ADDENDUM NO. 2
Airfield Pavement and Marking Maintenance
Middle Tennessee Airports
TAD # 99-555-1303-19
AERO-21-999-00

The following additional project information and clarifications are hereby incorporated into the bidding requirements for the referenced project:

1. The attendee list from the pre-bid meeting is attached.

2. Revised Project Manual Sections:
   a. Table of Contents
   b. Proposal
   c. P-101
   d. P-605
   e. P-608
   f. P-620

3. Revised Drawing Sheets, available at the following link.

https://bwsc.sharefile.com/d-s881da30be4c24605b403c5d0981601d1

   a. C0.01
   b. C0.03
   c. C0.04
   d. C5.02
   e. C7.01
   f. C7.02
   g. C7.03
   h. C7.04
   i. C7.05
   j. C7.06
   k. C7.07
   l. C7.08

4. Questions and Answers
   a. **"Could you explain what is considered a type 3 crack?'"** A Type III joint is greater than 1.5" and less than 3.5. See revised Sheet C0.04. Type III cracks are only anticipated at Maury County.
   b. **"Also, can we coordinate a site visit for the airports?"** We are not scheduling site visits; however, you may visit the airports. Please coordinate with the Airport managers at the locations that you plan on visiting.
   c. **Are there low-profile barricades available at each airport, or will the contractor be providing them?** There may be some barricades available at

some airports. However, the contractor is expected to provide them per note 25 on the CX.01 sheets.

d. **On John Tune airfield, do the marking on the blast pad need to be removed/re-marked?** The blast pad markings at John Tune shall be remarked, see sheet C4.03. Removal of markings is required per P-620.

e. **Are there any details for the various surface painted holding position signs (dimension, which numbers they are)?** See Sheet C0.05, detail 8, Note 1 regarding dimensions. See revised sheets C7.03-C7.08 in this Addendum.

f. **Is there a time limit for each airport? Some of this work will shut down operations until it is safe re-open.** See time limits on CX.01 and CX.02 sheets issued in Addendum No. 1.

g. **Please confirm that friction testing will be required on all airports that have seal coat applied to runway/high speed taxiway surfaces, and that this cost is incidental to the P608 pay item.** Friction testing will be required at all airports where P-608 is applied to runway/high speed taxiway surfaces and the cost for friction testing will be incidental to the P-608 pay item. See requirements stated in P-608, specifically paragraphs 608-6.2 and 608-8.1.

h. **Technical spec item P-608 states friction testing needs to be completed on P-608 test sections, will there be any additional testing required?** See testing requirements in P-608, specifically paragraphs 608-2.1, 608-2.2, 608-2.3, 608-2.5, 608-3.2 and 608-6.2.

i. **Will disposal of debris need to be hulled off site for each Airport?** The contractor is responsible for removing all debris generated at each airport.

j. **Can we drain grey water from water blasting removal operations at the Airport to a designated area? (It's not hazardous)** Yes, grey water will be allowed to be drained in locations as mutually agreed to by the Engineer and Airport Managers.

k. **Will routing be required for any of the cracks? If so, how will this be determined?** See requirements stated in P-101, specifically paragraphs 101-3.9.1 and 101-3.9.2.

l. **What kind of retro reflectivity testing will be required for each airport?** See requirements stated in P-620, specifically paragraph 620-3.8.

m. **If item P-623 is used, will friction testing be required?** See requirements in P-623, specifically paragraph 623-2.4.

n. **Do you anticipate the bid date being pushed to give time for the contractors to respond to the question response?** There is not a plan to move the bid date past Friday, February 19, 2021.

o. **Will the Surface Painted Hold Position Signs receive black boarder?** The Surface Painted Hold Position Signs will not receive a black outline.

p. **The quantities for the Runway Surface Painted Hold Position Signs are 1,600 SF does this cover all 17 Surface Painted Hold Position Signs at Smyrna Airport?** The quantities for red paint have been adjusted for the Smyrna Airport in this Addendum.

q. **Does the total number of calendar days for the phasing at each airport include the time for permanent marking?** Yes, the phasing at each airport includes the time for permanent markings.

r. **Will an additional phase be added to include permeant markings after recommended cure time for the sealer?** No additional phase will be added for the permanent markings, the time allotted for each phase includes permanent markings.

s. **For P-608, Will friction tests be required on Taxiways?** Friction tests will only be required for P-608 on runways and high-speed taxiways per paragraph 608-6.2.

t. **For P-608, How many test strips will be required at an airport? Just runway, or Runway and Taxiway? Will each phase require them or will one test strip work for the entire airport?** A test strip will be required for each differing asphalt pavement surface per paragraph 608-3.2.

u. **Will a Manufacturer's Rep be required at all airports for P-608? or Just Airports with Runway Work?** A qualified manufacturer's representative will be present in applying control strips per paragraph 608-3.2.

v. **What is the spec or Detail for Crack Repair Type 3?** See the revised sheet C0.04 included in this Addendum showing the detail for Type III crack repair.

w. **Will the contractor be required to get a meter to pay for water use at each location?** The contractor should plan on a water meter at each location to pay for water usage.

x. **Will the contractor be required to remove all the marking removal debris off site?** The contractor will be required to remove all project debris to include marking debris off site.

y. **Can you please provide a marking removal/demolition plan sheet for each airport that shows the markings that are required to be removed in their existing locations?** The marking sheets for each airport show the markings that need to be removed.

z. **Last contract we were required to route all virgin cracks regardless of manufactures recommendation, Will the contractor be required to router all virgin cracks in order to be paid for the footage?** Cracks will need to be prepared per paragraph 101-3.9, 101-3.9.1, 101-3.9.2, and 101-3.9.3.

aa. **What is the spec and detail for the Type 3 cracks?** See the revised sheet C0.04 included in this Addendum showing the detail for Type III crack repair.

bb. **If a crack is larger than 1.5 inches will it be required to be filled? And if so, what pay item if the Type 3 line item does not exist in the schedule of qtys.** See the revised sheet C0.04 included in this Addendum showing the detail for Type III crack repair. Type III cracks are only anticipated at Maury County Airport.

cc. **Will a hot air lance be required to prep on all cracks that have been previously sealed?** Existing sealants will be removed as stated in paragraph 101-3.9.2 which include use of a hot lance.

dd. **Will friction testing before application be required on all runways?** Friction testing will be required prior to seal coat application per paragraph 608-2.5.

ee. **Will a minimum of 2 coats be required in all areas including areas that have been previously seal coated for the p623 spec?** Application of 2 application coats will be required per paragraphs 623-1.2 and 623-4.6.

ff. **Is squeegee application of p-623 the only allowable application method?** P-623 shall be applied per paragraph 623-4.3.

gg. **Will all lights, informational signs, etc. need to be covered before applying seal coat?** Buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking, and in-pavement duct markers shall be covered per paragraphs 608-4.2 and 623-4.3

hh. **Which markings require a black outline it is not clearly specified in the plans?** The runway hold position markings at all airports will receive a black outline per recommendations in FAA AC 150/5340-1M. All other markings at John C. Tune Airport will receive a 6” black outline.

ii. **Will retro reflective testing be required on all airports?** Retro-reflectance testing shall occur at each airport.

jj. **Will type 3 beads be required on enhanced lead in lines or only Hold Shorts?** Type III beads are required on all hold position lines and enhanced taxiway centerlines per Detail 8 on Sheet C0.05 and Detail 7 on Sheet C0.06.

kk. **Will any spall repair be required of the concrete panels that have joint repair if the corners of the panels are deteriorating?** No spall repair is included as part of this project.

ll. **Will the markings be required to be laid out by a licensed TN surveyor?** Markings will not be required to be laid out by a licensed TN surveyor.

mm. **Have the airport managers been notified about the phasing plans?** The airport managers have been notified about the phasing plans.

nn. **Will the plans or the airport managers dictate the allowable closures? For instance, if the phasing plan allows the runway to be shut for 16 days, and the airport manager doesn't want his airport closed for that long what is the course of action?** The phasing plans will dictate the number of days. The actual closure days will be coordinated with the airport managers.

oo. **Will there be any additional runway closure days allowed if there are weather delays after the runway is shut down and during the shutdown?** The total number of days that the runway can be closed are shown on the phasing plans. Runways should be reopened when active work is not occurring.

pp. **Why is Maury County Regional Airport the first one that needs to be completed?** Specific needs at the airport.

qq. **Will an RPR be required to be always onsite during construction like last year?** Yes, an RPR will be required to be onsite during construction.

rr. **Whose responsibility will it be to prepare the pay applications at the end of the month?** The contractor shall prepare the pay applications with the concurrence of the RPR.

ss. **What are the requirements for the RPR qualifications?** An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor as determined by TDOT.

tt. **Since the project has a price schedule for each airport when determining major contract items will the 20% of total contract calculation in order to determine which item is a major contract item?** Per paragraph 10-33, a major item is one that is 20% or greater of the awarded contract.

uu. **Can the engineer/rpr reduce the qtys of a single pay item by more than 25% without the contractor being allowed to adjust pricing as in previous contracts?** Price adjustment shall be governed by paragraphs 40-02 and 90-03.

vv. **Which bid items constitute a major contract item that if the quantities are reduced by more than 25% the contractor will be allowed to requote the line item?** Per paragraph 10-33, a major item is one that is 20% or greater of the awarded contract.

ww. **Can the engineer/rpr remove certain pay items from the contract without any additional compensation?** Price adjustment shall be governed by paragraphs 40-02 and 90-03.

xx. **What reasonable allowances will be made if there is a covid outbreak among the crew, rpr, or airport staff?** No allowances are anticipated.

yy. **Has the engineer conducted site visits and field checked all as-bid quantities to ensure accuracy of quantity and scope?** Yes, the engineer has conducted site visits and determined quantities with estimates for continued deterioration. The quantities have also been checked against the Tennessee IDEA pavement condition data.

zz. **Have all CAD plans been checked for accuracy to ensure no issues with any layout/survey needs?** The CAD plans are founded on base drawings provided from each airport's consultants and have been checked for general accuracy. See Note 8 on the marking sheets.

aaa. **Can you provide a sign-in sheet from the mandatory pre-bid meeting?** See attached attendee list from the pre-bid meeting.

bbb. **Will a manufacturer's representative be required in the field for the P-608 and p623 work at each location?** A qualified manufacturer's representative will be present in applying control strips per paragraph 608-3.2 and a manufacturer's representative will need to recommend application rates per paragraph 623-1.2.

ccc. **What is the engineer's estimate for this project?** TDOT Aeronautics policy is to not provide engineer's estimates.

ddd. **Please confirm the unit of measure for the P-608 sealing. The current specifications (per addendum 1) show both square yards and square meters.** The unit of measure is square yards.

eee. **How soon can payment be expected upon completion of work? Will there be monthly pay applications like phase 1 and what is the expected turnaround time once the application is submitted?** Monthly pay applications are anticipated. Pay applications once recommended for approval by the Engineer will be processed by TDOT for payment. Once approved, payment normally occurs within 30 days.

fff. **Please confirm that removal of existing crack sealant as well as all plowing and saw cutting will be limited to concrete joints and does not apply to asphalt cracks.** Removal of existing crack sealant applies to asphalt cracks as well per paragraph 101-3.9.2.

ggg. **Please confirm all beads for John Tune are Type 3 beads including the white. The addendum didn't update the spec sheets to include type 3 for the white paint. Paint says type 1 in original specs, not updated in addendum 1.** The P-620 spec has been updated per the attached Addendum.

hhh. **Plans sheets from addendum 1 say paint will have a TDOT approved microbicide. Addendum 1 Plans Sheets C4.08. Can you please confirm**

that a micro biocide will be required in all paint? The original marking sheets all include the requirement for an approved TDOT microbicide.

iii. **The current bid sheet has the Alternate seal coat P-623 added with the total base bid, which includes the same yardage for P-608. So, that yardage is getting counted twice in the total bid amount. Could those two line items be combined and the contractor elect to use whichever material they choose for the lowest price?** It appears this question was generated based on the original proposal form. Addendum No. 1 gives the contractor the choice of proposing the most economical seal coat at each airport.

jjj. **With the addendum changing a lot of the bid documents do you prefer us to just send bound book back with the addendum loose attached to the book or is the printed electronic copy I have ok for us to submit with me switching out the changed forms and stapling all documents together and submitting to you?** It is preferred that you return the bound book with the changed forms included to TDOT at the address provided in the instructions to bidders.

kkk. **In regards to P-101 and removal of existing crack sealant. Does all the existing crack sealant need to be removed or just existing material that is loose?** Removal of existing crack sealant is required per paragraph 101-3.9.2.

Please see Verification of Receipt form, next page.

END OF ADDENDUM NO. 2

VERIFICATION OF RECEIPT

Receipt of Addendum No. 2 for the referenced project shall be acknowledged by signing below and immediately returning this verification of receipt via email to michelle.howell@bargedesign.com and john.greaud@bargedesign.com. A copy of this addendum **must** also be submitted with the bid proposal.

COMPANY: _____

NAME: _____

TITLE: _____

DATE: _____

M. TN Pavement and Marking Maintenance Pre-Bid Meeting
February 2, 2021
Attendee List

TDOT Aeronautics
- John-Paul Saalwaechter
- Jacob Brooks
- Adam Guy
- Steve Upshaw
- Bill Burney
- Katherine Finks

Barge Design Solutions
- John Greaud
- Jeremy Green
- Jake Campbell
- Ben Malone

American Road Maintenance
- Kyle Paulson

American Stripers

Asphalt Sealing Systems
- Charlie Miller

Axtell's Inc.
- Jason Corby

Cantrell Construction

Crafco
- Tad McDonald

GEE Asphalt
- Shaun Kukuzke

Griffin Contracting
- Troy Davis

Hi-Lite Airfield Services
- Dennis Haefner
- Tim Hurtibus

Kerr Brothers

Metro Construction
- Danny Morrow

Pavement Restorations, Inc

Remac Inc.

Russell Standard Group
- Nathan Hunt

Sunbelt Sealing
- Jeff Marshall
- Justin Pittman

Vance Brothers

SealMaster
- Bryan Wyatt

Mike Oliver

TABLE OF CONTENTS

ATTENTION

It shall be the bidders' responsibility to confirm that the Proposal Contract contains all the documents indicated on the Table of Contents.

Should any omissions occur, the appropriate documents may be obtained from the Construction Division upon request.

PROPOSAL

TO THE TENNESSEE DEPARTMENT OF TRANSPORTATION AERONAUTICS DIVISION, NASHVILLE, TENNESSEE

By submitting this Proposal, the bidder represents that it has carefully examined the sites of the work described herein, has become familiar with local conditions and the character and extent of the work; has carefully examined the Plans, the Standard Specifications for Construction of Airports, Federal Aviation Administration, Advisory Circular 150/5370-10H, with subsequent revisions which are acknowledged to be a part of this Proposal, the Special Provisions, the Proposal Form, the Form of Contract, and the Form of Contract Payment and Performance Bond (or the Form of Contract Performance Irrevocable Letter of Credit, for mowing contracts); and thoroughly understands their stipulations, requirements, and provisions.

The bidder has determined the quality and quantity of materials required; has investigated the location and determined the sources of supply of the materials required; has investigated labor conditions; and, has arranged for the continuous prosecution of the work herein described.

By submitting this Proposal, the bidder agrees to provide all necessary equipment, tools, labor, incidentals, and other means of construction, to do all the work, and furnish all the materials of the specified requirements which are necessary to complete the work in accordance with the Plans, and the Specifications, and agrees to accept as payment in full therefor the unit prices for the various items described in the Specifications that are set forth in this Proposal. The bidder understands that the quantities of work specified are approximate only and are subject to increase or decrease and that any such increase or decrease will not affect the unit prices set forth in this Proposal. Compensation for "extra work" which may be required by the Department in connection with the construction and completion of the work but which was not reflected in the Plans and Specifications at the time of bidding, will be made in the following manner: work for which there is a unit price set forth in this Proposal will be compensated at that unit price; work for which there is no unit price set forth in this Proposal will be compensated in accordance with the applicable Standard Specifications.

By submitting this Proposal, the parties hereto, in the performance of this Contract, shall not act as employees, partners, joint ventures, or associates of one another. It is expressly acknowledged by the parties hereto that such parties are independent contracting entities and that nothing in this Contract shall be construed to create an employer/employee relationship or to allow either to exercise control or direction over the manner or method by which the other transacts its business affairs or provides its usual services. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purpose whatsoever.

By submitting this Proposal, the bidder, if awarded the contract, agrees that it will be responsible for compliance with the Patient Protection and Affordable Care Act ("PPACA") with respect to itself and its employees, including any obligation to report health insurance coverage, provide health insurance coverage, or pay any financial assessment, tax, or penalty for not providing health insurance. The Contractor shall indemnify the State and hold it harmless for any costs to the State arising from Contractor's failure to fulfill its PPACA responsibilities for itself or its employees.

By submitting this Proposal, the bidder, if awarded the contract, shall be registered with the Department of Revenue for the collection of Tennessee sales and use tax or provide confirmation from the Department of Revenue that the bidder is not required to register for the Tennessee sales and use tax. This registration requirement is a material requirement of this Contract.

By submitting this Proposal, the bidder hereby agrees to be bound by the award of the Contract and, if awarded the Contract on this Proposal, to execute the required Contract and the required Contract Payment and Performance Bond (or Contract Payment and Performance Irrevocable Letter of Credit, for mowing contracts only) within ten days after receipt of notice of the award. The bidder must execute the required documents by signing each document provided in the bid package. The bidder submits herewith the required Proposal guaranty (or Proposal Irrevocable Letter of Credit, for mowing contracts only) in an amount of not less than five per cent of the total amount of the Proposal offered and agrees and consents that the Proposal guaranty (or Proposal Irrevocable Letter of Credit) shall immediately be at the disposal of the Department, not as a penalty, but as an agreed liquidated damage if the required Contract and Contract Payment and Performance Bond (or Irrevocable Letter of Credit) are not executed within ten days from receipt of the notice of award.

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to § 12-12-106. This list is generated to identify entities ineligible to contract with the State of Tennessee or any political subdivision of the State per the Iran Divestment Act, T.C.A. §§ 12-12-101 – 113, and the current list may be found at the Tennessee Department of General Services, Central Procurement Office, website under the Public Information Library webpage at the following link: https://www.tn.gov/content/dam/tn/generalservices/documents/cpo/cpo-library/List_of_persons_pursuant_to_Tenn._Code_Ann._12-12-106_Iran_Divestment_Act_updated_with%20NY10.14.20.pdf

THIS PROPOSAL SUBMITTED BY:

_____
Bidder (1)

By: _____

_____
Printed Name and Title

_____
Address

_____
City/State/Zip

Bidder (1) being a_____ composed of officers, partners, or owners as follows:
(Type of business entity)

_____
Name/Title Name/Title

_____
Name/Title Name/Title

_____
Name/Title Name/Title

_____
Bidder (2)*

By: _____

_____
Printed Name and Title

_____
Address

_____
City/State/Zip

Bidder (2) being a_____ composed of officers, partners, or owners as follows:
(Type of business entity)

_____
Name/Title Name/Title

_____
Name/Title Name/Title

_____
Name/Title Name/Title

BID FORM

Tennessee Department of Transportation
Aeronautics Division

Re: Airfield Pavement and Marking Maintenance of Middle Tennessee Airports
99-555-1303-19

In compliance with your Invitation to Bid for the above named project, having examined the Drawings and specifications and related documents and the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including availability of materials and labor, we hereby propose to furnish all labor, materials, and supplies and to construct the project in accordance with the contract documents, specifications and Drawings, within the time and prices stated below.

We acknowledge the receipt of Addenda numbered _____ through _____.
We acknowledge the right of the Owner to accept any proposal, to reject any or all proposals, and to waive any informalities in bidding.

If notice of acceptance of bid is delivered within 60 days from date of bid opening, we will promptly execute and deliver a contract in accordance with bid, as accepted by the Owner, in the form designated, or forfeit the bid security to the Owner for delay and additional expense caused thereby.

After the Notice to Proceed (NTP) is received, we will begin work within (10) days.

We acknowlege that all work must be completed on or before October 1st, 2021. We further agree to pay as liquidated damages to the Owner the sum of $1,600.00 for each calendar day of delay beyond the time frame shown for each airport and beyond October 1st, 2021, as provided in the Modifications to the General Conditions.

Eight (8) airports are included in the Bid as shown on the bid form. One contract will be awarded for this project. Award will be for the lowest acceptable bid, which is in the sole best interest of the Owner. Any award is subject to the availability of funding at the time of the award.

PROJECT BID

Clarksville Regional Airport, CKV

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	5,200		
P-101-5.2	CRACK REPAIR (TYPE II)	LF	1,050		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	765		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	12,380		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	600		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	600		
				Subtotal	

Ellington Airport, LUG

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	82,206		
P-101-5.2	CRACK REPAIR (TYPE II)	LF	1,829		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	66,851		
P-608-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608)	SY	56,819		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	63,181		
P-620-5.1	TEMPORARY WHITE PAINT	SF	32,000		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	5,200		
P-620-5.3	WHITE PAINT WITH REFLECTIVE MEDIA	SF	32,000		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	5,200		
P-620-5.5	BLACK PAINT	SF	1,085		
				Subtotal	

Fayetteville Municipal Airport, YFM

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	74,524		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	71,500		
P-605-5.1	JOINT SEALING FILLER	LF	1,220		
P-608-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608)	SY	65,725		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	46,475		
P-620-5.1	TEMPORARY WHITE PAINT	SF	32,500		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	6,000		
P-620-5.3	WHITE PAINT WITH REFLECTIVE MEDIA	SF	32,500		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	6,000		
P-620-5.5	BLACK PAINT	SF	2,475		
				Subtotal	

John C Tune Airport, JWN					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Extended Price**
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	69,510		
P-101-5.2	CRACK REPAIR (TYPE II)	LF	9,030		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	126,809		
P-620-5.1	TEMPORARY WHITE PAINT	SF	80,650		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	15,395		
P-620-5.3	WHITE PAINT WITH REFLECTIVE MEDIA (TYPE III BEADS)	SF	80,650		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA (TYPE III BEADS)	SF	15,935		
P-620-5.5	BLACK PAINT	SF	31,124		
				Subtotal	

Maury County Regional Airport, MRC					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Extended Price**
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	81,827		
P-101-5.2	CRACK REPAIR (TYPE II)	LF	10,925		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	75,815		
P-101-5.4	CRACK REPAIR (TYPE III)	LF	75		
P-608-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608)	SY	66,946		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	34,154		
P-620-5.1	TEMPORARY WHITE PAINT	SF	32,750		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	5,800		
P-620-5.3	WHITE PAINT WITH REFLECTIVE MEDIA	SF	32,750		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	5,800		
P-620-5.5	BLACK PAINT	SF	1,450		
				Subtotal	

Portland Municipal Airport, 1M5					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Extended Price**
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	13,670		
P-101-5.2	CRACK REPAIR (TYPE II)	LF	14,315		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	2,325		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	23,725		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	2,100		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	2,100		
P-620-5.5	BLACK PAINT	SF	300		
				Subtotal	

Smyrna Airport, MQY					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Extended Price**
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	323,897		
P-101-5.1	CRACK REPAIR (TYPE II)	LF	80,783		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	159,047		
P-605-5.1	JOINT SEALING FILLER	LF	99,920		
P-608-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608)	SY	61,622		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	211,998		
P-620-5.1	TEMPORARY WHITE PAINT	SF	64,692		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	44,615		
P-620-5.3	WHITE PAINT WITH REFLECTIVE MEDIA	SF	64,692		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	44,615		
P-620-5.5	BLACK PAINT	SF	8,840		
P-620-5.6	RED PAINT	SF	3,248		
				Subtotal	

Springfield-Robertson County Airport, M91					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Extended Price**
C-100	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1		
C-105	MOBILIZATION	LS	1		
P-101-5.1	CRACK REPAIR (TYPE I)	LF	85,205		
P-101-5.2	CRACK REPAIR (TYPE II)	LF	41,042		
P-101-5.3	AIRFIELD PAVEMENT MARKING REMOVAL	SF	72,053		
P-608-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608)	SY	61,900		
P-608-8.1 or P-623-8.1	EMULSIFIED ASPHALT SEAL COAT (P-608 OR P-623)	SY	60,350		
P-620-5.1	TEMPORARY WHITE PAINT	SF	32,350		
P-620-5.2	TEMPORARY YELLOW PAINT	SF	6,150		
P-620-5.3	WHITE PAINT WITH REFLECTIVE MEDIA	SF	32,350		
P-620-5.4	YELLOW PAINT WITH REFLECTIVE MEDIA	SF	6,150		
P-620-5.5	BLACK PAINT	SF	800		
				Subtotal	

Bid Total	

Item P-101 Preparation/Removal of Existing Pavements

DESCRIPTION

101-1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size designated by the Engineer. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlaying material that is to remain in place, shall be recompacted and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. If the material is to be wasted on the airport site, it shall be pulverized and either utilized in the project embankments in accordance with Specification P-152 or stockpiled at a location chosen by the Owner.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25 mm). If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch (6 mm) wide) with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to exceed ¼ inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide (38 mm)), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the RPR.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches (+0 to -3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

101-3.3 Removal of Foreign Substances/contaminates prior to overlay/seal-coat/remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

Chemicals, high-pressure water, heater scarifier (asphaltic concrete only), cold milling, rotary grinding or sandblasting may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch (3 mm) deep. If it is deemed by the RPR that damage to the existing pavement is caused by

operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. Repair of concrete spalls in areas to be overlaid with asphalt. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw cut a minimum of 2 inches (50 mm) outside the affected area and 2 inches (50 mm) deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches (100 mm) in depth. This method of repair applies only to pavement to be overlaid.

b. Asphalt pavement repair. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlaying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed off Airport property, unless otherwise specified. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The RPR shall layout the area to be milled with a straightedge in increments of 1-foot (30 cm) widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch (+0 mm and -6mm) of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to windrow the millings or cuttings and/or remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport, unless otherwise specified.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property, unless otherwise specified.

101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment. Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

b. Repair joints and cracks in accordance with paragraph 101-3.2.

c. Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement prior to resealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch (2 mm) from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.8.3 Joint sealant. Joint material and installation will be in accordance with Item P-605.

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

101-3.9.1 Preparation of Crack. Widen crack with router or random crack saw by removing a minimum of 1/16 inch (2 mm) from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Crack Sealant. Existing sealants will be removed by routing or random crack saw. Following routing or sawing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

101-3.9.3 Crack Sealant. Crack sealant material and installation will be in accordance with Item P-605.

101-3.9.4 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. Not used.

b. Removal of Inlets/Manholes. Not used.

METHOD OF MEASUREMENT

101-4.1 Joint and crack repair*. The unit of measurement for joint and crack repair shall be the linear foot of joint.*

101-4.2 Marking removal*. The unit of measurement for marking removal shall be measured by the number of square feet of paint removed.*

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P 101-5.1	*Crack Repair (Type I) – per linear foot*
Item P 101-5.2	*Crack Repair (Type II) – per linear foot*
Item P 101-5.3	*Airfield Pavement Marking Removal – per square foot*
Item P 101-5.4	*Crack Repair (Type III) – per linear foot*

REFERENCES

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

Advisory Circulars (AC)

AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

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

END OF ITEM P-101

Item P-605 Joint Sealants for Pavements

DESCRIPTION

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

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D5893, Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements *and ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements*.

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

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

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

CONSTRUCTION METHODS

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

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 14 days prior to use on the project.

a. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

f. Hot-poured sealing equipment. *The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.*

***g*. Cold-applied, single-component sealing equipment**. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, or waterblaster as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch (12 mm) from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches (75 mm) from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet (15 m) ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/8 inch ±1/16 inch below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 Joint sealing material shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 Payment for *rigid pavement* joint sealing material shall be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment for flexible pavement joint sealant shall be made for by pay item P-101, Crack Repair.

Payment will be made under:

Item P-605-5.1	Joint Sealing Filler, per linear foot

REFERENCES

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

ASTM International (ASTM)

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

ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	*Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt*

Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids

END ITEM P-605

Item P-608 Emulsified Asphalt Seal Coat

DESCRIPTION

608-1.1 This item shall consist of the application of a emulsified asphalt surface treatment composed of an emulsion of natural and refined asphalt materials, water and a polymer additive, for taxiways and runways with the application of a suitable aggregate to maintain adequate surface friction; and airfield secondary and tertiary pavements including low-speed taxiways, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied as designated on the plans. The terms seal coat, asphalt sealer, and asphalt material are interchangeable throughout this specification. The term emulsified asphalt means an emulsion of natural and refined asphalt materials.

MATERIALS

608-2.1 Aggregate. The aggregate material shall be a dry, clean, dust and dirt free, sound, durable, angular shaped manufactured specialty sand, such as that used as an abrasive, with a Mohs hardness of 6 to 8. The Contractor shall submit the specialty sand manufacturer's technical data and a manufacturer's Certificate of Analysis (COA) indicating that the specialty sand meets the requirements of the specification to the RPR prior to start of construction. The sand must be approved for use by the RPR and shall meet the following gradation limits when tested in accordance with ASTM C136 and ASTM C117:

Aggregate Material Gradation Requirements[1]

Sieve Designation (square openings)	Individual Percentage Retained by Weight
No. 10 (2.00 mm)	0
No. 14 (1.41 mm)	0-4
No. 16 (1.18 mm)	0-8
No. 20 (850 µm)	0-35
No. 30 (600 µm)	20-50
No. 40 (425 µm)	10-45
No. 50 (300 µm)	0-20
No. 70 (212 µm)	0-5
No. 100 (150 µm)	0-2
No. 200 (75 µm)	0-2

[1] Locally available sand or abrasive material that is slightly outside of the gradation requirements may be approved by the RPR with concurrence by the seal coat manufacturer for the use of locally available sand or abrasive material. The RPR and manufacturer's field representative should verify acceptance during application of Control strips indicated under paragraph 608-3.2.

The Contractor shall provide a certification showing particle size analysis and properties of the material delivered for use on the project. The Contractor's certification may be subject to verification by testing the material delivered for use on the project.

608-2.2 Asphalt Emulsion. The asphalt emulsion shall meet the properties in the following table:

Concentrated Asphalt Emulsion Properties

Properties	Specification	Limits
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	20 – 100 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	57% minimum
Sieve Test	ASTM D6933	0.1% maximum
24-hour Stability	ASTM D6930	1% maximum
5-day Settlement Test	ASTM D6930	5.0% maximum
Particle Charge [1]	ASTM D7402	Positive 6.5 maximum pH

[1] pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting, asphalt emulsions.

The asphalt material base residue shall contain not less than 20% gilsonite, or uintaite and shall not contain any tall oil pitch or coal tar material and shall contain between one and three and one-half percent (1-3.5%) polymer.

Tests on Residue from Distillation or Evaporation

Properties	Specification	Limits
Viscosity at 275°F (135°C)	ASTM D4402	1750 cts maximum
Solubility in 1, 1, 1 trichloroethylene	ASTM D2042	97.5% minimum
Penetration	ASTM D5	50 dmm maximum
Asphaltenes	ASTM D2007	15% minimum
Saturates	ASTM D2007	15% maximum
Polar Compounds	ASTM D2007	25% minimum
Aromatics	ASTM D2007	15% minimum

The asphalt emulsion, when diluted in the volumetric proportion of one part concentrated asphalt material to one part hot water shall have the following properties:

One-to-One Dilution Emulsion Properties

Properties	Specification	Limits
In Ready-to-Apply Form, one part concentrate to one part water, by volume		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	28.5% minimum
Pumping Stability [1]		Pass

[1] Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

Two-to-One Dilution Emulsion Properties

Properties	Specification	Limits
In Ready-to-Apply Form, two parts concentrate to one part water, by volume		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	38% minimum
Pumping Stability [1]		Pass

[1] Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the emulsified asphalt delivered to the project. If the asphalt emulsion is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties.

The COA shall be provided to and approved by the RPR before the emulsified asphalt is applied. The furnishing of the vendor's certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

The asphalt material storage and handling temperature shall be between 50°F - 160°F (10°C - 70°C) and the material shall be protected from freezing, or whenever outside temperature drops below 40°F (4°C) for prolonged time periods.

Contractor shall provide a list of airport pavement projects, exposed to similar climate conditions, where this product has been successfully applied within at least 5 years of the project.

608-2.3 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use. Water used in making and diluting the emulsion shall be potable, with a maximum hardness of 90ppm calcium and 15ppm magnesium; deleterious iron, sulfates, and phosphates maximum 7ppm, and less than 1ppm of organic byproducts. Water shall be a minimum of 140°F (60°C) prior to adding to emulsion.

608-2.4 Polymer. The polymer shall meet the properties in the following table:

Polymer Properties

Properties	Limits
Solids Content	47% to 65%, Percent by Weight
Weight	8.0 to 9.0 pounds/gallon (1.07 to 1.17 kg/L)
pH	3.0 to 8.0
Particle Charge	Nonionic/Cationic
Mechanical Stability	Excellent
Film Forming Temperature, °C	+5°C, minimum
Tg, °C	22°C, maximum

The manufacturer shall provide a copy of the Certificate of Analysis (COA) for the polymer used in the seal coat; and the Contractor shall include the COA with the emulsified asphalt COA when submitting to the RPR.

608-2.5 Seal Coat with Aggregate. The Contractor shall submit friction test data from no less than one of the airport projects identified under 608-2.2. The test data must be from the same project and include technical details on application rates, aggregate rates, and point of contact at the airport to confirm use and success of sealer with aggregate.

Friction test data in accordance with AC 150/5320-12, at 40 or 60 mph (65 or 95 km/h) wet, must include as a minimum; the friction value prior to sealant application; two values, between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value between 180 days and 360 days after the application. The results of the tests between 24 and 96 hours shall indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long-term test shall indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

Seal coat material submittal without required friction performance will not be approved. Friction tests performed on this project cannot be used as a substitute of this requirement.

COMPOSITION AND APPLICATION RATE

608-3.1 Application Rate. The approximate amounts of materials per square yard for the asphalt surface treatment shall be as provided in the table for the treatment area(s) at the specified dilution rate(s) as noted on the plans. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation.

Application Rate

Dilution Rate	Quantity of Emulsion gal/yd^2 (l/m^2)	Quantity of Aggregate lb/yd^2 (kg/m^2)
1:1	0.10-0.17 (0.45-0.77)	0.20-0.50 (0.11-0.27)

608-3.2 Control areas and control strips. Prior to full application, the control strip must be accepted by the RPR. The surface preparation, personnel, equipment, and method of operation used on the test area(s) and control strip(s) shall be the same as used on the remainder of the work.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying control areas and/or control strips to determine the appropriate application rate of both emulsion and aggregate to be approved by the RPR.

A test area(s) and control strip(s) shall be applied for each differing asphalt pavement surface identified in the project. The test area(s) and control strip(s) shall be used to determine the material application rate(s) of both emulsion and sand prior to full production.

a. For taxiway, taxilane and apron surfaces. Prior to full application, the Contractor shall place test areas at varying application rates as recommended by the Contractor's manufacturer's representative to determine appropriate application rate(s). The test areas will be located on representative section(s) of the pavement to receive the asphalt surface treatment designated by the RPR.

b. For runway and high-speed exit taxiway surfaces. Prior to full application, the Contractor shall place a series of control strips a minimum of 300 feet (90 m) long by 12 feet (3.6 m) wide, or width of anticipated application, whichever is greater, at varying application rates as recommended by the manufacturer's representative and acceptable to the RPR to determine appropriate application rate(s). The control strips should be separated by a minimum of 200 feet between control strips. The area to be tested will be located on a representative section of the pavement to receive the asphalt surface treatment designated by the RPR. The control strips should be placed under similar field conditions as anticipated for the actual application. The skid resistance of the existing pavement shall be determined for each control strip with a continuous friction measuring equipment (CFME). The skid resistance of existing pavement can be immediately adjacent to the control strip or at the same location as the control strip if testing prior to application. The Contractor may begin testing the skid resistance of runway and high-speed exit taxiway control strips after application of the asphalt surface treatment has fully cured, generally 8 to 36 hours after application of the control strips depending on site and environmental conditions. Aircraft shall not be permitted on the runway or high speed exit taxiway control strips until such time as the Contractor validates that its surface friction meets the maintenance planning friction levels in AC 150/5320-12, Table 3-2 when tested at speeds of 40 and 60 mph (65 and 95 km/h) wet with approved CFME.

If the control strip should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment shall be made. Additional control strips shall be placed and additional skid resistance tests performed and evaluated. Full production shall not begin without the RPR's approval of an appropriate application rate(s). Acceptable control strips shall be paid for in accordance with paragraph 608-8.1.

CONSTRUCTION METHODS

608-4.1 Worker safety. The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt emulsion product and sand and require workmen to follow the manufacturer's recommended safety precautions.

608-4.2 Weather limitations. The asphalt emulsion shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. No material shall be applied in strong winds that interfere with the uniform application of the material(s), or when dust or sand is blowing or when rain is anticipated within eight (8) hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be at, or above 60°F (16°C) and rising. Seal coat shall not be applied when

pavement temperatures are expected to exceed 130ºF within the subsequent 72 hours if traffic will be opened on pavement within those 72 hours. During application, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should emulsion get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the RPR, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

608-4.3 Equipment and tools. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Pressure distributor. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven hundred (700) feet per minute (213 m per minute). The equipment will be tested under pressure for leaks and to ensure proper set-up before use. The Contractor will provide verification of truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application per nozzle manufacturer, spray-bar height and pressure and pump speed appropriate for the viscosity and temperature of sealer material, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a 12-foot (3.7-m), minimum, spray bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard. These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

The distributor truck shall effectively heat and mix the material to the required temperature prior to application in accordance with the manufacturer's recommendations.

The distributor shall be equipped with a hand sprayer to spray the emulsion in areas not accessible to the distributor truck.

b. Aggregate spreader. The asphalt distributor truck will be equipped with an aggregate spreader mounted to the distributor truck that can apply sand to the emulsion in a single pass operation without driving through wet emulsion. The aggregate spreader shall be equipped with a variable control system capable of uniformly distributing the sand at the specified rate at varying application widths and speeds. The aggregate spreader must be adjusted to produce an even and accurate application of specified aggregate. Prior to any seal coat application, the aggregate spreader will be calibrated onsite to ensure acceptable uniformity of spread. The RPR will observe the calibration and verify the results. The aggregate spreader will be re-calibrated each time the aggregate rate is changed either during the application of test strips or production. The Contractor may consult the seal coat manufacturer representative for procedure and guidance. The sander shall have a minimum hopper capacity of 3,000 pounds (1361 kg) of sand. Push-type hand sanders will be allowed for use around lights, signs and other obstructions, if necessary.

c. Power broom/blower. A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

d. Equipment calibration. Asphalt distributors must be calibrated within the same construction season in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

608-4.4 Preparation of asphalt pavement surfaces. Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease from the asphalt pavement by scrubbing with a detergent, washing thoroughly with clean water, and then treat these areas with a spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with Item P-101, paragraph 101-3.6.

a. New asphalt pavement surfaces. Allow new asphalt pavement surfaces to cure so that there is no concentration of oils on the surface. A period of at least 30 days at 70°F (21°C) daytime temperatures shall elapse between the placement of a hot mixed asphalt concrete surface course and the application of the surface treatment.

Perform a water-break-free test to confirm that the surface oils have degraded and dissipated. (Cast approximately one gallon (4 liters) of clean water out over the surface. The water should sheet out and wet the surface uniformly without crawling or showing oil rings.) If signs of crawling or oil rings are apparent on the pavement surface, additional time must be allowed for additional curing and retesting of the pavement surface prior to treatment.

608-4.5 Emulsion mixing. The application emulsion shall be obtained by blending asphalt material concentrate, water and polymer, if specified. Always add heated water to the asphalt material concentrate, never add asphalt material concentrate to heated water. Mix one part heated water to one part asphalt material concentrate, by volume.

Add 1% polymer, by volume, to the emulsion mix. If the polymer is added to the emulsion mix at the plant, submit weight scale tickets to the RPR. As an option, the polymer may be added to the emulsion mix at the job site provided the polymer is added slowly while the asphalt distributor truck circulating pump is running. The mix must be agitated for a minimum of 15 minutes or until the polymer is mixed to the satisfaction of the RPR.

608-4.6 Application of asphalt emulsion. The asphalt emulsion shall be applied using a pressure distributor upon the properly prepared, clean and dry surface at the application rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated treatment area. The asphalt emulsion should be applied at a temperature between 130°F (54°C) and 160°F (70°C) or in accordance with the manufacturer's recommendation.

If low spots and depressions greater than 1/2 inch (12 mm) in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be lightly broomed with a broom or brush type squeegee until the pavement surface is free of any pools of excess material.

During all applications, the surfaces of adjacent structures shall be protected to prevent their being spattered or marred.

608-4.7 Application of aggregate material. Immediately following the application of the asphalt emulsion, friction sand at the rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated application area, shall be spread uniformly over the asphalt emulsion in a single-pass operation simultaneous with the sealer application. The aggregate shall be spread to the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing.

Sprinkling of additional aggregate material, and spraying additional asphalt material over areas that show up having insufficient cover or bitumen, shall be done by hand whenever necessary. In areas where hand work is necessitated, the sand shall be applied before the sealant begins to break.

Minimize aggregate from being broadcast and accumulating on the untreated pavement adjacent to an application pass. Prior to the next application pass, the Contractor shall clean areas of excess or loose aggregate and remove from project site.

QUALITY CONTROL (QC)

608-5.1 Manufacturer's representation. The manufacturer's representative knowledgeable of the material, procedures, and equipment described in the specification is responsible to assist the Contractor and RPR in determining the appropriate application rates of the emulsion and aggregate, as well as recommendations for proper preparation and start-up of seal coat application. Documentation of the manufacturer representative's experience and knowledge for applying the seal coat product shall be furnished to the RPR a minimum of 10 work days prior to placement of the control strips. The cost of the manufacturer's representative shall be included in the Contractor's bid price.

608-5.2 Contractor qualifications. The Contractor shall provide documentation to the RPR that the seal coat Contractor is qualified to apply the seal coat, including personnel, and equipment, and has made at least three (3) applications similar to this project in the past two (2) years.

MATERIAL ACCEPTANCE

608-6.1 Application rate. The rate of application of the asphalt emulsion shall be verified at least twice per day.

608-6.2 Friction tests. Friction tests in accordance with AC 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, shall be performed on all runway and high-speed taxiways that received a seal coat. Each test includes performing friction tests at 40 mph and 60 mph (65 or 95 km/h) both wet, 15 feet (4.5 m) to each side of runway centerline with approved continuous friction measuring equipment (CFME). The Contractor shall coordinate testing with the RPR and provide the RPR a written report of friction test results. The RPR shall be present for testing.

METHOD OF MEASUREMENT

608-7.1 Asphalt surface treatment. The quantity of asphalt surface treatment shall be measured by the square yards of material applied in accordance with the plans and specifications and accepted by the RPR.

The Contractor must furnish the RPR with the certified weigh bills when materials are received for the asphalt material used under this contract. The Contractor must not remove material from the tank car or storage tank until initial amounts and temperature measurements have been verified.

BASIS OF PAYMENT

608-8.1 Payment shall be made at the contract unit price per square yard for the asphalt surface treatment applied and accepted by the RPR, and the contract unit price per lump sum for runway friction testing. This price shall be full compensation for all surface preparation, furnishing all materials, delivery and application of these materials, for all labor, equipment, tools, and incidentals necessary to complete the item, including the friction testing and all work required to meet AC 150/5320-12, and any costs associated with furnishing a qualified manufacturer's representative to assist with control strips.

Payment will be made under:

Item P-608-8.1 Emulsified Asphalt Seal Coat – per square yard

REFERENCES

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

ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D5	Standard Test Method for Penetration of Asphalt Materials
ASTM D244	Standard Test Methods and Practices for Emulsified Asphalts
ASTM D2007	Standard Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
ASTM D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D2995	Standard Practice for Estimating Application Rate of Bituminous Distributors
ASTM D4402	Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys

Advisory Circulars (AC)

AC 150/5320-12	Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces
AC 150/5320-17	Airfield Pavement Surface Evaluation and Rating (PASER) Manuals
AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements

END OF ITEM P-608

Item P-620 Runway and Taxiway Marking

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms "paint" and "marking material" as well as "painting" and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer's certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer's surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint[1]				Glass Beads[2]	
Type	**Color**	**Fed Std. 595 Number**	**Application Rate Maximum**	**Type I, Gradation A[1] Minimum**	**Type III Minimum**
Waterborne, Type I	Yellow	33538 or 33655	115 ft^2/gal	7 lb/gal	10 lb/gal
Waterborne, Type I	White	37925	115 ft^2/gal	7 lb/gal	10 lb/gal
Waterborne, Type I	Black	37038	115 ft^2/gal		
Waterborne, Type I	Red	31136	115 ft^2/gal	5 lb/gal	
Temporary Marking Waterborne Type I	All		230 ft^2/gal	No beads	

[1] See paragraph 620-2.2a

[2] See paragraph 620-2.2b

a. Paint. Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595.

Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type I. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis. The acrylic resin used for Type III shall be 100% cross linking acrylic as evidenced by infrared peaks at wavelengths 1568, 1624, and 1672 cm-l with intensities equal to those produced by an acrylic resin known to be 100% cross linking.

b. Reflective media. Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type I, Gradation A or Type III**.**

Glass beads for red and pink paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminates that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to

eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans. The locations of markings to receive silica sand shall be shown on the plans.

620-3.5 Application. A period of 30 days shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

620-3.6 Application--preformed thermoplastic airport pavement markings.

Preformed thermoplastic pavement markings not used.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly

embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 Retro-reflectance. Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

Minimum Retro-Reflectance Values

Material	**Retro-reflectance mcd/m^2/lux**		
	White	**Yellow**	**Red**
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than[1]	100	75	10

[1] 'Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance

620-3.9 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1a The quantity of surface preparation shall be measured by **[** the number of square feet for each type of surface preparation specified in paragraph 620-3.3.

620-4.1b The quantity of markings shall be paid for shall be measured by the number of square feet of painting**.**

620-4.1c Reflective media shall not be measured for separate payment.

620-4.1d Temporary markings not required.

BASIS OF PAYMENT

620-5.1 This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

620-5.1a Payment for surface preparation shall be made at the contract price for the number of square feet for each type of surface preparation specified in paragraph 620-3.3.

620-5.2b Payment for markings shall be made at the contract price for by the number of square feet of painting.

620-5.3c Payment for reflective media shall not be measured for separate payment.

620-5.4d Temporary markings are not required.

Payment will be made under:

Item P-620-5.1	Temporary White Paint - per square foot
Item P-620-5.2	Temporary Yellow Paint - per square foot
Item P-620-5.3	White Paint with Reflective Media - per square foot
Item P-620-5.4	Yellow Paint with Reflective Media - per square foot
Item P-620-5.5	Black Paint - per square foot
Item P-620-5.6	Red Paint with Reflective Media - per square foot

REFERENCES

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

ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24
Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based

Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

END OF ITEM P-620