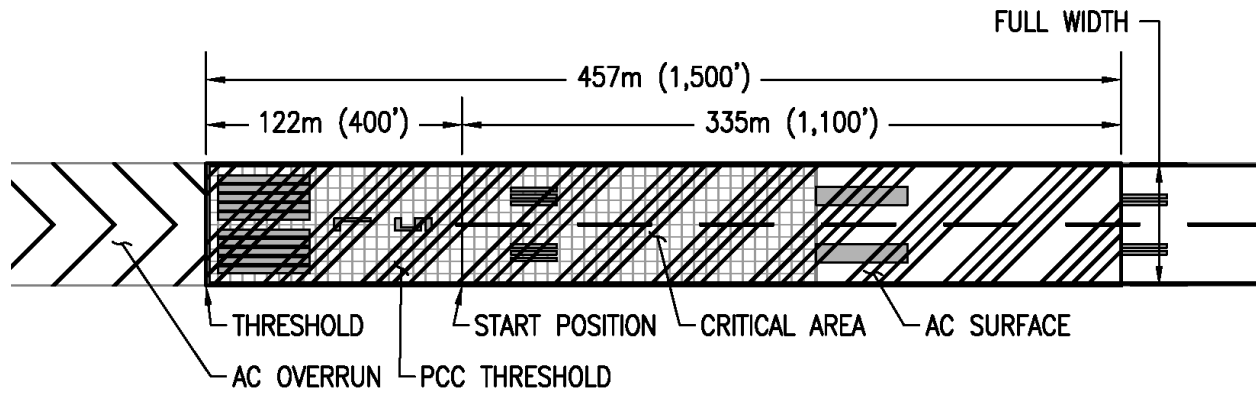
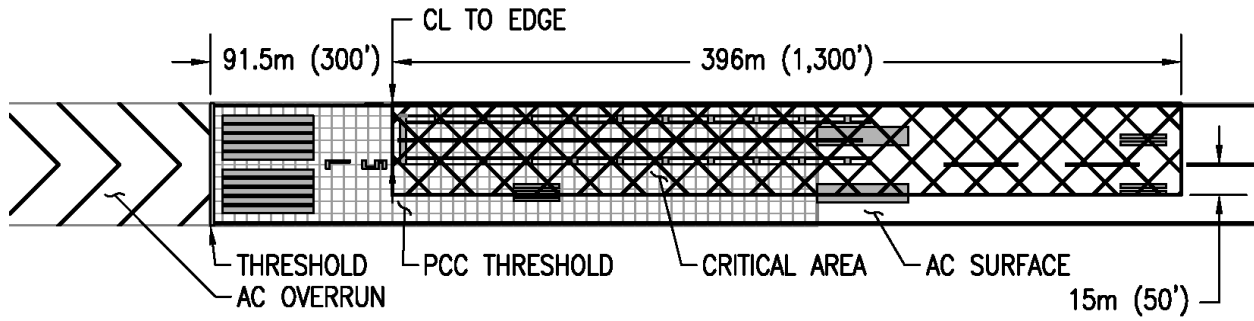


FIGURE 22-3 FCLP CRITICAL AREA



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**APPENDIX B BEST PRACTICES**

RESERVED

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## APPENDIX C GLOSSARY

C	degrees Celsius
F	degrees Fahrenheit
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFCEC	Air Force Civil Engineer Center
AFJMAN	Air Force joint manual
AOS	apparent opening size
APU	auxiliary power unit
ASR	alkali-silica reaction
ASTM	American Society for Testing and Materials
CRC	continuously reinforced concrete
CTE	coefficient of thermal expansion
DBST	double bituminous surface treatment
DOD	Department of Defense
DWG	Discipline Working Group
ETL	Engineering Technical Letter
FAA AC	Federal Aviation Administration Advisory Circular
FARP	forward area refueling point
FOD	foreign object damage
FWD	falling-weight deflectometer
gal/yd <sup>2</sup>	gallon per square yard
HCA	hot compressed air
HMA	hot-mix asphalt

HMAC	hot-mix asphalt concrete
HTC	high-temperature concrete
in.	inch
JPCP	Jointed Plan Concrete Pavement
kg/m <sup>2</sup>	kilogram per square meter
kPa	kilopascal
l/m <sup>2</sup>	liter per square meter
lb/yd <sup>2</sup>	pound per square yard
LTR	load transfer restoration
M&R	maintenance and repair
mm	millimeter
MMA	methyl methacrylate
MPC	magnesium phosphate cement
MS	medium-setting emulsion
NAVFAC EXWC	Naval Facilities Engineering Command Engineering and Expeditionary Warfare Center
NCS	neoprene compression seal
PFC	porous friction course
PFS	porous friction surface
OSHA	Occupational Safety and Health Administration
PCC	Portland cement concrete
pH	numeric scale to specify the acidity or alkalinity of an aqueous solution
PM	preventive maintenance
POL	petroleum, oil, lubricants

PPE	personal protective equipment
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QS	quick-setting emulsion
RPM	revolutions per minute
RS	rapid-setting emulsion
SBST	single bituminous surface treatment
SMA	stone mastic asphalt
SME	subject matter expert
SS	slow-setting emulsion
TDS-NAVFAC EXWC	TechData - Sheet Naval Facilities Engineering Command Engineering and Expeditionary Warfare Center
TM	Army technical manual
TSMCX	Transportation Systems Center
TSP	trisodium phosphate
TSPWG	Tri-Service Pavements Working Group
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specifications
USACE (CEMP-ET)	United States Army Corps of Engineers, Directorate of Military Programs
VL	vertical landing
VLZ	vertical landing zone comprising the imaginary airspace, VL pad, safety zone, shoulders, and connecting taxiway
WMA	warm mix asphalt















Yellow = Asphalt  
Blue = Sidewalks