



*Office of the
City Clerk*

NOTICE OF SPECIAL MEETING

OF THE

CHICKASHA MUNICIPAL AIRPORT AUTHORITY

In compliance with Title 25, Oklahoma Statutes, Section 301-314, the Oklahoma Open Meeting Act, including the posting of notice and agenda, be advised that the Chickasha Municipal Airport Authority of the City of Chickasha, Oklahoma, will conduct a

**SPECIAL MEETING ON MONDAY,
MARCH 13, 2023 AT 6:30 P. M.** Said meetings will be held in the Council Chambers, City Hall, 117 North 4th Street, Chickasha, Oklahoma.

The City of Chickasha encourages participation from all its citizens. If participation is not possible due to a disability, notification to the City Clerk at least 48 hours prior to the scheduled meeting is encouraged to make the necessary accommodations. The City may waive the 48-hour rule if signing is not the necessary accommodation.

Agenda items are attached.

Posted on the bulletin board of the Chickasha Municipal Building on Wednesday, March 8, 2023 at 4:30 P.M.



Susan M. McDaniel, CMC - City Clerk

SPECIAL MEETING OF THE
CHICKASHA MUNICIPAL AIRPORT AUTHORITY AGENDA
LOCATION OF MEETING
CITY HALL COUNCIL CHAMBERS
117 NORTH FOURTH STREET
CHICKASHA, OKLAHOMA 73018

TIME OF MEETING

6:30 P. M.

DATE OF MEETING

MARCH 13, 2023

1. Call to Order / Roll Call
2. Discussion and Consideration:
 - a. Discussion, consideration, and possible action to authorize Staff to solicit bids for CAA-2301- Rehabilitate Runway 18/36 and Taxiways.
3. Motion to Adjourn.

SOLICITATION FOR BIDS

Notice is hereby given that the City of Chickasha will receive sealed bids in the office of the City Clerk, 2nd Floor of the City Hall, 117 N. 4th St., Chickasha, OK 73018 until 10:00 AM Local Time on April 5, 2023. Said bids will be opened immediately thereafter in the 2nd floor conference room for:

Rehabilitate Runway 18/36 and Taxiways
Bid No. CAA-2301
OAC CHK-23-S
CHICKASHA MUNICIPAL AIRPORT
Chickasha, Oklahoma

Bids shall be made in accordance with Solicitation for Bids, Information to Bidders, Plans, Specifications, and Bidder's Proposal, on file and available for examination at the Office of the City Clerk in City Hall, Chickasha, Oklahoma, and made part of this notice as though fully set forth herein. A PDF (hard copies not provided) may be obtained from Parkhill, 14101 Wireless Way, Suite 350, Oklahoma City, Oklahoma 73134, 405.832.9900, at no charge.

Bids filed with the City Clerk shall be publicly opened and considered by the City at time stated herein. Bidder must supply all information required by Bid/Proposal Form.

Bids/Proposals received more than 96 hours, (excluding Saturdays, Sundays, and holidays), before set time for opening bids as well as Bids/Proposals received after set time for opening of bids, will not be considered and be returned unopened.

Cashier's check, certified check, surety bond, or irrevocable letter of credit in 5 percent of bid shall accompany sealed Bid/Proposal of each Bidder/Proposer. Deposits will be returned to unsuccessful Bidder(s)/Proposer(s).

The City of Chickasha reserves the right to reject any/all bids and waive any/all informalities.

Upon receipt of acceptable Bid/Proposal, contract will be awarded within ninety (90) days after opening Bids/Proposals and written contract executed within 10 days thereafter.

A Prebid Conference concerning this Project will be held at 10:00 AM, March 23, 2023, in the Terminal Building, 2344 Beechcraft Rd., Chickasha Municipal Airport, Chickasha, OK 73018. **Attendance at Prebid Conference is MANDATORY. Bids will NOT be accepted from contractors who do NOT have a representative in attendance. No Plans, Specifications, or Bid Documents will be issued after Prebid Conference. All Bidders/Proposers must visit and inspect construction site and be familiar with site physical characteristics and conditions.**

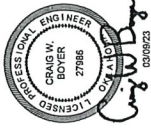
For eligibility to bid this Project, contractors must be listed:

- on official Bidder List by obtaining an official set of Plans and Specifications from Parkhill;
AND
- as an attendee of mandatory Project Prebid Conference.

Bids received from contractors not meeting these requirements will be returned unopened.

City of Chickasha

END OF SOLICITATION FOR BIDS



Rehabilitate Runway 18/36
and Parallel Taxiway

OAC CHK-23.5



Client
Chickasha Municipal Airport
City of Chickasha
1000 North Main Street
Chickasha, Oklahoma 73018

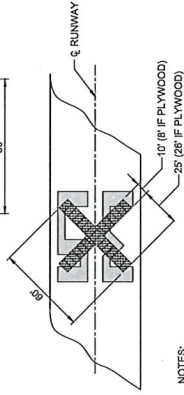
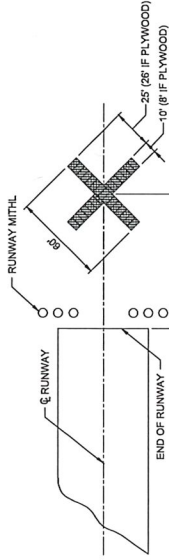
Project No.
019022.10

#	DATE	DESCRIPTION

Construction
Safety Plan
Notes & Details
G-003

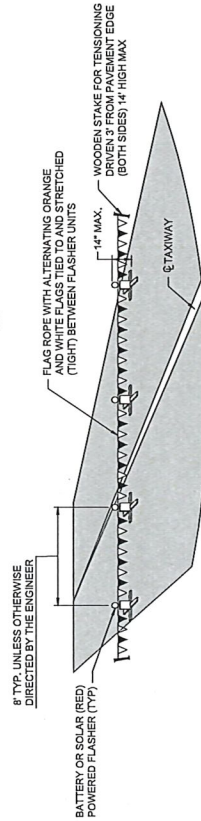
CONSTRUCTION SAFETY PLAN NARRATIVE:

- GENERAL SAFETY REQUIREMENTS:
THE CONTRACTOR SHALL MAINTAIN ACCESS TO THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING AREAS. THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING AREAS SHALL REMAIN IN USE BY AIRCRAFT TO THE MAXIMUM EXTENT POSSIBLE. AIRCRAFT USE OF AREAS NEAR THE CONTRACTOR'S WORK WILL BE CONTROLLED TO MINIMIZE DISTURBANCE TO THE CONTRACTOR'S OPERATION. THE CONTRACTOR SHALL MAINTAIN ACCESS TO THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING AREAS FOR ANY PERSON OVER WHOM HE/SHE HAS CONTROL TO ENTER OR REMAIN IN ANY PART OF THE AIRPORT WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS. WHENEVER AIRCRAFT OPERATIONS REQUIRE, THE OWNER, INSPECTOR, OR AIRCRAFT OPERATOR SHALL BE NOTIFIED IN ADVANCE. THE CONTRACTOR SHALL MAINTAIN ACCESS TO THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING AREAS UNTIL AIRCRAFT USE IS COMPLETED.
- CONSTRUCTION MAINTENANCE AND FACILITIES MAINTENANCE:
BEFORE BEGINNING ANY CONSTRUCTION ACTIVITY, THE CONTRACTOR MUST, THROUGH THE AIRPORT OPERATOR, GIVE NOTICE USING THE NOTICE TO ARMEN (NOTAM) SYSTEM OF PROPOSED LOCATION, TIME, AND DATE OF COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR SHALL MAINTAIN ACCESS TO THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING AREAS TO STANDARD CONDITIONS. THE CONTRACTOR MUST, THROUGH THE AIRPORT OPERATOR, VERIFY THE CANCELLATION OF ALL NOTICES ISSUED VIA THE NOTAM SYSTEM. THROUGHOUT THE DURATION OF THE CONSTRUCTION PROJECT, THE CONTRACTOR MUST -
 - INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY TO BE AWARE OF CONDITIONS.
 - REMOVE ALL ACTIONS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS SOON AS THEY ARE DISCOVERED.
- APPROACH CLEARANCE TO RUNWAYS:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS.
- RUNWAY AND TAXIWAY SAFETY AREA:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS.
- MARKING AND LIGHTING FOR TEMPORARY THRESHOLDS:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS.
- CLOSED RUNWAY MARKING AND LIGHTING:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS.
- HAZARDOUS AREA MARKING AND LIGHTING:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS. OTHER BARRICADES AS SHOWN ON EACH PHASE OF CONSTRUCTION SAFETY PLAN.
- TEMPORARY LIGHTING AND MARKING:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS.
- NAVIGATIONAL AIDS:
SEE INDIVIDUAL PHASING CONSTRUCTION PLAN SHEET FOR REQUIREMENTS.
- LIMITATIONS ON CONSTRUCTIONS:
ALL OPEN TRENCHES, EXCAVATIONS, AND STOCKPILED MATERIALS SHALL BE PROMINENTLY MARKED AND LIGHTED AS HAZARDOUS.
- ALL STOCKPILED MATERIAL SHALL BE CONSTRAINED TO PREVENT MOVEMENT AS A RESULT OF THE MAXIMUM ANTICIPATED AIRCRAFT BLAST AND FORECAST WIND CONDITIONS.
- RADIO COMMUNICATIONS:
NONE REQUIRED.
- DEBRIS:
WASTE AND LOOSE MATERIALS MUST NOT BE PLACED IN ACTIVE AIRCRAFT MOVEMENT AREAS. MATERIALS TRACKED ONTO THESE AREAS MUST BE REMOVED CONTINUOUSLY DURING THE PROJECT.



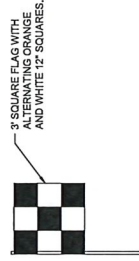
- NOTES:
- THE CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN, RELOCATE AND REMOVE THE CROSSES AND FLASHERS FOR THIS PROJECT. CROSSES SHALL REMAIN THE CONTRACTOR'S PROPERTY.
 - CROSSES SHALL BE FIRMLY ANCHORED IN PLACE BY AN ACCEPTABLE METHOD, TYPICALLY SANDBAGS (PAINTED YELLOW) NO ROCKS OR BRICKS, ALL VISIBLE COMPONENTS OF THE CROSSES SHALL BE YELLOW IN COLOR.
 - ALL VISIBLE COMPONENTS OF THE CROSSES SHALL BE YELLOW IN COLOR.
 - CROSSES MAY BE CONSTRUCTED USING 4" X 8" X 3/4" CD/EXT PLYWOOD SHEETING, VISQUEENE, OR OTHER APPROVED MATERIAL.
 - CROSSES SHALL BE PLACED ON TOP OF THE RUNWAY DESIGNATION MARKINGS.

CLOSED RUNWAY CROSS
NOT TO SCALE



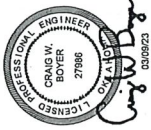
- NOTES:
- FLAG AND FLASHER BARRICADES, AS SHOWN ABOVE, SHALL BE FURNISHED, INSTALLED, MAINTAINED, RELOCATED WHEN NECESSARY AND REMOVED BY THE CONTRACTOR ONLY AFTER CONSTRUCTION AREA IS ACCEPTED BY THE ENGINEER AND IS OPEN TO AIRCRAFT OPERATIONS.
 - BARRICADES SHALL BE CHECKED DAILY TO CONFIRM THEY ARE PROPERLY ALIGNED AND IN WORKING ORDER.
 - THIS DETAIL FOR REFERENCE ONLY.
 - BARRICADES SHALL BE INSTALLED PRIOR TO BEGINNING, AND REMOVED AT THE CONCLUSION OF EACH WORK PERIOD.

LOW PROFILE FLAG AND FLASHER BARRICADE
NOT TO SCALE



- NOTES:
- FLAGS SHALL BE CONSTRUCTED OF FABRIC AND SHALL BE MOUNTED ON A POLE SUITABLE FOR VEHICLE MOUNTING OR HANDLING BY PERSONNEL.
 - ALL VEHICLES AND EQUIPMENT SHALL DISPLAY FLAG OR AMBER FLASHING LIGHTS WHILE ON PROJECT.

CHECKERED VEHICLE FLAG
NOT TO SCALE



Rehabilitate Runway 18/36
and Parallel Taxiway
OAC CHK-23.5

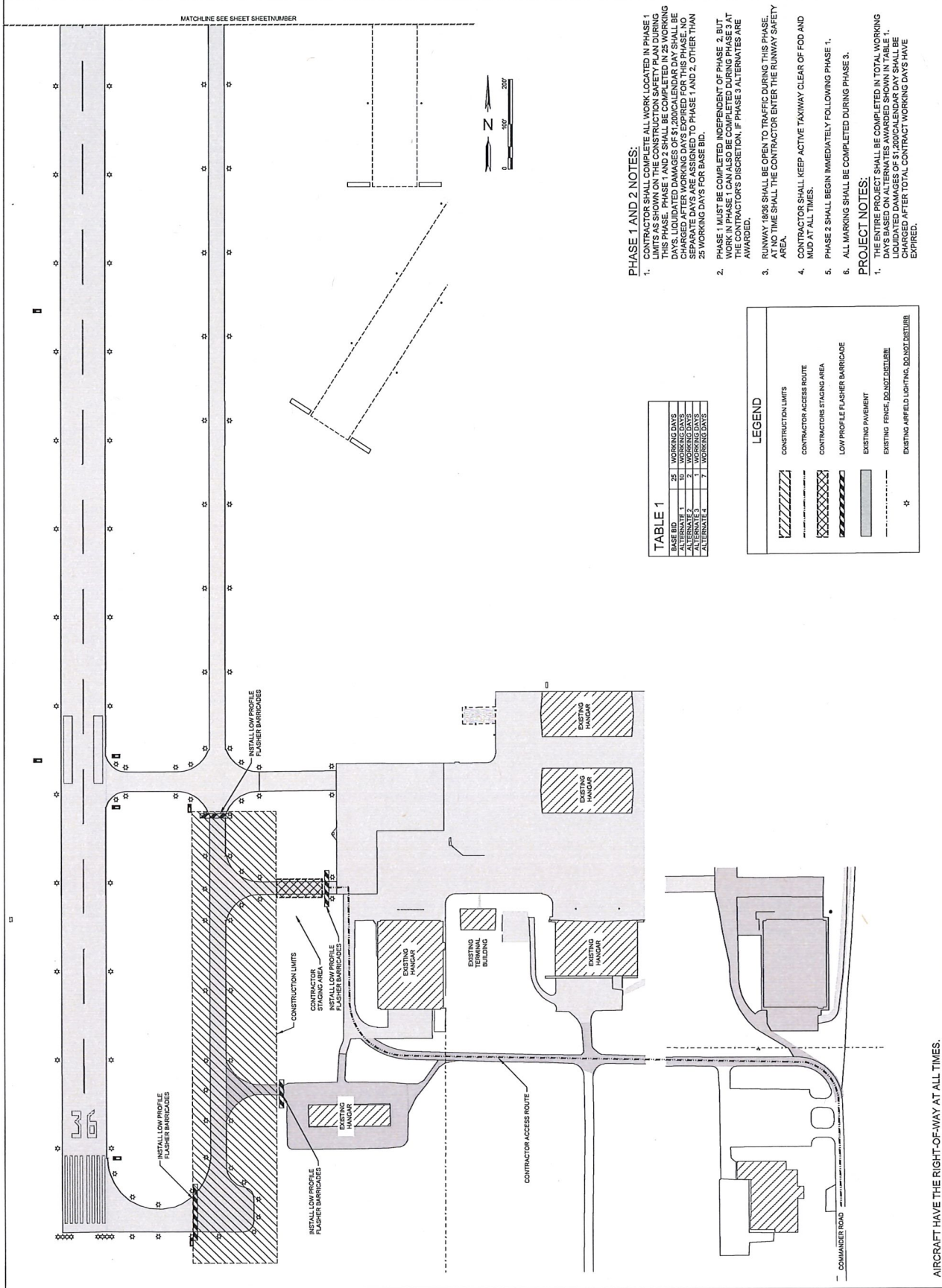


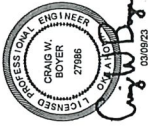
Client
Chickasha Municipal Airport
City of Chickasha
1100 S. Broadway
Chickasha, Oklahoma 73018

Project No.
070023.10

#	DATE	DESCRIPTION

Construction
Safety Plan Phase
1
G-004





Rehabilitate Runway 18/36
and Parallel Taxiway
OAC CHK-23.5



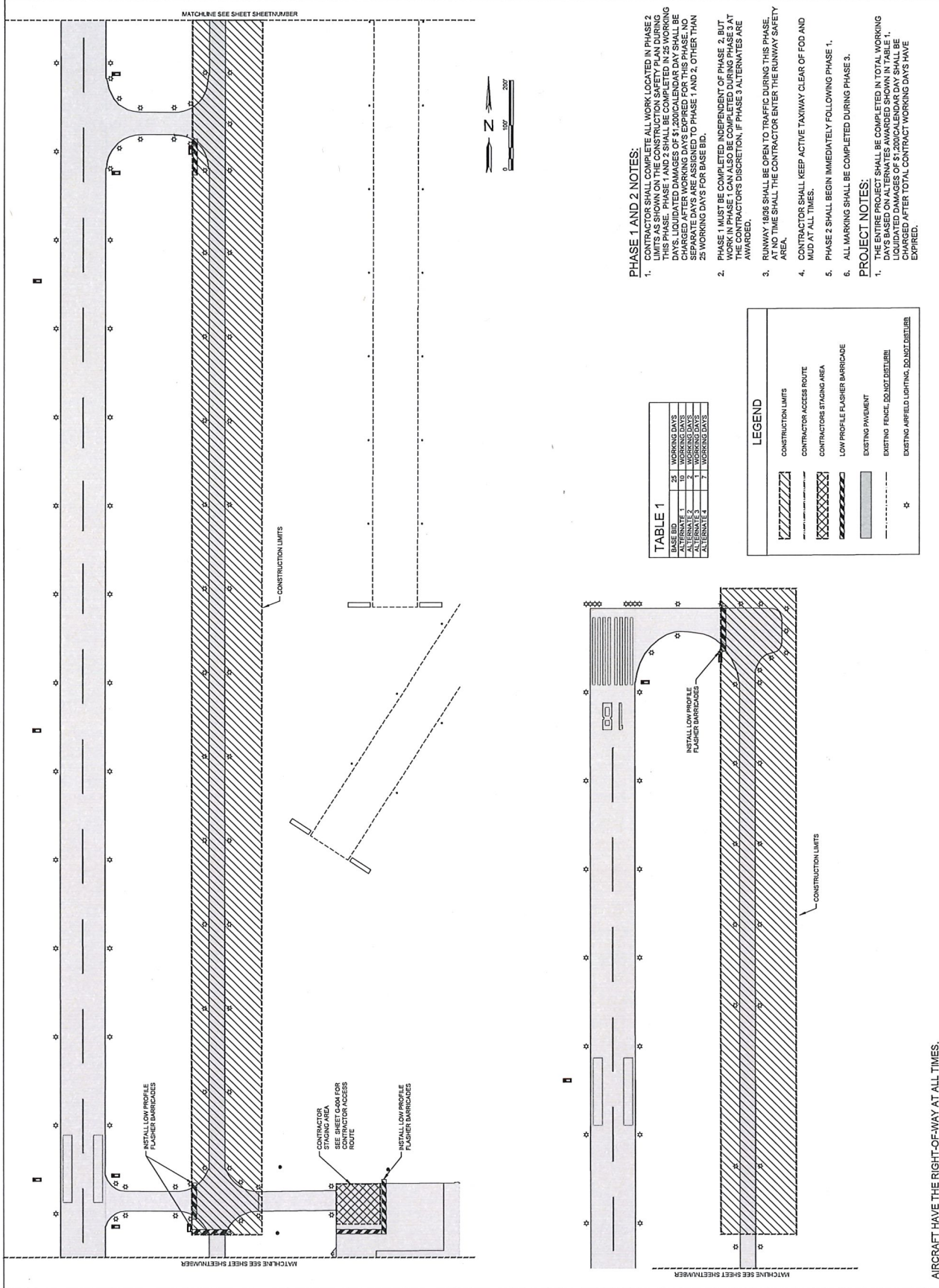
Chickasha Municipal Airport
City of Chickasha
Chickasha, Oklahoma 73018

PROJECT NO.
0100222.10

#	DATE	DESCRIPTION

Construction
Safety Plan Phase
2

G-005



PHASE 1 AND 2 NOTES:

- CONTRACTOR SHALL COMPLETE ALL WORK LOCATED IN PHASE 2 LIMITS AS SHOWN ON THE CONSTRUCTION SAFETY PLAN DURING THIS PHASE. PHASE 1 AND 2 SHALL BE COMPLETED IN 25 WORKING DAYS. LIQUIDATED DAMAGES OF \$1,200 CALENDAR DAY SHALL BE CHARGED AFTER THE 25 WORKING DAYS HAVE EXPIRED FOR THIS PHASE. NO SEPARATE DAYS ARE AWARDED TO PHASE 1 AND 2, OTHER THAN 25 WORKING DAYS FOR BASE BID.
- PHASE 1 MUST BE COMPLETED INDEPENDENT OF PHASE 2, BUT PHASE 2 MAY BE COMPLETED INDEPENDENT OF PHASE 1 AT THE CONTRACTOR'S DISCRETION. IF PHASE 3 ALTERNATES ARE AWARDED.
- RUNWAY 18/36 SHALL BE OPEN TO TRAFFIC DURING THIS PHASE. AT NO TIME SHALL THE CONTRACTOR ENTER THE RUNWAY SAFETY AREA.
- CONTRACTOR SHALL KEEP ACTIVE TAXIWAY CLEAR OF FOD AND MUD AT ALL TIMES.
- PHASE 2 SHALL BEGIN IMMEDIATELY FOLLOWING PHASE 1.
- ALL MARKING SHALL BE COMPLETED DURING PHASE 3.

PROJECT NOTES:

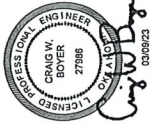
- THE ENTIRE PROJECT SHALL BE COMPLETED IN TOTAL WORKING DAYS BASED ON THE 25 WORKING DAYS IN PHASE 1. LIQUIDATED DAMAGES OF \$1,200 CALENDAR DAY SHALL BE CHARGED AFTER TOTAL CONTRACT WORKING DAYS HAVE EXPIRED.

TABLE 1		
BASE BID	25	WORKING DAYS
ALTERNATE 1	10	WORKING DAYS
ALTERNATE 2	2	WORKING DAYS
ALTERNATE 3	1	WORKING DAYS
ALTERNATE 4	3	WORKING DAYS

LEGEND

	CONSTRUCTION LIMITS
	CONTRACTOR ACCESS ROUTE
	CONTRACTOR STAGING AREA
	LOW PROFILE FLASHER BARRIER
	EXISTING PAVEMENT
	EXISTING FENCE, BOUNDARY LINE
	EXISTING AIRFIELD LIGHTING, DO NOT DISTURB

AIRCRAFT HAVE THE RIGHT-OF-WAY AT ALL TIMES.



Rehabilitate Runway 18/36
and Parallel Taxiway
OAC CHK-23-S



CLIENT	
Chickasha Municipal Airport	
City of Chickasha	
1111 N. Main Street	
Chickasha, Oklahoma 73018	
PROJECT NO.	
170022310	
DATE	
03/09/23	
DESCRIPTION	
Rehabilitate Runway 18/36 and Parallel Taxiway	

Construction
Safety Plan Phase
3
G-006

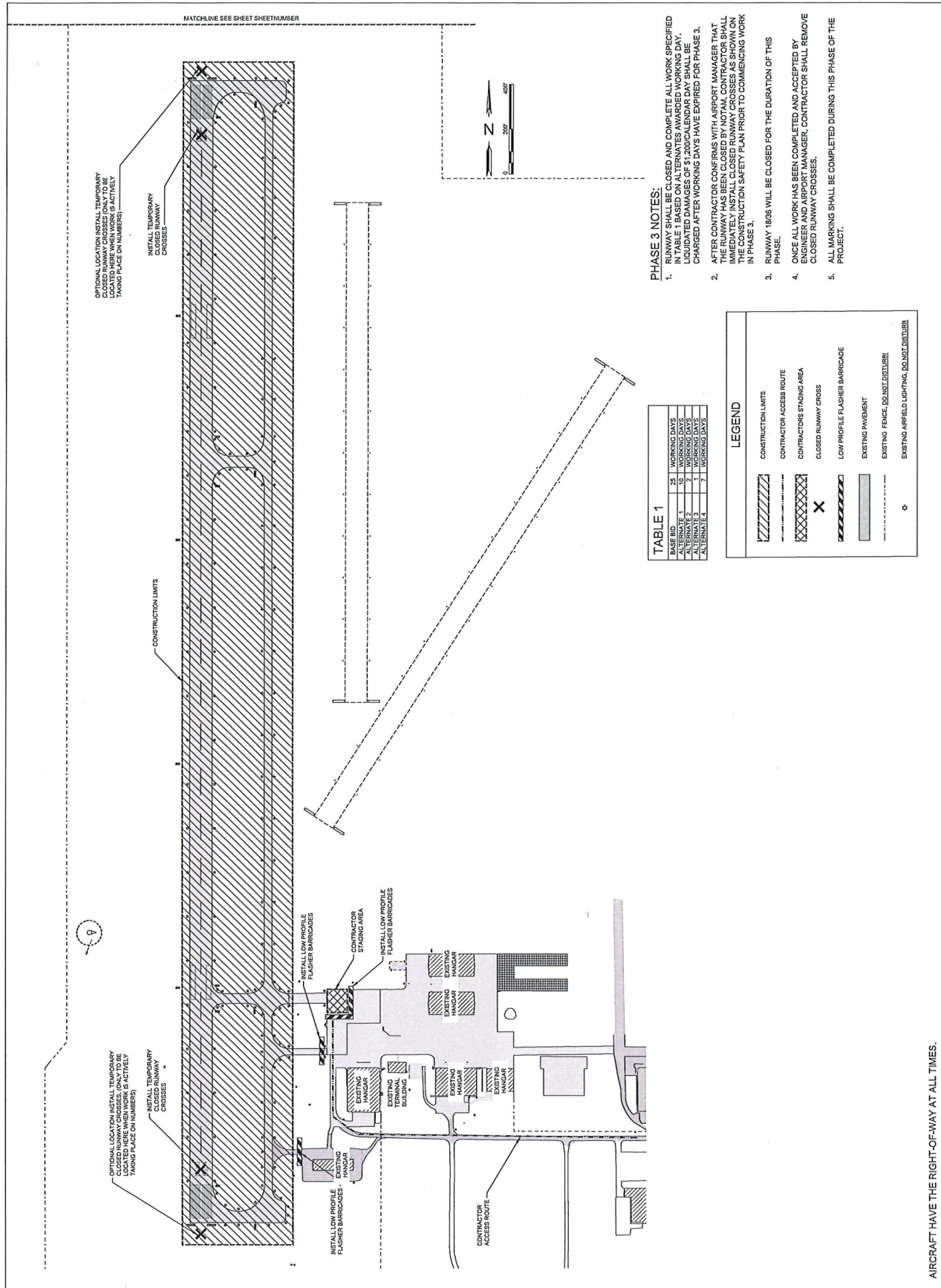


TABLE 1

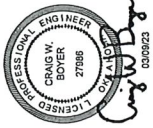
ALTERNATE	WORKING DAYS
ALTERNATE 1	25
ALTERNATE 2	10
ALTERNATE 3	2
ALTERNATE 4	7

- PHASE 3 NOTES:
- RUNWAY SHALL BE CLOSED AND COMPLETE ALL WORK SPECIFIED IN TABLE 1 BASED ON ALTERNATES AWARDED WORKING DAY. LIQUIDATED DAMAGES OF \$1,200 CALENDAR DAY SHALL BE CHARGED AFTER WORKING DAYS HAVE EXPIRED FOR PHASE 3.
 - AFTER CONTRACTOR CONFIRMS WITH AIRPORT MANAGER THAT THE RUNWAY HAS BEEN CLOSED BY NOTAM, CONTRACTOR SHALL IMMEDIATELY INSTALL CLOSED RUNWAY CROSSES AS SHOWN ON THE CONSTRUCTION SAFETY PLAN PRIOR TO COMMENCING WORK IN PHASE 3.
 - RUNWAY 18/36 WILL BE CLOSED FOR THE DURATION OF THIS PHASE.
 - ONCE ALL WORK HAS BEEN COMPLETED AND ACCEPTED BY ENGINEER AND AIRPORT MANAGER, CONTRACTOR SHALL REMOVE CLOSED RUNWAY CROSSES.
 - ALL MARKING SHALL BE COMPLETED DURING THIS PHASE OF THE PROJECT.

LEGEND

	CONSTRUCTION LIMITS
	CONTRACTOR ACCESS ROUTE
	CONTRACTORS STAGING AREA
	CLOSED RUNWAY CROSS
	LOW PROFILE FLASHER BARRIAGE
	EXISTING PAVEMENT
	EXISTING FENCE, DO NOT DISTURB
	EXISTING AIRFIELD LIGHTING, DO NOT DISTURB

AIRCRAFT HAVE THE RIGHT-OF-WAY AT ALL TIMES.



Rehabilitate Runway 18/36 and Parallel Taxiway

OAC CHK-23-S

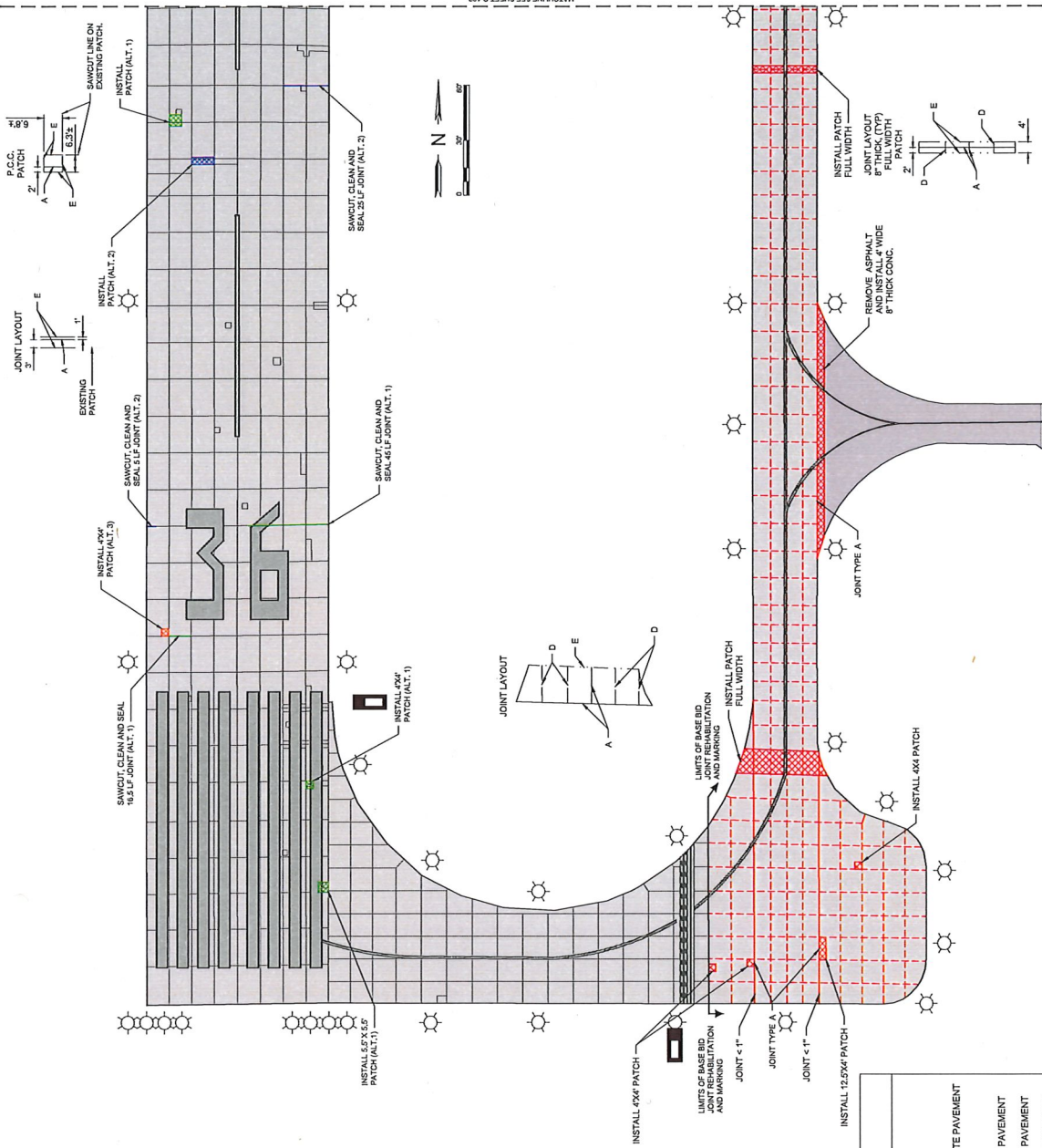


CITY
Chickasha Municipal Airport
City of Chickasha
1001 S. Main Street
Chickasha, Oklahoma 73018

PROJECT NO.
07160221.0

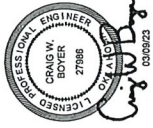
#	DATE	DESCRIPTION

Rehabilitation Plan Sheet 1 **C-101**



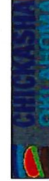
GENERAL NOTES
1. SEE SHEET C-101 FOR JOINT DETAILS.

LEGEND	
	BASEBID SAWCUT, CLEAN AND SEAL JOINTS
	BASEBID JOINT < 1"
	BASEBID REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
	ALT. 1 SAWCUT, CLEAN AND SEAL JOINTS
	ALT. 1 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
	ALT. 2 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
	ALT. 3 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
	EXISTING JOINTS NOT BEING SEALED
	EXISTING AIRFIELD LIGHT (DO NOT DISTURB)
	EXISTING AIRFIELD DIRECTION SIGN (DO NOT DISTURB)



Rehabilitate Runway 18/36 and Parallel Taxiway

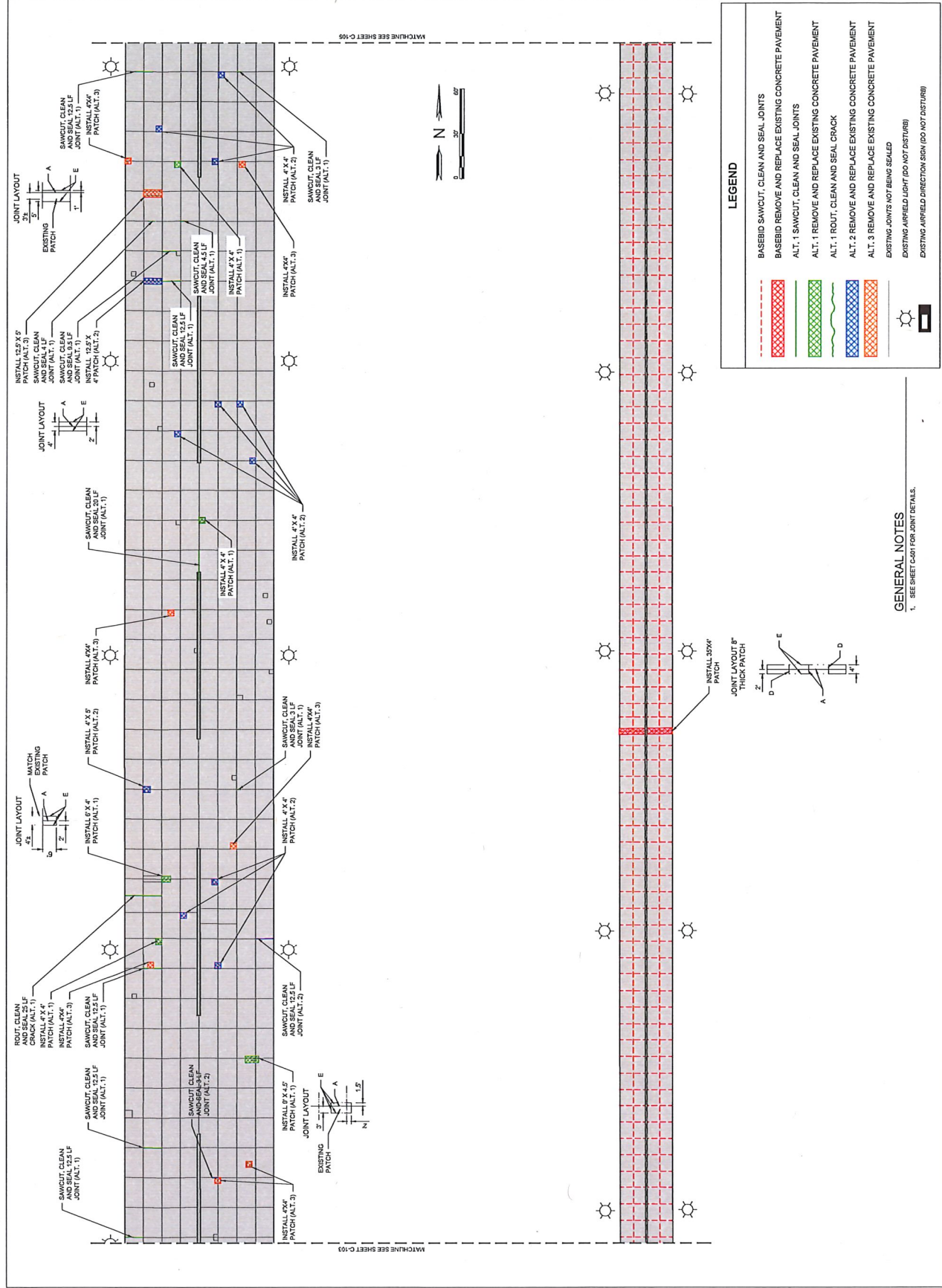
OAC CHK-23.5



Client
Chickasha Municipal Airport
City of Chickasha
177 North 4th Street
Chickasha, Oklahoma 73018

#	DATE	DESCRIPTION
1	01/05/23	PROJECT NO.

Rehabilitation Plan Sheet 4 C-104

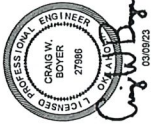


LEGEND

- BASEBID SAWCUT, CLEAN AND SEAL JOINTS
- BASEBID REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
- AL.T. 1 SAWCUT, CLEAN AND SEAL JOINTS
- AL.T. 1 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
- AL.T. 1 ROUT, CLEAN AND SEAL CRACK
- AL.T. 2 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
- AL.T. 3 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
- EXISTING JOINTS NOT BEING SEALED
- EXISTING AIRFIELD LIGHT (DO NOT DISTURB)
- EXISTING AIRFIELD DIRECTION SIGN (DO NOT DISTURB)

GENERAL NOTES

- SEE SHEET C-101 FOR JOINT DETAILS.



Rehabilitate Runway 18/36
and Parallel Taxiway

OAC CHK-23-S

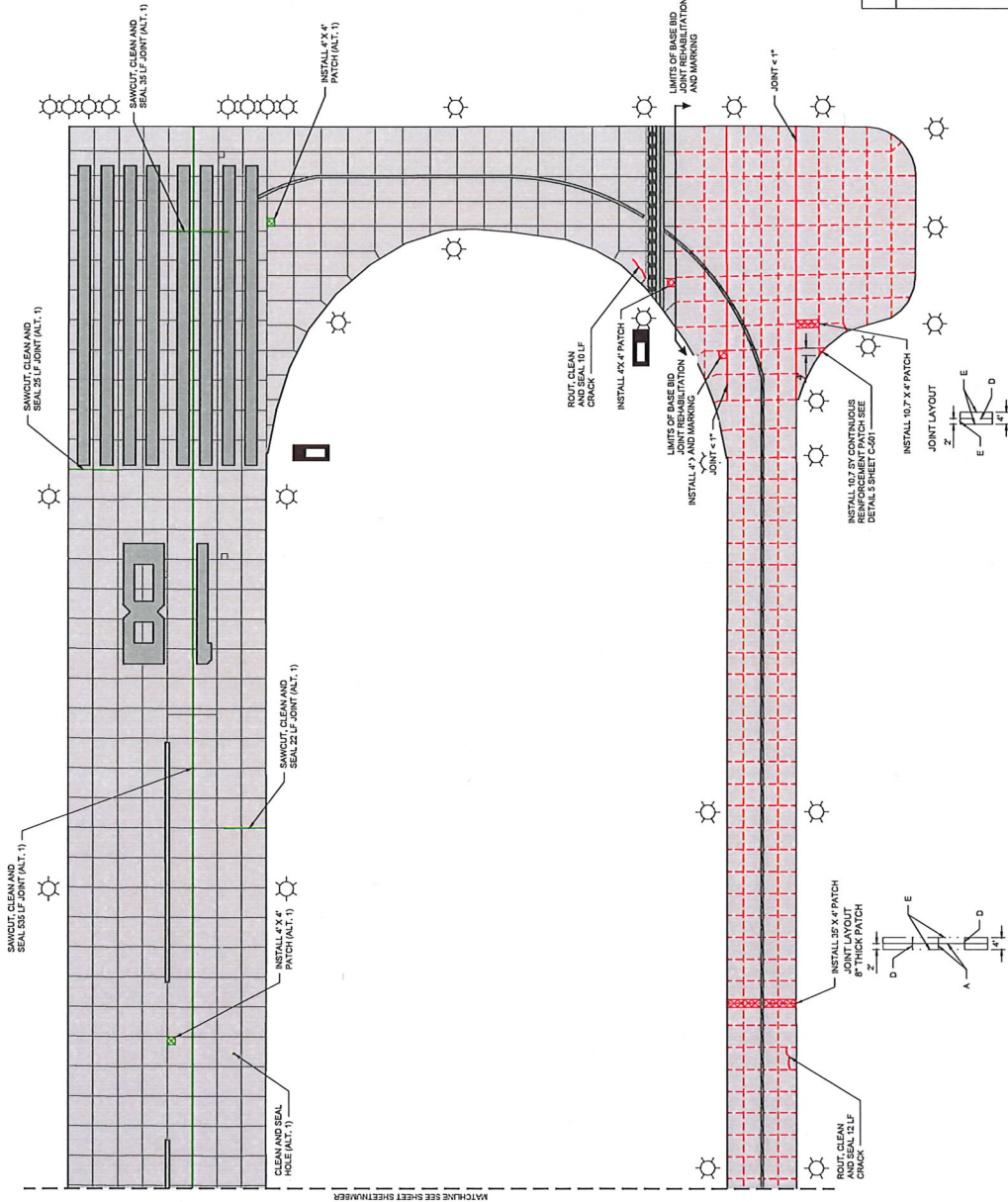


Client
Chickasha Municipal Airport
City of Chickasha
11 North 40 Street
Chickasha, Oklahoma 73018

Project No.
010022210

#	DATE	DESCRIPTION

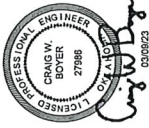
Rehabilitation
Plan Sheet 7
C-107



LEGEND	
	BASEBID SAWCUT, CLEAN AND SEAL JOINTS
	BASEBID JOINT < 1"
	BASEBID REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
	BASEBID ROUT, CLEAN AND SEAL CRACK
	ALT. 1 SAWCUT, CLEAN AND SEAL JOINTS
	ALT. 1 REMOVE AND REPLACE EXISTING CONCRETE PAVEMENT
	EXISTING JOINTS NOT BEING SEALED
	EXISTING AIRFIELD LIGHT (DO NOT DISTURB)
	EXISTING AIRFIELD DIRECTION SIGN (DO NOT DISTURB)

GENERAL NOTES

1. SEE SHEET C-601 FOR JOINT DETAILS.



Rehabilitate Runway 18/36 and Parallel Taxiway

OAC CHK-23.5

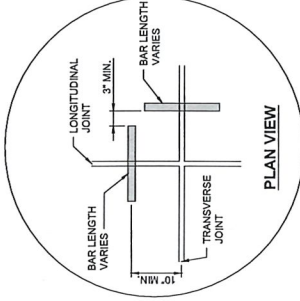


Client
Chickasha Municipal Airport
City of Chickasha
1100 N. Lincoln
Chickasha, Oklahoma 73018

Project No.
070622.00

DATE DESCRIPTION

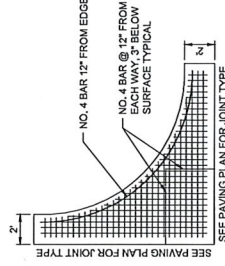
Rehabilitation Detail Sheet 1 C-501



DETAIL 2 - POSITION OF
DOWELS AT EDGE OF JOINT

3

NOT TO SCALE



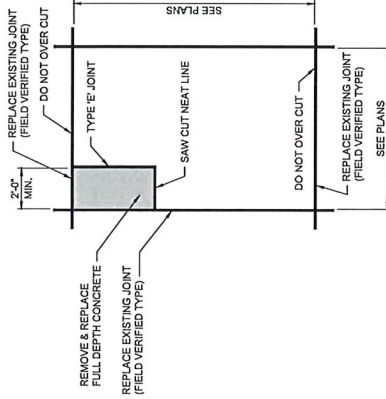
TYPICAL STEEL PLAN
FOR REINFORCED SLABS

5

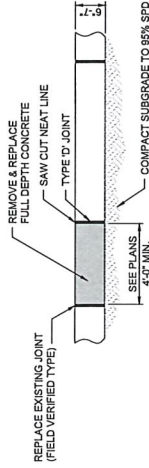
NOT TO SCALE

FULL DEPTH PATCHING NOTES:

- FULL DEPTH CONCRETE REMOVAL AND REPLACEMENT SHALL BE INCLUDED IN THE PRICE BID FOR FULL DEPTH PATCHING. THE CONTRACTOR SHALL MATCH EXISTING PAVEMENT WITH SPECIFICATION SECTION P-821.
- THE CONTRACTOR SHALL COMPACT THE SUBGRADE TO 95% DENSITY PRIOR TO REPLACING WITH NEW P.C. CONCRETE PAVEMENT.
- ALL OPERATIONS BY THE CONTRACTOR SHALL BE SUCH THAT THE INTEGRITY OF THE EXISTING PAVEMENT SHALL BE MAINTAINED. THE CONTRACTOR SHALL REPAIR ANY DAMAGE TO THESE ITEMS CAUSED BY HIS OPERATIONS IN A MANNER APPROVED BY THE ENGINEER.
- OPERATIONS ON ALL DOWELS, TIE-BARS, AND USED JOINTS SHALL PRESERVE THE INTEGRITY OF THE JOINT. THE CONTRACTOR SHALL REPAIR ANY SUCH JOINT DAMAGED BY HIS OPERATIONS IN A MANNER APPROVED BY THE ENGINEER.
- REHABILITATION SHALL CONSIST OF SAWING, REMOVING, COMPACTING SUBGRADE, REPLACING WITH NEW P.C. CONCRETE PAVEMENT, AND FINISHING TO SPECIFICATIONS. MINIMUM PAVEMENT REMOVAL AND REPLACEMENT SHALL BE TWO FEET (2'-0") WIDE AND FULL DEPTH OF PAVEMENT.
- SAWING SHALL BE FULL-DEPTH OF EXISTING PAVEMENT. SAWING COST WILL NOT BE PAID SEPARATELY, BUT SHALL BE INCLUDED IN PRICE BID FOR P.C. CONCRETE PAVEMENT REMOVAL.
- THE CONTRACTOR SHALL CONTROL THE SAWING AND SHALL NOT OVER CUT THE PAVEMENT REMOVAL DIMENSIONS SHOWN ON THE PLANS. REMOVAL OF CORNER PIECES SHALL BE DONE USING ALTERNATIVE METHODS WITH MINIMAL DAMAGE TO THE PAVEMENT.
- THE COST OF DOWEL BARS, TIE-BARS, DRILLING, EPOXY, PLACEMENT, LABOR, EXPANSION CAPS, AND ANY INCIDENTALS REQUIRED FOR INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR P.C. PATCHING OR P.C. CONCRETE SURFACE COURSE, AS APPROPRIATE.



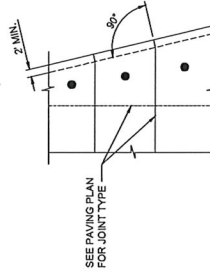
PLAN



SECTION

2 TYPICAL FULL DEPTH PAVEMENT REPAIR

NOT TO SCALE

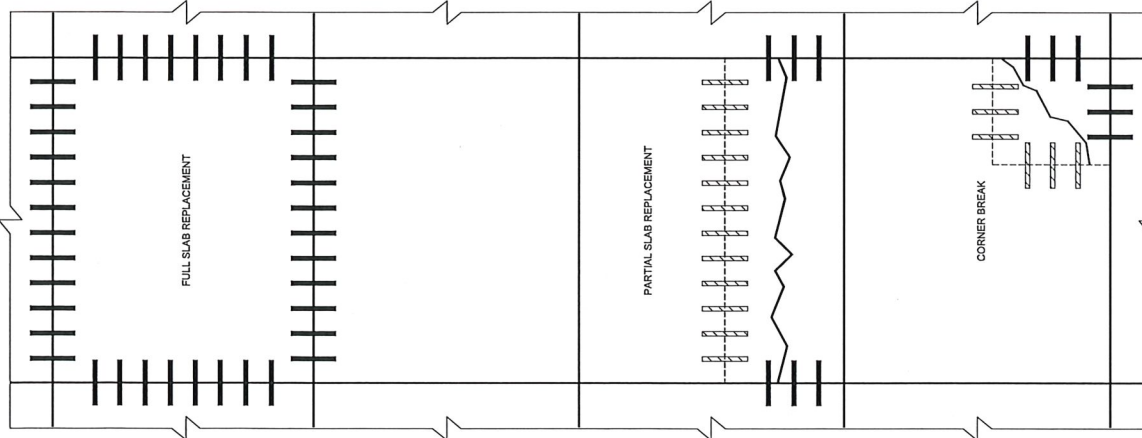


FILLET DETAIL FOR
REINFORCED SLABS

4

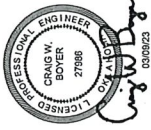
NOT TO SCALE

LEGEND	
	TIEBAR
	DOWEL
	SAW CUT
	CRACK



1 RIGID PAVEMENT REPAIR

NOT TO SCALE



Rehabilitate Runway 18/36 and Parallel Taxiway

OAC CHK-23-S

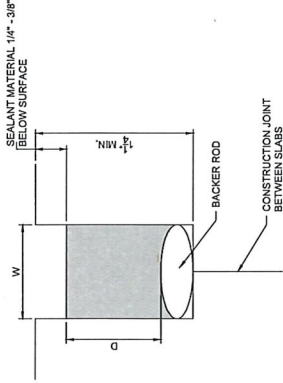


CLIENT
Chickasha Municipal Airport
City of Chickasha
117 North 4th Street
Chickasha, Oklahoma 73018

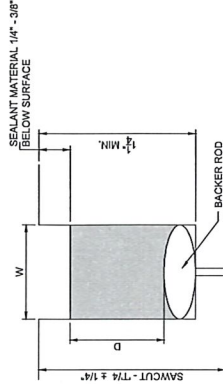
PROJECT NO.
91100223-0

#	DATE	DESCRIPTION

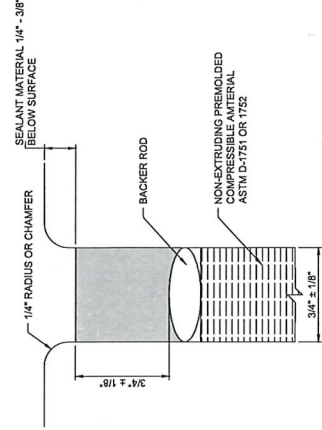
Rehabilitation Detail Sheet 2 C-502



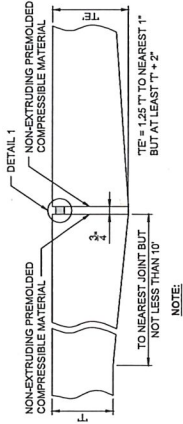
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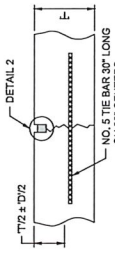
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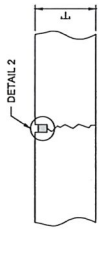
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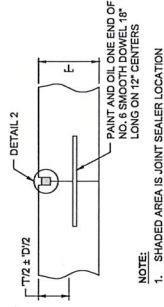
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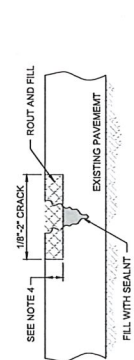
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11 TYPE D - DUMMY
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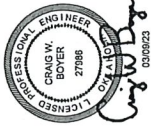
12 TYPE E - DOWELED
NOT TO SCALE



- NOTE:**
- ALL CRACKS 1/8\"/>

TABLE 1 - JOINT DEPTH SPECIFICATIONS			
JOINT WIDTH ±1/4"	BACKER ROD DIAMETER	SEALANT DEPTH	MIN JOINT DEPTH
1/2"	3/4"	5/8"	1 5/8"
1"	1 1/4"	1 1/4"	2 3/4"
1 1/2"	1 3/4"	1 7/8"	3 7/8"
2"	2 1/4"	2 1/2"	5"

13 DETAIL - TYPICAL CRACK ROUTING AND SEALING
NOT TO SCALE



Rehabilitate Runway 18/36
and Parallel Taxiway

OAC CHK-23-S

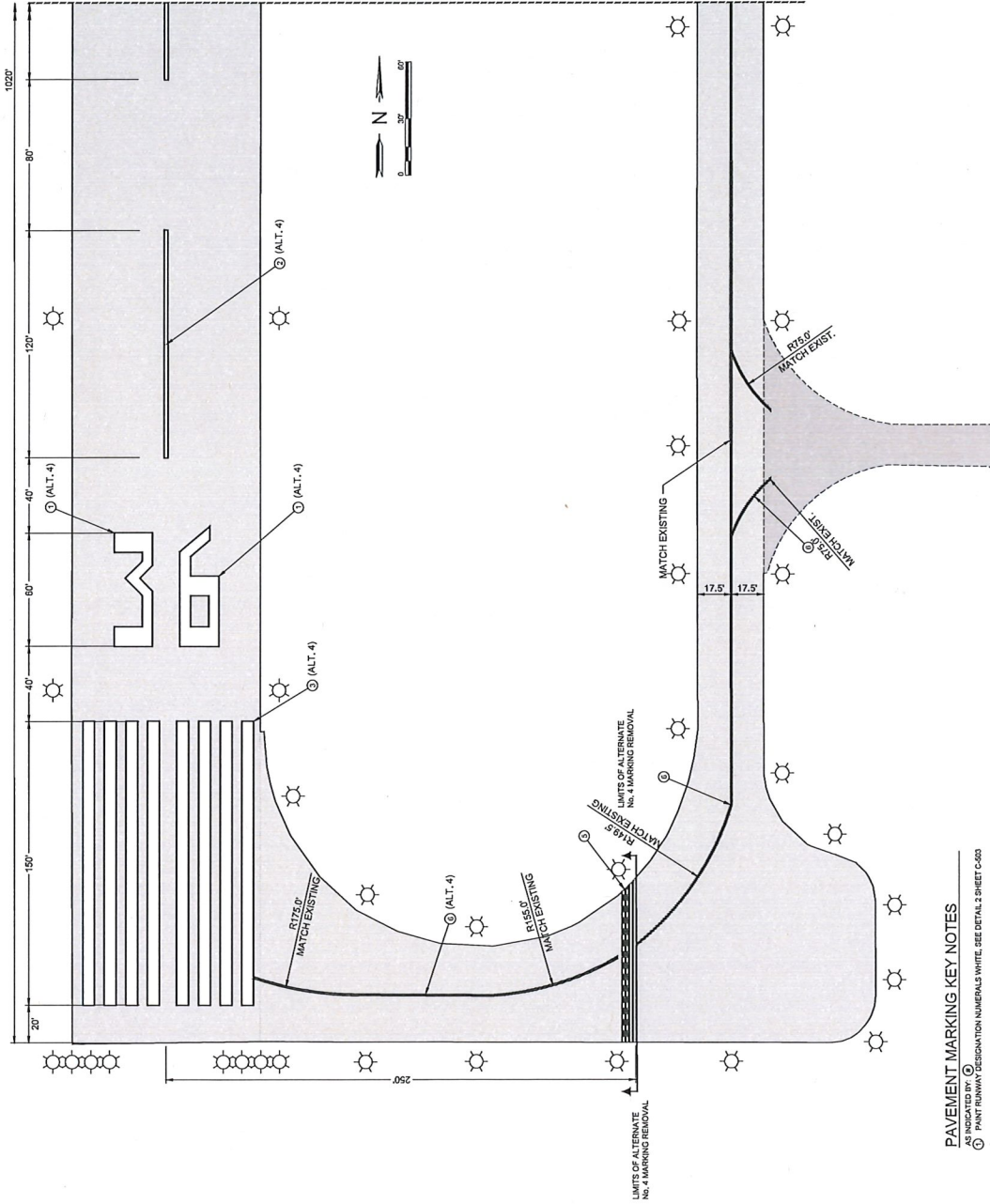


Chickasha Municipal Airport
City of Chickasha
1000 S. Lincoln Blvd.
Chickasha, Oklahoma 73018

PROJECT NO.
010023170

DATE	DESCRIPTION

Marking Plan
Sheet 1
C-108

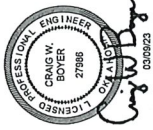


PAVEMENT MARKING KEY NOTES

- AS INDICATED BY:
- ① PAINT RUNWAY DESIGNATION NUMERALS WHITE. SEE DETAIL 2 SHEET C-503
 - ② PAINT RUNWAY CENTERLINE SEGMENTS WHITE. 1" WIDE
 - ③ PAINT RUNWAY CENTERLINE SEGMENTS WHITE. 1" WIDE
 - ④ PAINT THRESHOLD STRIPES WHITE. SEE DETAIL 1 SHEET C-503
 - ⑤ PAINT ANIMATING POINT MARKINGS WHITE. SEE DETAIL 3 SHEET C-503
 - ⑥ PAINT HOLD-LINE STRIPES YELLOW. SEE DETAIL 4 SHEET C-504
 - ⑦ PAINT TAXIWAY STRIPES YELLOW 6" WIDE. FOR TAXIWAY LEAD-IN STRIPES SEE DETAIL 5 SHEET C-504

MARKING NOTES

- A. ALL YELLOW AND WHITE MARKINGS SHALL HAVE REFLECTIVE MEDIA (WITH 10% REMOVAL).
- B. ALL MARKINGS SHALL BE APPLIED IN ACCORDANCE WITH SPECIFICATION SECTION P-203.
- C. OUTLINE IN BLACK THE RUNWAY AND TAXIWAY MARKINGS. SEE DETAILS 1 SHEET C-504.
- D. ALL DIMENSIONS SHOWN EXTEND TO THE YELLOW OR WHITE PAINT AND DO NOT INCLUDE THE 6" BLACK OUTLINE.
- E. EXISTING MARKING ON RUNWAY SHALL BE REMOVED WITH 80% REMOVAL.
- F. CONTRACTOR SHALL LOCATE MAG NAIL POINTS IN THE RUNWAY. CONTRACTOR SHALL USE AN OPTICAL DEVICE TO DISBURSE THAT EACH MAG NAIL POINT IS CENTERED ON THE ESTABLISHED BASELINE.
- G. CONTRACTOR SHALL USE AN OPTICAL DEVICE TO DISBURSE THAT EACH MAG NAIL POINT IS CENTERED ON THE ESTABLISHED BASELINE.
- H. YELLOW MARKINGS SHALL STOP AT THE EDGE OF ANY CROSSING WHITE MARKINGS.
- I. ONLY HOLD LINES AS CALLED OUT ARE TO BE REMOVED. ALL OTHER TAXIWAY MARKINGS SHALL REMAIN.



Rehabilitate Runway 18/36
and Parallel Taxiway
OAC CHK-23-S

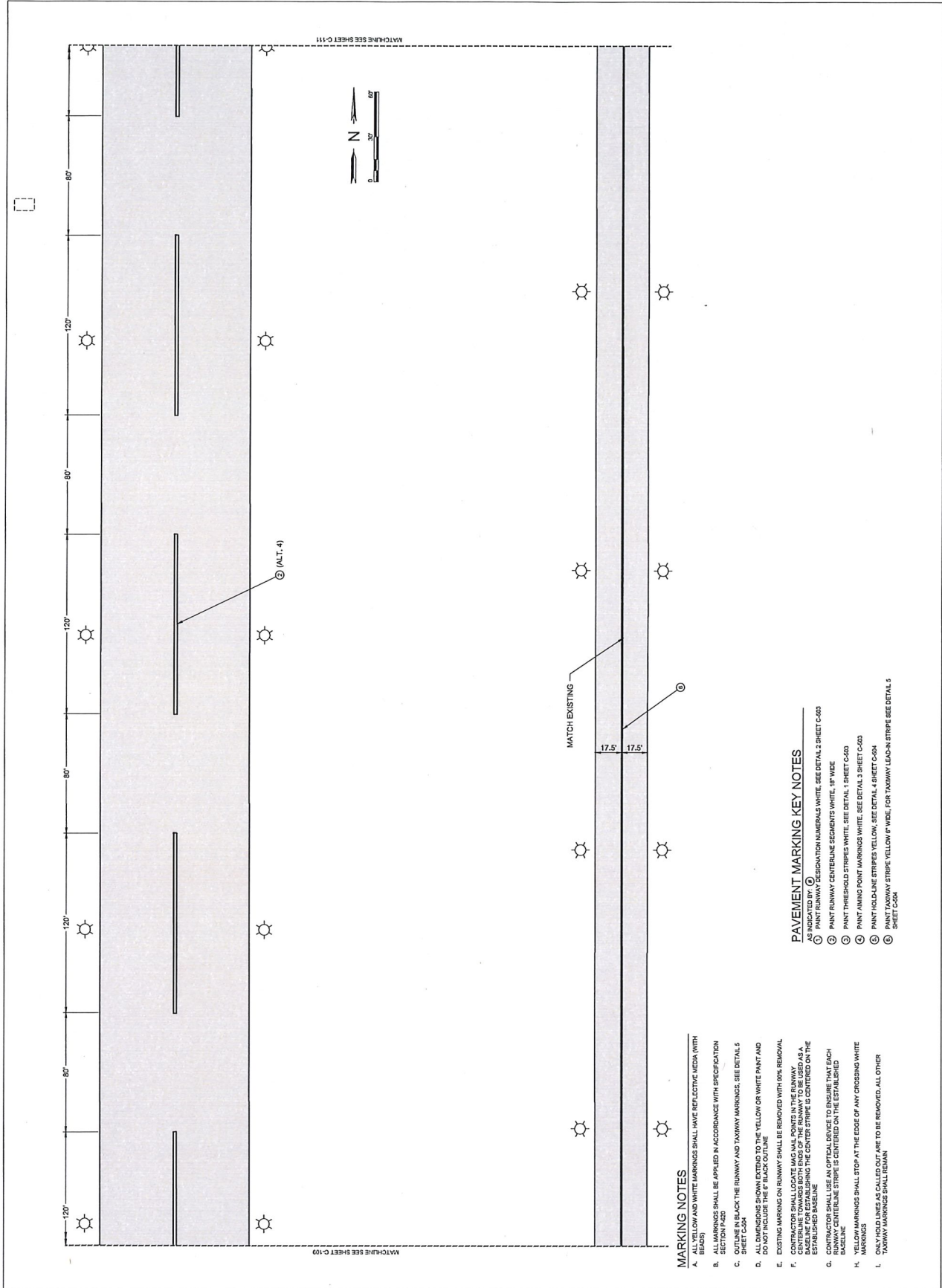


CLIENT
Chickasha Municipal Airport
City of Chickasha
1000 E. Main Street
Chickasha, Oklahoma 73018

PROJECT NO.
011929.23-S

DATE	DESCRIPTION

Marking Plan
Sheet 3
C-110

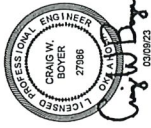


MARKING NOTES

- A. ALL YELLOW AND WHITE MARKINGS SHALL HAVE REFLECTIVE MEDIA (WITH BEADS)
- B. ALL MARKINGS SHALL BE APPLIED IN ACCORDANCE WITH SPECIFICATION SECTION P420
- C. OUTLINE IN BLACK THE RUNWAY AND TAXIWAY MARKINGS. SEE DETAIL 5 SHEET C-604
- D. PAINT THRESHOLD STRIPES TO THE YELLOW OR WHITE PAINT AND ADD CENTERLINE STRIPES TO THE YELLOW OR WHITE PAINT
- E. EXISTING MARKINGS ON RUNWAY SHALL BE REMOVED WITH 6% REMOVAL
- F. CENTERLINE STRIPES SHALL BE PAINTED IN ACCORDANCE WITH DETAIL 5 SHEET C-604. AN OPTIONAL STRIPE TO RUNWAY SLAY EACH CENTERLINE STRIPE IS CENTERED ON THE ESTABLISHED RUNWAY CENTERLINE STRIPE IS CENTERED ON THE ESTABLISHED RUNWAY CENTERLINE STRIPE
- G. YELLOW MARKINGS SHALL STOP AT THE EDGE OF ANY CROSSING WHITE MARKINGS
- H. ONLY HOLD LINES AS CALLED OUT ARE TO BE REMOVED. ALL OTHER MARKINGS SHALL REMAIN

PAVEMENT MARKING KEY NOTES

- AS INDICATED BY: ①
- ① PAINT RUNWAY CENTERLINE SEGMENTS WHITE. SEE DETAIL 2 SHEET C-603
- ② PAINT RUNWAY CENTERLINE SEGMENTS WHITE. 18" WIDE
- ③ PAINT THRESHOLD STRIPES WHITE. SEE DETAIL 1 SHEET C-603
- ④ PAINT TAXIWAY POINT MARKINGS WHITE. SEE DETAIL 3 SHEET C-603
- ⑤ PAINT HOLDLINE STRIPES YELLOW. SEE DETAIL 4 SHEET C-604
- ⑥ PAINT TAXIWAY STRIPE YELLOW 6" WIDE. FOR TAXIWAY LEAD-IN STRIPE SEE DETAIL 5 SHEET C-604



Rehabilitate Runway 18/36
and Parallel Taxiway
OAC CHK-23-S

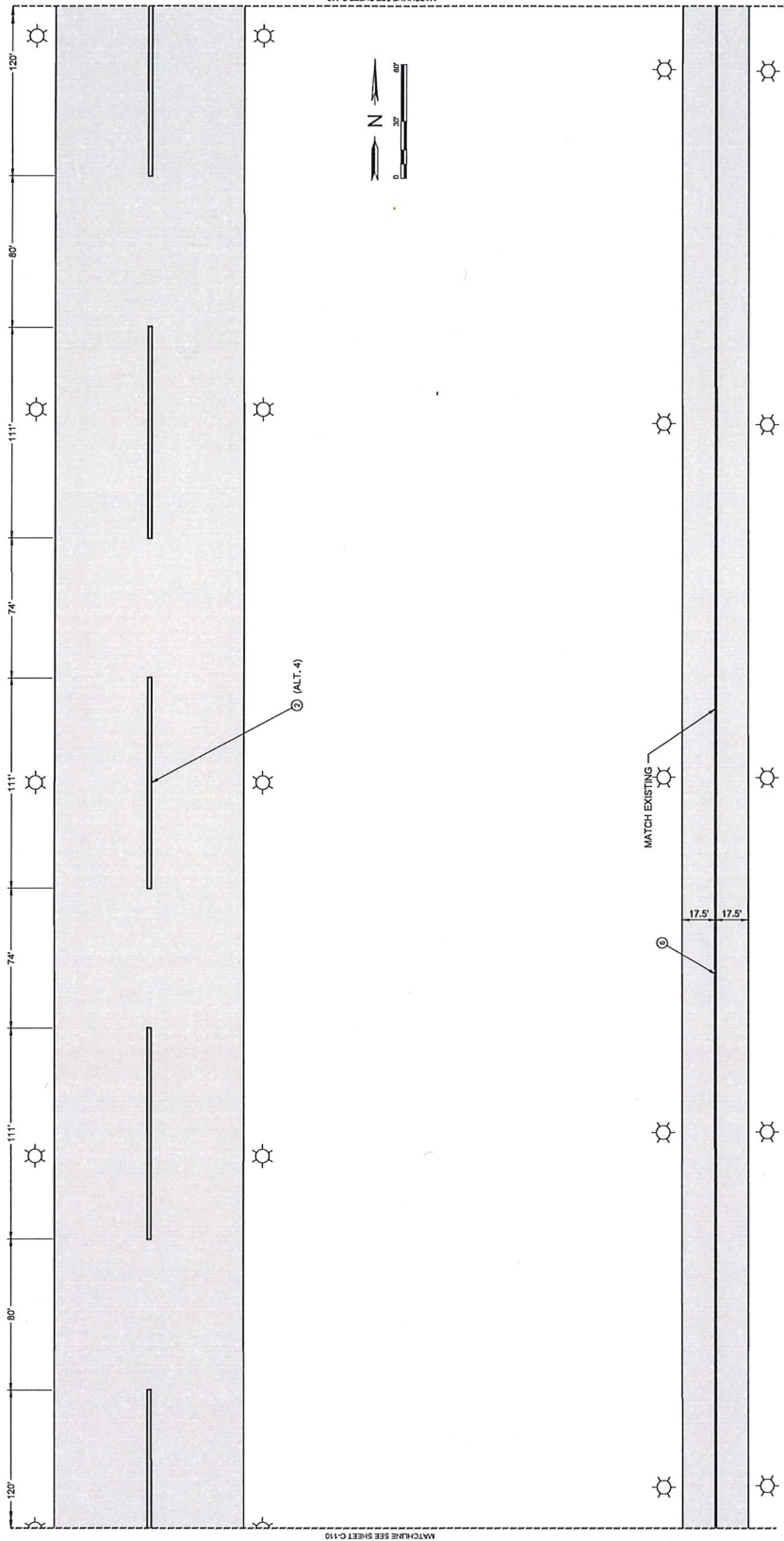


Client
Chickasha Municipal Airport
City of Chickasha
1700 West Main
Chickasha, Oklahoma 73018

PROJECT NO.
01700223.10

#	DATE	DESCRIPTION

Marking Plan
Sheet 4
C-111

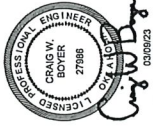


MARKING NOTES

- ALL YELLOW AND WHITE MARKINGS SHALL HAVE REFLECTIVE MEDIA (WITH BEADS).
- ALL MARKINGS SHALL BE APPLIED IN ACCORDANCE WITH SPECIFICATION SECTION F-603.
- OUTLINE IN BLACK THE RUNWAY AND TAXIWAY MARKINGS, SEE DETAILS SHEET C-504.
- ALL DIMENSIONS SHOWN EXTEND TO THE YELLOW OR WHITE PAINT AND DO NOT INCLUDE THE 6" BLACK OUTLINE.
- EXISTING MARKING ON RUNWAY SHALL BE REMOVED WITH 90% REMOVAL.
- CONTRACTOR SHALL LOCATE MAG NAIL POINTS IN THE RUNWAY AND TAXIWAY MARKINGS TO BE REMOVED AS A BASELINE FOR ESTABLISHING THE CENTER STRIPE IS CENTERED ON THE ESTABLISHED BASELINE.
- CONTRACTOR SHALL USE AN OPTICAL DEVICE TO ENSURE THAT EACH CENTERLINE STRIPE IS CENTERED ON THE ESTABLISHED BASELINE.
- YELLOW MARKINGS SHALL STOP AT THE EDGE OF ANY CROSSING WHITE MARKINGS.
- ONLY HOLD LINES AS CALLED OUT ARE TO BE REMOVED, ALL OTHER TAXIWAY MARKINGS SHALL REMAIN.

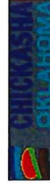
PAVEMENT MARKING KEY NOTES

- AS INDICATED BY:
- ① PAINT RUNWAY DESIGNATION NUMERALS WHITE, SEE DETAIL 2 SHEET C-503
 - ② PAINT RUNWAY CENTERLINE SEGMENTS WHITE, 18" WIDE
 - ③ PAINT THRESHOLD STRIPES WHITE, SEE DETAIL 1 SHEET C-503
 - ④ PAINT JAWING POINT MARKINGS WHITE, SEE DETAIL 3 SHEET C-503
 - ⑤ PAINT HOLD-LINE STRIPES YELLOW, SEE DETAIL 4 SHEET C-504
 - ⑥ PAINT TAXIWAY STRIPE YELLOW 6" WIDE, FOR TAXIWAY LEAD-IN STRIPE SEE DETAIL 5 SHEET C-504



Rehabilitate Runway 18/36
and Parallel Taxiway

OAC CHK-23-S

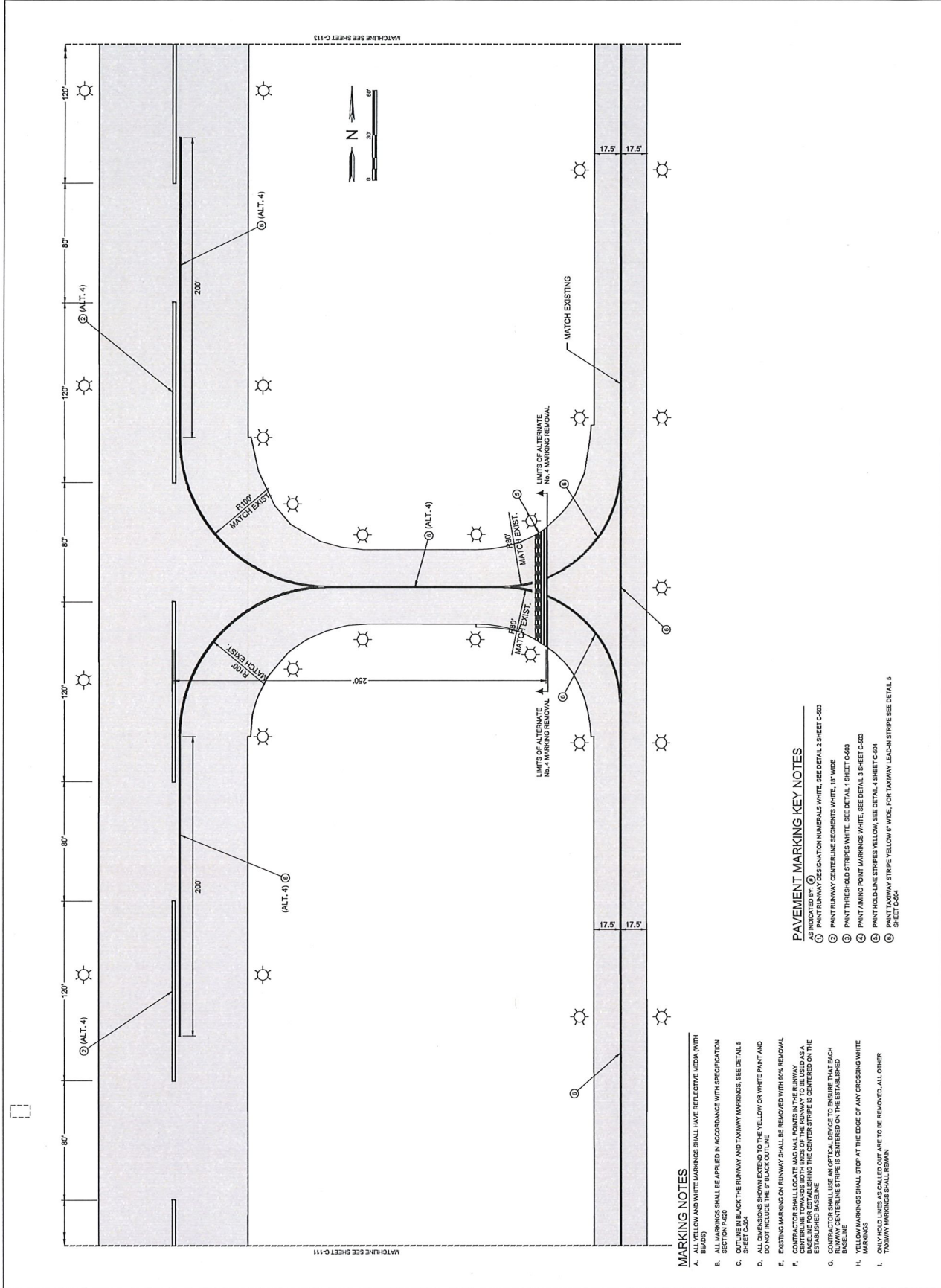


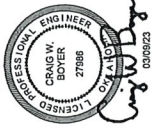
Chickasha Municipal Airport
City of Chickasha
1100 S. Broadway
Chickasha, Oklahoma 73018

PROJECT NO.
0170022170

#	DATE	DESCRIPTION

Marking Plan
Sheet 5
C-112





Rehabilitate Runway 18/36
and Parallel Taxiway
OAC CHK-23-S

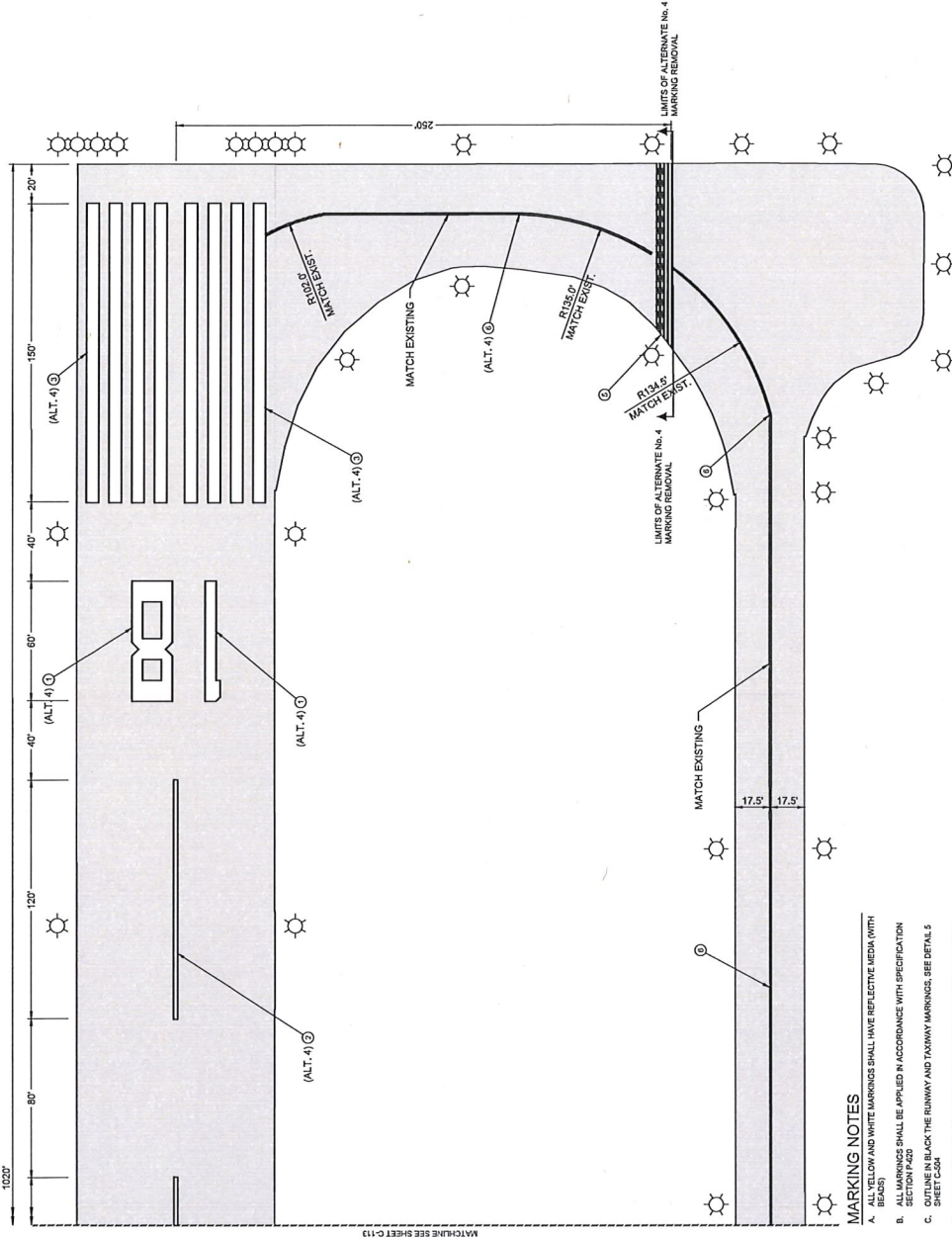
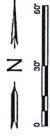


Chickasha Municipal Airport
City of Chickasha
1700 S. Main Street
Chickasha, Oklahoma 73018

PROJECT NO.
01700222.10

#	DATE	DESCRIPTION

Marking Plan
Sheet 7
C-114



MARKING NOTES

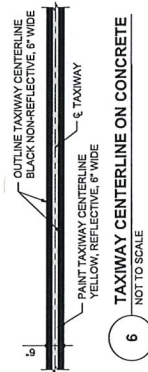
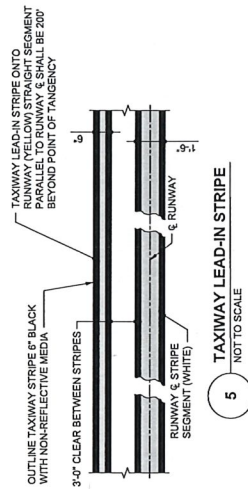
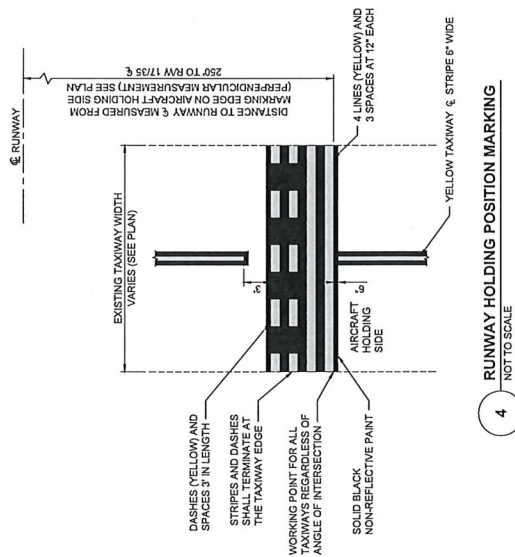
- ALL YELLOW AND WHITE MARKINGS SHALL HAVE REFLECTIVE MEDIA (WITH MINUS).
- ALL MARKINGS SHALL BE APPLIED IN ACCORDANCE WITH SPECIFICATION SECTION P402.
- OUTLINE IN BLACK THE RUNWAY AND TAXIWAY MARKINGS, SEE DETAILS SHEET C-504.
- EXISTING MARKINGS SHOWN EXTEND TO THE YELLOW OR WHITE PAINT AND DO NOT INCLUDE THE P BLACK OUTLINE.
- CONTRACTOR SHALL LOCATE MAG NAIL POINTS IN THE RUNWAY CENTERLINE AND TAXIWAY CENTERLINE AS A BASELINE FOR ESTABLISHING THE CENTER STRIPE IS CENTERED ON THE ESTABLISHED BASELINE.
- CONTRACTOR SHALL USE AN OPTICAL DEVICE TO ENSURE THAT EACH CENTERLINE STRIPE IS CENTERED ON THE ESTABLISHED BASELINE.
- YELLOW MARKINGS SHALL STOP AT THE EDGE OF ANY CROSSING WHITE MARKINGS.
- ONLY HOLD LINES AS CALLED OUT ARE TO BE REMOVED. ALL OTHER TAXIWAY MARKINGS SHALL REMAIN.

PAVEMENT MARKING KEY NOTES

- AS INDICATED BY:
- ① PAINT RUNWAY DESIGNATION NUMERALS WHITE, SEE DETAIL 2 SHEET C-503
 - ② PAINT RUNWAY CENTERLINE SEGMENTS WHITE, 18" WIDE
 - ③ PAINT THRESHOLD STRIPES WHITE, SEE DETAIL 1 SHEET C-503
 - ④ PAINT ANIMATING POINT MARKINGS WHITE, SEE DETAIL 3 SHEET C-503
 - ⑤ PAINT HOLD-LINE STRIPES YELLOW, SEE DETAIL 4 SHEET C-504
 - ⑥ PAINT TAXIWAY STRIPE YELLOW 6" WIDE, FOR TAXIWAY LEAD-IN STRIPE SEE DETAIL 5 SHEET C-504



011943642.10



PROJECT MANUAL

CITY OF CHICKASHA

Rehabilitate Runway 18/36 and Parallel Taxiway

OAC CHK-23-S

Chickasha Municipal Airport

Chickasha, Oklahoma

March | 2023

Parkhill Project #01192922.10

PROJECT MANUAL

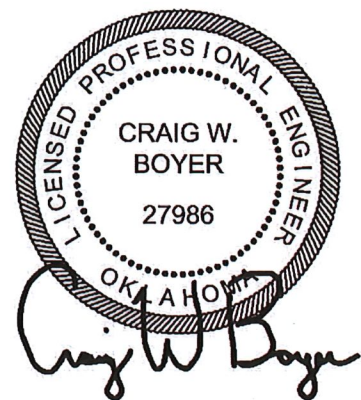
CITY OF CHICKASHA

Rehabilitate Runway 18/36 and Parallel Taxiway

OAC CHK-23-S

Chickasha Municipal Airport

Chickasha, Oklahoma



3/9/2023

March | 2023

Parkhill Project #01192922.10

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Construction Contract
Affidavit and Release
Special Provisions

FAA AC 150/5370-10H

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Section 701 Portland Cement Concrete

NOTICE TO BIDDERS

There will be a Prebid Conference concerning this Project at 10:00 AM, March 23, 2023, in in the Terminal Building 2344 Beechcraft Rd., Chickasha Municipal Airport, Chickasha, OK 73018.

Attendance at the Prebid Conference is MANDATORY. Bids will NOT be accepted from contractors who do NOT have a representative attending the Prebid Conference. No Plans, Specifications or Bid Documents will be issued after the Prebid Conference. All bidders must visit and inspect the construction site and be familiar with the physical characteristics and conditions at the construction site.

For eligibility to bid Project, Contractors must be listed:

1. on official Bidder List by obtaining formal set of Plans and Specifications from Parkhill;
and
2. as an attendee of mandatory Prebid Conference.

Bids received from contractors not meeting these requirements will be returned unopened.

Toby J. Baker, PE

END OF NOTICE TO BIDDERS

SOLICITATION FOR BIDS

Notice is hereby given that the City of Chickasha will receive sealed bids in the office of the City Clerk, 2nd Floor of the City Hall, 117 N. 4th St., Chickasha, OK 73018 until 10:00 AM Local Time on April 5, 2023. Said bids will be opened immediately thereafter in the 2nd floor conference room for:

Rehabilitate Runway 18/36 and Taxiways

Bid No. CAA-2301

OAC CHK-23-S

CHICKASHA MUNICIPAL AIRPORT

Chickasha, Oklahoma

Bids shall be made in accordance with Solicitation for Bids, Information to Bidders, Plans, Specifications, and Bidder's Proposal, on file and available for examination at the Office of the City Clerk in City Hall, Chickasha, Oklahoma, and made part of this notice as though fully set forth herein. A PDF (hard copies not provided) may be obtained from Parkhill, 14101 Wireless Way, Suite 350, Oklahoma City, Oklahoma 73134, 405.832.9900, at no charge.

Bids filed with the City Clerk shall be publicly opened and considered by the City at time stated herein. Bidder must supply all information required by Bid/Proposal Form.

Bids/Proposals received more than 96 hours, (excluding Saturdays, Sundays, and holidays), before set time for opening bids as well as Bids/Proposals received after set time for opening of bids, will not be considered and be returned unopened.

Cashier's check, certified check, surety bond, or irrevocable letter of credit in 5 percent of bid shall accompany sealed Bid/Proposal of each Bidder/Proposer. Deposits will be returned to unsuccessful Bidder(s)/Proposer(s).

The City of Chickasha reserves the right to reject any/all bids and waive any/all informalities.

Upon receipt of acceptable Bid/Proposal, contract will be awarded within ninety (90) days after opening Bids/Proposals and written contract executed within 10 days thereafter.

A Prebid Conference concerning this Project will be held at 10:00 AM, March 23, 2023, in the Terminal Building 2344 Beechcraft Rd., Chickasha Municipal Airport, Chickasha, OK 73018. **Attendance at Prebid Conference is MANDATORY. Bids will NOT be accepted from contractors who do NOT have a representative in attendance. No Plans, Specifications, or Bid Documents will be issued after Prebid Conference. All Bidders/Proposers must visit and inspect construction site and be familiar with site physical characteristics and conditions.**

For eligibility to bid this Project, contractors must be listed:

- on official Bidder List by obtaining an official set of Plans and Specifications from Parkhill;
- AND
- as an attendee of mandatory Project Prebid Conference.

Bids received from contractors not meeting these requirements will be returned unopened.

City of Chickasha

INFORMATION FOR BIDDERS

1. PROPOSALS

- 1.01 Preparation: Bidder shall submit proposal and affidavits on furnished forms. Correctly fill in all blank spaces in proposal forms and Bidder shall state prices, written in ink, both words and numerals, proposed work contemplated or furnish materials required. Such prices shall be written distinctively legible. In case of conflict between words and numerals, words shall govern.
- A. If an individual submits proposal, individual's name must be signed by individual or duly authorized agent and post office address given.
 - B. If firm or partnership submits the proposal, name and post office address of each member must be given and proposal signed by a member of firm or partnership as person duly authorized.
 - C. If proposal is made by a company or corporation, company or corporation is chartered, business address must be given, and proposal signed by an official or agent duly authorized. Power of attorney, authorizing agents, or others to sign proposals must be properly certified, in writing, and on file with Owner.
- 1.02 Affidavits and Bidding Bills:
- A. Bidders shall complete and sign Non-Collusion Affidavit, Business Relationships Affidavit, and Certification of Bidder Regarding Equal Employment Opportunity forms included with Proposal. Bids containing incomplete/unsigned affidavits/certificate will be rejected.
 - B. Bidders and successful Contractor will be required to comply with Public Competitive Bidding Act of 1974, Title 61, Oklahoma Statutes, Sections 101 through 136, both inclusive. Copies of this bill are on file in the Architect/Engineer office where they may be read by all bidders.
- 1.03 Proposal Guarantee: Proposals will not be considered unless accompanied by certified check, cashier's check, acceptable bidder bond, or irrevocable letter of credit in 5 percent of base bid, made payable to Owner. Proposal guaranty is required as evidence of good faith and to guarantee, if awarded the contract, Bidder will execute required contracts and bonds within required time.
- 1.04 Filing: Owner will not consider proposals unless they are filed in sealed envelopes, within time limit for receiving proposals, and as stated in the advertisement. Proposal shall be plainly marked on envelope with "PROPOSAL" and Project name.
- 1.05 Modification: Any Bidder may modify Bid by withdrawing and modifying Bid any time prior to scheduled closing time for receipt of Bids, if Owner receives modified bid prior to said closing time.
- 1.06 Irregular Proposals: Proposals will be considered irregular if they show omission, alterations of forms, additions/conditions not called for, unauthorized alternate bids, irregulars of any kind, or un signed by Bidder's authorized person. However, Owner reserves the right to waive technicalities as to changes, alterations, or reservations and make award in the best interest of Owner.
- 1.07 Rejection: Owner reserves the right to reject any/all proposals, and all proposals submitted are subject to Owner reservation. Proposals may be rejected for any of the following specific reasons:
- A. Proposals received after time limit for receiving proposals as stated in Advertisement.
 - B. Proposal contain any irregularities.

1.08 Bidder Disqualification: Bidders may be disqualified and proposal not considered for any of the following specific reasons:

- A. Where more than one proposal for an individual, firm, partnership, or corporation is filed under same or different names and are not identical in every respect.
- B. Bidder in arrears on existing contracts, interested in any litigation against Owner, or defaulted in previous contract.
- C. Lack of competency, as revealed by financial statement, experience, equipment questionnaires, etc.
- D. Uncompleted work, which, in Owner judgment, will hinder or prevent prompt completion of additional work, if awarded.

2. CONTRACTOR QUALIFICATIONS

2.01 Attention is called to the fact that Bidder, in signing Proposal, represents financial ability and experience to carry work through several stages, and must show evidence of such ability to be eligible to receive contract award. Each Bidder with Bid shall furnish a financial statement and experience statement in accordance with form herewith attached, and failing in this, shall not be entitled to further consideration. Owner reserves the right to award contract to whose statements reveal qualified by experience and finances to successfully carry out work.

2.02 Data enclosed in these statements shall be respected as confidential and each statement will, upon Bidder request, be returned to Bidder except that of successful Bidder.

3. SURETY BONDS

3.01 Surety Bonds required as specified.

4. SUBCONTRACT APPROVAL

4.01 Owner must approve subcontractors proposed for any part of work in writing within 30 days after contract award.

5. CONTRACT DOCUMENTS

5.01 Bidders are required to become fully informed of conditions relating to construction and labor under which the work will be performed, and Contractor must employ, as far as possible, methods and means in carrying out work to not cause interruption or interference with other Contractor(s).

6. CONSENT TO ASSIGNMENT

6.01 Contractor shall obtain prior written consent of Sponsor to any proposed assignment of any interest in or part of contract.

7. DRAWING, SPECIFICATION, AND CONTRACT DOCUMENT INFORMATION

- 7.01 Submit questions if contemplating submitting a Bid for proposed contract and in doubt as to true meaning of any part of Drawings, Specifications, or other proposed documents, to Architect/Engineer:

Toby J. Baker, P.E.
Parkhill
14101 Wireless Way Suite 350
Oklahoma City Oklahoma 73134
405.832.9900; 405.843.4687 (fax)

as written or phone request for interpretation of any item on Plans or Specifications. Person submitting such request will be responsible for prompt delivery. Interpretation of proposed documents will be made only by Addendum prepared and duly issue by Architect/Engineer. A copy of such Addendum will be mailed, faxed, emailed, or delivered to each person receiving a set of such documents. Owner will not be responsible for other explanations or verbal interpretations of proposed documents.

8. EXAMINATION OF PREMISES

- 8.01 Before submitting proposal for work, Bidder must examine the premises, confirm all utility locations, sizes, pressures, etc., and be confident as to existing conditions under obligation to operate.

9. CONTRACTOR INSURANCE

- 9.01 Liability Insurance Requirements:

- A. Bidder shall provide with his Contract a listing of both automobile and personal liability insurance coverage currently in force as well as a copy of Certificate of Insurance as verification of that coverage. In addition, Bidder shall provide a statement of premium cost issued by agent or insurance carrier for that coverage.
- B. If Owner determines low Bidder's coverage in force is inadequate, Owner may require low Bidder to procure additional coverage in amounts specified by Owner. Cost of premiums for additional coverage shall be paid by Owner as a reimbursement under the contract.
- C. If after diligent effort, low Bidder is unable to procure such additional coverage as required by Owner, Owner shall provide such additional coverage, naming Contractor as insured or, at Owner option, reduce amount of additional coverage required or waive any requirements for additional coverage.

- 9.02 Third-Party Coverage:

- A. If Bidding Documents require Contractor to name Consultant/Owner as additional insured, Bidder shall show premium cost for additional insured in Proposal in item for additional coverage. Amount shown in bid item for additional premium cost shall be amount of additional premium above premium for coverage shown in Certificate of Insurance submitted with Bid.

-
- B. If Owner requires additional coverage, Owner shall pay additional premium cost for third-party coverage above amounts shown in Certificate of Insurance as reimbursement under the contract.

10. ELECTRICAL ENERGY OR OTHER HAZARDOUS ENERGY SOURCES

- 10.01 For Projects involving electrical energy or other hazardous energy sources, Contractor shall submit a copy of their Lockout/Tagout program to meet requirements of 29 CFR 1910.331, Safety-Related Work Practices (OSHA). During electrical work, an unannounced inspection is recommended by Airport Sponsor or agent to determine if Lockout/Tagout program is followed. Immediate action shall be taken to correct noncompliance including suspension of work, if necessary.

11. REQUIRED CONTRACT PROVISIONS

- 11.01 For Airport Improvement Program and Obligated Sponsors required contract provisions, refer to FAA Mandatory Contract Provisions.

END OF INFORMATION FOR BIDDERS

**Rehabilitate Runway 18/36 and Taxiways
OAC CHK-23-S**

**Chickasha Municipal Airport
CHICKASHA, OKLAHOMA**

**PROPOSAL SUMMARY SHEET
OF**

Company Name of Bidder

Base Bid.....\$_____

Alternate No. 1.....\$_____

Alternate No. 2.....\$_____

Alternate No. 3.....\$_____

Alternate No. 4.....\$_____

Check List:	Bidders shall fill in Yes or No
-------------	---------------------------------

- | | |
|---|-------|
| 1. <u>Two copies of Proposal</u> are enclosed | _____ |
| 2. All items in the Base Bid and Alternates (if applicable) are bid | _____ |
| 3. Addendum(a) receipt is acknowledged | _____ |
| 4. 5% Bid Security is enclosed | _____ |
| 5. Proposal is signed | _____ |
| 6. Noncollusion Affidavit is signed | _____ |
| 7. Business Relationship Affidavit is signed | _____ |
| 8. Equal Employment Opportunity Certificate is signed | _____ |
| 9. Bidders' Qualifications Statement is enclosed | _____ |

Two copies of this proposal are to be filed in the office of the City Clerk, 2nd Floor of the City Hall, 117 N. 4th St., Chickasha, OK 73018 by 10:00 AM on April 5, 2023.

PROPOSAL

Rehabilitate Runway 18/36 and Taxiways –OAC CHK-23-S, Chickasha Municipal Airport, Chickasha, Oklahoma

Date

Proposal of _____, a corporation organized and existing under the laws of the State of _____, with principal offices at _____.

Proposal of _____, a partnership consisting of _____
with offices at _____.

Proposal of _____, an individual trading as _____ with offices at _____.

TO:

Honorable Mayor and City Council
City of Chickasha
117 N. 4th St.
Chickasha, Oklahoma 73018

Honorable Mayor and City Council:

Having carefully examined the plans and specifications and other contract documents, and having fully investigated the location, character and extent of the work to be done and the materials to be furnished in connection with the construction of the improvements as set forth in the plans and specifications and being familiar with the type of construction work involved, the undersigned hereby proposes to furnish all tools, appliances, equipment, materials, labor and all minor items necessary to provide a finished project, ready for operation and to construct and complete the project in a thorough, workmanlike and satisfactory manner in accordance with the plans and specifications therefore and the documents attached hereto, to the satisfaction of the Engineer representing the Owner and to the satisfaction and acceptance of the work by the Owner for the following unit prices or for the following lump sum per unit as set out herein. Quantities shown are approximate and are for comparison of bids and to determine approximate amount of the contract. The amount bid included all payment due for full performance of the project work.

Rehabilitate Runway 18/36 and Taxiways, OAC CHK-23-S
Chickasha Municipal Airport, Chickasha, Oklahoma

It is understood that the undersigned is bidding on the unit prices stated below:

Item No.	SPEC No.	Item Description and Estimated Quantity	Unit Price	Estimated Amount
BASE BID				
1.	C-105-6.1	Mobilization 1 LS		
		_____	Dollars (\$_____)	\$_____
2.	SPECIAL	Low Profile Flag And Flasher Barricades 1 LS		
		_____	Dollars (\$_____)	\$_____
3.	P-501-8.1	Remove and Replace 6" P.C. Concrete Surface 85 CY		
		_____	Dollars (\$_____)	\$_____
4.	P-101-5.1	Saw, Clean and Seal Joints 39,000 LF		
		_____	Dollars (\$_____)	\$_____
5.	P-101-5.2	Saw, Clean and Seal Joints greater than 1 inch 1,450 LF		
		_____	Dollars (\$_____)	\$_____
6.	P-101-5.3	Rout, Clean and Seal Cracks (Concrete) 55 LF		
		_____	Dollars (\$_____)	\$_____
7.	P-620-5.1	Reflective Marking (with glass beads) 3,200 SF		
		_____	Dollars (\$_____)	\$_____

Item No.	SPEC No.	Item Description and Estimated Quantity	Unit Price	Estimated Amount
8.	P-620-5.2	Non-Reflective Marking 6,300 SF		
		_____	Dollars (\$_____)	\$_____
9.	SPECIAL	Third Party Insurance 1 LS		
		_____	Dollars (\$_____)	\$_____
TOTAL BASE BID			\$_____	
ALTERNATE NO. 1				
10.	SPECIAL	Runway Closed Crosses 1 LS		
		_____	Dollars (\$_____)	\$_____
11.	P-501.8.1	Remove and Replace 6" P.C. Concrete Surface 37 CY		
		_____	Dollars (\$_____)	\$_____
12.	P-101-5.1	Saw, Clean and Seal Joints 2,800 LF		
		_____	Dollars (\$_____)	\$_____
13.	P-101-5.3	Rout, Clean and Seal Cracks (Concrete) 185 LF		
		_____	Dollars (\$_____)	\$_____
TOTAL ALTERNATE NO. 1			\$_____	

Item No.	SPEC No.	Item Description and Estimated Quantity	Unit Price	Estimated Amount
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ALTERNATE NO. 2

14.	P-501-8.1	Remove and Replace 6" P.C. Concrete Surface 19 CY		
			Dollars (\$_____)	\$_____
15.	P-101-5.1	Saw, Clean and Seal Joints 300 LF		
			Dollars (\$_____)	\$_____

TOTAL ALTERNATE NO. 2 \$_____

ALTERNATE NO. 3

16.	P-501-8.1	Remove and Replace 6" P.C. Concrete Surface 16 CY		
			Dollars (\$_____)	\$_____

TOTAL ALTERNATE NO. 3 \$_____

ALTERNATE NO. 4

17.	P-620-5.1	Marking Removal 46,000 SF		
			Dollars (\$_____)	\$_____
18.	P-620-5.1	Reflective Marking (with glass beads) 35,900 SF		
			Dollars (\$_____)	\$_____
19.	P-620-5.2	Non-Reflective Marking 10,100 SF		
			Dollars (\$_____)	\$_____

TOTAL ALTERNATE NO. 4 \$_____

Certification Regarding Foreign Trade Restrictions (49 CFR Part 30)

The Contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

- a. is not owned or controlled by one or more citizens or nationals of a foreign country included in the list of countries that discriminate against the U.S. firms published by the Office of the United States Trade representatives (USTR);
- b. has not knowingly entered into any contract or subcontract for this project with a Contractor that is a citizen or national of a foreign country on said list or is owned or controlled directly or indirectly by one or more citizens or nationals of foreign country on said list.
- c. has not procured any product or subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a Contractor or subcontract who is unable to certify to the above. If the Contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project; the Owner may direct cancellation of the contract at no cost to the Government.

Further, the Contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The Contractor may rely upon the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The Contractor shall provide immediate written notice to the sponsor if the Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide immediate written notice to the Contractor, if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Owner may direct cancellation of the contract or subcontract or default as no cost to the Government.

Nothing contained in the forgoing shall be construed to require established of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a Contractor are not required to exceed that which is normally possessed by a pursuant person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion (49 CFR Part 29)

The bidder (offeror) certifies, by submission of this proposal or acceptance of this contract, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in this transaction by any Federal or State department or agency. It further agrees that by submitting this proposal that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/offeror/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

The City of Chickasha reserves the right to take ninety (90) days from the bid date to award the contract(s). This bidder agrees that, if his proposal is accepted, he will enter into a contract with the City of Chickasha within ten (10) days after the acceptance of his bid; and he further agrees to commence work within ten (10) calendar days after written Notice to Proceed is issued and to complete the work within:

	<u>Working Days</u>	<u>Liquidated Damages per Working Day</u>
Base Bid	25	\$1200.00
Alternate No. 1	10	\$1200.00
Alternate No. 2	2	\$1200.00
Alternate No. 3	1	\$1200.00
Alternate No. 4	7	\$1200.00

Enclosed is bidder's (Bid Bond), (Certified Check), (Cashier's Check) or (Irrevocable Letter of Credit) in the amount of 5 percent of the total bid: _____ Dollars (\$ _____).
(Enter amount of guaranty)

We hereby acknowledge receipt of Addendum(a) No. _____.

_____	_____
Street or P.O. Box	Name of Firm
_____	_____
City, State and Zip	Signature
_____	_____
Telephone	Typed Name
_____	_____
Fax	Title
_____	_____
E-mail Address	Date

THESE TWO AFFIDAVITS MUST BE EXECUTED FOR THE BID TO BE CONSIDERED:

A. Noncollusion Affidavit

STATE OF _____)
) SS.
COUNTY OF _____)

I, _____ of lawful age, being first duly sworn, on oath say:

1. (s)he is the duly authorized agent of _____, the bidder submitting the competitive bid which is attached to this statement, for the purpose certifying that facts pertaining to the existence of collusion among bidders and between bidders and state officials or employees, as well as facts pertaining to the giving or offering of things of value to government personnel in return for special consideration in the in the letting of any contract pursuant to the bid to which this statement is attached;
2. (s)he is fully aware of the facts and circumstances surrounding the making of the bid to which this statement is attached and has been personally and directly involved in the proceedings leading to the submission of such bid; and
3. neither the bidder nor anyone subject to the bidder's direction or control has been a party:
 - a. to any collusion among in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding.
 - b. to any collusion with any state official or employee as to quantity, quality or price in the prospective contract, or as to any other terms of such prospective contract, nor
 - c. in any discussions between bidders and any state official concerning exchange of money or other thing of value for special consideration in the letting of a contract.

(Signature)

(Title)

SUBSCRIBED AND SWORN to before me this _____ day of _____, 20_____.

Notary Public (or Clerk or Judge)

My Commission Expires _____.

B. Business Relationships Affidavit

STATE OF _____)
) SS.
COUNTY OF _____)

_____, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the nature of any partnership, joint venture, or other business relationship presently in effect or which existed within one (1) year prior to the date of this statement with the architect, engineer, or other party to the project is as follows:

Affiant further states that any such business relationship presently in effect or which existed within one (1) year prior to the date of this statement between any officer or director of the bidding company and any officer or director of the architectural or engineering firm or other party to the project is as follows:

Affiant further states that the names of all persons having any such business relationships and the positions they hold with their respective companies or firms are as follows:

(If none of the business relationships hereinabove mentioned exist, affiant should so state.)

Bidder or Agent

SUBSRIBED AND SWORN to before me this _____ day of _____, 20_____.

Notary Public

My Commission Expires:

THIS CERTIFICATE MUST BE EXECUTED FOR THE BID TO BE CONSIDERED

**CERTIFICATION OF BIDDER REGARDING
EQUAL EMPLOYMENT OPPORTUNITY**

GENERAL

BIDDERS NAME _____

ADDRESS _____

INTERNAL REVENUE SERVICE EMPLOYER IDENTIFICATION NUMBER _____

NONSEGREGATED FACILITIES

NOTICE TO PROSPECTIVE FEDERALLY ASSISTED CONSTRUCTION CONTRACTORS (41 CFR 60-1.8)

1. A Certification of Nonsegregated Facilities must be submitted prior to the award of a federally assisted construction contract exceeding \$10,000, which is not exempt from the provision of the equal opportunity clause.
2. Contractors receiving federally assisted construction contract awards exceeding \$10,000 that are not exempt from the provisions of the equal opportunity clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the equal opportunity clause.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR CERTIFICATION ON NONSEGREGATED FACILITIES:

1. A Certification of Nonsegregated Facilities must be submitted prior to the award of the subcontract exceeding \$10,000 that is not exempt from the provisions of the equal opportunity clause.
2. Contractors receiving subcontract awards exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the equal opportunity clause.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained.

The federally assisted construction contractor agrees that a branch of this certification is a violation of the Equal Opportunity Clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex or national origin, because of habit, local custom, or any other reason. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause, and that he will retain such certification in his files.

NOTICE TO PROSPECTIVE CONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NONSEGREGATED FACILITIES:

A Certification of Nonsegregated Facilities must be submitted prior to the award of a contract or subcontract exceeding \$10,000 that is not exempt from the provisions of the Equal Opportunity Clause.

Certification – The information above is true and complete to the best of my knowledge and belief.

Name and Title of Signer (Please Type)

Signature

Date

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001

THIS STATEMENT MUST BE COMPLETE AND SUBMITTED WITH BID

BIDDERS QUALIFICATIONS STATEMENT

Date _____, 20____

1. Name of Bidder _____

2. Business Address _____

3. Date Organized Under Present Firm Name _____, _____

4. Type of Organization:

Individual

Partnership/LLC consisting of the following members:

Corporation with the following officers:

_____ President _____ Vice President

_____ Secretary _____ Treasurer

5. Background and Experience of Principal Members of Firm:

a. Name _____ Age _____

Years of experience in construction work _____

Duties performed _____

b. Name _____ Age _____

Years of experience in construction work _____

Duties performed _____

c. Name _____ Age _____

Years of experience in construction work _____

Duties performed _____

d. Name _____ Age _____

Years of experience in construction work _____

Duties performed _____

Description and Location	Construction Cost	% Comp.	Estimated Comp. Date

[illegible]

a. Maximum bonding capacity	\$ _____
b. Amount obligated for current work	\$ _____
c. Net capacity available for new work	\$ _____

Company _____ Agent _____
Name Name
Agent _____

Current Assets	\$	_____
Current Liabilities	\$	_____
Present Net Worth	\$	_____

Owner	Project Description	Cost
-------	---------------------	------

Cost

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small, dark speck is located near the top center of the page. A small, brownish mark is visible on one of the lines towards the left side. The paper appears slightly aged or off-white.

CONSTRUCTION CONTRACT

This Contract, made the Contract Day day of Contract Month, 2023, by and between Contract Winner, Inc. herein called CONTRACTOR, and the City of Chickasha hereinafter called OWNER.

ARTICLE 1, SCOPE OF WORK

CONTRACTOR shall furnish all materials and perform all work shown on drawings and described in specifications entitled:

Rehabilitate Runway 18/36 and Taxiways
OAC CHK-23-S
Bid No. CAA-2301
Chickasha Municipal Airport
Chickasha, Oklahoma

hereinafter called the PROJECT, and as prepared by Parkhill, hereinafter called ENGINEER, and shall do everything required by this Contract, Specifications, and Drawings. Observation of construction of this Contract shall be under ENGINEER supervision.

ARTICLE 2, TIME OF COMPLETION

Work to be performed under this contract shall be commenced within 10 calendar days after date of written "Notice to Proceed" of Owner is issued and fully completed within _____ Working days for Base Bid {and Alternate(s) No. ____}. Working days shall count beginning on date given in the "Notice to Proceed."

ARTICLE 3, AMORTIZATION PAYMENT REQUIREMENTS

CONTRACTOR does hereby agree to pay to Owner liquidated damages for such time, as entire PROJECT is not acceptable for occupancy beyond the contract time. Liquidated damages shall be \$1200 per calendar day after stated working days expired after date of "Notice to Proceed," until such time as all PROJECT is acceptable for use and operation.

Any sum of money owed to CONTRACTOR, under terms of this contract retained by OWNER, may be used to pay the liquidated damages to OWNER.

ENGINEER shall certify, after consultation with CONTRACTOR and OWNER, date on which PROJECT is available for use and operation.

OWNER shall furnish site and access to site. Further, OWNER shall do all to cooperate with CONTRACTOR and facilitate to CONTRACTOR efforts to complete work as provided in contract. CONTRACTOR is relieved of responsibility for the payment of such liquidated damages only to the extent that failure of space to be available for occupancy in accordance with completion time established in Article 2 is caused by Acts of God.

ARTICLE 4, CONTRACT SUM

OWNER shall pay CONTRACTOR for performance of the contract in current funds sum of

(\$ _____).

ARTICLE 5, CONTRACT DOCUMENTS

Drawings and Specifications referred to in Article 1 herein are part of this contract as if hereto attached and repeated. This Contract is based on Plans and Specifications dated March, 2023 and addenda thereto as follows:_____.

It is agreed changes, additions, or deletions may be made to Drawings and Specifications and work performed only upon an agreement executed on a form in writing entered by parties to this contract.

ARTICLE 6, CLAIM OR INVOICE AFFIDAVIT

Each monthly estimate for payment must contain, or have attached, an affidavit as required by Senate Bills 469 and 565 of the 1974 Legislature, executed on a form similar and essentially the same as that (page CA-1) bound in the specifications.

ARTICLE 7, CONTINGENCY AGREEMENT

The contract is contingent upon the "Notice to Proceed."

ARTICLE 8, SWORN, NOTARIZED AFFIDAVIT MUST BE SIGNED AND NOTARIZED BEFORE THIS CONTRACT WILL BECOME EFFECTIVE.**ARTICLE 9, HOLD HARMLESS, INDEMNIFY, AND DEFEND CLAUSE**

Any Contractor or subcontractor performing work in connection with Drawings and Specifications for this Project shall hold harmless, indemnify, and defend Owner and Engineer, their consultants and each of their officers, agents, and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from Contractor (or subcontractor) negligence in performance of work described in Contract Documents, but not including liability that may be due to sole negligence of Owner, Engineer, their consultants or their officers, agents, and employees.

IN WITNESS WHEREOF, parties hereto executed this agreement the day and year noted herein.

CONTRACTOR**OWNER**_____
Contract Owner Name, President_____
Chris Mosley, Mayor_____
CONTRACTOR ATTEST_____
CITY CLERK (ATTEST)

APPROVED as to form and legality this _____ day of _____, 20__.

MUNICIPAL COUNSELOR

AFFIDAVIT

STATE OF (_____)

COUNTY OF (_____)

I, _____, of lawful age, being first duly sworn on oath say:

1. (s)he is duly authorized agent of _____,
Contractor under the contract which is attached to this statement, for certifying facts pertaining to
giving of things of value to the government personnel to procure said contract;
2. (s)he is fully aware of facts and circumstances surrounding the making of contract which this
statement is attached and has been personally and directly involved in proceedings leading to the
procurement of said contract; and
3. neither Contractor nor anyone subject to Contractor direction or control has paid, given or donated
or agreed to pay, give or donate to any officer or employee of the State of Oklahoma any money or
other thing of value, either directly or indirectly, in procuring the contract to which this statement
is attached.

Contract Owner Name, President

Subscribed as to form and legality this _____ day of _____, 20_____.

Notary Public (or Clerk/Judge)

My Commission Expires _____

CERTIFICATE OF NON-DISCRIMINATION

In connection with the performance of work under this Contract, Contractor agrees as follows:

- A. Contractor agrees not to discriminate against any employee or applicant for employment because of race, creed, color, sex, national origin, or ancestry. Contractor shall take affirmative action to ensure that employees are treated without regard to their race, creed, color, sex, national origin, or ancestry. Such actions shall include, but not be limited to the following: Employment, upgrading, demotion or transfer, recruiting or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. Contractor and subcontractor shall agree to post in a conspicuous place, available to employees and applicants for employment, notices to be provided by Owner setting forth provisions of this section.

- B. In the event of Contractor's non-compliance with this non-discrimination clause, Contract may be canceled or terminated by Owner. Owner may declare Contractor ineligible for further contracts with the said agency until satisfactory proof of intent to comply shall be made by Contractor.

- C. Contractor agrees to include this non-discrimination clause in any subcontracts connected with the performance of this Agreement.

I have read the stated clause and agree to abide by its requirements.

Contract Owner Name, President

ATTEST:

SECRETARY

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that _____
_____, as Principal,
hereinafter called Contractor, and _____,
a corporation organized and existing under the laws of the State of _____, as Surety,
hereinafter called Surety, are held and firmly bound unto _____
as Oblige, hereinafter called Owner, in the amount of _____
_____ Dollars (\$ _____)

for payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated Contract Month Contract Day, 2023, entered into a contract with Owner for **Rehabilitate Runway 18/36 and Taxiways, OAC CHK-23-S** in accordance with Drawings and Specifications prepared by Parkhill, 14101 Wireless Way, Suite 350, Oklahoma City, Oklahoma 73134. Which contract is by reference made a part hereof and is hereinafter referred to as Contract.

NOW, THEREFORE THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by Owner.

Whenever Contractor shall be, and declared by Owner to be in default under Contract, Owner having performed Owner's obligations thereunder, Surety may promptly remedy default, or promptly

- (1) Complete Contract in accordance with its terms and conditions, or
- (2) Obtain bid(s) for completing Contract in accordance with terms and conditions, and upon determination by Surety, of lowest responsible bidder, or, if Owner elects upon determination by Owner and Surety jointly of lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as work progresses (even though there should be a default or a succession of sufficient funds to pay cost of completion arranged under this paragraph) sufficient funds to pay cost of completion less balance of contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, amount set forth in first paragraph hereof. "Balance of contract price," as used in this herein, shall mean total amount payable by Owner to Contractor under Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of one year from date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than Owner named herein or the heirs, executors, administrators, or successors of Owner.

Signed and sealed this _____ day of _____, 20_____ in the presence of:

Contract Winner

By _____ (Seal)

(Witness)

(Surety)

By _____ (Seal)

(Witness)

STATUTORY BOND

KNOW ALL MEN BY THESE PRESENTS, that _____
_____, as Principal,
and _____,
a corporation authorized under the laws of the State of _____ and authorized to
transact business in the State of Oklahoma, as Surety, are held and firmly bound unto in the penal sum
_____ (Owner) of
_____ Dollars (\$ _____)

in lawful money of the United States of America, for the payment of which, well and truly made we bind
ourselves and each of us, our heirs, executors, administrators, trustees, successor, and assigns, jointly and
severally, firmly by these presents:

DATED this _____ day of _____, 20_____.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT WHEREAS, said principal
has entered into a written contract with

(Owner)
DATED Contract Month Contract Day, 2023, for

all in compliance with Plans and Specifications therefore, made a part of said Contract and on file in the
office of

(Name and Address of Owner)

NOW THEREFORE, if said Principal shall fail or neglect to pay all indebtedness incurred by said Principal
or subcontractor of said Principal who perform work in performance of such contract, for labor and
materials, rental of machinery or equipment, and repairs to and parts for equipment used and consumed in
performance of said Contract within 30 days after that same becomes due and payable, person, firm, or
corporation entitled thereto may sue and recover on this bond, amount so due and unpaid.

It is further expressly agreed and understood by parties hereto that no changes or alterations in said
Contract and no deviations from plan or mode of procedure herein fixed shall have effect of releasing
sureties, or any of them, from obligations of this Bond.

IN WITNESS WHEREOF, said Principal has caused these presents to be executed in its name, and corporate seal to be hereunto affixed, by duly authorized officers, and said Surety has caused these presents to be executed in its name and corporate seal to be hereunto affixed by its attorney-in-fact, duly authorized so to do, day and year first above written.

ATTEST: Principal _____

Secretary

By _____
Title

Surety _____

By _____
Attorney-In-Fact

DEFECT BOND

KNOW ALL MEN BY THESE PRESENTS, that _____

_____, as Principal, and _____

a corporation authorized under the laws of the State of _____ and authorized to

transact business in the State of Oklahoma, as Surety, are held and firmly bound unto _____

_____ in the penal sum of _____

(Owner)

_____ Dollars (\$ _____)

in lawful money of the United States of America, said sum being equal to one hundred percent (100%) of contract price, for payment of which, well and truly to be made, we bind ourselves and each of us, our heirs, executors, administrators, trustees, successors, and assigns, jointly and severally, firmly by these presents.

The condition of this obligation is such that:

WHEREAS, said Principal entered a written Contract with _____

(Owner)

DATED Contract Month Contract Day, 2023, for

all in compliance with Plans and Specification therefore, made a part of said Contract and on file in the office of

(Name and Address of Owner)

NOW, THEREFORE, if said Principal shall pay or cause to be paid to _____
(Owner)

all damage, loss, and expense that may result by reason of defective materials/workmanship in connection with said work, occurring within one year from and after acceptance of said project by

_____; then this obligation shall be null and void,
(Owner)

otherwise, to be and remain in full force and effect.

It is further expressly agreed and understood by parties hereto that no changes or alterations in said Contract nor deviations from plan or mode of procedure herein fixed shall have effect of releasing the sureties, or any of them, from obligations of this Bond.

IN WITNESS WHEREOF, said Principal has caused these presents to be executed in its name and corporate seal to be hereunto affixed by its duly authorized officers, and said Surety has caused these presents to be executed in its name and corporate seal to be hereunto affixed by its attorney-in-fact, duly authorized so to do, the day and year first above written.

DATED this _____ day of _____, 20_____.

ATTEST: Principal _____

_____ By _____
Title

Surety _____

By _____
Attorney-In-Fact

**CERTIFICATE OF COMPLIANCE WITH STATUS VERIFICATION SYSTEM FOR
EMPLOYEES OF CONTRACTOR AND EMPLOYEES OF SUBCONTRACTORS USED BY
CONTRACTOR**

That Title 25 Oklahoma Statutes Section 1313 B. (as enacted by Oklahoma House Bill 1804 effective November 1, 2007) provides that after July 1, 2008, no public employer (City or related public trusts) "shall enter into a contract for the physical performance of services within this state unless the contractor registers and participates in the Status Verification System to verify the work eligibility status of all new employees."

That as a condition of the award of the contract to **Contract Winner**, for project **Rehabilitate Runway 18/36 and Taxiways, OAC CHK-23-S** said Contractor represents and warrants it has used the Status Verification System to verify work eligibility status (i.e. not an unauthorized alien as defined in Section 1324a(h)(3) of Title 8 of the United States Code) of all employees hired since July 1, 2008, that will perform under contract and verified (or will within 10 days of bid award and prior to Notice to Proceed) any subcontractors it will use also verified work eligibility status of its employees hired since July 1, 2008, it will use in performing services under the above contract.

Dated this ____ day of _____, _____.

Contract Winner

Contract Owner Name, President

Witness: _____

APPOINTMENT OF AGENT

The City of Chickasha, Oklahoma, hereinafter referred to as "City," does hereby appoint "CONTRACTOR" an Oklahoma Corporation, acting through officers and employees, hereinafter referred to as "Agent" of City for the sole purpose of completing Rehabilitate Runway 18/36 and Taxiways, OAC CHK-23-S, Chickasha Municipal Airport, under a contract dated the Contract Day day of Contract Month, 2023 being constructed in Chickasha, Oklahoma, hereinafter referred to as "Project," for City use. Agent agrees to act as agent for City subject to provisions of this Appointment.

Legal title to all tangible personal property purchased, and right to direct use of all tangible personal property rented, by agent pursuant to this Appointment shall pass directly from vendor to City. Agent shall designate on purchase orders and elsewhere as appropriate when making purchases pursuant to this Appointment, the following legend:

"CONTRACTOR has been appointed agent for City of Chickasha, Oklahoma, for property described herein. Upon passage of title, all such property will be included in project owned by City. Title to all such property shall pass to said City from vendor F.O.B. place specified in this purchase order. All such property is exempt from Oklahoma sales and use taxes and/or City sales taxes."

Rental agreements relating to such property shall contain suitable provisions which disclose agent's agency and indicate no Oklahoma sales tax or use tax or City sales tax is payable.

Agent agrees not to purchase or rent any tangible personal property pursuant to this Appointment unless such property is authorized for inclusion in or exclusive use in construction of project described above. Agent shall not have the power to appoint any other person or entity as agent for City.

Agent shall be responsible in a separate capacity for payment of purchase price or other consideration for property purchased or rented as agent and not have power to bind City to any financial or other commitments or obligations. Agent shall hold City harmless from liability for, or arising out of, purchase, rental, or use of the property purchased or rented hereunder.

This Appointment shall be effective upon execution by City acting through Mayor, by agent, and binding upon successor of the parties hereto.

Executed by the undersigned Mayor of City of Chickasha, State of Oklahoma, on behalf of City of Chickasha, on this Contract Day day of Contract Month, 2023.

City of Chickasha, Oklahoma

73-6005139
Tax Exemption Number

Chris Mosley, Mayor

Contract Winner

Contract Owner Name, President

AGENT'S MAILING ADDRESS:

Contract Owner Address
Contract Owner City, Oklahoma Contract Owner Zip
xxx.xxx.xxxx

AFFIDAVIT FOR PAYMENT OF \$1,000.00 OR MORE

STATE OF _____)
) SS.
COUNTY OF _____)

Undersigned Contractor, lawful age, first duly sworn on oath, says this invoice/claim is true and correct. Affiant further states (work, services, or materials) as shown by this invoice/claim have been completed or supplied in accordance with Plans, Specifications, orders, or requests furnished affiant. Affiant further states (s)he made no payment directly/indirectly to any elected official, officer, or employee of the State of Oklahoma, and county or local subdivision of state, money, or any other thing of value to obtain payment.

(Contractor, Supplier, or Engineer)

Subscribes and sworn to before me this _____ day of _____, 20_____.

(Notary Public, Clerk, or Judge)

My Commission Expires _____, 20_____.

Note:

Attach a copy of this Affidavit to any invoice submitted by Architect, Contractor, Engineer, or Supplier for material of \$1,000.00 or more.

RELEASE

(Execute this form of release at contract completion.)

KNOW ALL MEN BY THESE PRESENTS:

That _____
hereinafter called Contractor, individually and collectively, have in consideration of the sum of _____
_____ Dollars (\$ _____), (retained by Owner hereinafter described for exceptions yet to be performed by Contractor when such exceptions are performed) to us in hand paid by CITY OF Chickasha, hereinafter called Owner, receipt whereof is hereby acknowledged, remised, released, and forever discharged, and by these presents do for heirs, executors, administrators, successors and assigns, remise, release, and forever discharge and said Owner and successors in office and heirs, executors, and administrators, of and from all, and all manner of action and actions, cause and causes of actions, suits, debts, dues, sums of money, accounts, reckonings, bonds, bills, specialties, covenants, contracts, controversies, executions, claims, and demands whatsoever in law or equity which against them, said Owner ever had, now have, or may have reason of contract entered into by and between Contractor and Owner dated _____, 20____, which pertains to construction by Contractor for Owner, for Rehabilitate Runway 18/36 and Taxiways, OAC CHK-23-S at Chickasha Municipal Airport, Chickasha, Oklahoma including change orders covered therein.

This release includes any and all other work or material furnished in connection with such contract and building and other facilities.

Said Contractor(S), individually and collectively, hereby certify Contractor paid in full to each and every person, firm, partnership, corporation, joint venture, and subcontractor, for all labor and material used in performance of foregoing contract.

IN WITNESS WHEREOF, Contractor executed this release on the ____ day of _____, 20____.

CONTRACTOR SIGNATURE

ATTEST:

SPECIAL PROVISIONS

SECTION 301 GENERAL

- A. These Special Provisions are supplemental to General Specifications and considered part of Specifications and Contract. In case of conflict between stipulations of Special Provisions and Specifications, Plans, or General Provisions, Special Provisions take precedence and govern. Engineer shall make interpretation of Plans and Specifications.
- B. Contractor's work consists of furnishing all tools, labor, equipment, materials, and performing all work necessary for construction, complete, of all airport improvements shown on Plans in strict accordance with detailed Plans and Specifications.
- C. Plans and Specifications prescribe a complete work and improvement. Where items of work are necessary for satisfactory completion of improvement for which specific contract prices are not provided in proposal and Contract, such work shall be considered incidental to main construction and any costs involved reflected in such other prices as are provided.
- D. Project Description: Rehabilitate Runway 18/36 and Taxiways, OAC CHK-23-S, Chickasha Municipal Airport, Chickasha, Oklahoma.
- E. Base Bid: Rehabilitate Runway 18/36 and Taxiways.
- F. Notices to Airmen (NOTAMs): Issued by the City.
- G. General Provisions Article 20-02, Prequalification of Bidders, shall mean any bidder as previously prequalified by the Oklahoma Department of Transportation (ODOT).
- H. Each successful Bidder shall furnish Performance Bond, Statutory Bond, and Defect Bond each in the amount of 100 percent of Contract.
- I. Waiver of Legal Rights. Inspection by Owner (or any duly authorized representative) any order, measurement, or certificate by Engineer of any work or extension of time, or any possession taken by Owner shall not operate as a waiver of any provisions of Contract or any power therein provided. Any waiver of any breach of contract shall not be held as a waiver of any other or subsequent breach. Owner reserves the right to correct any error that may be discovered in any estimate that may have been paid and to adjust the same to meet requirements of Contract and Specifications. Owner reserves the right to claim and recover by process of law sums as may be sufficient to correct any error(s) or make good any deficiency in work resulting from such error or deficiency in work resulting from such error of deficiency, dishonesty, or collusion discovered in work after final payment is made.
- J. Transportation Tax. Under provisions of the Internal Revenue Code Section 3475 (b), as amended, the State of Oklahoma, its agencies, and political subdivisions are exempt from payment of the 3 percent transportation tax levied by Section 3475 Subsection (a), in either of the following cases:
 - 1. When property (equipment, goods, materials, etc.) is consigned to the State, its agencies, or political subdivisions; or
 - 2. When such property is consigned to the State, its agencies, or political subdivisions in care of Contractor.

-
- K. Subletting of Contract. Contractor shall not sublet, sell, transfer, assign, or otherwise dispose Contract(s) or any portion thereof, or any rights, title, or interests therein, without written consent of Engineer or authorized representative. In case such consent to Subcontract is given, Contractor is permitted to sublet a portion of work as specified, but shall perform with his own organization, work amounting to no less than 50 percent of total Contract amount based on unit prices bid for items subcontracted. Merely supplying materials to Project shall not be considered performance of work. Any items designated in Contract as "specialty items" may be performed by Subcontract and cost of any such specialty items so performed by Subcontract may be deducted from total cost before computing amount of work required to be performed by Contractor with his/her own organization.
1. Requests for permission to sublet or otherwise dispose any portion of Contract work shall be in writing and accompanied by a statement showing the organization which will perform work is particularly experienced and equipped for such work. Contractor shall give assurance the minimum wage for labor as stated in Proposal shall apply to labor performed on all work sublet. No Subcontracts or transfer or Contract shall in any case release Contractor of liability under Contract and bonds.
 2. Should Contractor assign any right title or interest in Contract said, assignment shall be made only with full knowledge and written consent of Surety. It is specifically understood a violation of this Subsection will constitute Contractor's act of default.
- L. Small Business Participation. In compliance with 49 CFR Part 26, the City encourages Prime Contractor to foster small business participation in this Project. NAICS (North American Industry Classification System) codes for work items in this Project potentially accomplished by small businesses are 237310, 238910, 423320, 484220, 561730, 541330, 541370, 541380, and 541611. No specific numerical goal is assigned regarding Small Business Participation. While no goal is assigned, Contractor, sub-recipient, or subcontractor, should make every effort to solicit Small Business firms to participate as subcontractors, service providers, and suppliers.
- M. Owner will furnish Contractor a complete Appointment of Agent Form (Page AA-1) to eliminate any requirement of Contractor to pay Oklahoma and local sales tax on materials, equipment, and goods furnished on this Project, because the City is exempt from such sales tax, and since Contractor is an Agent of the City, no sales tax shall be paid.

SECTION 302 OUT-OF-STATE CONTRACTORS

- A. Contractors and subcontractors without Offices in the State of Oklahoma must provide a Non-Resident Contractor's Bond with Power of Attorney in the penal sum of 10 percent of total contract price to the Oklahoma Tax Commission, Business Tax Division, 2501 North Lincoln, Oklahoma City, Oklahoma 73194, with a copy to Engineer before the City executes Contract. Successful Bidder must also notify the following agencies about this contract with amount of contract and copies to Engineer before Contract can be awarded.
1. Oklahoma County Assessor
 2. Workers Compensation Court
1915 North Stiles
Oklahoma City Oklahoma 73105
405.557.7600
 3. Oklahoma Employment Security Commission
200 Will Rogers Building
Oklahoma City Oklahoma 73105
405.557.7226

SECTION 303**AWARD OF CONTRACT**

- A. Contractor must bid all items in Base Bid to be considered.
- B. Construction Contract will be awarded based on lowest responsive and responsible bid of each base bid (if applicable) in accordance with Article 30.02 of the General Provisions.

SECTION 304**CONTRACTOR'S INSURANCE**

- A. Contractor shall not commence work under this Contract until all insurance required is obtained under this Specification and such insurance approved by Owner. Contractor shall not allow any subcontractor to commence work on subcontract until all similar insurance required of subcontractor is obtained and approved.
- B. Contractor shall furnish Owner triplicate copies of Certification of Insurance or policies indicating all exclusions, providing waiver of subrogation claims against Owner and Engineer which waiver(s) shall be subject to approval by Owner on an individual claim basis, and showing Contractor is carrying at Contractor expense, in reliable insurance companies satisfactory to Owner and authorized to do business in the State of Oklahoma, the following types of insurance on contract forms approved by Owner with limits not less than shown on the following respective items:

Workmen's Compensation	Statutory Limits
Employer's Liability	500/500/500
General Liability (including explosions, collapse, and underground where applicable and Broad Form CGL Endorsement)	1,000,000 Combined Single Limits
Contractual Liability	1,000,000 Combined Single Limits
Automobile Liability	1,000,000 Combined Single Limits

- 1. Property damage portion will provide for all damages arising out of injury to or destruction of property of others arising directly or indirectly out of or in connection with performance of work under Contract(s) including explosion, collapse, and underground exposures.
 - 2. Included in such coverage will be contractual coverage sufficiently broad to insure "indemnity" provision under Article 9 of Contract herein. Comprehensive general liability insurance will include as additional insureds, Owner, Engineer, and each of their officers, agents, and employees.
- C. Contractor's Liability Insurance Requirements: Successful Bidder shall provide with Contract documents a listing of both automobile and personal liability insurance coverage currently in force, along with a copy of a Certificate of Insurance as verification of coverage.
 - 1. If Owner determines low Bidder's coverage in force is inadequate, Owner may require low Bidder to procure additional coverage in amounts specified by Owner. Owner, as a reimbursement under Contract, shall pay cost of premiums for such additional coverage.
 - 2. If low Bidder is unable, after diligent effort, to procure such additional coverage as required by Owner, Owner shall provide such additional coverage, naming Contractor as insured or, at Owner option, reduce amount of additional coverage required or waive any requirement for additional coverage.

SECTION 305 FIELD OFFICE (Not required)

SECTION 306 CONSTRUCTION MANAGEMENT PROGRAM

- A. Before contract is awarded, Bidder may be required to furnish a complete statement of origin, composition, or manufacture of materials proposed in construction of work, together with samples, which may be subjected to tests provided in these Specifications to determine quality and fitness for work.
- B. All testing shall be as required by Engineer/Owner and in accordance with Specifications. All testing shall be made by an Owner-approved laboratory. Such tests Engineer/Owner may order shall be evaluated, in turn, by Engineer, and in turn, pass on to Owner by notation on test report the result of his evaluation. Engineer/Owner have the right to order any number of tests deemed necessary to properly determine intent of these Specifications is complied with. In all cases where Engineer orders tests/inspections made by testing laboratory and results show materials or workmanship tested or inspected fail to meet Specification requirements, Contractor bears costs of tests.

SECTION 307 MATERIAL SUBMITTAL

- A. Contractor shall submit two copies (plus number Contractor wants returned) of complete descriptive information, catalog cuts, etc., of all materials proposed for use on Project. Present items in order they are specified, (section number, etc.), followed by items described on Drawings. Use identifying marks on descriptive sheets and catalog cuts to indicate exactly which item is presented for approval. List any airfield lighting equipment, regulators, cable connectors, insulating transformers, and light bases required by Project in current FAA Approved Airport Lighting Equipment List. All other items shall be as specified herein or on Drawings.

SECTION 308 DISPOSAL OF WASTE MATERIALS AND CLEAN-UP

- A. Legally dispose all waste materials off airport property. Before Owner accepts Project, Project area must be cleaned of all foreign materials that could be picked up in mowers used by airport personnel. Engineer and Contractor shall thoroughly inspect area before final Project inspection. Contractor failure to clean jobsite could delay final inspection and thereby delay final Contract payment. Cleaning Project work area is incidental to all other work involved, and no separate payment for this work will be made.

SECTION 309 CONTRACTOR'S USE OF CITY WATER

- A. Contractor shall be charged for City water. Contractor may request the City set a meter on a nearby fire hydrant for Contractor use. Contractor will also be responsible for all repairs and maintenance of meter while in use by Contractor.

Item C-105 Mobilization

105-1 Description. This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-2 Mobilization limit. Mobilization shall be limited to 10 percent of the total project cost.

105-3 Posted notices. Before construction activities, Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended. These notices must remain posted until final acceptance of the work by Owner.

105-4 Engineer/RPR field office. Not required.

METHOD OF MEASUREMENT

105-5 Basis of measurement and payment. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

- a. With first pay request, 25%.
- b. When 25% or more of the original contract is earned, an additional 25%.
- c. When 50% or more of the original contract is earned, an additional 40%.
- d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 10%

BASIS OF PAYMENT

105-6.1 Payment will be made under:

Item C-105 Mobilization

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.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD) WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

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 Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

Contractor 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. 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. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by Engineer.

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 underlying material that is to remain in place, shall be recompact/replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at Contractor 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.

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 Engineer. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor removal process shall be repaired at Contractor 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. If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks greater than 1/4 inch 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 , not to exceed 1/4 inch . Any excess joint or crack sealer shall be removed from the pavement surface. Fill all cracks greater than 1/4 inch wide by sweeping sand across the surface, prior to placement of underlayment fabric.

101-3.3 Removal of Foreign Substances/contaminates prior to overlay, seal-coat, or 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 RPR in the field during construction.

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 deep. If it is deemed by 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, Contractor shall repair the damaged area without compensation and as directed by RPR.

Removal of foreign substances shall not proceed until approved by Engineer. Water used for high-pressure water equipment shall be provided by Contractor at Contractor 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. Contractor shall repair all spalled concrete as shown on the plans or as directed by Engineer. The perimeter of the repair shall be saw cut a minimum of 2 inches outside the affected area and 2 inches 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 Engineer until material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphalt pavement repair. Contractor shall repair all spalled concrete as shown on the plans or as directed by 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. If Contractor mills or grinds deeper or wider than the plans specify, Contractor shall replace the material removed with new material at Contractor 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. RPR shall layout the area to be milled with a straightedge in increments of 1-foot 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. Tolerances shall be maintained within +0 and -1/4 inch 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 or remove millings or cuttings from pavement and load into a truck. All millings shall be removed and disposed off airport.

c. Clean-up. 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, Contractor shall wet down the milled pavement and thoroughly sweep/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 of Airport property.

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. Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by 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 Contractor 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. Contractor shall demonstrate, in the presence of 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 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. Not required.

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. Contractor shall demonstrate, in the presence of RPR, that the method used cleans the cracks and does not damage the pavement.

101-3.9.1 Preparation of Crack. Not required.

101-3.9.2 Removal of Existing Crack Sealant. Not Required.

101-3.9.3 Crack Sealant. Not required.

101-3.9.4 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. Remove types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be

backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 95% of ASTM D698.

b. Removal of Inlets/Manholes. Where indicated on the plans or as directed by the Engineer, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to 95% of ASTM D698, when outside of paved areas must be compacted to 95% of ASTM D698.

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 or crack.

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract lump sum 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	Saw, clean and seal Joints – per linear foot
Item P-101-5.2	Saw, clean and seal Joints greater than 1 inch – per linear foot
Item P-101-5.3	Rout, clean and seal cracks (concrete) – 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.
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ASTM International (ASTM)

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
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END OF ITEM P-101

Item P-501 Cement Concrete Pavement

DESCRIPTION

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

MATERIALS

Oklahoma Department of Transportation Specification Section 701 – “Portland Cement Concrete” (enclosed) shall be substituted in lieu of the sections deleted below. All other provisions and requirements with this section shall remain in effect.

501-2.1 Aggregates.

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

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

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

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

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

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

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

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

Coarse Aggregate Material Requirements		
Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate or 18% maximum using magnesium sulfate	ASTM C88
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8" sieve ¹	ASTM D4791
Bulk density of slag ²	Weigh not less than 70 pounds per cubic foot	ASTM C29
D-cracking (Freeze-Thaw) ³	Durability factor ≥ 95	ASTM C666

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

²—Only required if slag is specified.

³—Coarse aggregate may only be accepted from sources that have a 20-year service history for the same gradation to be supplied with no history of D-Cracking. Aggregates that do not have a 20-year record of service free from major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless the material currently being produced has a durability factor greater than or equal to 95 per ASTM C666. Contractor shall submit a current certification and test results to verify the aggregate acceptability. Test results will only be accepted from a State Department of Transportation (DOT) materials laboratory or an accredited laboratory. Certification and test results which are not dated or which are over one year old or which are for different gradations will not be accepted.

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

Limits for Deleterious Substances in Coarse Aggregate

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

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

²—Chert and aggregates with less than 2.4 specific gravity.

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

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

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

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

$$CF = \frac{(\text{cumulative percent retained on the } 3/8 \text{ in. sieve})(100)}{(\text{cumulative percent retained on the No. 8 sieve})}$$

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

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

e. Contractors combined aggregate gradation. Contractor shall submit their combined aggregate gradation using the following format:

Contractor's Combined Aggregate Gradation

Sieve Size	Contractor's Concrete mix Gradation (Percent passing by weight)
2 inch	*
1 1/2 inch	*
1 inch	*
3/4 inch	*
1/2 inch	*
3/8 inch	*
No. 4	*
No. 8	*
No. 16	*
No. 30	*
No. 50	*
No. 100	*

501-2.2 Cement. Cement shall conform to the requirements of ASTM C150 Type I.

501-2.3 Cementitious materials.

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

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

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

d. Ultrafine fly ash and ultrafine pozzolan. UltraFine Fly Ash (UFFA) and UltraFine Pozzolan (UFP) shall conform to ASTM C618, Class F or N, and the following additional requirements:

- (1) The strength activity index at 28 days of age shall be at least 95% of the control specimens.
- (2) The average particle size shall not exceed 6 microns.

501-2.4 Joint seal. The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-605 and shall be of the type specified in the plans.

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

501-2.6 Steel reinforcement. Reinforcing as shown on the plans and conforming to the requirements of ASTM A615, A706, A775, A934, A1064, A184 as applicable.

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

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

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

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

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

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

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

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

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

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

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

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D.

c. Other admixtures. The use of set-retarding and set-accelerating admixtures shall be approved by the Engineer prior to developing the concrete mix. Retarding admixtures shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating admixtures shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon and shall have the approximate chemical form as shown below:

Lithium Admixture	
Constituent	Limit (Percent by Mass)
LiNO ₃ (Lithium Nitrate)	30 ±0.5
SO ₄ (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

The lithium nitrate admixture dispensing and mixing operations shall be verified and certified by the lithium manufacturer's representative.

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

- a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.
- c. Material for use for injecting cracks shall be Type IV, Grade 1.
- d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 Bond Breaker. Fabric shall meet the requirements of AASHTO M 288 Class I fabric with elongation less than 50% at the specified strength. A certificate of compliance (COC) shall be provided by the fabric manufacturer that the material may be used as a bond breaker.

CONCRETE MIX

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

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

501-3.3 Concrete Mix Proportions. ~~Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day compressive strength that meets or exceeds the acceptance criteria contained in paragraph 501-6.6 for a compressive strength of 4,000 psi per ASTM C78.~~

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

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

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

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

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

501-3.4 Concrete Mix submittal. ~~The concrete mix shall be submitted to Engineer at least 30 days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the~~

materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by Engineer.

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

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

501-3.5 Cementitious materials.

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

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

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

d. Ultrafine fly ash (UFFA) and ultrafine pozzolan (UFP). UFFA and UFP may be used in the concrete mix with Engineer's approval. When UFFA and UFP is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 7% and 16% by weight of the total cementitious material.

501-3.6 Admixtures.

a. Air-entraining admixtures. Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 6.0% Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

~~**b. Water-reducing admixtures.** Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.~~

~~**c. Other admixtures.** Set controlling and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.~~

~~**d. Lithium nitrate.** Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.~~

CONSTRUCTION METHODS

501-4.1 Control Strip. The control strip(s) shall be to the next planned joint after the initial 250 feet of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). Contractor shall demonstrate, in the presence of Engineer, that the materials, concrete mix, equipment, construction processes, and quality control processes meet the requirements of the specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by Engineer, Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by Engineer. Acceptable control strips will meet edge slump tolerance and surface acceptable with little or no finishing, air content within action limits, strength equal or greater than requirements of P501-3.3. The control strip will be considered one lot for payment (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 501-8.1 using a lot pay factor equal to 100.

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

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

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

b. Finishing equipment.

(1) Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous

pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.

(2) Fixed-form. On projects requiring less than 500 square yards of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by Engineer. Hand screeding and float finishing may only be used on small irregular areas as allowed by Engineer.

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

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

d. Concrete saws. Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

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

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

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

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

501-4.6 Mixing concrete. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. A central plant will be required on all projects with concrete volume exceeding 2,500 cubic yards. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or C685.

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

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

a. Cold weather. Unless authorized in writing by Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

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

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

Curing during cold weather shall be in accordance with paragraph 501-4.13d. Requirements of ACI 306R, Cold Weather Concreting shall apply.

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

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

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

Curing during hot weather shall be in accordance with paragraph 501-4.13e. Requirements of ACI 305R, Hot Weather Concreting shall apply.

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

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

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

(3) Anticipated timing of initial sawing of joint.

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

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

501-4.8 Concrete Placement. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a compressive strength of 3,100 psi (21.4 MPa), based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. Contractor must determine that the above minimum strengths are adequate to protect the pavement from overloads due to the construction equipment proposed for the project.

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

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

Internal vibration means vibrating units located within the specified thickness of pavement section.

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

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a

minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

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

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

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

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

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

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

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

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

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

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

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

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

air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by Engineer.

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

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

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

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

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

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

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

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

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

d. Dowels and Tie Bars for Joints

(1) Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in paragraph 501-4.10(f.). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed. If tie bars are installed by drilling and epoxying into the cured concrete, then testing shall be performed by Contractor according to ASTM C900 at a frequency of once per panel or as dictated by Engineer. Minimum tie bar pullout strength shall be equivalent to 75% of the yield strength of the tie bar.

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

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

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

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

(b) Construction joints. Install dowels and tie bars by the cast-in- place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held

in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

(c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum compressive strength of 3100 psi before drilling begins. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of $\pm 1/2$ inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

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

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

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

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4 inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease.

Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

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

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

Bridge deck finishers shall have a minimum operating weight of 7,500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

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

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

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

a. Brush or broom finish. Shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface.

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

c. Artificial turf finish. Shall be applied by dragging the surface of the pavement in the direction of concrete placement with an approved full-width drag made with artificial turf. The leading transverse edge

of the artificial turf drag will be securely fastened to a lightweight pole on a traveling bridge. At least 2 feet of the artificial turf shall be in contact with the concrete surface during dragging operations. Approval of the artificial turf will be done only after it has been demonstrated by Contractor to provide a satisfactory texture. One type that has provided satisfactory texture consists of 7,200 approximately 0.85-inch-long polyethylene turf blades per square foot.

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

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

a. Impervious membrane method. Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by Engineer, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

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

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

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

e. Concrete protection for hot weather. Concrete should be continuously moistured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours.

However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by Engineer.

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

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

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

501-4.16 Sealing joints. The joints in the pavement shall be sealed in accordance with Item P-605.

501-4.17 Protection of pavement. Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by Contractor's employees and agents until accepted by Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at Contractor's expense.

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

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

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

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

501-4.18 Opening to construction traffic. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a compressive strength of 3,100 pounds per square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion. Contractor shall bear the cost of molding and testing additional test specimens for early opening testing.

501-4.19 Repair, removal, or replacement of slabs. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 501-6.6 shall be removed and replaced or repaired, as directed by Engineer, at Contractor expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. Engineer will determine whether cracks extend full depth of the pavement and

may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be have a diameter of 2 inches to 4 inches,, shall be drilled by Contractor and shall be filled by Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

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

b. Slabs with cracks through interior areas. Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth, that extend into the interior area.

c. Cracks close to and parallel to joints. All full-depth cracks within 6 inches either side of the joint and essentially parallel to the original joints, shall be treated as follows.

(1) Full depth cracks and original joint not cracked. The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.

i. Full-depth crack. The joint sealant reservoir for the crack shall be formed by sawing to a depth of 3/4 inches, $\pm 1/16$ inch, and to a width of 5/8 inch, $\pm 1/8$ inch. The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with P-605 or as directed by Engineer.

ii. Original joint. If the original joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures.

Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full depth cracks and original joint cracked. If there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced.

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

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

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

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

e. Spalls along joints.

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

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

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

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

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

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

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

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

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

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

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

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

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

g. Clay balls, mud balls, dirt balls, and other deleterious contamination. Any panel with observable contamination beyond reasonable expectation, whether from stockpile contamination or other means, shall be fully removed and replaced. "Reasonable Expectation" shall be considered not more than 3 points of contamination greater than 1 inch in diameter per 225 square feet or any foreign matter greater than 2 inches in diameter. Contractor will be responsible for repairing isolated points of contamination in a manner approved by Engineer.

CONTRACTOR QUALITY CONTROL (CQC)

501-5.1 Quality control program. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program .

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

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

a. Fine aggregate.

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

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

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

b. Coarse Aggregate.

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

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

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

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

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

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

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

g. Smoothness for Contractor Quality Control.

Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than 1/4 inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by Contractor before construction continues

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

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

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

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the third points of paving lanes when widths of paving lanes are 20 ft or greater.

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

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by Contractor.

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

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

Areas with humps or depression that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch less than the

thickness specified on the plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 501-4.19d. Grinding shall be in accordance with paragraph 501-4.19f. All corrections will be at Contractors expense.

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

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

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

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

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

Control Chart Limits¹

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

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

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

³ Action and suspension limits shall be determined by Contractor.

501-5.5 Corrective action at Suspension Limit. A process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

- a.** Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.
- b.** Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.
- c.** Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

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

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

OR

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

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

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

OR

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

MATERIAL ACCEPTANCE

501-6.1 Quality Assurance (QA) Acceptance sampling and testing. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by RPR. Contractor shall provide adequate facilities for the initial curing of beams. Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 501-6.5b(1).

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

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

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

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

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

501-6.5 Acceptance Sampling and Testing.

a. Strength.

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

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

The strength of each specimen will be determined in accordance with ASTM C39. The strength for each subplot will be computed by averaging the results of the two test specimens representing that subplot.

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

b. Pavement thickness.

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

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

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

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

501-6.6 Acceptance criteria.

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

- (1) Strength**
- (2) Thickness**
- (3) Grade**
- (4) Profilograph smoothness**
- (5) Adjustments for repairs**

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

Production quality must achieve 90 PWL or higher to receive full payment.

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

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

Lower Specification Tolerance Limit (L)

Strength	3,720 psi
Thickness	Lot Plan Thickness in inches, - 0.50 in

b. Acceptance criteria.

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

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

(3) Grade. The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch vertically or 0.1 feet laterally. The documentation, stamped and signed by a licensed surveyor shall be in accordance with paragraph 501-5.3h. Payment for sublots that do not meet grade for over 25% of the sublot shall be reduced by 5% and not be more than 95%.

(4) Profilograph roughness for QA Acceptance. The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2-inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that indicate "must grind" shall be corrected with diamond grinding per paragraph 501-4.19f or by removing and replacing full depth of surface course, as directed by the Engineer. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.

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

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

METHOD OF MEASUREMENT

501-7.1 Remove and Replace P.C. Concrete. The unit of measurement for concrete shall be the number of cubic yards removed by the Contractor. Any pavement removed outside of the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. This item also includes the installation of the new concrete (remove and replacement will only be measured once, not separately). No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation and any continuous reinforcement shall be incidental.

BASIS OF PAYMENT

501-8.1 Payment. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-6.6. Acceptance Criteria shall be based on results of strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness; 501-8.1b for repairs; 501-8.1c for grinding; and 501-8.1d for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both strength and thickness are less than 100%.

Price Adjustment Schedule¹

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject ²

¹ Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

² The lot shall be removed and replaced unless, after receipt of FAA concurrence, Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

b. Adjusted payment for repairs. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with paragraph 501-4.19 on more than 20% of the slabs within the subplot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

c. Adjusted payment for grinding. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a subplot.

d. Profilograph Roughness. The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 501-6.6b(4). When the final average profile index

for the entire length of pavement does not exceed 15 inches per mile per 1/10 mile, payment will be made at the contract unit price for the completed pavement.

BASIS OF PAYMENT

Payment shall be made under:

- | | |
|----------------|--|
| Item P-501-8.1 | Portland Cement Concrete Pavement, per cubic yard. |
| Item P-501-8.2 | Separator Fabric, 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 A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1035	Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates

ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Compressive Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	Standard Test Method for Lightweight Particles in Aggregate
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface
American Concrete Institute (ACI)	
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
Advisory Circulars (AC)	
AC 150/5320-6	Airport Pavement Design and Evaluation
Federal Highway Administration (FHWA)	
HIPERPAV 3, version 3.2	
Portland Concrete Association (PCA)	
PCA	Design and Control of Concrete Mixtures, 16 th Edition
U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD)	
CRD C662	Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)
United States Air Force Engineering Technical Letter (ETL)	
ETL 97-5	Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements

END ITEM P-501

Item P-605 Joint Sealants for Pavements

DESCRIPTION

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

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D6690 Standard 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 $25\% \pm 5\%$ 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 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 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 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, 21 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. Contractor must demonstrate sandblasting equipment including the air compressor, hose, guide, and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. Contractor shall demonstrate, in the presence of RPR, that the method cleans the joint and does not damage the joint.

d. Waterblasting equipment. 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. Contractor shall demonstrate, in the presence of 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. Contractor shall demonstrate, in the presence of 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 sandblasting as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 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 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 RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/8 to 1/4 inch $\pm$ 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 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. 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 not be measured for payment and shall be considered subsidiary to price bid for concrete pavement and joint repair.

BASIS OF PAYMENT

605-5.1 No separate payment shall be made for joint sealant and shall be considered subsidiary to price bid for concrete pavement. 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 will be made under:

Item P-605-5.1 Joint Sealing Filler, no separate payment to be made.

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 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-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 Engineer. "Paint," "marking material," "painting," and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. 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 Engineer prior to the initial application of markings. The reports can be used for material acceptance or Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. Contractor shall notify Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by Engineer.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint ¹				Glass Beads ²	
Type	Color	Fed Std. 595 Number	Application Rate Maximum	Type	Application Rate Minimum
Waterborne	White	37925	115 ft ² /gal	I/II	7 lb/gal
Waterborne	Red	31136	115 ft ² /gal	I/II	7 lb/gal
Waterborne	Yellow	33538	115 ft ² /gal	I/II	7 lb/gal
Waterborne	Black	37038	115 ft ² /gal	I/II	7 lb/gal

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 White (37925), Red (31136), Yellow (33538 or 33655), and Black (37038)

Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type I. Non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

(9) Abrasion resistance. Subject the panels prepared in paragraph 620-2.2b(6) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747-0.750 inch. Five liters of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (of sand for the removal of the paint films.

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

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 contaminants 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 Engineer. 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 Engineer 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 Engineer 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 Engineer. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, 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 Engineer 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 Engineer.

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

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

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, Contractor shall prepare a control strip in the presence of Engineer. 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). Take six readings over a 6-square-foot area with three 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. 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 Engineer. 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 not be measured separately for payment.

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 The quantity of reflective media shall not be measured separately for 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 Engineer 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 the number of square feet of painting.

620-5.3c Payment for reflective media shall be considered subsidiary to price bid for marking with reflective media.

Payment will be made under:

- | | |
|----------------|---|
| Item P-620-5.1 | Reflective Marking (with glass beads)-per square foot |
| Item P-620-5.2 | Non-reflective Marking-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 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
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
FED SPEC TT-B-1325DBeads (Glass Spheres)	Retro-Reflective
FED SPEC TT-P-1952FPaint, Traffic and Airfield Marking, Waterborne	
FED STD 595	Colors used in Government Procurement
A-A-2886B	Paint, Traffic, Solvent Based
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

SECTION 701

PORTLAND CEMENT CONCRETE

701.01 MIX DESIGN AND PROPORTIONING

Engineer requires that all Portland cement concrete be air entrained. Engineer will allow Portland cement concrete produced using Portland cements, blended hydraulic cements, and hydraulic cements.

A. Classes of Concrete

If Plans do not show the concrete class, provide concrete in accordance with:

Class A. Use Class A concrete for pavements and substructures (pier caps, columns, abutments, retaining walls, and reinforced concrete not requiring Class AA concrete).

Table 701:1 specifies the requirements for each concrete class:

Table 701:1 Concrete Classes					
Class of Concrete	Minimum Cement Content, lb/yd ³	Air Content, %	Water/Cement Ratio ^a , lb/lb	Slump ^b , in [mm]	Minimum 28-day Compressive Strength ^c , psi
A	517	6 ±1.5	0.25 – 0.48	2 ±1	3,000

Table 701:1 Concrete Classes	
^a Use the weight of each material to calculate the water to cement ratio (W/C) using the following equation: $W/C = \text{Water} / (\text{Cement} + \text{Cement Substitutes})$	

Determine the water use by adding the water measured into the batch, the water used in admixtures, and the free water on wet aggregate and subtracting the water absorbed by dry aggregate.

^b Ensure the slump reflects a workability appropriate for the application. If using a high-range water-reducing admixture, limit the slump to a maximum of 9 in provided no segregation occurs.

^c Compressive strength is based on the average of the results of three test cylinders. The contract documents specify Class P concrete compressive strengths.

Ensure Class A concrete for paving has flexural strength of at least 650 psi at 28 days or 700 psi at 56 days. Determine the flexural strength at the mix design stage and obtain certification from the concrete supplier.

B. Cement Substitution

Engineer will allow a substitution of a portion of the cement content at the concrete batch plant. Provide cement substitutes in accordance with Section 702, "Supplementary Cementitious Materials." Make cement substitutions on a one-to-one basis by weight in accordance with Table 701:2. Refer to Subsection 701.02.A(1), "Portland Cement," and Subsection 701.02.A(3), "Hydraulic Cement," for Portland cement and hydraulic cement specifications.

Table 701:2 Cement Substitutes for Portland and Hydraulic Cement	
Cement Substitutes	Maximum Percent by Weight
Fly ash or pozzolans only	20
Silica fume only	10
Combination of fly ash or pozzolans, and silica fume	30
Combination of fly ash or pozzolans and silica fume	50

Refer to Subsection 701.02.A(2), "Blended Hydraulic Cement," for blended hydraulic cement specifications.

Table 701:3 Cement Substitutes for Blended Hydraulic Cement		
Cement Type	Material	Maximum Percent by Weight
IP (XX)	Fly ash	30 – (XX)
	Silica fume	10

IS (XX)		
	Combinations	See Table 701:2
	Fly ash	20
	Silica fume	10
IL(XX)		
	Combinations	See Table 701:2
	Fly ash	20
	Silica fume	10
Note: (XX) is the percentage of pozzolan in the IP cement.		

Ensure Portland cement is at least 50% of the cementitious materials including substitutions at the cement production and the concrete batch plant. For concrete mix design purposes, consider the intended concrete use and weather conditions when determining cement substitutes.

Ensure the substitutions do not exceed the limits specified in Table 701:2 and Table 701:3. Limit combinations to individual limits.

C. Proportioning

Design and produce concrete mixtures in accordance with Table 701:1, "Concrete Classes." Base the mix design on absolute volume for the concrete class required by the Contract and the consistency for concrete placement. Proportion the coarse and fine aggregate in accordance with ACI 211.1. Use the least amount of fine aggregate and mixing water to produce the workability for placement conditions. Ensure high early strength concrete meets the minimum strength within 72 hours of placement. Submit the mix design to Engineer at least 14 days before production. Engineer will not allow placing PCC to begin until the Engineer approves the mix design. Include the following information with each mix design:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Subsection 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,

- Type of cement substitutions, if used, and source,
 - Type of admixtures and sources,
 - High Range Water Reducer, if used in accordance with Subsection 701.03
 - Material proportions,
 - Unit weight,
 - Air content,
 - Slump,
 - Water to cement ratio,
 - Compressive strengths at seven days and 28 days,
 - Compressive strengths at 72 hours for high early strength concrete, and
 - Flexural strength at 28 days or 56 days for Class A used for concrete paving.
- Submit new mix designs if:
- Engineer rejects the mix design,
 - Material sources change, or
 - The mix design produces unacceptable workability or production test results.

D. Tests and Samples

For concrete sampling and testing, use the procedures in Table 701:4.

Table 701:4 Concrete Sampling and Testing	
Property Tested	AASHTO Test Procedure
Sampling	R 60
Slump	T 119
Air	T 152 or T 196
Curing of specimens ^a	T 23
Temperature	ASTM C 1064
Strength:	
Compressive ^b	T 22
Flexural ^c	T 97
^a Maintain the initial curing temperature at 40°F or greater. Engineer will not require a recording thermometer. Maintain the final cure 40-85°F until tested. ^b Base compressive strengths on the average of three test cylinders. ^c Base flexural strengths on the average of two test beams.	

E. Mix Identification

Reference authorized mix identifications on batch tickets, test results, reports, and correspondence.

701.02 PORTLAND CEMENT

A. General

Provide cement that meets the specifications for the following types, as required by the Contract:

- Portland Cement,
- Blended Hydraulic Cement,
- Hydraulic Cement, or
- Rapid Setting Cement (for bridge deck overlays and repairs only).

(1) Portland Cement (must conform to AASHTO M 85 requirements except as modified by Specifications)

Provide Portland cement in accordance with except as modified by the following: Ensure the tricalcium aluminate (C3A) content in Type I cement does not exceed 15%. Report amount of Portland cement retained on the No. 325 sieve in accordance with AASHTO T 192 on mill test reports.

Ensure the total equivalent alkalis do not exceed 0.95%. Engineer may waive this limit on a per project basis if the proposed concrete mix design meets the expansion limits in Option R of ASTM C1157 when tested in accordance with ASTM C1260.

Provide Types IV and V cements to meet optional physical requirements. Supply supporting data for cement provided under optimum SO₃ requirements, as described in footnoted of Table 1 of AASHTO M 85, quarterly to Engineer.

B. General Construction Requirements

Table 701:6 specifies cement for each application. Use these cement types as shown on the Plans.

Table 701:6 Cement Properties	
Cement Type	Use
I, II, V, GU, IP(XX), IS(XX), IL(XX)	General construction
I, II, III, HE, GU, IP(XX), IL(XX)	High early strength

If required by Contract, provide white Portland cement in accordance with the requirements for Type I cement. Use the product from one mill for one hydraulic cement brand and type on structures. Provide a storage unit that protects the cement against dampness. Engineer will reject partially set cement or cement with caked lumps. The Engineer will not allow salvaged cement. Ensure the cement manufacturer identifies the types and amounts of cement substitutions on each shipping ticket.

All tests shall be performed by a qualified domestic manufacturer. Contractor shall reimburse Engineer for all inspection expenses incurred outside the United

States and additional expenses incurred using foreign cement. Use sampling and test methods in accordance with AASHTO M 85, AASHTO M 240, or ASTM C1157 except as modified by Engineer's acceptance policy, "Approval Procedure for Hydraulic Cement." The procedure is available at www.okladot.state.ok.us.

701.03 ADMIXTURES

This subsection does not cover specifications for fly ash, , or silica fume. Use admixtures included in the approved mix design. Engineer will not allow using admixtures to replace cement or using admixtures containing more than 10,000 ppm of chloride in prestressed or reinforced concrete. Provide admixtures in accordance with the following:

- Accurately measure admixture dosages into each batch.
- Dispense admixtures in liquid form. Provide dispensers large enough to measure the quantity for each batch. Unless liquid admixtures are added to pre-measured water, arrange the discharge to uniformly flow into the water stream.
- Store admixtures to prevent freezing. Agitate admixtures to prevent solids from separating or settling. Do not use air agitation.
- Use separate equipment to provide and dispense each admixture if using more than one admixture. Ensure that admixtures are compatible when used in combination.

A. Air Entraining Admixtures

Provide air entraining admixtures in accordance with AASHTO M 154. Engineer may allow an exception if the manufacturer provides certification that the product is neutralized vinsol resin with caustic soda and contains no other additive. Add air entraining admixture during initial batching. If air content is below the specification minimum, additional air entraining admixture may be added directly to the concrete surface (not the drum or fins) in a ready-mix truck at the jobsite followed by a minimum of 30 revolutions at mixing speed provided the revolution limit of 300 is not exceeded.

B. Chemical Admixtures

Provide chemical admixtures (water reducers, retarders, accelerators, etc.) in accordance with AASHTO M 194 for the type of admixture supplied.

When concrete mix designs contain a High Range Water Reducer (HRWR) admixture (Mid-range water reducers are to be considered HRWR's), Type F or G, define the following:

- The purpose for its use,
- Whether it will be added to the mix at the plant or jobsite and,
- The maximum slump after addition.

Do not add water to the concrete after the addition of the HRWR to increase or maintain the slump. Provide a concrete mixture design in accordance with Subsection 701.01, "Mix Design and Proportioning," before adding the admixture.

C. Corrosion-Inhibiting Admixtures

If required by Contract, provide corrosion-inhibiting admixtures with characteristics specified in Table 701:7 when tested in accordance with AASHTO M 194.

Table 701:7	
Physical Requirements for Corrosion-Inhibiting Admixture	
Characteristic	Value
Calcium nitrite content, percent by weight [mass]	30±2
Time of setting, allowable deviation from control:	
Initial	-1 hr/+3.5 hr
Final	-1 hr/+3.5 hr
Strength, minimum percent of the control (any time):	
Compressive	90
Flexural	90
Length change, maximum shrinkage, percent of control	135
Relative Durability Factor, minimum	80

Ensure the corrosion inhibitor-protected specimens have an average corrosion current less than 2 μA when tested in accordance with ASTM G109. Run the test for three cycles in accordance with Section 8, "Period of Testing," after the control specimens fail.

Ensure the protection potentials (E_p) are greater than -280 mV versus SCE when tested in accordance with ASTM G 61. Modify the test medium to contain a 12.5 pH calcium hydroxide ($\text{Ca}(\text{OH})_2$) solution and sodium chloride (NaCl) content equal to approximately 5 lb/yd³ of concrete.

After five years of testing, ensure the corrosion inhibitor-protected test specimens have a corrosion current in micro amps of less than 10% of the control when tested in accordance with

ASTM G109. Make concrete test specimens with at least 1 inch of cover over the reinforcement and ensure a maximum water to cement ratio of 0.40.

Provide concrete containing 4.0 gal/yd³ of corrosion inhibiting admixture unless otherwise required by Contract. Account for possible set acceleration effects from calcium nitrite-based admixture. Engineer will allow the use of set-retarding admixtures to counter the acceleration effects.

D. Latex Emulsion Admixtures

Provide a water based, homogenous, nontoxic, film forming, polymeric emulsion formulated latex admixture to which all stabilizers were added at the point of manufacture. Provide the latex modifier in accordance with Table 701:8.

Table 701:8
Latex Modifier Properties — Polymer Type Styrene Butadiene Stabilizers

(1) Latex	Nonionic surfactant
(2) Portland cement composition	Poly-dimethyl siloxane
Percent solids	46.0 – 49.0
Mass per unit volume, lb/gal at 77°F	8.4
Color	White

Store latex admixture in suitable enclosures and completely cover with insulating blankets to protect from freezing and exposure to temperatures greater than 85°F. Engineer will not allow storage of latex admixture containers at the project site more than 10 days.

701.04 WATER

Provide water in accordance with AASHTO M 157, except as modified by the following:

Engineer will not require additional quality testing if the water used is from an approved ODEQ public water source. Submit test reports from the concrete producer showing compliance with AASHTO M 157 and Table 701:9, "Chemical Limits for Mix Water," before use, if using water from another source.

Engineer will allow a blend of concrete wash water and other water sources as mix water if the concrete producer submits certification that the water meets the requirements of AASHTO M 157, Table 701:9, "Chemical Limits for Mix Water," and Table 701:10, "Acceptance Criteria for Questionable Water Supplies." Test the blended water weekly for 4 weeks or provide previous test reports. Test blended water monthly for compliance. Provide water test results when requested by Engineer.

Table 701:9 Chemical Limits for Mix Water		
Contaminant	Test Method	Maximum Concentration, ppm
Chloride (Cl)	ASTM D512	
Prestressed concrete	—	500
Bridge decks and superstructure	—	500
All other concrete	—	1,000
Sulfate (SO ₄)	ASTM D516	1,000
Alkalis (Na ₂ O + 0.658K ₂ O)	ASTM D4191 and D4192	600
Total solids	AASHTO T 26	50,000

Table 701:10 Acceptance Criteria for Questionable Water Supplies

Property	Limits	Test Method
Compressive strength, minimum percent of control (at 7 days)	90%	AASHTO T 106
Time of set, deviation from control, <i>hr</i>	-1/+1.5	AASHTO T 131

701.05 FINE AGGREGATE

A. Materials Covered

This subsection covers fine aggregate quality and size for PCC pavements or bases, highway bridges, and incidental structures.

Provide mortar sand in accordance with AASHTO M 45.

B. General Requirements

Provide fine aggregate that consists of a single-source natural sand in accordance with AASHTO M 6, Class A, except as modified by Subsection 701.05.C, "Gradation."

Alternatively, provide a fine aggregate that consists of a combination of natural sands or a combination of natural and manufactured sands in accordance with AASHTO M 6, Class A, except as modified by the following:

- Mix the two materials under controlled conditions and stockpile as a finished aggregate. Alternatively, the two materials may be combined from separate stockpiles during batching operations at a hydraulic cement concrete plant.
- Ensure the combined fine aggregate meets gradation requirements of Subsection 701.05.C,
 - "Gradation."
- Ensure the fine aggregate blend has an acid insoluble residue of at least 60 percent by weight when tested in accordance with OHD L-25, if using a manufactured sand in combination with natural sand.
- Obtain crushed fine aggregate (manufactured sand) from a coarse aggregate source, on the Materials Division's "Approved Products List," for use in hydraulic cement concrete.
- Fine Aggregate used in Section 701.19, "Controlled Low Strength Material," may be made from 100% manufactured sand meeting all other requirements of this Section.

C. Gradation

Provide fine aggregate with a fineness modulus between 2.3 and 3.1, that is well graded from coarse to fine, and when tested in accordance with AASHTO T 27 and AASHTO T 11 meets the requirements of Table 701:11.

Table 701:11 Fine Aggregate Gradation	
Sieve Size	Percent Passing

$\frac{3}{8}$ in	100
No. 4	95 – 100
No. 8	80 – 100
No. 16	50 – 85
No. 30	25 – 60
No. 50	5 – 30
No. 100	0 – 10
No. 200	0.0 – 3.0

The gradation requirements specified in Table 701:11 represent the extreme limits of suitability. Ensure gradation from one source does not have large changes in percentages of gradation. Use the average fineness modulus to determine the uniformity of the fine aggregate. The average fineness modulus is the average of the last 10 tests by Engineer and maintained by his office. The Resident Engineer will not accept fine aggregate represented by a test result with a fineness modulus that deviates more than 0.20 from the average. Determine the aggregate fineness modulus by adding the total percentage of sample material that is coarser than each of the following sieve sizes and dividing by 100:

- No. 100,
- No. 50,
- No. 30,
- No. 16,
- No. 8,
- No. 4, and
- $\frac{3}{8}$ inch.

701.06 COARSE AGGREGATE

This subsection covers coarse aggregate quality and size for use in PCC pavements or bases, highway bridges, and incidental structures.

Provide coarse aggregate in accordance with AASHTO M 80, Class A, consisting of crushed gravel or stone, or when approved by Engineer in writing, a combination of crushed gravel or stone from different sources, except as modified by the following:

- Ensure coarse aggregate produces Class A concrete with a durability factor of at least 50. Determine the durability factor after 350 cycles of alternate freezing and thawing in accordance with AASHTO T 161, Procedure A.
- Limit the Los Angeles Abrasion percent wear to a maximum of 40 percent after 500 revolutions when tested in accordance with AASHTO T 96.
- The Resident Engineer will not apply the sodium sulfate soundness requirement.
- Ensure that at least 70 percent of the coarse aggregate retained on the No. 4 [4.75 mm] sieve is crushed stone or mechanically crushed gravel with at least two fractured faces.

- Limit the quantity of flat or elongated pieces to 15 percent or less, at a ratio of 1:5, when tested in accordance with ASTM D 4791.
- Provide coarse aggregate graded in accordance with Table 701:12.

Table 701:12					
Coarse Aggregate Gradation					
Sieve Size	Percent Passing per Processed Aggregate Size Number				
	357	57	67	7	8
2½ in	100	—	—	—	—
2 in	95 – 100	—	—	—	—
1½ in	—	100	—	—	—
1 in	35 – 70	95 – 100	100	—	—
¾ in	—	—	90 – 100	100	—
½ in	10 – 30	25 – 60	—	90 – 100	100
⅜ in	—	—	20 – 55	40 – 70	85 – 100
No. 4	0 – 5	0 – 10	0 – 10	0 – 15	10 – 30
No. 8	—	0 – 5	0 – 5	0 – 5	0 – 10
No. 16	—	—	—	—	0 – 5
No. 200	0 – 1.5	0 – 2.0	0 – 2.0	0 – 2.0	0 – 2.0

Provide the specified sizes of coarse aggregate for the following types of concrete:

- No. 57 for Class A and Class AP concrete;
- No. 357 for massive Class A concrete;
- No. 57, No. 67, or No. 357 for Class C concrete;
- No. 7 or No. 8 for thin overlays, details, and thin sections if allowed by the Engineer;
- No. 67 for Class AA or Class P concrete; and
- No. 57, No. 7 or No. 8 for Class P concrete if the specified 28-day compressive strength is greater than 6,000 psi or the Contract requires permeability limits.

701.07 CURING AGENTS

Provide concrete curing agents consisting of the following:

- Burlap,
- Cotton mats,
- White or red-pigmented membrane curing compound,
- Waterproof paper,
- Polyethylene film,
- Linseed oil emulsion, or
- Water for ponding.

Keep the curing agents free of material that may damage the concrete surface.

D. Burlap

Provide Class 3 burlap cloth in accordance with AASHTO M 182.

Provide new burlap free of starch, filler, or other substances added during the manufacturing process. If the burlap contains these substances, wash it by repeatedly rinsing in clear water.

Alternatively, Engineer will allow old burlap if its only previous use was for curing concrete. Engineer will not allow the use of worn burlap or burlap with holes. Provide burlap that is at least 2 feet longer than the width of the concrete to be covered.

E. Cotton Mats

Provide new cotton mats, or used cotton mats, used only for curing concrete. Engineer will not allow the use of worn cotton mats or cotton mats with holes.

F. Liquid Membrane Curing Compounds

Provide liquid membrane curing compounds in accordance with ASTM C309, Type 2 or Type 1-D, except as modified by the following:

- Ensure Type 2, white-pigmented compound hiding power has a daylight reflectance of at least 65 percent of magnesium oxide reflectance in accordance with ASTM E 97.
- Color Type 1-D compound with a red fugitive dye so inspection indicates complete coverage. Ensure the color remains for at least 4 hr and then gradually disappears.
- Ensure the curing compound has at least 90 percent water retention when tested in accordance with OHD L-17.

G. Sheet Materials

Provide sheet materials in accordance with ASTM C171. Engineer may approve a sheet material type not specified in ASTM C171 if it meets all other requirements of ASTM C171. Cut the sheet material into sheets wide enough that they completely cover the exposed concrete surface. Provide a lap joint of at least 2 feet, if it is necessary to have joints in the sheets. Engineer will not allow the use of sheet sections that have lost their moisture-retaining qualities.

H. Linseed Oil Emulsion

Provide linseed oil emulsion in accordance with AASHTO M 233: Ensure emulsion is stable at the time of application.

Color linseed oil emulsion with a red fugitive dye to indicate complete coverage for inspection. Ensure color remains for at least 4 hours then gradually disappears within two weeks.

Ensure curing compound has at least 90 percent water retention at a coverage rate of 175 ft²/gal and tested in accordance with OHD L-17.

Store and transport linseed oil emulsion in plastic containers marked with manufacturer name, contents, lot number, and date of manufacture.

I. Water for Ponding and Material for Dikes

Provide water for ponding in accordance with Subsection 701.04, "Water." Construct dikes from a combination of loam, sand, or clay. Ensure dikes are free of rocks, sticks, or objects that may prevent a watertight dike.

701.08 JOINT FILLERS AND SEALANTS

This subsection covers the requirements for joint fillers and sealants for PCC.

- A. Preformed Expansion Joint Filler for Concrete (Bituminous Type) Not used.**
- B. (Not used)**
- C. Preformed Elastomeric Compression Joint Sealant**

This subsection covers preformed elastomeric compression joint sealants for PCC pavements and concrete bridge floors.

(1) Preformed Joint Seals

Provide joint seals manufactured from an elastomeric material that is resistant to heat, oil, jet fuel, and ozone. Ensure the material is compatible with concrete and is in accordance with ASTM D2628.

(2) Shape and Dimensions

Make the molded joint seals to the cross-sectional dimensions, lengths, and tolerances as shown on the Plans. Place the sealant in one piece for the full length of transverse joint and in practical lengths to suit field conditions for longitudinal joints.

(3) Inspection

Engineer will inspect the surface and dimensions of representative sections of each lot to determine visual compliance. Replace preformed elastomeric compression joint sealant that elongates more than 2 percent during placement, at no additional cost.

(4) Lubrication Adhesive

Provide lubricant adhesive, if necessary, that maintains consistency at the installation temperature and is compatible with the sealant and concrete. Ensure the lubricant remains unaffected by the normal moisture in the concrete. Ensure the lubricant adhesive consists of the same base polymer as the sealant, blended

with a volatile solvent.

D. Hot Poured Joint Sealant Not used.

E. Low Modulus Silicone Joint Sealant (Non-Sag) Not used. Low Modulus Silicone Joint Sealant (Self-Leveling)

This subsection covers self-leveling, low modulus silicone joint sealants and polyethylene backer rod for sealing PCC pavement joints, PCC to asphalt concrete pavement joints, or both. Provide self-leveling silicone sealant in a one-part silicone formulation. Acid cure sealants is not allowed.

(1) Silicone Sealant

Provide a silicone sealant in accordance with ASTM D 5893 Standard Specification for Cold-Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements, Type SL.

(2) Backer Rod

Provide a backer rod that is compatible with the joint sealant and does not bond or react with the sealant. Provide a backer rod in accordance with ASTM D 5249.

F. Not used.

701.10 HIGH DENSITY CONCRETE FOR BRIDGE DECK REPAIR AND OVERLAY (Not Used)

701.11 LATEX MODIFIED CONCRETE FOR BRIDGE DECK OVERLAYS (Not Used)

701.10 PENETRATING WATER REPELLENT FOR TREATMENT OF CONCRETE SURFACES (Not Used)

701.12 EPOXY RESIN AND OTHER ADHESIVES FOR GENERAL USE WITH CONCRETE

This subsection covers epoxy-resin and related bonding systems for PCC.

A. General

If the epoxy-resin type, grade, and class are shown on the Plans provide an epoxy meeting those requirements. If the epoxy-resin system is not specified, provide the appropriate type, with the approval of the Resident Engineer, for the intended purpose as follows:

- **Type A.** An epoxy-resin for bonding hardened concrete to hardened concrete.
- **Type B.** An epoxy-resin for bonding fresh concrete to hardened concrete.
- **Type C.** An epoxy-resin for bonding traffic markers to hardened concrete and asphalt concrete.

- **Type D.** A fluid epoxy for crack injection in old structures repair.
- **Type E.** An epoxy for repairing spalled areas on vertical concrete structures without forms.
- **Type F.** An epoxy for repairing spalled areas on concrete structures with forms.
- **Type G.** An epoxy for filling small holes in concrete.
- **Type H.** An epoxy for installing rebar and anchor bolts in hardened concrete except when exposed to suspended or sustained tension loads.
- **Type J.** An epoxy for post-tensioning anchorage protection systems.
- **Type K.** High Molecular Weight Methacrylate (HMWM): A monomer which, when polymerized, can structurally re-bond cracks and act as a film forming sealant against chloride ions on concrete surfaces.
- **Type L.** Epoxy Penetrant: A two-part, low viscosity, epoxy resin penetrating sealant that re-bonds cracks and acts as a film forming sealant against chloride ions on concrete surfaces.
- **Type M.** An epoxy for sealing cracks before an epoxy bridge deck overlay.
- **Type N.** An epoxy or epoxy-urethane for multiple layer polymer concrete bridge deck overlays.

B. Specification Requirements for Epoxy-Resin and Related Bonding Systems

- **Type A.** Provide Type A epoxy in accordance with AASHTO M 235 for Type IV, Grade 2.
- **Type B.** Provide Type B epoxy in accordance with AASHTO M 235 for Type V, Grade 2.
- **Type C.** Provide Type C epoxy in accordance with AASHTO M 237 for Type IV.
- **Type D.** Provide Type D epoxy in accordance with AASHTO M 235 for Type IV Grade 1 with a maximum viscosity of 600 cP [0.6 Pa•s] at 77°F [25°C].
- **Type E.** Provide Type E epoxy in accordance with AASHTO M 235 for Type IV Grade 3, except with an elongation in tension of at least 10 percent. Mix no greater than 2.25 parts sand to 1 part epoxy by volume. Match to the color of No. 36622 in Federal Standard No. 595.
- **Type F.** Provide Type F epoxy in accordance with AASHTO M 235 for Type IV Grade 1 or Grade 2 with an elongation in tension of at least 10 percent. Mix no greater than 2.25 parts sand to 1 part epoxy by volume. Match to the color of No. 36622 in Federal Standard No. 595.
- **Type G.** Provide Type G epoxy in accordance with AASHTO M 235 for Type II Grade 1, Grade 2, or Grade 3 at hole location as shown on the Plans.
- **Type H.** Provide Type H epoxy in accordance with AASHTO M 235 for Type IV Grade 3.
- **Type J.**
 - Provide Type J epoxy that will produce a low exothermic reaction and have characteristics for machine base plate applications. Extend the material with the aggregate supplied by the manufacturer. Use all the aggregate supplied.
 - Provide factory preportioned epoxy compound with aggregate. Deliver epoxy

and aggregate in the original containers, labeled with manufacturer's name, date of manufacture, product identification, and batch numbers. Store, condition, and use the product in accordance with the manufacturer's recommendations.

- Provide epoxy grout and aggregate mix for Type J epoxy in accordance with Table 701:21.

Table 701:21		
Epoxy Grout and Aggregate Mix Properties		
Property	Test Value	Test Method
Compressive strength cubes 7 day cure at 77°F	≥10,000 psi	ASTM C579B
Tensile strength at 7 day	≥2,100 psi	ASTM C307
Flexural strength 7 day cure at 77°F	≥3,600 psi	ASTM C580
Modulus of Elasticity 7 day cure at 77°F	<2,100,000 psi	ASTM C580
Coefficient of thermal expansion from 74°F to 210°F	<20×10 ⁻⁶ in/in/°F	ASTM C531
Peak Exotherm, specimen 12 in × 12 in × 3 in	<150°F	ASTM D2471
Slant shear at 7 day (bond strength to concrete)	>3,000 psi	ASTM C882
Thermal compatibility	5 cycles passed	ASTM C884
Linear shrinkage at 7 day	≤0.025%	ASTM C531
Flowability and bearing area	90% Contact area	ASTM C1339
Gel time, specimen 12 in × 12 in × 3 in	<4 hr	ASTM D2471

(1) Type K — Monomer Materials for HMWM

Provide a low viscosity, low odor, HMWM monomer system in accordance with Table 701:22.

Ensure standard Methyl Methacrylate (MMA) resins are not used due to volatility. Provide a compatible promoter/initiator system that has a deck surface cure time 40 minutes to 6 hours at surface application temperature. Formulate the promoter/initiator system to allow for adjustment of the gel time to compensate for the temperature changes during treatment application. Submit to Engineer a table showing correct promoter and initiator proportions to be added to the monomer to achieve the cure time requirements based on the surface temperature. Ship materials within 6 months of the date of manufacture. Engineer will accept two component materials if the material requirements of Table 701:22 are met.

Table 701:22

HMWM Properties		
Property	Requirement	ASTM Test Method
Viscosity (Brookfield) ^a	10 cP – 25 cP	D 1824
Density (Pensky Martens CC), at 77°F	>8.4 lb/gal	D 2849
Flash point	>200°F	D 93
Vapor pressure, at 77°F	<1.0 mm Hg	D 323
Shelf life	≥1 year	—

Table 701:22 HMWM Properties		
Property	Requirement	ASTM Test Method
Gel time, 100 g mass to a thin film	>40 min	D 2471
Tensile elongation	≥30%	D 638
Cure time at deck temperature:		
Bulk	40 min – 150 min	—
Surface	40 min – 360 min	—
Bond strength	>750 psi	C 882
Percent volatiles	≤30%	D 2369
^a Brookfield viscometer, Model RVT with a UL adaptor or Model LVF, No. 1 spindle and UL adaptor at 77°F.		

(2) Type L - Materials for Epoxy-Resin

Supply a two-part epoxy-resin in accordance with Table 701:23, "Epoxy-Mixed System Properties." Add a fluorescent tracer dye to provide evidence of crack penetration.

Table 701:23 Epoxy-Mixed System Properties		
Property	Requirement	Standard
Mixing ratio	1:01	—
Viscosity (Brookfield)	≤50 cP	ASTM C881
Bond strength (14 day cure)	≥1,500 psi	ASTM C882
Water adsorption (24 hr)	≤1.0%	ASTM D570
Tensile strength (10 mil thickness)	≥2,500 psi	ASTM D638
Elongation	≥2%	ASTM D638

Gel time in mass at 72°F	≥30 min	AASHTO M 235
Percent volatile	≤30%	ASTM D2369

(3) **Type M — Hairline Cracks and Encapsulating Steel Grid**

Provide Type M epoxy, as a two component, hybrid polymer system, free of fillers and volatile solvents that can provide a simple volumetric ratio. Formulate Type M epoxy so that it has an extremely low viscosity and surface tension, and an affinity for concrete and steel.

Mix component A and component B in the appropriate ratio so the cured resin is in accordance with Table 701:24.

Table 701:24 Physical Properties of the Cured System		
Property	Value	Standard
Strength:		
Compressive (7 days)	5,500 psi – 7,500 psi	AASHTO T 106
Tensile	3,000 psi – 4,000 psi	ASTM D638
Tensile elongation	30 – 40%	ASTM D638
Water absorption	≤0.1%wt.	ASTM D570
Shore D Hardness, 77°F	65 – 75	ASTM D2240
Gel time	40 min – 60 min	Gel Time Procedure ^a
Adhesion to concrete, percent failure in concrete	100	ASTM C1583
Surface tension	26 Dynes/cc – 32 Dynes/cc	ASTM D971
Percent solids	100	ASTM D2369
^a Measure a 6-oz sample of epoxy into unwaxed paper cup, in recommended proportions at 77°F. Record time and mix immediately for specified duration. Pour 3.5 oz. of mixture into new 6-oz unwaxed paper cup and place on a wooden surface. Starting 20 min from recorded time, probe mixture every 2 min with a small stick until small ball forms in center of container. Gel Time is total time from pouring the mix to ball formation. Perform test in enclosed area with a temperature of 77 ±3.6°F and relative humidity of 50 ±5 percent.		

(4) **Type N — Physical Requirements of Epoxy or Epoxy-Urethane Copolymer Overlay System**

Provide a two-component epoxy or epoxy-urethane system in accordance with Table 701:25.

Table 701:25

Physical Properties of the Cured System		
Property	Value	Standard
Compressive strength with aggregate:		
At 5 hr	≥1,000 psi	ASTM C579 ^a
At 2 days	≥5,000 psi	ASTM C579 ^a
Tensile strength (7 day)	1,800–5,000 psi	ASTM D638
Elongation (neat)(7 day)	25 – 100%	ASTM D638

Table 701:25 Physical Properties of the Cured System		
Property	Value	Standard
Absorption (neat) (1 day)	≤1.0%	ASTM D570
Shore D Hardness, 77°F	≥60	ASTM D2240
Gel time	15 min – 45 min	ASTM C881
Adhesion to concrete, percent failure in concrete	100	ASTM C1583
Viscosity	7 P – 70 P	Brookfield RVT, spindle No. 3 at 20 rpm.
Thermal compatibility	No delamination of overlay	ASTM C884
^a Modified with plastic inserts.		

701.13 WHITE CONCRETE

This subsection covers the requirements for providing white PCC for median barriers specified in Section 627, “Concrete Longitudinal Barrier.”

A. Materials

If white PCC is shown on the Plans, use the following requirements to supplement the general provision for PCC.

(1) Cement

Provide white Portland cement in accordance with AASHTO M 85 for Type 1 Portland cement. Ensure the Portland cement contains no more than 0.50 percent of ferric oxide (Fe₂O₃) by mass.

(2) Fine Aggregate

Provide light colored fine aggregate in accordance with Subsection 701.05, “Fine Aggregate.”

(3) Coarse Aggregate

Provide light colored coarse aggregate. Use No. 57 or No. 67 coarse aggregate in accordance with Subsection 701.06, "Coarse Aggregate."

(4) Water

Use mixing water in accordance with Subsection 701.04, "Water," that is free of impurities that may cause staining.

B. Proportioning

Proportion white concrete mixes in accordance with ACI 211.1. For barrier construction, ensure the white concrete mix contains 660 lb/yd³ of white Type 1 cement with an air content of 6 percent ± 1 percentage point, and a slump of 3 in ± 1 in. Ensure a maximum water to cement ratio of 0.53, and a minimum compression strength of 3,000 psi at 28 days.

C. Batching and Mixing

Provide clean mixing and batching equipment to prevent white concrete contamination and discoloration. Use cement bins, truck mixer drums, and weigh hoppers that are free of loose, gray Portland cement.

D. Surface Finish

Use form oil that will not stain the surface to construct white concrete median barriers in metal forms. Treat the surface with a penetrating water repellent solution at the rate recommended by the manufacturer in accordance with Section 515, "Penetrating Water Repellent Treatment."

E. Acceptance

Ensure the white concrete barrier or parapet is at least as white as 10Y91 in accordance with the Munsell Book of Color. Before white concrete barrier or parapet production, submit to the Resident Engineer a 1 ft² [test panel of material for the construction. Use the test panel as a standard as approved by Engineer.

701.14 FIBER REINFORCEMENT FOR PCC

A. General Requirements

This subsection covers fiber reinforcement added to PCC. Provide polypropylene fibers or steel fibers in accordance with the Subsection 701.15.A(1) and Subsection 701.15.A(2).

(1) Polypropylene Fibers

Use synthetic fibers that are 100 percent polypropylene, collated, fibrillated fibers manufactured to graduated lengths of equal proportions for secondary reinforcement. Provide fibers in accordance with ASTM C1116 for Type III.

(2) Steel Fibers

Use steel fiber in accordance with ASTM A820, for Type II, cut-sheet steel. Provide steel fibers with an aspect ratio of 30:60 and from 1½ - 2 in long.

B. Application

Add the fibers to the PCC at a rate specified by the manufacturer. Mix the concrete to uniformly distribute the fiber.

701.15 DOWEL BAR RETROFIT MORTAR

Provide a mortar for retrofitting Portland cement concrete pavements with dowel bars in accordance with Table 701:26. Combine the mortar mix with an aggregate extender in accordance with Subsection 701.06, "Coarse Aggregate," size No. 8, to form a concrete.

Table 701:26 Mortar Properties		
Property	Test Value	ASSHTO / ASTM Test Method
Compressive strength @ 3 hours without aggregate extender	≥4,000 psi	T106
Compressive strength @ 7 days without aggregate extender	≥6,000 psi	T106
Compressive strength @ 3 hours with aggregate extender	≥3,000 psi	T106
Compressive strength @ 7 days with aggregate extender	≥5,000 psi	T106
Freeze-thaw Durability Factor with and without aggregate extender @ 300 cycles	≥90.0%	T161, procedure B
Bond Strength by Slant Shear with and without aggregate extender @ 7 days	≥3,000 psi	C882 ^a
Linear Shrinkage with and without aggregate extender @ 7 days	≤0.180%	C531
^a Referenced from ASTM C928.		

701.10 TEMPORARY CONCRETE MIX DESIGN AND PROPORTIONING (Not Used)**701.16 POST-TENSIONING GROUT (Not Used)****701.17 CONTROLLED LOW-STRENGTH MATERIAL****A. General**

Controlled Low-Strength Material (CLSM): A low strength grout backfill material consisting of Portland cement, fly ash, fine aggregate, and water. Engineer will allow the

use of an air entraining agent.

B. Mix Design

Design the mix using absolute volumes. Use at least 20 lb/yd³ of Portland cement in the mix design. Submit the proposed mix design with trial batch testing data before use. Include the weight, specific gravity, material source, and material requirements for each ingredient.

Include the flowability results, unit weight, and trial batch strength tests. Engineer will allow the submittal of previously used and successful mix designs without retesting if material sources have not changed. Provide materials in accordance with the following sections and subsections for CLSM:

Material:	Section or Subsection:
<u>Portland Cement</u>	<u>701.02</u>
<u>Fly Ash</u>	<u>702.01</u>
<u>Fine Aggregate</u>	<u>701.05</u>
<u>Water</u>	<u>701.04</u>
<u>Air Entraining Agents</u>	<u>701.03.A</u>

C. Sampling and Testing

Test CLSM in accordance with the following methods:

- Conduct the flow test in accordance with ASTM D6103. Provide a CLSM spread diameter of 8 in or greater.
- Conduct the unit weight tests in accordance with ASTM D6023. The Resident Engineer will reject batches with a unit weight that deviates 5 percent or more from the mix design value.
- Conduct the compressive strength tests in accordance with OHD L-62. Provide a CLSM compressive strength at 28 days from 100-800 psi. Earlier strength tests may be performed to confirm that the material reaches the minimum strength, but are not required by the Contract.

701.18 EARLY STRENGTH CONCRETE FOR BRIDGE DECK PATCHING AND OVERLAYS (Not Used)

701.19 MAGNESIUM AMMONIUM PHOSPHATE CONCRETE FOR CONCRETE REPAIR

This subsection covers magnesium ammonium phosphate concrete (MAPC) for repairing block-outs, holes, and defects in post-tensioned boxes and girders. Follow the manufacturer's recommendations for preparing surfaces, mixing, placing, and curing concrete. Provide MAPC in accordance with Table 701:29.

Table 701:29 Physical Properties		
Requirement	Test Value	Test Method
Strength at 28 day (air curing instead of moist curing):		
Compressive	≥8,500 psi	ASTM C109
Flexural	≥600 psi	ASTM C348
Slant shear bond at 14 day (air curing instead of moist curing)	≥2,500 psi	ASTM C882
Time of setting, initial set (at least 95°F)	≥15 min	ASTM C266
Scaling resistance	No scaling	ASTM C672
Maximum length change:		
Wet cure at 28 days	0.03%	ASTM C157
Dry cure at 28 days	0.03%	ASTM C596
Sulfate resistance after 52 weeks of immersion	0.10%	ASTM C1012
Maximum chloride absorption at 21 days (use cubes meeting ASTM C 109)	1.50%	NCHRP T-244