EMF REACH 4/SIGNAL BUTTE JOINT REPAIR DESIGN REPORT

FINAL DESIGN REPORT

TABLE OF CONTENTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING STAFF
PHOENIX, ARIZONA
June 2, 1988

DESIGN REPORT

Job : East Maricopa Floodway Reach-4/Signal Butte Floodway Joint Repair

Project : Williams-Chandler and Buckhorn-Mesa

Location : Maricopa County

Authority: PL-566

Phase : Final Design

Summary

East Maricopa Floodway Reach-4:

Based on the comments and recommendations offered by the WNTC in the Preliminary Design Review Report, we have reconsidered and find that a two (2) inch wide joint, with installation temperature restrictions, will provide for a better design.

It should be stressed that a safety factor of 1.0 does not put a properly installed joint at the edge of failure, but at its working capacity as determined by ASTM.

We will also monitor multiple joint widths (existing, 2" and 3") during the testing period to gain experience in the behavior of low modulus silicones.

Basis for Design

Preliminary Design Review Report 5/26/88
Joint Movement Calculations by LMS 5/16/88
Facsimile Transmittal Sheet from LMS 6/2/88

Performance Time

The temperature restrictions put on the Contractor for cutting and appling sealant to the joints for EMF R-4 should not increase normal performance time since he will be able to sequence his work between the Signal Butte Floodway, which has no restrictions.

Bid Schedule

The alternative for additional one inch joints on EMF R-4 will no longer be considered since it would not be economically feasible when compared to the revised two inch joints.

Donald Paulus 6/3/88

Submitted (Head of Design) Date

6/3/88

Approved (State Conservation Engineer) Date

Joint Repair Project
6/3/88

Copies & Distribution —

Name	DESIGN FOLDER	BLUELINES
WNTC	2	3
FCD	2	6
NRCD	—	1
State Office:		
Weaver	1	1
Sullivan	1	1
Mesa Project Office:		
Herbert	1 (include one copy of preliminary design Report)	2

Date 6/2/88

FACSIMILE TRANSMITTAL SHEET

No. of Pages: Transmittal Sheet + 2

To: Ralph Arrington
Phoenix, Az.

Telephone No 8-261-5143

FACS Machine Telephone No. 8-261-5440

From: Celand Saele
WNTC

Comments:
Attn. Don Paulus

Transmission completed by: _____ Date _____

to: Ralph Arrington, State Conservation Engineer, Az.
subj: East Maricopa Floodway, Reach 4, Joint Repair
date: June 2, 1988

The items below and details on the attached drawing are what we believe are necessary for inclusion in the specifications and drawings to adequately monitor the concrete temperature during the joint repair for Reach 4. In the interest of time this information is being sent by FAX. Other comments concerning this job were sent by Speed Memo from Leland Saele to Don Paulus on 5/26/88.

Items to include in the specification covering temperature monitoring of the concrete:

The contractor shall measure and record daily the temperature of the existing concrete channel lining beginning 24 hours prior to saw cutting or installation of joint sealant at any joint and ending at the completion of all work. A minimum of two temperature readings will be recorded each day corresponding with the approximate high and low temperature of the concrete during the working day.

The temperature of the concrete shall be measured by installing sensors two inches below the concrete surface as shown on the drawings. The sensors shall be installed in such a manner as to insure thermal conductivity between the sensor and the surrounding concrete and to accurately measure the temperature of the concrete at the 2 inch depth. Location of the sensor shall be adequately marked and protected to prevent accidental damage. Marking or protective barriers shall not alter normal temperature conditions at sensor location.

The sensor shall be a thermocouple or similar device that can be connected to a portable readout instrument. The readout unit shall be an easily portable (hand held), battery powered instrument. The readout unit and sensor shall have an accuracy within ±2 degrees farenheit over a minimum temperature range of 0°F to 250°F . The response time for readings shall be less than 15 seconds. The readout instrument complete with connecting leads and instruction manual shall become the property of the government at the completion of work.

The contractor shall provide his plan, for installation of sensors, monitoring temperature and type of equipment to be used, for approval, 10 days prior to installation.

Depending on how the specifications are prepared the following sentence could follow the first paragraph above or

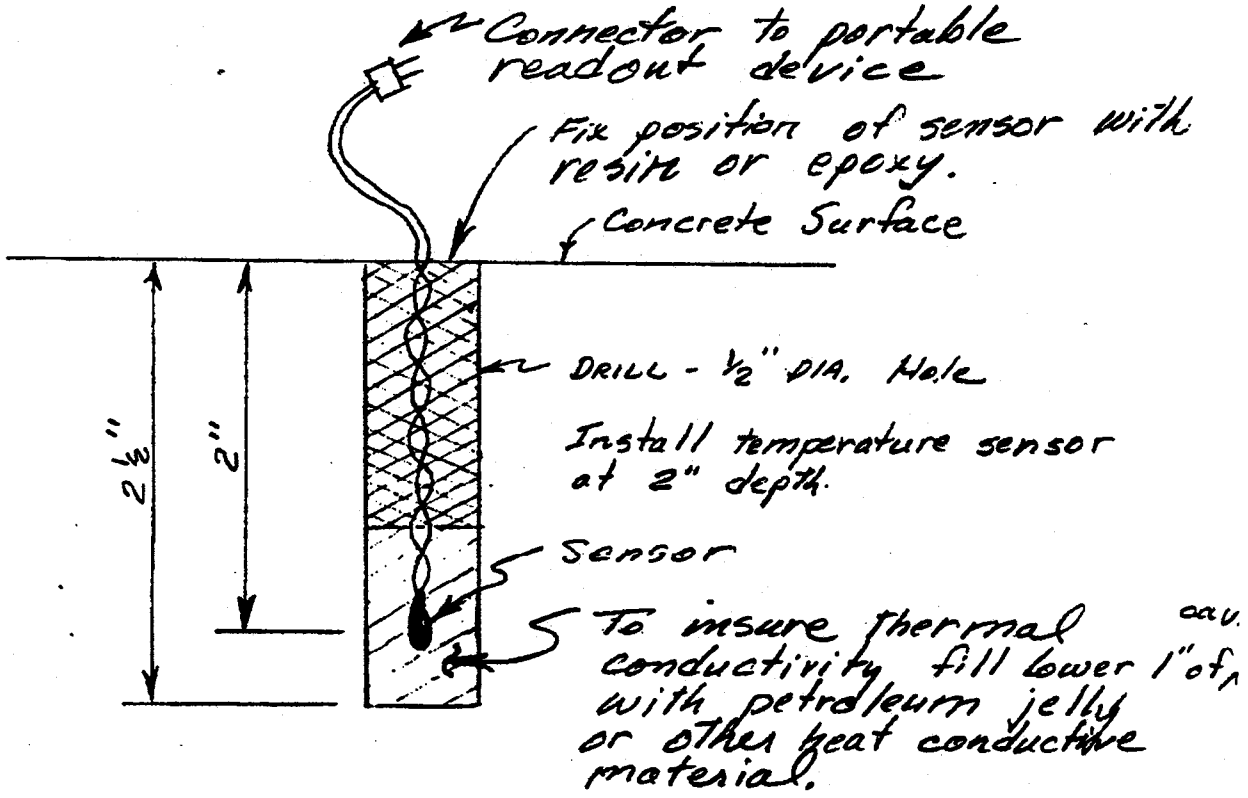
be the alternate wording if the information above is repeated in another item specifically for the test section.

"During the installation and 10 day monitoring period of the test section, sufficient readings shall be taken to determine the approximate high and low temperature extremes of the concrete within any 24 hour period."

Leland Saele, WNTC, Portland, Or.

cc: Wallin
Middlecamp

AZ RWCD R4
LMS 6/2/88
Joint Repair - Temperature Sensors



DETAIL OF TEMPERATURE SENSOR INSTALLATION

☆ U.S. Government Printing Office: 1981—351-522

U.S. DEPARTMENT OF AGRICULTURE

SPEED MEMO

PART NUMBER	DATE
1	5/26/88

TO: Don Paulus
SCS — DESIGN
Phoenix, AZ.

FROM: L.M. Saele
WNTC

SUBJECT: EMF Reach 4
Joint Repair

MESSAGE (*WRITE CONCISE MESSAGE SIGN AND FORWARD PARTS 1 AND 3 TO ADDRESSEE RETAIN PART 2.*)

Don

I am sending preliminary comments on the subject job so that you can see what we have in mind. The test section is a change from our last conversation but I believe, the best part of project. Hope we can get all this buttoned down by the end of next week. Will discuss by phone on tue 5/31/88.

SIGNATURE: Leland M Saele

REPLY (*USE THIS SPACE FOR REPLY. SIGN AND DATE. RETURN PART 3 TO SENDER. RETAIN PART 1.*)

Attach: Review comments (prel.)
Design analysis
Red lined spec. (prel.)

SIGNATURE | DATE

FORM AD-311 (REV. 3/81)

ADDRESSEE COPY

5/26/88

Design Review Report
East Maricopa Floodway, Reach 4
Joint Repair

Summary
In review of the design, the Engineering Investigation Report, other references, discussion with manufacturers of silicone sealants, and the attached analysis, we are of the opinion that a properly installed 2 inch to 2 1/4 inch wide joint will provide satisfactory performance at this site. To verify the design we are recommending a more extensive test and evaluation phase be included in the contract.

Review Comments

A. Design - The proposed design offers the contractor two options: (1) 3 inch wide joints at 100 foot intervals or (2) one inch wide joints at 33 foot intervals.

Both designs should provide for minimal sealant stress from joint movement. However, the assurance of long term performance for a wide joint is less positive because of the volunerability of the sealant to physical damage. On the other hand, one inch joints reduce the exposure of sealant to a minimum but increase the total joint length by 200 percent. We have no experience or definitive information indicating that a joint over a given size should or should not be used. Although silicone sealants have been used in joints up to 4 inches wide, the more common practice is to limit the width for this type of material to two inches or less. Commmonly used joint widths of 3/4 inch provided good protection for sealants from most physical forces. As the width increases the sealant becomes more volunerable to the point where damage can be expected from debris, debris removal equipment, other O&M operations and possibly from stresses induced by hydrostatic pressure against inadequately supported sealants. The initial cost and the cost of O&M for sealant replacement increases directly with the increase in joint width. Replacement cost becomes a major factor in producing an efficient design if the service life of the sealant (an unknown for modern sealants) is less than the service life of the project.

has been confirmed by Sealant Manuf. to be adequate.

* The dynamics of joint movement experienced at this site provide a research setting for accelerated testing of joint sealants. We believe the opportunity exists to gain considerable experience and from this information provide a satisfactory joint at the most reasonable cost. It is with these thoughts in mind that our recommendations for repair have been prepared.

Recommendations:

1. The contract should be set up in ~~two phases~~ with the first part as a ~~test and evaluation~~ and the second part for completing the ~~major repair work~~.

Phase 1, will consist of installation of silicone sealant in ~~9 consecutive joints at three different joint widths~~. Joint widths of ~~1 inch~~(existing), ~~1.5 inch~~ and ~~2 inch~~ with a low modulus silicone sealant are proposed for the test section. ~~A straight reach~~ of channel with a minimum of 200 feet from alignment or cross section changes ~~should be selected~~. The joints will need to be cleaned and prepared in accordance with the proposed specifications except that ~~no saw cutting will be required for the 1 inch joint and only saw cutting on one side for the 1.5 inch joint~~. ~~Temperature~~ of the concrete is to be ~~monitored and recorded during~~ the joint preparation and sealant ~~installation~~ period. Two thermometers should be required to monitor the temperature of the concrete and should be installed as shown on the attached drawing. Following installation, ~~each joint will be monitored twice daily for a minimum period of 10 days~~ after the installation of sealant. ~~Concrete temperature~~, ~~joint movement~~ and ~~sealant condition~~ will be recorded during the ten day performance period. ~~Measurements~~ will be taken ~~to coincide with daily concrete temperature extremes~~. ~~Following the performance period, a minimum of ten days~~ should be provided for evaluation of the sealant, selection of a joint design and authorization for contractor to continue with the phase 2 repair. We recommend the ~~contract require the sealant manufacturer have personnel~~ knowledgeable in sealant performance characteristics and evaluation available during this period ~~for consultation with SCS engineers~~. SCS will make the final determination for joint design to be used in phase 2.

Two joint designs will be included in the contract for bidding of the phase 2 work. One will be for a ~~2 1/8~~ inch $\pm$ 1/8" wide joint and ~~one for a 3 inch $\pm$ 1/8"~~ wide joint. The ~~final repair will include reworking the 1 inch joints~~ in the test section and others if determined necessary during the evaluation.

~~Testing of the existing joint width~~ (1 inch $\pm$) with silicone sealant should ~~provide performance evaluation similar~~ to what might be expected for a wider joint width over the ~~full range of annual temperatures expected~~.

A 2 1/8 inch wide joint is our best guess at the present on what we believe will provide satisfactory sealant performance at minimal exposure. The design analysis is attached. This design will require limiting installation to periods when the ~~temperature of the concrete~~ is between ~~65°F and 115°F~~. The design provides a ~~safety factor of 1.26~~ for

ed bid ems fo each en pick(1)?

1-inch actually existing?

my infor indicates they'd rather cut each side. Let them decide.

temps - sawing - installation

test perf. perio

Why a 3"; it's not even being tested?

erf. time calc. on cutting. Sealant may need 2 or more hours

sealants in compression with a working capacity of 50%. For tension the S.F. = 1.12 for sealants with a working capacity of 50%.

The 8 inch wide joint will provide safety factors of 1.79 and 1.58 respectively for the same installation temperature range, design analysis and sealant working capacity.

CONSTRUCTION SPECIFICATION

400. JOINT SEALANT FOR CONCRETE LINED FLOODWAYS

1. SCOPE

The work shall consist of saw cutting and surface preparation of existing or new concrete expansion joints, application of primer, and placement of bond breaker/backer rod material and joint sealant.

2. MATERIALS

Joint Sealer: Shall be Type S, Grade NS, use NT or T, low modulus silicone conforming to the requirements of ASTM C-920 and can tolerate submergence by intermittent flood flows.

The sealant shall have the capability to withstand without failure an increase of 100 percent and a decrease of 50 percent of the joint width as measured at the time of application when tested in accordance with ASTM C-719.

The elongation shall be a minimum of 800 percent without failure when tested in accordance with ASTM D-412, and 500 percent without adhesion failure when tested in accordance with ASTM C-719.

Bond Breaker/

Backer Rod: A bond breaking material shall be compatible with the sealant and conform to the sealant manufacturer's

requirements.

Primer: A material ensuring proper bond between the sealant and the prepared concrete surface (which will be exposed to intermittent flood flows). The primer shall conform to the requirements of the sealant manufacturer.

— statement does not seem appropriate here.

3. SURFACE PREPARATION AND APPLICATION

The sealant manufacturer's representative shall be present during initial installation to insure that proper surface preparation, application, and handling techniques are being used by the contractor.

~~SAW CUT~~:
~~Water Wash:~~
Sealant Removal and Refacing:

All old sealant and/or joint filler ~~must~~ shall be completely removed from the joint to the depth of the saw cut. ~~within~~ The removal of sealant or filler from the joint sidewalls may be done with any ~~area. All contaminants, especially dried laitance from saw-cutting and~~ suitable procedure that does not damage the joint surface or concrete. Power ~~previous sealants, must be removed by an immediate water wash with a~~ driven wire brushes will not be permitted on ~~any~~ surfaces where sealant ~~minimum operating pressure of 90 psi. Flushing shall be done only in one~~ will be installed. The ~~saw~~ new joint shall be saw cut to the width ~~direction~~ and depth shown on the drawings. ~~Concrete~~ Cutting equipment shall be equiped with carbide or diamond blades. A water wash with a minimum operating pressure of 90 psi is permissible for the initial removal of contaminants and dried laitance. Flushing shall be done only in one direction.

~~Sandblast:~~
Cleaning:

The top one inch of each joint face shall be sand-blasted. The sand-blasting nozzle must be held at an angle to ~~the~~ joint face and within one or two inches of the pavement. One pass shall be made for each joint face. ~~Upon completion of the sand blasting operation, the joint surface shall be visibly clean.~~

or fitted with deflectors to direct the sand against the

A minimum of

~~Air Blast:~~

allowed to air dry for a minimum of 24 hours, under natural drying conditions. ~~or until approved unless approved~~ Just prior to priming the joints shall be

After sand-blasting, the joint shall be air-blasted to remove sand and dust. Air compressors used for sandblasting & airblasting ~~this purpose must~~ shall be equiped with traps capable of removing moisture and oil from the air. Air-blasting shall be done ~~only~~ in one direction only.

Proper cleanliness is established ~~from~~ following the air-blasting operation when no residue is evident after rubbing your finger along the dry cleaned or dark lint free cloth joint face. The joint ~~shall must~~ be completely dry before proceeding with the ~~the primer~~ application of primer or sealant as determined by the Engineer.

~~Prime Coat:~~

Sealant Installation:

Apply ~~the~~ primer ~~coat~~ to the clean, dry joint surfaces by brushing or spraying the top one inch of each joint face. The primer ~~coat~~ shall be allowed to dry ~~until all the solvent evaporates or~~ in accordance with the manufacturers recommendations.

~~Bond Breaker:~~

~~The~~ Bond breaker material shall be placed such that it will prevent adhesion of the sealant with the bottom surface of the ~~cut~~ prepared joint, and also establish the cross section needed for the application of the sealant. Installation of the bond breaker shall be done in such a manner that it will not force extrusion of the sealant during closure of the joint.

~~Sealant:~~

Joints must be clean and dry when the sealant is installed. Drying of the joint surfaces may only occur from natural weather conditions.

During the sealant placement the nozzle of the sealant applicator shall be moved steadily along the joint, pushing the sealant ahead to form the required cross section. The minimum temperature at installation should be in accordance with the manufacturer's recommendation unless specified otherwise in section 6.

Immediately after placement and before a skin forms, the sealant shall be tooled, forcing it onto the bond breaker surface and against the joint faces. The finished tooled surface shall be recessed below the concrete surface as detailed on the drawings. Excess sealant on the pavement surface shall be ~~scraped up and~~ removed.

Handling? — safety

4. DELIVERY AND STORAGE

Material shall be delivered in original, tightly sealed containers, clearly labeled with the manufacturer's name, product indentification and lot numbers where applicable.

unopened sealer/primer?

Material shall be stored out of the weather, in original, tightly sealed containers, as recommended by the manufacturer. Storage temperature shall be below 90 degrees fahrenheit.

5. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of joint sealant will be determined to the nearest foot by measurement of the placed sealant along the prepared joint.

Payment for sealant will be made at the contract unit price for the type specified. Such payment will constitute full compensation for furnishing, transporting, placement and application of all materials; and saw cutting and preparing the concrete joints including labor, tools, equipment, and all other items necessary and incidental to the completion of the work.

Ca.

5. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

SIGNAL BUTTE FLOODWAY:

a. Bid Item 2, Channel Floor
Bid Item 3, Channel Wall
Bid Item 4, Side Inlets

(1) These items shall consist of: saw cutting the existing joints to the dimensions shown on the drawings, removing the existing joint filler and/or sealer within the cut section, preparing the joint surfaces, applying a primer, installation of a backer-rod and placement of the joint sealant to the repair details shown on the drawings.

(2) Existing preformed expansion joint filler is a cork material conforming to ASTM D 1752, Type II.

(3) Existing joint sealing compound is an elastomeric type II, Class A material conforming to Federal Specification TT-S-227.

(4) Existing concrete had a minimum compressive strength of 4000 psi at 28 days.

(5) The Contractor shall furnish certification showing that every lot of sealant meets the requirements shown in Section 2, and submit a letter of assurance stating that the sealant is able to tolerate submergence by intermittent flood flows.

EAST MARICOPA FLOODWAY REACH-4, ALTERNATE A:

b. Bid Item A5, Side Inlet and Bridge Pier Joints

Bid Item A6, 3 Inch Channel Joints

(1) These items shall consist of: saw cutting the existing joints, removing the existing joint filler and sealer within the cut section, preparing the joint surfaces, applying a primer, installation of a bond breaker, and placement of the joint sealant.

(2) Existing preformed expansion joint filler is a sponge rubber material conforming to ASTM D 1752, Type I.

(3) Existing joint sealing compound is an elastomeric type II, Class A material conforming to Federal Specification TT-S-227.

(4) Exisitng concrete had a minimum compressive strength of 4000 psi at 28 days.

(5) The side inlet and bridge pier joints shall be repaired to the dimensions and details shown on the drawings.

(6) The Contractor shall submit to the Contracting Officer, for approval, a detail providing the depth (D), shape, and dimensions of the sealant and bond breaker sheeting for the repair detail (Alternate A) of the three inch channel joints

shown on the drawings. Dimensions shall be shown with allowable tolerances, minimum, or maximums where applicable.

(7) Prior to full production, the Contractor shall perform a test section for approval by the Contracting Officer. The test section shall consist of repairing three consecutive transverse channel joints in accordance with the drawings, specifications, and approved contractor sealant and bond breaker detail.

The test period shall extend 10 calendar days past the last day of joint sealant installation for the test section. At the end of the 10 calendar days the joints sealant shall show no signs of stress or ~~have withstood any~~ failure ~~due to~~ from natural causes.

(8) The Contractor shall furnish certification showing that every lot of sealant meets the requirements shown in Section 2, and submit a letter of assurance stating that the sealant is able to tolerate submergence by intermittent flood flows.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCS-ENG-328
02-85

REQUEST FOR SERVICES OF DESIGN SECTION

ENGINEERING AND WATERSHED PLANNING UNIT

FROM	DATE
Ralph M. Arrington	May 10, 1988

STATE	COUNTY OR SCD	REQUESTED DELIVERY DATE
Arizona	Maricopa	May 27, 1988

JOB NAME

East Maricopa Floodway Reach-4/Signal Butte Floodway - Joint Repair

BUDGET DESIGNATION	ESTIMATED CONSTRUCTION COST
08	$105,000

SIGNATURE _____
(STATE CONSERVATION ENGINEER)

1. LIST OF MATERIAL SUBMITTED

(A) ~~CARTOGRAPHIC REQUISITION (SCS-19) NO.~~

Design Folder - 2 sets (Contains: Preliminary Design Report, notes and correspondence, design quantities/cost estimate/performance time, O&M plan, inspection plan, specifications, drawing layout.)

Drawings - 3 sets of bluelines

2. DESCRIPTION OF SERVICES REQUIRED

Review of preliminary design. (NOTE: At this time the drawings have been completed to define only the elements of design and the possible contracting method. Drafting standards have not entirely been adhered to.)

RETURN ORIGINAL MATERIAL TO:

SEND _____ **(NUMBER) CHECK PRINTS TO:**

SEND _____ **(NUMBER) FINAL PLANS TO:**

201 E. Indianola Ave.
Suite 200
Phoenix, AZ 85012

Subject: ENG - East Maricopa Floodway Reach-4/ Signal Butte Floodway - Joint Repair

Date: May 11, 1988

To: Stanley Hobson
Director, WNTC

File Code: 210-13

Attached are three (3) copies of SCS-ENG-328 requesting engineering services from the design section for the preliminary review of the subject project.

The material submitted, as listed on the SCS-ENG-328, has been sent under separate cover to the attention of Donald Wallin.

The requested delivery date is essential in maintaining our schedule for final design review the week of June 6, 1988, and the contracting submittal by June 15, 1988.

Acting For

Verne M. Bathurst
State Conservationist

cc:
Donald E. Wallin, Head Design Unit, WNTC.

DEP:jlg

201 E. Indianola Ave.
Suite 200
Phoenix, AZ 85012

May 11, 1988

210-13

Dan Segramoso, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County
3335 W. Durango Street
Phoenix, AZ 85009

RE: Preliminary design review for the East Maricopa Floodway Reach-4/Signal Butte Floodway - Joint Repair.

Dear Dan:

Under separate cover we are sending two (2) sets of design folders and six (6) sets of bluelines for your review of the preliminary design of the subject project.

Because of contracting constraints, we will need your review comments no later than May 27, 1988.

Please be informed that the final design will be submitted for your review June 6, 1988 with a requested return date of June 10, 1988. The final engineering package will be submitted to contracting June 15, 1988.

Your cooperation for expediant reviews is appreciated.

Sincerely,

Acting For

Verne M. Bathurst

cc: w/encl.
Scott Clement, MCFCD

DEP:jlg

☆ U.S. Government Printing Office: 1981—351-522

U.S. DEPARTMENT OF AGRICULTURE **SPEED MEMO**

PART NUMBER	DATE
3	5-2-88

FROM
Larry Martinez
District Conservationist, Chandler

Don Poulus
Design Unit, S.O.

SUBJECT
EMF R-2, R-4 and Signal Butte Fluy. Repair Projects for FY 88

MESSAGE

As discussed, I have attached abstracts of the Engineering reports explaining each of the projects. Also enclosed are a set of preliminary drawings for the EMF R-2 repair. I hope these will help the NRCD members better understand these projects and prepare them for when we will need their approval signitures on the plans. If you have any qurstions please call.

SIGNATURE Donald E Poulus

REPLY

Don -

Our meeting on Saturday included 3 Board members out of the 5. I'm thinking that at the June meeting (6-14-88) we can once again review our design work. I'm sure they will appreciate our effort! Can you be here at the June meeting?

IDEA

SIGNATURE Larry P. Martinez DATE 5-10-88

FORM AD-311 (REV. 3/81)

RETURN TO SENDER

AZ. RWCD R4

LMS 5/16/08

JOINT REPAIR

FACTORS AFFECTING JOINT MOVEMENT

1. Temperature related
   a) concrete aggregates
   b) slab Thickness
   c) reinforcement
   d) cThers

2. Channel Slope
   a) steep
   b) flat

3. Subgrade drag
   a) foundation
   b) curves, changes in section, cutoffs.

channel slope can be ignored since the grade is flat, therefore will not affect movement in one direction or the other.

Temperature effects determine coefficient of expansion contraction. $C_t = 6.6 \times 10^{-6}$ is commonly accepted value for R/C concrete.

Therfore $C_t = 6.6 \times 10^{-6}$ will be used

Subgrade drag -

foundation soils under this channel are very uniform. I expect the coefficient of friction between soil and concrete through This reach To be very uniform.

For conservative analysis assume
$f_{sc} = 0.25$ for wet fine grained soils

$f_{sc} = 0.50$ for coarse grained soils

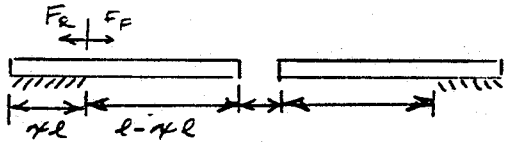
There are no cutoff walls except at the beginning and end. Assume no effect on expansion - contraction. Curves are long radius - may have minor effect. No changes in x-section after inlet transition.

LMS 5/16/88

JOINT Repair 2

Assume that friction between soil and concrete will be the only significant factor in movement of consecutive slabs in one direction thereby opening one joint excessively.

Determine length of slab with low friction to overcome length of high resistance. Worst case would occur if two adjacent slabs were situated on weak materials while the outer ends of same slabs were on strong soils. those resisting movement



F_R = force due to frictional resistance for soils w/ $f_{sc_R} = 0.5$

F_F = Force due to " " " " w/ $f_{sc_F} = 0.25$

$F_R = (\alpha)(l)(f_{sc_R})(\text{Weight})$

$F_F = (l - \alpha l)(f_{sc_F})(\text{Weight})$

$\text{Weight} = (7/12)(150)(1) = 87.5 \text{ lbs/ft}$

$l = 100'$

$F_R = F_F$

$\alpha l (f_{sc_R})(wt) = (l - \alpha l)(f_{sc_F})(wt)$

$\alpha f_{sc_R} = (1-\alpha) f_{sc_F}$

$0.5\alpha = .25 - .25\alpha$

$\alpha = \frac{.25}{.75} = 0.33$

∴ effective length of slab affecting joint opening is equal to $(2)(l - \alpha l) = (2)(100 - 33) = 134$ ft.

$l_e = 134$ feet

Az RWCD #4

LMS 5/16/88

JOINT REPAIR 3

Joint filler to re-distribute the "expansion" movement.

{ ~~Use Le = 1.57~~ for determining joint mov. and determining joint width

Temp. extremes

Concrete (high) = 145°

(Low) = 25°

Control installation temp.

Concrete (high) = 115°

(Low) = 65°

Sealant Material

Silicone (low Modulus)

Minimum capacity of 50% compression
50% Tension

Determine JOINT MOVEMENT

Compression (closure) Install @ 65°

$\Delta L = (\Delta t)(le)(C_t)$

$C_t = 6.6 \times 10^{-6}$ (Joint Filler manufacturer)

$le = (134)(12) = 1608''$

$\Delta t = 145 - 65 = 80°$

$\Delta L = (80)(1608)(6.6 \times 10^{-6})$

(65-25) $\Delta L = 0.43$

$\Delta L = 0.85$

$W_c = \frac{\Delta L}{50\%} = 1.70$ inch min. (safety factor = 1.0)

Cut cold 2" (65°)
Apply cold (65°) 2" − .043 = 1.57
Compr. $\frac{.85}{1.57} = 54\%$

(Should control cutting temp.)

Cut cold 2" (65°)
Apply cold → 2"
compr. $\frac{.85}{2.00} = 43\%$ ok

Az RWCD R4

LMS 5/16/88

Joint Repair

Tension Install at 115°

$\Delta L = (\Delta t)(l_e)(C_t)$ $\Delta t = 115 - 25 = 90°$ $65 - 50$

$\Delta L = (90)(134)(12)(C_t \times 10^{-6})$

$\Delta L = 0.96$ (50) 0.53

$W_t = \frac{\Delta L}{50\%} = 1.91$ inch min (S.F. = 1)

cut cold 2" (extreme = 25°)
apply hot 2 - 0.96 = 1.04"
compr. 0% tens. @ 100%

$\frac{x}{y} = 0.5$ $y = 2x$

2 - x = y
2 - x = 2x
2 = 3x
x = 2/3 = 0.667"
ΔL = Δt 134(12)(10 ⁻⁶)
Δt = 63°
at 25° + 63 = 88°F

Better restrict temp. for cutting!

cut cold (65°) = 2"
apply hot 2 - 0.53 = 1.47"
0.96/1.47 = 65% < 100 OK

JOINT WIDTH

$W_c = 1.7$
$W_t = 1.91$

Silicone capacity in tension generally greater than in compression.
Some manufacturers products specify 100% in tension.

Compression is most critical
provide minimum safety factor = 1.25

∞ $W = 1.25\ W_c = 2.125$ inch

Safety factor for tension = $\frac{2.125}{1.91} = 1.11$ for 50% sealant

Use Minimum JOINT Width = 2.125

Construction Tolerance ± 1/8"

Spec. 2 1/8" ± 1/8

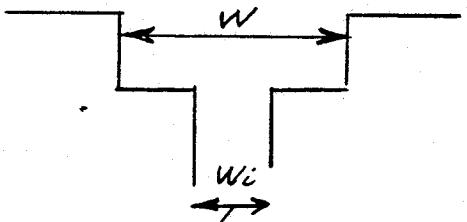
Control temp of conc. at installation
Low 65°
high 115°

Az. RWCD R4

LMS 5/16/88

Joint Repair 5

The proposed joint design with sealant reservoir at top will limit closure of joint. Therefore safety factor for sealant in compression is not as important as for tension as long as joint width is sufficient to insure that full closure does not exceed sealant capacity



Maximum closure cannot exceed this distance at time of sealant installation (between 65° & 115°)

Silicone with 50% compression capacity

$W \geq \frac{Wi}{0.5}$ Assume $Wi = 1.0"$

$\therefore W \geq 2.0"$

$2\frac{1}{8}" \pm \frac{1}{8}"$ joint width ok.

Ck Joint width with ACI 504R

Fig. 6 for Sealants with ± 25%

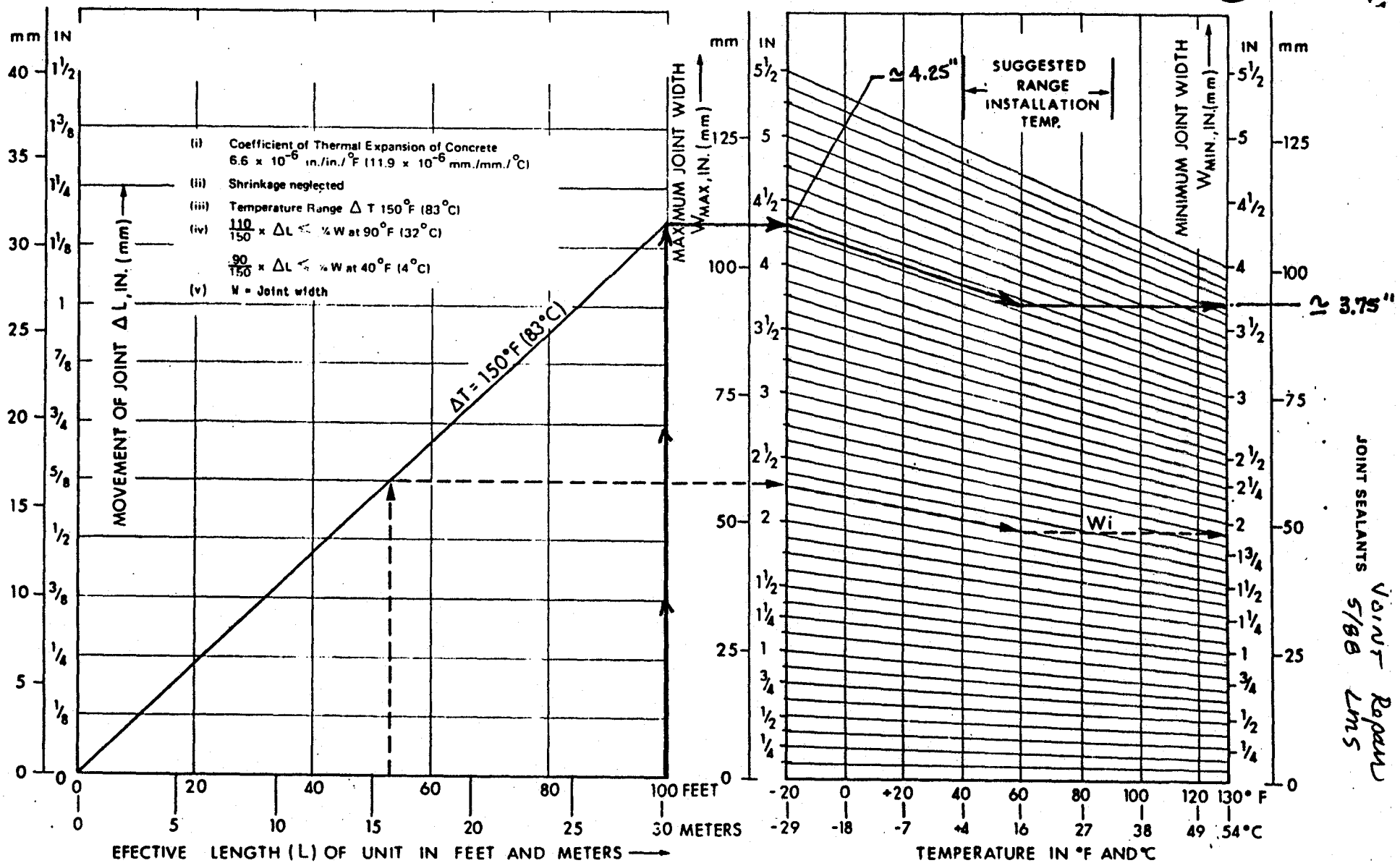
Wmin = 3.75

Wmax = 4.25

Adjust for sealant with ± 50%

Wmin = 1.88

Wmax = 2.125 Use $W = 2.125 \pm \frac{1}{8}$



Method of Use (1) Enter at L to diagonal line
(2) Horizontal to intercept Max Joint Width line
(3) Follow slope to vertically projected Installation Temp.
(4) Follow horizontal intercept right to Min Joint Width line to determine joint width at installation (Wi)

JOINT SEALANTS

Joint Repairs 5/88 LMS

504R-23

Fig. 6—Chart for determining joint movements and width; field-molded sealants, based on 25% ± joint movement
For sealants with 50% ±, use ½ value indicated.

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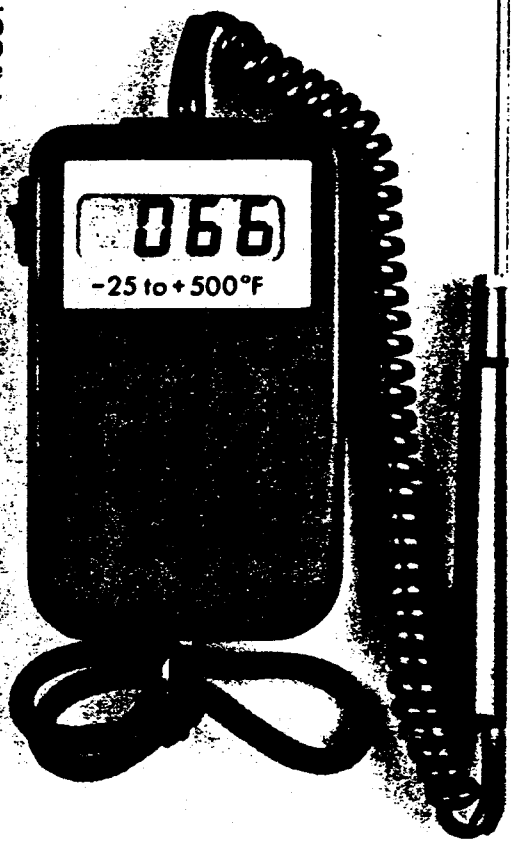
Cyril Matter, President



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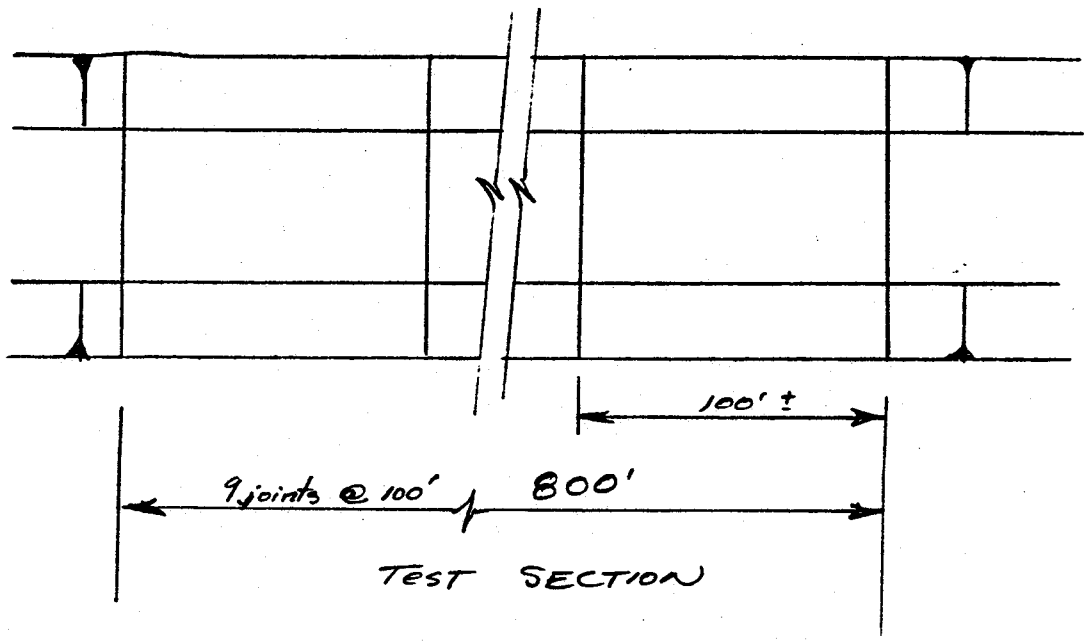
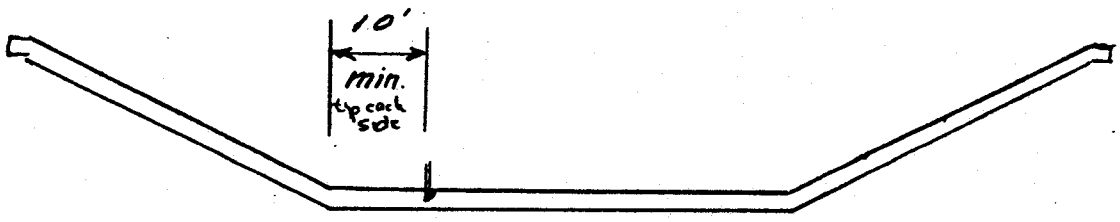
Thermocouple probes.

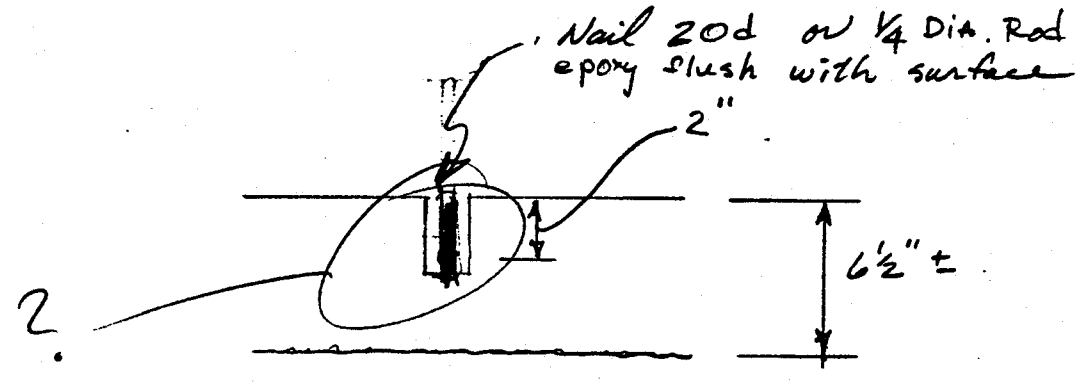
Something like this would work for measuring temp from embedded metal bar or rail. tbt

Specify depth @ 2"



Two
Locate Thermometers approximately
500 apart in floor of channel

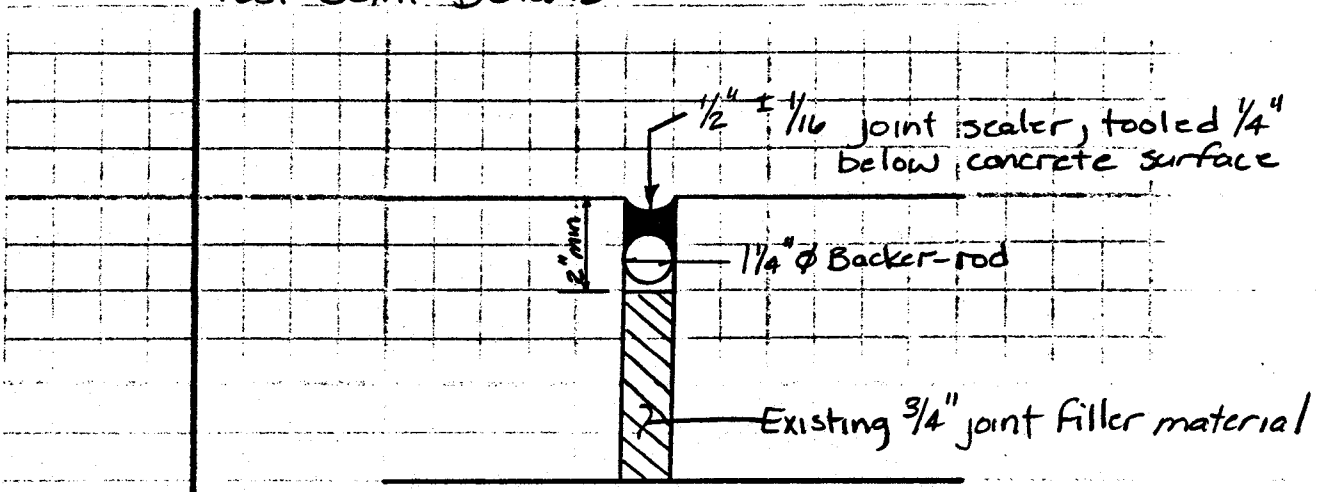




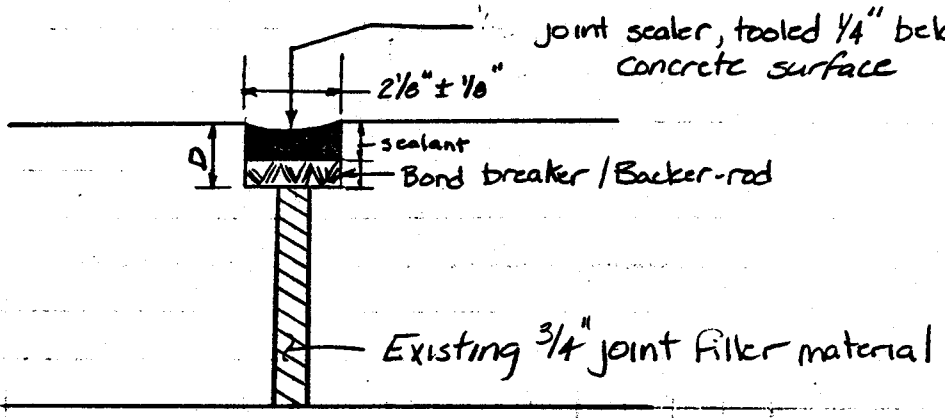
Az. EMF & 4 Joint Repair

DE Paulus 6-1-88

Test Joint Details



EXISTING



2-inch JOINT

(same as above except top width = 3 1/8" ± 1/8")

3-inch JOINT

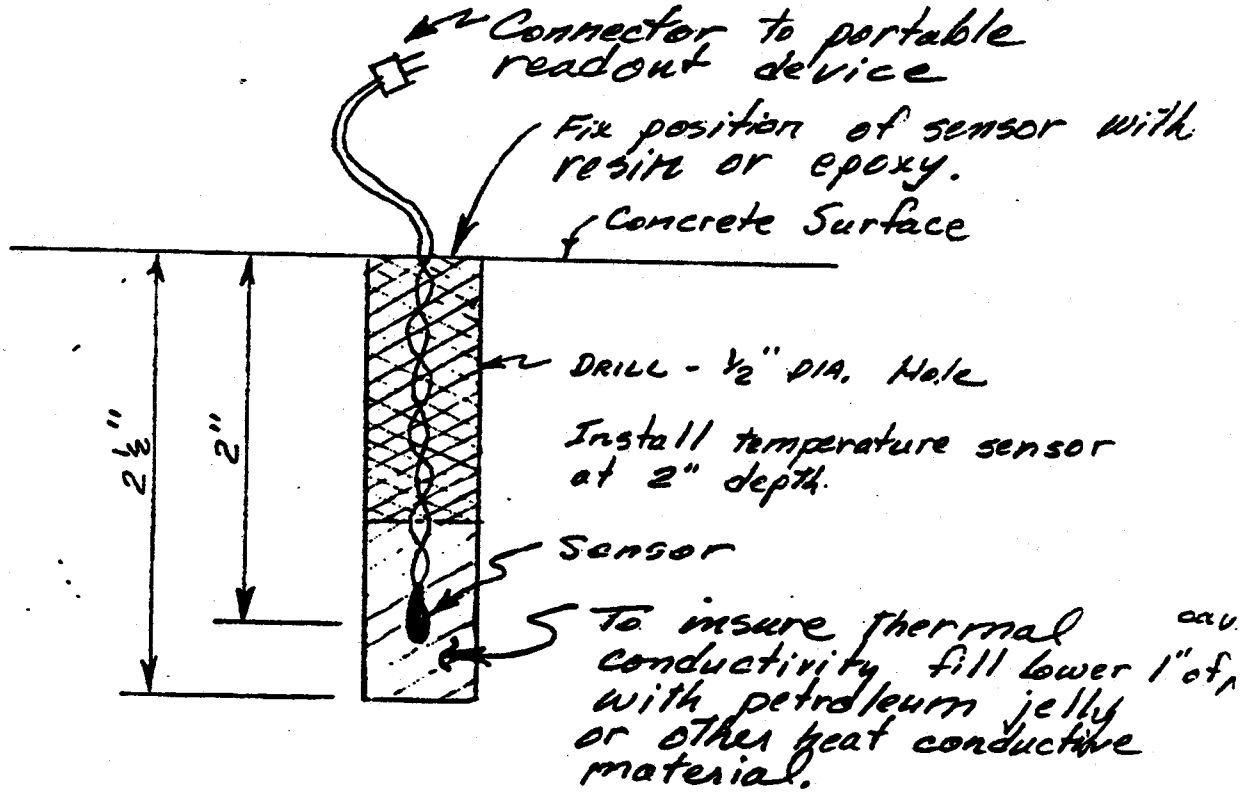
be the alternate wording if the information above is repeated in another item specifically for the test section.

"During the installation and 10 day monitoring period of the test section, sufficient readings shall be taken to determine the approximate high and low temperature extremes of the concrete within any 24 hour period."

Leland Saele, WNTC, Portland, Or.

cc: Wallin
Middlecamp

AE RWCD R4
LMS 6/2/88
Joint Repair - Temperature Sensors



DETAIL OF TEMPERATURE SENSOR INSTALLATION

BID SCHEDULE
EMF Reach-4 and Signal Butte Floodway
Expansion Joint Repair

ITEM NO	WORK OR MATERIAL	SPEC NO	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	8	1	L.S.	$ XXX	$
	Signal Butte Flwy:	400				
2	Channel Floor		2693	Feet	$	$
3	Channel Wall		3041	Feet	$	$
4	Side Inlets		468	Feet	$	$
	EMF R-4:	400				
5	Test Joints		893	Feet	$	$
6	Side Inlet & Bridge Pier Joints		411	Feet	$	$
7	2-Inch Channel Joints		6053	Feet	$	$
				TOTAL		$

Az EMF C-4 & Sig. Butte Flwy Joint Repair

DE Paulus 6-2-88

Cost Estimate 1 1

Alternate A for EMF C-4 will be used for the cost estimate of the revised plans. This assumes that the savings which would be incurred from using a 2 inch joint vs. a 3 inch joint will be offset by the additional temperature restrictions and monitoring required by the Contractor.

Total Est. $102,875

Az. EMF C-4 Joint Repair

DE Paulus 6-1-88

Test Section Selection 1 1

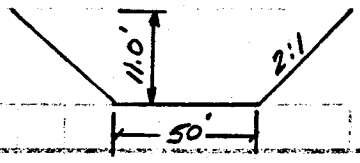
Recommendations: 9 consecutive joints in a straight reach with a min. 200 feet from varying X-sec or alignment.

500 + 25
1 + 25
2 + 25
} Existing (≈1") joint

503 + 25
4 + 25
5 + 25
} 2 inch joint

506 + 25
7 + 25
8 + 25
} 3 inch joint

Total length



$9\left[50 + 2\left(\sqrt{11^2 + 22^2}\right)\right] = 893$ feet

Total Channel joints	6648
Test Joints	−893
+(Re-do 1" ex. test joints)	+298
	6053 feet 2" joint repair

COMPUTATION SHEET

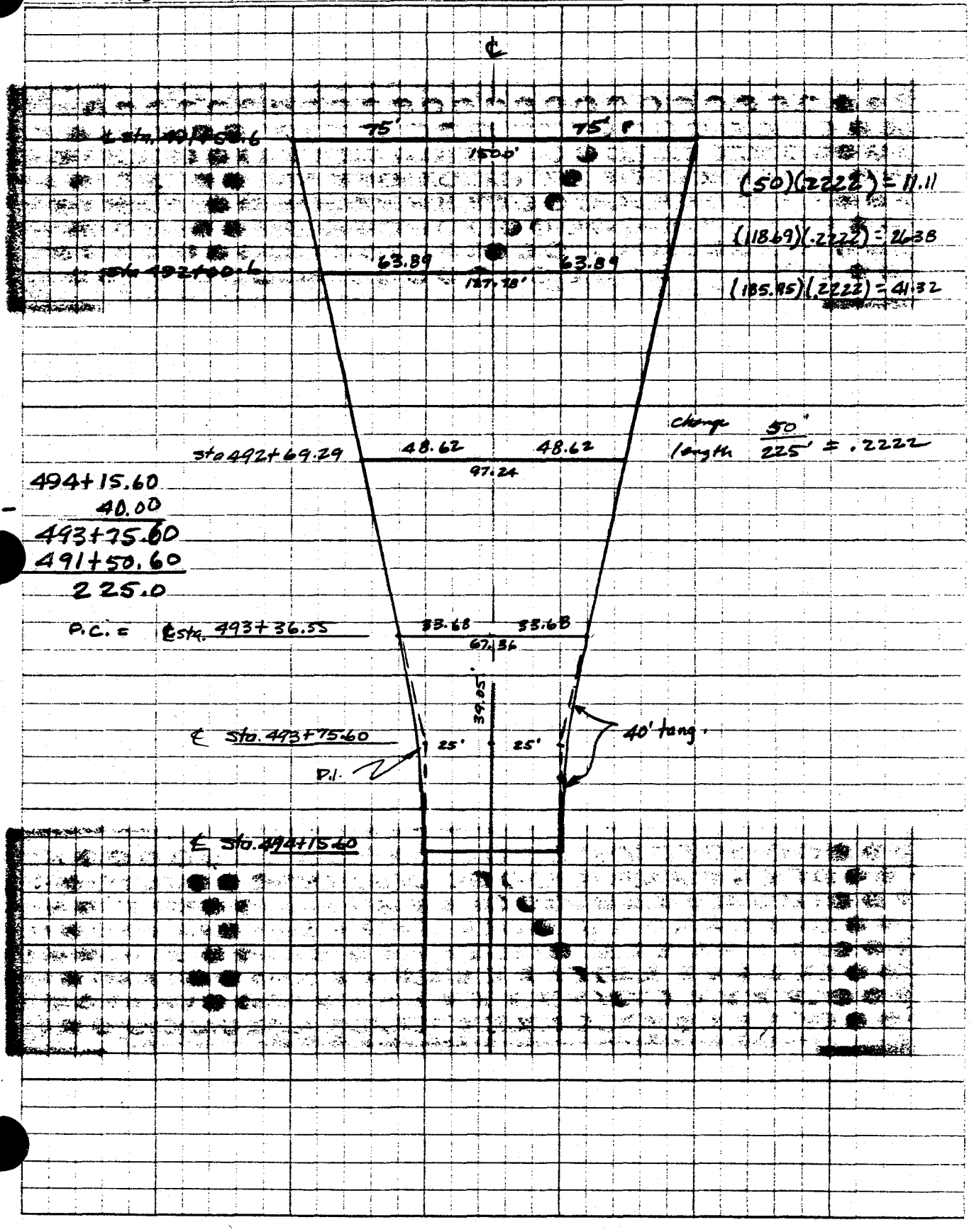
SCS-ENG-5234 Rev. 9-69

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE: ARIZONA | PROJECT: E. Maricopa Floodway R-4 Joint Repair

BY: J.E.B. | DATE: MAY 1988 | CHECKED BY | DATE | JOB NO

SUBJECT: LENGTH OF JOINTS IN TRANSITION SECTION | SHEET ___ OF ___



Az.

EMF I-4 Joint Repair

DE Paulus 3/29/88

Cost Estimate

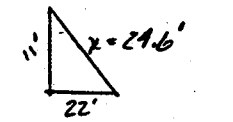
Length of joints

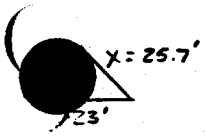
B.W.
491+50.6 - 150'
492+00.6 127.6 - 131' ✓
492+69.29 97.2 105' ✓
493+36.55 67.4 80' ✓
494+15.6 - 50' ✓
Total length 265'

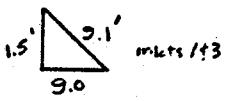
Pavement Edges

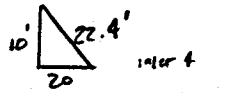
	B.W.	+ S. Slope	= Total
Sta 492+00.6	~~131~~ 127.8	49.2	= ~~180.2~~ 177.0
492+69.29	~~105~~ 97.2	49.2	= ~~154.2~~ 146.4
493+36.55	~~80~~ 67.4	49.2	= ~~129.2~~ 116.6
℄ 491+50.6 to 493+80 ← Design calc. for 494+15.6 = 265			= 229.4
			4166.4 ✓
Sta 494+15.6 to 535+25	42 - (50 + 49.2) (42)(99.2) = 4166.4		= 4364.8
Sta 536+25 to 547+25	12 (50 + 51.4) 1014.4		= 1216.8
Sta 548+25 to 552+00	6 (50	49.2)	= 595.2 / 6648
Side Inlet #1	10	18.2	= 28.2
" " #2	22.5	60.8	= 83.3
" " #3	3 (10	18.2)	= 84.6
" " #4	10	44.8	= 54.8
Bridge Pier			= 160

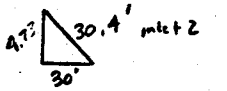
TOTAL 7280 feet.











Cost Analysis to include:

Joint preparation
1.) Saw cutting & removal of existing material
2.) Flush joint (water jet) & let dry.
3.) Sand blast joint
4.) Air Clean joint (≈90psi)
5.) Apply Primer
6.) install backer rod
7.) Apply Joint Sealer

AZ

EMF R-4 Joint Repair

DE Paulus 4/29/88

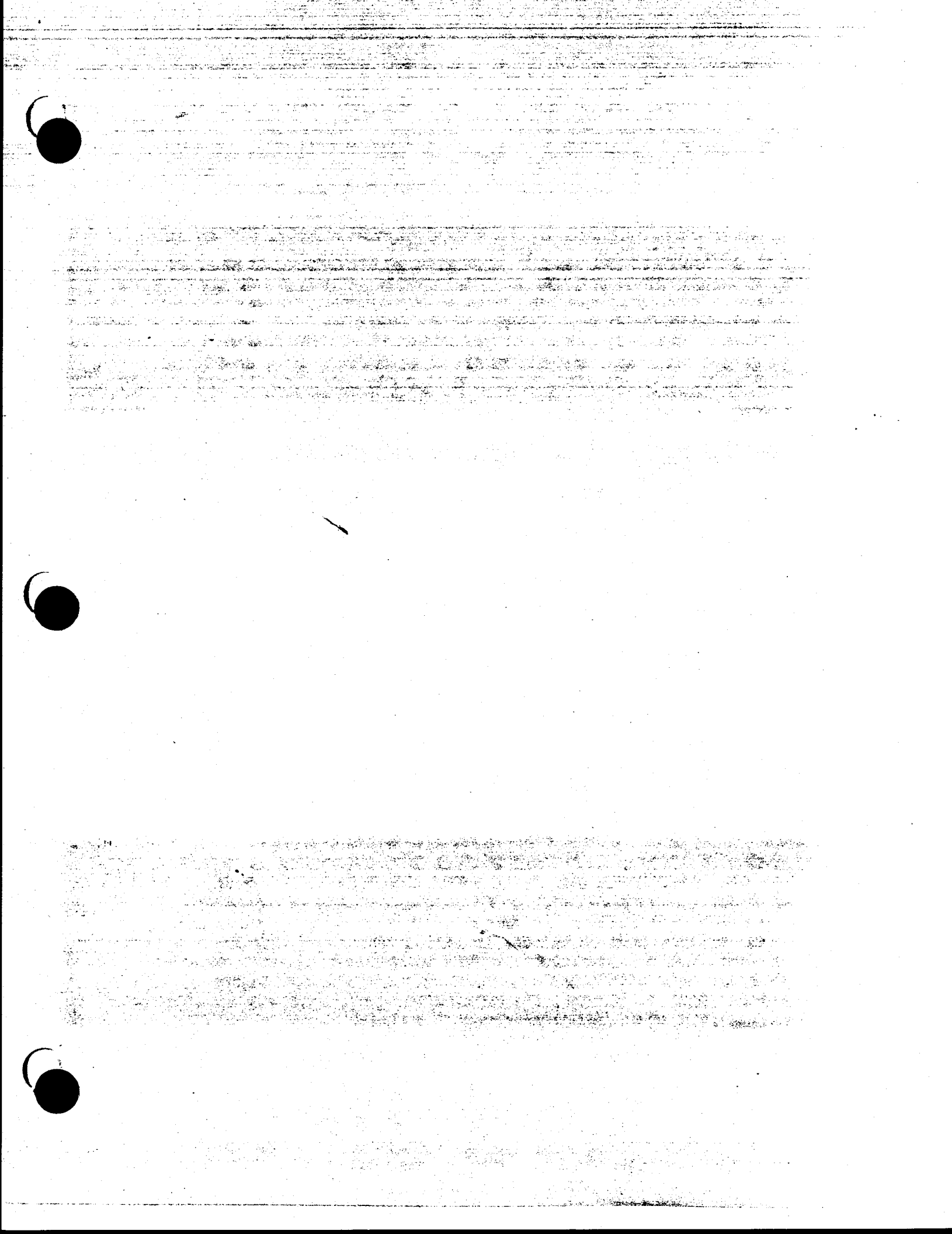
Cost Est. / Quantities 4 15

Break out the lengths & joints for:
- Bridge Pier & Side Inlets
- Alt A
- Alt B — Existing Cuts
  — New Cuts

1. Side Inlet & Bridge Pier Joints 411 feet
2. Alt A, 3" joints ~~6869~~ 6640 feet
3. Alt B., 1" existing joints ~~6869~~ 6640 feet
   1" new joints 12,430 feet
   (new joints shall be equally spaced such that the maximum joint length between slabs is 35')

Inlet Transition
- 190
- 168
- 142
- 120
- 110

117 joints @ 100'



AZ SIGNAL BUTTE FLWY JOINT REPAIR

DE Paulus 3/31/88 JEB 6-1-88

Cost Estimate 12 15

Length of joints

	(B.W. or Floor) + (S. Slope or Wall)	= Total
Side Inlets #16 to 27	12 (30 + 9)	= 468'
Floodway:		
97+63 to 101+53	14 (10 + 13)	= 322'
Flwy Inlet Str.	10 + 22	= 32
	10 + ~~8~~ 17.5	= 28
	2 (10 + 14.6)	49.2
Flwy @ Inlet 16 & 17	2 ~~8~~ (10 + 15)	= ~~75~~ 50
Flwy 103+03 to 105+11	8 (10 + 14)	= 192
Flwy @ North Inlet Join 9 & 10	17.5 (20 + ~~25~~) 25.9	= ~~45~~ 43.3
Join 10 & 11	16.4 (20 + ~~21~~) 21.8	= ~~41~~ 37.2
Join 11 & 12	16.2 (18 + 17) 15.0	= 35 31.2
Join 12 & 13	15.1 (18 + 15) 15.0	= 33 30.1
Sta. 106+45 Join 13 & 14	12.9 (15 + 15) 15.0	= ~~30~~
Flwy 106+45 to 107+95	6 (14 + 15)	= 174
Flwy @ Inlet 18	2 (14 + ~~16~~) 15.9	= 60
Flwy 108+85 to 112+45	13 (14 + 15)	= 377
Flwy @ Inlet 19 to 27	9 (14 + ~~16~~)	= ~~270~~
Flwy 113+35 to 156+50	126 (14 + 15)	= 3654

NORTH CHANNEL

27.5 + (4)(22.5) - 117.5

TOTAL ~~5836~~ feet

6094

115

6209

Cost Analysis To include:

Joint Prep.: Removing Cork
Flushing
Sandblast
Air clean

Primer
Backer rod
hint sealer

2 : 4.5 / 4

F.W.	Wall
360	108
142	182
10	22
10	17.5
28	29.2
32	32
112	
175	25.9
21.4	21.4
150	
150	
84.0	90.0
25	31.2
182.0	195.0
254.0	254.4
170.4	159.2
3015.2	3069.
- 360	- 108
2655	7961

Az. SIG Butte Flwy Joint Repair

DEPaulus 4/29/88

Cost Est. / Quantities 13 15

Break out lengths of joints for:
- Channel floor
- channel sidewall
- side inlets

1. Channel floor	2595	feet	2595
2. Channel Wall	2823	feet	3041
3. Side Inlets	468	feet	446

NORTH CHANNEL

FLOOR 37.5

WALL 80.0

Az. EMF L-4 & Sig. Butte Fwy Joint Repair

DE Paulus 6-2-88

Performance Time / /

Sig. Butte Fwy = 43 cal. days
(same as shown in prel. – no changes)

EMF L-4 = use Alt A (3" option) 71 cal. days
- Assume increased time due to temperature restrictions will be handled by sequencing work between this project & Sig Butte Fwy. where no temperature restrictions are required.

Total Perf. Time 114 days

GOVERNMENT INSPECTION PLAN
for
EMF REACH-4 AND SIGNAL BUTTE FLOODWAY
EXPANSION JOINT SEALER REPAIR

AMENDMENT NO. 1

GENERAL

1. EMF Reach-4 Joint Repair:
   Delete Alternates A&B.
   Total Joint Repair will include 7357 feet of joints.

2. Signal Butte Floodway Joint Repair:
   Change total length of repair to 6202 feet.

ITEMS OF WORK TO BE INSPECTED

Saw cutting joints and sealant application will be restricted to the temperature requirements set in the specifications. Monitoring and recording measurements will be the responsibility of the Contractor and will not require additional SCS personnel for inspection.

TIMING OF INSPECTIONS

Delete the two Alternates A&B.
Corrected performance time is 114 days for the total job;

Mobilization	9	calendar days
Joint Prep & Sealant	73	calendar days
Clean up	2	calendar days
Weather	30	
	114	total

PAYMENT AND ACCEPTANCE OF WORK

For progress payment, Government approval shall be deemed to have occurred on the 10th working day after Contractor estimates have been received by the designated billing office in the resulting contract. For work or services completed by the Contractor, Government acceptance shall be deemed to have occurred constructively on the 10th working day after the Contractor has completed the work or services in accordance with the terms and conditions of the resulting contract.

STATEMENT OF AVAILABILITY

The staff mentioned within this inspection plan will be available to work on the project.

By: _____
Supervisor

Title: State Conservation Engineer
Date: _____

By: _____
Supervisor

Title: Project Engineer
Date: _____

APPROVAL OF CO-DETERMINERS

_____
State Conservation Engineer — Date

_____
Contracting Officer — Date

CONSTRUCTION SPECIFICATION

8. MOBILIZATION

1. SCOPE

The work shall consist of the mobilization of the Contractor's forces and equipment necessary for performing the work required under the contract. Mobilization will not be considered as work in fulfilling the contract requirement for commencement of work.

Mobilization shall include the cost for transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities as the site not covered in specific bid items, and other pereparatory work at the site. The cost of the entire amount of premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable shall be paid upon request when evidence of full payment to the surety has been provided to the Contracting Officer.

Work done under this specification shall not include mobilization for any specific item of work for which payment for mobilization is provided elsewhere in the contract.

The specification covers mobilization for work required by the contract at the time of award. If additional mobilization costs are incurred during performance of the contract as a result of changed or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

2. PAYMENT

Payment will be made as the work proceeds, after presentation of invoices by the Contractor showing his own mobilization costs and evidence of the charges of suppliers, subcontractos, and others for mobilization work performed by them. If the total of such payments is less than the contract lump sum for mobilization, the unpaid balance will be included in the price final contract payment. Total payment will be the lump sum contract price for mobilization, regardless of actual cost to the Contractor.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

Payment of the lump sum contract price for mobilization will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to completion of the work.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 1, Mobilization

(1) This item consists of the mobilization of the Contractor's equipment and forces for the repair of the expansion joints in the East Maricopa Floodway - Reach 4 and Signal Butte Floodway.

CONSTRUCTION SPECIFICATION

400. JOINT SEALANT FOR CONCRETE LINED FLOODWAYS

1. SCOPE

The work shall consist of saw cutting and surface preparation of existing or new concrete expansion joints, application of primer, and placement of bond breaker/backer rod material and joint sealant.

2. MATERIALS

Joint Sealer: Shall be Type S, Grade NS, use NT or T, low modulus silicone conforming to the requirements of ASTM C-920 and shall tolerate submergence by intermittent flood flows.

The sealant shall have the capability to withstand without failure an increase of 100 percent and a decrease of 50 percent of the joint width as measured at the time of application when tested in accordance with ASTM C-719.

The elongation shall be a minimum of 800 percent without failure when tested in accordance with ASTM D-412, and 500 percent without adhesion failure when tested in accordance with ASTM C-719.

Bond Breaker/

Backer Rod: A bond breaking material shall be compatible with the sealant and conform to the sealant manufacturer's

requirements.

Primer: The primer shall insure that proper bond exists between the sealant and the prepared concrete surface and will resist intermittent flood flows. The primer shall conform to the requirements of the sealant manufacturer and the material data submitted to the Contracting Officer for final approval.

3. SURFACE PREPARATION AND APPLICATION

The sealant manufacturer's representative shall be present during initial installation to insure that proper surface preparation, application, and handling techniques are being used by the contractor.

Sealant Removal and Refacing:

All old sealant and/or joint filler shall be completely removed from the joint to the depth of the saw cut. The removal of sealant or filler from the joint sidewalls may be done with any suitable procedure that does not damage the joint surface or concrete. Power driven wire brushes will not be permitted. The new joint shall be saw cut as required to attain the width and depth shown on the drawings. Concrete cutting equipment shall be equiped with carbide or diamond blades. A water wash with a minimum operating pressure of 90 psi is permissible for the initial removal of contaminants and dried laitance. Flushing shall be done in one direction only.

Cleaning:

The top one inch of each joint face shall be sand-blasted. The sand-blasting nozzle must be held at an angle or fitted with deflectors to direct the sand against the joint face within one or two inches of the pavement. A minimum of one pass shall be made for each joint face.

After sand-blasting, the joint shall allowed to air dry for a minimum of 24 hours, under natural drying conditions. Just prior to priming, the joints shall be be air-blasted to remove sand and dust. Air compressors used for sandblasting and airblasting shall be equiped with traps to remove moisture and oil from the air. Air-blasting shall be done in one direction only.

The joint is considered to be clean when no residue is evident after rubbing your finger or dark lint free cloth along the cleaned dry joint face. The joint shall be completely dry before proceeding with the application of primer or sealant.

Sealant Installation:

Apply primer coat to the clean, dry joint surfaces by brushing or spraying the top one inch of each joint face. The primer shall be allowed to dry in accordance with the manufacturer's recommendations.

Bond breaker material shall be placed such that it will prevent adhesion of the sealant with the bottom surface of the prepared joint, and also establish the cross section needed for the application of the sealant. Installation of the bond breaker shall be done in such a manner that it will not force extrusion of the sealant during closure of the joint.

Joints must be clean and dry when the sealant is installed. Drying of the joint surfaces may only occur from natural weather conditions.

During the sealant placement the nozzle of the sealant applicator shall be moved steadily along the joint, pushing the sealant ahead to form the required cross section. The minimum and maximum temperature at installation should be in accordance with the manufacturer's recommendation unless specified otherwise in Section 6.

Immediately after placement and before a skin forms, the sealant shall be tooled, forcing it onto the bond breaker surface and against the joint faces. The finished tooled surface shall be recessed below the concrete surface as detailed on the drawings. Excess sealant on the pavement surface shall be and removed.

4. DELIVERY AND STORAGE

The sealant material shall be delivered in original, tightly sealed containers, clearly labeled with the manufacturer's name, product indentification and lot numbers where applicable.

The unopened sealant material shall be stored out of the weather, in original, tightly sealed containers, as recommended by the manufacturer. Storage temperature shall not exceed 90 degrees fahrenheit.

5. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of joint sealant will be determined to the nearest foot by measurement of the placed sealant along the prepared joint. Payment for sealant will be made at the contract unit price for the type specified. Such payment will constitute full compensation for furnishing, transporting, placement and application of all materials; and saw cutting and preparing the concrete joints including labor, tools, equipment, and all other items necessary and incidental to the completion of the work.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

SIGNAL BUTTE FLOODWAY:

a. Bid Item 2, Channel Floor
Bid Item 3, Channel Wall
Bid Item 4, Side Inlets

(1) These items shall consist of: removing the existing joint filler and/or sealer within the cut section, preparing the joint surfaces, applying primer, installation of backer-rod and placement of the joint sealant as shown on the drawings.

(2) The existing preformed expansion joint filler is a cork material conforming to ASTM D 1752, Type II.

(3) The existing joint sealing compound is an elastomeric type II, Class A material conforming to Federal Specification TT-S-00227.

(4) The minimum 28 day compressive strength of the concrete was 4000 psi.

(5) The Contractor shall furnish certifications showing that each lot of sealant meets the requirements specified in Section 2, and a letter of assurance from the manufacturer stating that the sealant will tolerate submergence by intermittent flood flows.

EAST MARICOPA FLOODWAY REACH-4:

b. Bid Item 5, Test Joints

(1) This item shall consist of: saw cutting the existing joints as required to attain the dimensions shown on the drawings, removing the existing backer-rod, joint filler and sealer within the cut section, preparing the joint surfaces, applying primer, installation of bond breaker/backer rod and placement of the joint sealant.

The test section shall consist of nine (9) consecutive test joints of three (3) different joint details as listed below:

Existing Joint Detail	2 Inch Joint Detail	3 Inch Joint Detail
500+25	503+25	506+25
501+25	504+25	507+25
502+25	505+25	508+25

(2) The existing preformed expansion joint filler is a sponge rubber material conforming to ASTM D 1752, Type I.

(3) The existing joint sealing compound is an elastomeric type II, Class A material conforming to Federal Specification TT-S-00227.

(4) The minimum 28 day compressive strength of the concrete 4000 psi.

(5) The Contractor shall submit to the Contracting Officer, for approval, a joint detail showing the depth (D), shape, and dimensions of the sealant and the proposed bond breaker/backer-rod for the two inch and three inch channel joints shown on the drawings. Dimensions shall be in accordance with the sealant manufacturer's requirements and include the allowable tolerances and minimum, or maximums where applicable.

(6) Concrete temperatures shall be measured and recorded during the cutting and sealant installation of each test joint and during the performance period discribed below.

Concrete temperatures shall be measured two (2) inches below the concrete surface as shown on the drawings. The sensors shall be located within the middle one third of the bottom width of the floodway at Stations 505+00 and 525+00.

The sensors shall be installed in such a manner as to insure thermal conductivity between the sensor and the surrounding concrete and to accurately measure the temperature of the concrete at the 2 inch depth. Location of the sensor shall be adequately marked and protected to prevent accidental damage. Marking or protective, barriers shall not alter normal

temperature conditions at sensor location.

The sensor shall be a thermocouple or similar device that can be connected to a portable readout instrument. The readout unit shall be an easily portable (hand held), battery powered instrument. The readout unit and sensor shall have an accuracy within 2 degrees farenheit over a minimum temperature range of 0°F to 250°F. The response time for readings shall be less than 15 seconds. The readout instrument complete with connecting leads and instruction manual shall become the property of the government at the completion of work.

The contractor shall provide his plan, for installation of sensors, monitoring temperature and type of equipment to be used, for approval, 10 days prior to installation.

(7) Each test joint shall be monitored by the Contractor for a performance period of ten (10) work days after the installation of the sealant. Monitoring shall be preformed as required to record the concrete temperature, joint width (at mid points of each side slope and channel bottom), and sealant condition corresponding with the approximate high and low daily concrete temperature. The sealant condition shall be evaluated by sealant manufacturer personnel knowledgeable in sealant performance characteristics.

(8) Cutting the test joints and installation of the joint sealant shall be limited to periods when the average temperature of the concrete is within the range of 65°F to 115°F.

(9) The Contractor shall furnish certifications showing that each lot of sealant meets the requirements specified in Section 2, and a letter of assurance from the manufacturer stating that the sealant will tolerate submergence by intermittent flood flows.

c. Bid Item 6, Side Inlet and Bridge Pier Joints

Bid Item 7, Two Inch Channel Joints

(1) These items shall consist of: saw cutting the existing joints as required to attain the dimensions shown on the drawings, removing the existing backer rod, joint filler and sealer within the cut section, preparing the joint surfaces, applying primer, installation of bond breaker/backer-rod and placement of the joint sealant. Two inch channel joints shall be installed at all existing channel joint locations including those joints within the test section for existing joints at Stations 500+25, 501+25, and 502+25.

(2) The existing preformed expansion joint filler is a sponge rubber material conforming to ASTM D 1752, Type I.

(3) The existing joint sealing compound is an elastomeric type II, Class A material conforming to Federal Specification TT-S-00227.

(4) The minimum 28 day compressive strength of the concrete was 4000 psi.

(5) The Contractor shall submit to the Contracting Officer, for approval, a joint detail showing the depth (D), shape, and dimensions of the sealant and the proposed bond breaker/backer-rod for the two inch channel joints shown on the drawings. Dimensions shall be in accordance with the sealant manufacturer's requirements and include the allowable tolerances and minimum or maximums, where applicable.

(6) Concrete temperatures shall be measured and recorded by the Contractor during the cutting and sealant installation of each joint.

Concrete temperatures shall be measured using the sensors specified in Bid Item #5.

Cutting the test joints and installation of the joint sealant shall be limited to periods when the average temperature of the concrete is within the range of 65°F to 115°F.

(7) The Contractor shall furnish certification showing that each lot of sealant meets the requirements specified in Section 2, and a letter of assurance from the manufacturer stating that the sealant will tolerate submergence by intermittent flood flows.