PAVEMENT AND SHOULDER MAINTENANCE WORKSHOP

SPONSORED BY F H W A

REGION 8

DENVER, COLORADO

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PREPARED BY

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AND

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OFFICE OF MAINTENANCE

Iowa Department of Transportation

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CRACK SEALING OF BITUMINOUS PAVEMENT

Slide No.

1A LOGO

We, in Iowa, have not been as diligent as we should have been in maintaining a tight surface condition on asphalt pavements and in sealing cracks as they developed. This has become very evident in the past few years as construction funding has decreased and highway surfaces are being kept in service longer. In an effort to determine what could be cone to extend the surface life of pavements and to do so at the least possible expense, we have looked at some of our typical asphalt pavement problems and have been somewhat surprised at what was found. We have a few slides to show some problem conditions.

2A The first slide details a problem experienced on Highway 21 south of Waterloo. The highway was about 15 years old when it developed a very rough riding surface. Transverse cracks were very evident and spaced from 30' to 90' apart. Each crack was raised about 1" as is shown in the detail. These cracks developed in a pavement structure that was placed on a 6" soil lime sub-base. The structure consisted of 10" of asphalt treated base with a 2 1/2" binder course and a 3/4" surface course.

3A In an effort to determine the cause of the bumps at these joints a series of cores were taken at locations as shown in this slide. The cores numbers 1-4 were taken progressively farther from the transverse crack.

4A These are the cores. The core on the left was the core taken nearest the transverse crack and you will see how short it is in relationship to the others. The core on the right was taken the farthest from the crack and you will see also that it is in considerably better condition than any of the other three.

5A This is a close-up of core #1. This core is only 9" long even though the original construction was 13". The bottom 4 inches had raveled or stripped away and could not be recovered.

6A This is core #2 and although it retained its entire length, it is delaminated at the 5" level and is beginning to show signs of delamination at the 9" level.

7A This is core #3 showing delamination at both the 5" and 9" levels with substantial erosion of materials.

8A The fourth core came out inteact but is beginning to show some minor deterioration at the same levels as experienced in the other three cores. What caused this delamination and deterioration? The theory is that it was the instrusion of water through the crack and being pumped under the tires of passing vehicles that caused the fines and

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asphalt materials to be eroded away. Keep that thought in mind as we look at a couple of other samples.

9A This block is about 2' square and was removed from an asphalt pavement on Highway 61 north of Maquoketa. This highway had experienced substantial cracking and although there were no dips or heaves at the cracks, the road had become distorted giving a rather rough ride. This pavement was constructed on a 6" soil lime sub-base. The pavement structure consisted of a 7" asphalt treated base and a 4 1/2 " Type A surface course. The first sample that you see here was cut through a cracked area and brought into the laboratory for examination. A core was taken directly over the crack after the sample reached the laboratory and the core material is shown in the pan on top of the sample. It was removed in extremely poor condition, as can be seen. You will also notice the rather narrow surface crack gets wider as it goes deeper.

10A This slide is a close-up of the previous block showing the more extensive deterioration deeper down in the sample and the delamination of the bottom 2 inches.

11A This is the second block sample that was cut. It was cut where two adjacent cracks appeared on the surface. Please note the greater deterioration as these cracks progress deeper into the structure.

12A This slide is a close-up of the previous block showing the extent of the deep down deterioration. Delamination, erosion of materials, and loss of structure are evident.

13A This is the third block that was cut over a single crack that had been sealed. You will note the sealant floating down the side of the block. The sealant flowed freely as the block was removed and continued to flow even after the block was brought into the laboratory. The sealant material was an MC800 cut-back asphalt.

14A This is a closer shot of the same block. Note that the crack does not progress very deeply into this structure. Could it be that the sealant in this crack has, in some way, reduced the deterioration in the lower structure?

15A This is another picture of the sealant flowing freely from the crack and showing no evidence of a crack in the lower part of the block.

16A This core was taken through a crack in the asphalt pavement on Iowa 401 north of Des Moines. The crack, before coring, was less than 1/4" wide. The crack was not visible to the average motorist traveling 55 mph. There was no evidence of the crack ever having been sealed.

17A This slide shows a side view of the same core shown in the previous picture. These three different examples of asphalt pavement deterioration beneath cracks are but a few of the may that we have seen. They all tell the same story, that the surface courses which contain the most asphalt show the least effects of stripping and

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erosion of material. They also show that we have more problems below the surface than was at one time realized. Is it any wonder that cracks such as this depress as shown here when there is the type of deterioration found under our pavement surfaces.

18A This is a slide of a crack on an asphalt resurfaced concrete pavement. Note the extensive deterioration and the lack of evidence that the transverse crack is ever been sealed. The darker strip across the slide about 2 feet in from the outer edge is where the widening crack reflected up through from our previously widened concrete pavements. This longitudinal crack is easily sealed with a moving operation using a squeegee box and emulsion. Over the years it has been kept sealed because it is very near the wheel track and very easy to seal.

19A
20A Here is another slide of a very similar situation. Note how the longitudinal widening crack sealing operation has prevented deterioration of a transverse crack through that area. Maybe that's just a superficial thing. Maybe we have just skimmed over the surface with some recently placed emulsion and the crack is really still there.

21A One method used for cleaning cracks prior to filling them is with a high pressure washer. This high pressure washer puts out 2,000 psi and very effectively cleans debris and loose particles from the cracks. Let's give that longitudinally sealed widening crack a heavy blast with this washer and see what happens.

22A This picture tells the story. There are hundreds of miles in Iowa of existing testimony to the fact that had transverse cracks been sealed as diligently as longitudinal cracks, the problems that exist now would not have developed.

23A This is the man who does the work and this is the equipment now being used to seal these cracks, a recirculating wand that allows the crack filling material to be placed practically all year around.

24A This is the operation, showing the boom to support the hoses and make the job easier for the operator.

25A You can see that the fine controls on the recirculating wand can lead to a neat job. A trained operator can seal joints in an asphalt pavement so neatly with this operation that they are totally invisible at normal highway speeds.

26A This slide shows how roadway surfaces are prepared prior to thin overlays, seal coats or slurry seals. The cracks are blown out with air or high pressure water and over filled with liquid emulsion, blotted with sand and opened to traffic for at least 30 days prior to the resurfacing.

27A This is a close-up picture of the same operation. This method helps to reduce reflective cracking and helps to seal the road surface from intrusion of water.

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28A This slide shows an area that should have been sealed using a squeegee. A wide squeegee with emulsion and sand would have helped tie these particles together.

29A Earlier you saw pictures of depressions in asphalt surface. We have also developed a method of correcting the depression problem quite economically and quite satisfactorily. This slide shows a depressed crack that can be resealed and leveled with slurry. First step is to blow the crack clean and fill the crack with liquid emulsion.

30A The next thing is to drop some fine mixed slurry over the crack.

31A And squeegee the slurry across the road.

32A This is the way the surface looks after the slurry has broken. On I-80 west of Des Moines, we have significantly improved the ride with this procedure. But do all of these processed of flushing out cracks, sealing cracks, squeegee filling the surface have any effect on the damage that has been caused within the surface due to aneglect in past years. We are hopeful that it is doing some good.

33A These cores are taken from a highway that had extensive deterioration below the surface. All of the procedures we have talked about were followed. Cracks were flushed clean with high pressure water, flooded with emulsion or on several occasions cut-back, and then when the pavement was pretty well saturated and the emulsion was no longer flowing down through the pavement as fast as it was applied to the surface, the surface depressions were squeegee sealed with slurry.

34A This is a close-up of those same cores. You will note that voids have been fairly well filled and you can see where the squeegee sealed surface depressions were filled with slurry. These slides have been shown to our field people. Pictures have been made of some of the deterioration and have been posted on many of the bulletin boards. Our people now realize that there is a reason to seal the pavement surface. We are providing all of the tools we can to help them and are selecting suggestions from them for ways to make the work easier. They are responding.

35A We have a few slides on our rubber asphalt operations. This first slide is the melter that we use for the rubber asphalt.

36A Cracks narrower than 3/4" are routed with a router similar to this.

37A The routed crack is blown free of any loose debris.

38A The crack is filled with rubber asphalt.

39A The rubber asphalt material is squeegeed immediately after being placed.

40A Leaving a crack sealed as is shown here.

Slide No.

41A This crack has been under traffic on the interstate for one year and it can be seen that the material placed on the surface is beginning to wear off but the crack itself is still sealed.

Crack filling pays. These pictures are evidence of that fact. What is the payback or what is the cost benefit ratio of filling cracks as opposed to not filling cracks. We do not know. Our cost accounting system does not tell us how much it cost in the past not to fill them and since we have just started into the program, it is not known how much increased longevity there will be due to crack filling. Existing pavements must be protected as an investment that cannot be replaced due to today's tight money situation. The cost of crack filling is rather small when considered against the cost of replacing a pavement. We cannot merely overlay a pavement that has deep down cancer from lack of previous maintenance. That cancer will reflect up through the surface in a very short time. Maintenance of existing pavements is important even though someday it may only be the base for another resurfacing.

42A Blank

Sealing joints and cracks by state forces cost $7.15 per gallon of sealant placed. Filling the crack between shoulder and pavement cost $1.95/gallon when done by state forces.

FORM 850027 4-72 H-10279

PROPOSAL FORM

Type of Work 615 Proj. No. MP-2587--69-66

System MAINTENANCE Miles County MITCHELL

Location and description ON IOWA 9 FROM 0.4 MI. EAST OF EAST JCT. U S 218, EAST, NORTH & EAST TO RICEVILLE

ROUTING & CRACK SEALING

Proposal of _____
(name of bidder)

(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

ESTIMATING

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and [illegible] including the special provisions contained herein and of the site of the work, and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease, and further understands that all quantities of work, whether increased or decreased, are to be performed at the unit prices stipulated herein; that the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials specified in the contract and to perform all work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$2,000.00	40 WORKING DAYS	NOV. 2, 1981	$70.00

PROPOSAL

To furnish a contract bond in an amount not less than 10 percent of the contract award, as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check, or bank draft in the amount of [illegible] the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting JUNE 23, 1981 9 00 AM

Signed Not To Be Used For Bidding

Form 850028 8-70 H-10279

MP-2587--69-66

615 (1-2-3) 41 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES

MITCHELL

(11-12-13) (15–25)

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX,XXX	XXXXX		
1	CLASS 1 ROUTING AND SEALING PER LIN. FT.	44,000 LIN. FT.				
2	CLASS 2 CLEANING AND SEALING PER LIN. FT.	1,000 LIN. FT.				
	TOTAL					
	SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS					
	501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION - SERIES OF 1977					
	#874 DECEMBER 16, 1980 GENERAL SUPPLEMENTAL SPECIFICATION					
	#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#876 DECEMBER 16, 1980 ADDENDUM TO TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS					
	SP-375 JUNE 23, 1981 CRACK CLEANING AND SEALING					
	502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.					
	530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.					
	518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.					

IOWA DEPARTMENT OF TRANSPORTATION
Ames, Iowa

SPECIAL PROVISIONS
for

CRACK CLEANING AND SEALING

June 23, 1981

THE STANDARD SPECIFICATIONS, SERIES OF 1977, ARE AMENDED BY THE FOLLOWING ADDITIONS AND MODIFICATIONS. THESE ARE SPECIAL PROVISIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

375.01 DESCRIPTION. This work shall consist of routing and cleaning of cracks in the asphalt cement concrete surface and sealing of the prepared cracks with a rubberized asphalt mixture.

375.02 MATERIALS.

A. Premixed rubberized asphalt joint sealer complying with proportion requirements will be acceptable for use.
B. The proportions of the two materials to be premixed (asphalt cement and ground rubber) shall be as follows:

Asphalt Cement *	75 percent + 2% by weight
Ground Rubber	25 percent ∓ 2% by weight

*AC-5(or 120-150 Penetration Grade), unless otherwise approved by the engineer.

C. The asphalt-rubber mixture shall not contain water or solvents and, when cooled to 140 F, shall not be picked-up or tracked by traffic.
D. The sealer shall be free of fabric, wire, or other contaminents, and the sealer manufacturer shall certify this to the engineer.

375.03 EQUIPMENT.

A. Routing equipment shall be mechanical and power driven, capable of cutting the cracks to the required dimensions. Equipment designed to "plow" the cracks to dimension will not be permitted.
B. Equipment used for heating and placing the premixed material shall be of the oil-jacketed, double-boiler type, capable of heating the material to 400 F and pumping the material into the prepared cracks.

375.04 CONSTRUCTION.

A. Class I Cracks - Cracks which have an average opening of 3/4 inch or less shall be routed to provide a minimum sealant reservoir of 3/4-inch width by a nominal 1-inch depth.
B. Class II Cracks - Cracks which have an average opening greater than 3/4 inch will not require routing, but they shall be thoroughly cleaned of all foreign material to a minimum depth of one inch.
C. Routed asphalt cement concrete and foreign material resulting from crack preparation shall be removed from the roadway by brooming, compressed air, or other methods satisfactory to the engineer.
D. Cracks shall be clean and dry prior to sealing. The entire crack reservoir shall be filled with sealant to a level even with the roadway surface. A narrow "V" shaped squeegee may be used to aid in placement of the sealant. Sealant on the roadway surface in excess of 1/2 inch on each side of the crack edge will not be acceptable.
E. All signs and skids are to be furnished by the Highway Division Office of Maintenance and will be made available at a nearby maintenance yard designated by the engineer, and the contractor shall return them upon completion of the work. All other traffic control devices, such as flaggers, barricades, traffic cones, and warning lights shall be furnished by the contractor. All traffic control devices are to be erected, maintained, and removed by the contractor.

375.05 METHOD OF MEASUREMENT.

A. Class I cracks will be measured by the linear foot, to the nearest linear foot, of cracks routed, sealed, and accepted.
B. Class II cracks will be measured by the linear foot, to the nearest linear foot, of cracks cleaned, sealed, and accepted.

375.06 BASIS OF PAYMENT.

A. Class I Routing and Sealing will be paid for at the contract price per linear foot.
Payment shall be full compensation for all labor, equipment, materials, and incidentals required for crack routing, cleaning, and furnishing and placing sealant.
B. Class II Cleaning and Sealing will be paid for at the contract price per linear foot. Payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning and furnishing and placing sealant.

Unless there is a separate contract item for traffic control, this payment will also be full compensation for traffic control.

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

17A MILES

LOCATION ON IOWA 9 FROM 0.4 MI. EAST OF EAST JCT. U S 218, EAST, NORTH & EAST TO RICEVILLE

BID ORDER NO. 517

COUNTY MITCHELL
TYPE OF WORK
PROJECT NO. MP-2587--69-66
DATE OF LETTING JUNE 23, 1981

NO.	ITEM	QUANTITY	UNIT	BROWER CONSTR. CO. SIOUX CITY, IOWA UNIT PRICE	BROWER CONSTR. CO. SIOUX CITY, IOWA AMOUNT	D.L. SHELDAHL CONST. CO. SLATER, IOWA UNIT PRICE	D.L. SHELDAHL CONST. CO. SLATER, IOWA AMOUNT	MANATTS, INC. BROOKLYN, IOWA UNIT PRICE	MANATTS, INC. BROOKLYN, IOWA AMOUNT
1	CLASS 1 ROUTING AND SEALING	44000	LIN. FT	.65	28,600 00	.75	33,000 00	.82500	36,300 00
2	CLASS 2 CLEANING AND SEALING	1000	LIN. FT	.64	640 00	.75	750 00	.66	660 00
	TOTAL				$29,240 00		$33,750 00		$36,960 00

NO TIES OR RESERVATIONS

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FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

17 B MILES

LOCATION ON IOWA 9 FROM 0.4 MI. EAST OF EAST JCT. U S 218, EAST, NORTH & EAST TO RICEVILLE

BID ORDER NO. 517

COUNTY MITCHELL
TYPE OF WORK
PROJECT NO. MP-2587--69-66
DATE OF LETTING JUNE 23, 1981

NO.	ITEM	QUANTITY	UNIT	PAVEMENT SPECIALISTS INC. NAPOLEON, OHIO UNIT PRICE	PAVEMENT SPECIALISTS INC. NAPOLEON, OHIO AMOUNT	DUIT CONSTRUCTION CO., INC. IOWA FALLS, IOWA UNIT PRICE	DUIT CONSTRUCTION CO., INC. IOWA FALLS, IOWA AMOUNT	WATERLOO CONSTR. CO. INC WATERLOO, IOWA UNIT PRICE	WATERLOO CONSTR. CO. INC WATERLOO, IOWA AMOUNT
1	CLASS 1 ROUTING AND SEALING	44000	LIN. FT	.83400	36,696 00	.89	39,160 00	.99	43,560 00
2	CLASS 2 CLEANING AND SEALING	1000	LIN. FT	.83400	834 00	.50	500 00	.99	990 00
	TOTAL				$37,530 00		$39,660 00		$44,550 00

NO TIES OR RESERVATIONS

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

17C MILES

LOCATION ON IOWA 9 FROM 0.4 MI. EAST OF EAST JCT. U S 218, EAST, NORTH & EAST TO RICEVILLE

BID ORDER NO. 517

COUNTY MITCHELL
TYPE OF WORK
PROJECT NO. MP-2587--69-66
DATE OF LETTING JUNE 23, 1981

NO.	ITEM	QUANTITY	UNIT	CEDAR VALLEY CORP. WATERLOO, IOWA UNIT PRICE	CEDAR VALLEY CORP. WATERLOO, IOWA AMOUNT	GANNON CONSTRUCTION CORP. COLFAX, IOWA UNIT PRICE	GANNON CONSTRUCTION CORP. COLFAX, IOWA AMOUNT	ALLSTATE PAVING, INC OSSEO, MINNESOTA UNIT PRICE	ALLSTATE PAVING, INC OSSEO, MINNESOTA AMOUNT
1	CLASS 1 ROUTING AND SEALING	44000	LIN. FT	1.05	46,200.00	1.48	65,120.00	1.55	68,200.00
2	CLASS 2 CLEANING AND SEALING	1000	LIN. FT	1.25	1,250.00	1.45	1,450.00	1.75	1,750.00
	TOTAL				$47,450.00		$66,570.00		$69,950.00

NO TIES OR RESERVATIONS

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FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

17.0 MILES

LOCATION ON IOWA 9 FROM 0.4 MI. EAST OF EAST JCT. U S 218, EAST, NORTH & EAST TO RICEVILLE

BID ORDER NO. 517

COUNTY MITCHELL
TYPE OF WORK
PROJECT NO. MP-2587--69-66
DATE OF LETTING JUNE 23, 1981

NO.	ITEM	QUANTITY	UNIT	PROGRESSIVE CONTR., INC. OSSEO, MINNESOTA UNIT PRICE	PROGRESSIVE CONTR., INC. OSSEO, MINNESOTA AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
1	CLASS 1 ROUTING AND SEALING	44000	LIN. FT	205	90,200 00				
2	CLASS 2 CLEANING AND SEALING	1000	LIN. FT	300	3,000 00				
	TOTAL				$93,200 00				
	NO TIES OR RESERVATIONS								

CRACK AND JOINT SEALING OF CONCRETE PAVEMENT

Slide No.

Although a high percentage of Iowa's highways are Portland Cement Concrete with contraction joints placed from 20' to 76' on initial construction, very little joint maintenance has been done on our highways. Many of our concrete pavements are in excess of 30 years old and have never had any resealing of contraction joints.

On original construction, most of our primary highways had contraction joints sawed at 20' spacings to control transverse cracking. These joints were sealed with a hot pour material. The Interstate system was primarily constructed with dowel-basket assemblies at 76' centers for load transfer and mesh reinforcement placed between the baskets. Most of the mesh reinforced interstate developed two cracks between the 76' dowel-basket assemblies. We expected this type of cracking and it was hoped that the mesh reinforcing and aggregate interlock would prevent faulting at these intermediate cracks. In most areas this principle worked reasonably well. We did have problems, however, with the joint seal at contraction joints that were placed over the dowel-basket assemblies when the dowel-baskets functioned properly during cold weather contraction of the pavement. This allowed incompressables and water to enter these contraction joints and as the pavement expanded during warmer weather the joints could not completely close causing excessive pressures to build up in our pavements. The result was that after a few years, we began to have blow-ups developing in some pavements. Of course this same problem was also evident on some of our primary highways. It seemed that some pavements were more susceptible to blow-ups than others and that once blow-ups began to occur on a highway the frequency increased.

One interstate section was especially bad for developing blow-ups. This section was north of Des Moines on I-80. The highway carries 25,000 vehicles per day and began developing blow-ups after it was about 10 years old. After the first blow-up appeared, the number of blow-ups doubled each year until there were about 50 lane blow-ups in one year on about 15 centerline miles of interstate. We initiated an experiment to see if the damage caused by these blow-ups could be reduced by cutting pressure relief joints in the pavement. The informal research project indicated that blow-ups could practically be eliminated with 4" pressure relief joints cut every 1,000 feet. A contract was let to accomplish this on the interstate belt-line around Des Moines. The following year there were no blow-ups. The concept was used statewide and in adjoining states creating a need for small contractors to get into the business of cutting pressure relief joints in concrete pavements.

Blow-up relief seemed to last about four years until the joints closed. Blow-ups then began to reoccur. Pressure relief joints had to be recut. The recent joints performed again until about four years later when there was evidence of pressure building again in the pavement. Another series of special relief joints were being planned when we noticed that something was happening to the contraction joints. A review of the pavements showed that the contraction joints had all opened about 3/4" and were filled with incompressables. Field reviews of other highways across the state where we had cut pressure relief joints yielded the same picture. The pressure relief joints had been kept functioning by inserting a high quality foam material that kept incompressables out so the pavement relief joint completely closed, allowing contraction joints which were no longer sealed to fill with incompressibles and take up the slack as the pavements moved towards the pressure relief joint. Another problem developed, as pressure in the concrete slab was relieved, existing full depth patches loosened, became floaters and settled as much as 2 inches requiring an asphalt surface repair.

We have some slides of our pressure relief joint construction.

43A This is the type of machine that we use to cut the pressure relief joint with. This is a state owned machine. We have two of these machines. We also have many contractors in Iowa that are equipped to do this kind of work.

44A This is the machine actually beginning a cut through the concrete pavement.

45A This slide shows the foam material being placed.

46A This is a picture of the foam in place set slightly below the surface elevation of the concrete.

47A Here is a joint that has been in place for some time. It is at the end of a bridge where we try to maintain at least a 2 inch pressure relief joint at all times to avoid the pavement crowding in and damaging the back wall.

48A This is a pressure relief joint that is completely closed and would be recut if we were concerned about maintaining relief in the pavement and preventing blow-ups.

49A This, however, is the next joint to that one that is completely closed. It's only about 40 feet away and it is open 3/4 of an inch.

50A This is a pressure relief joing on Interstate 35 north of Des Moines. This joint has been in existence for several years and has been recut at least once. At the present time it is still open a couple inches providing plenty of pressure relief.

51A This is the next joint to that pressure relief joint we just saw. It is open about 2 inches.

52A This is a contraction joint midway between two pressure relief joints and it is open almost 2 inches.

53A This picture shows the next pressure relief joint. They are spaced 1000 ft. apart and all of the joints between the two pressure relief joints are open between 1 and 2 inches with still 2 inches of compression left in the pressure relief joint.

54A A similar problem exists where we have maintained pressure relief at our bridges without proper joint sealing of the contraction joints ahead of these pressure relief joints. This is a picture taken looking toward a bridge on an interchange in the Des Moines area on Interstate 80.

55A This is a pressure relief joint on that road that was installed at the end of the bridge to provide pressure relief, but bridge approach settlement has necessitated an overlay and the overlay is breaking down at the pressure relief joint.

56A A new pressure relief joint was cut about 50 feet from the previous one and it has never been filled.

57A This crack is within 50 feet of the previous pressure relief joint that had not been filled. It is open about 2 1/2 inches.

58A Even with all of those open cracks and joints, the local area supervisor called our state machine in to recut pressure relief at this bridge. This is the joint our crew cut before they went to the telephone and called us to come down and review the problem of all of the open joints and cracks. This is the first joint away from the newly cut pressure relief joint. It is open a full 2 inches.

59A Here is another joint just 76 feet from the previous one and it is open a full inch and a half.

60A The next joint, 76 feet away, is open almost 2 inches.

61A The next joint, 76 feet from the last one, is open well over 1 inch.

62A And this one is also open in excess of 1 inch as are all of the rest of the joints on this section of Interstate where pressure relief has been cut at least twice.

63A I am sure all of you know the theory behind aggregate interlock and how we have relied upon it in the past to transfer load from one slab to the other. This slide shows that it is practical if the slabs are kept tightly placed together.

64A

In constructing our pavements we cut control to establish contraction joints perpendicular to the centerline of the highway. As this slide shows these cracks generally establish themselves soon after the concrete is placed and during the curing process. Initial hot weather expands the concrete and if it is not restrained from moving it will extend its length. The concrete then cools after a cool night or cool rain opening up the contraction joints if there is no force that causes the pavement to move back to its initial length. These open contraction joints then collect incompressibles and the next hot weather causes the pavement to expand and grow an additional amount equal to the thickness of the incompressibles in all of the contraction joints. As long as the pavement remains unrestrained this process will continue to allow the pavement to grow as long as the pavement is unrestrained and the contraction joints unfilled.

65A
Blank

What have we learned from our experience with pressure relief joints? First, if we had diligently maintained a tight seal in our contraction joints, our blow-up problem would not have reached a stage so critical that we had to take the measures we did in cutting pressure relief joints. Secondly, if we had sealed all of the contraction joints and random cracks at the time we cut our first pressure relief joints, possibly those joints would still be functioning and would never have had to be recut.

Needless to say, we have changed our approach to pavement blow-ups and joint problems in Iowa. We have practically stopped cutting pressure relief joints in anticipation of problems. At the present time they are only being cut to relieve pressure on bridge backwalls and to correct critical blow-up problems. There must be evidence of pressure buildup in the slab before pressure relief joints are cut. The cost of constructing these relief joints with state personnel was about $17 per lineal foot in 1982. Contract work on large quantities cost approximately the same.

Starting in 1982 we let our first contract for resealing concrete pavement contraction joints and transverse cracks. Of course, the jury is still out on the overall long term benefits of resealing joints. We do know that cutting pressure relief in our pavements is not solving our problems. We expect that maintaining a good tight seal will reduce blow-ups, decrease faulting and maintain a more stable sub-grade because surface water will be sealed out.

We developed a new Special Provision 395 (attached), dated April 13, 1982, to cover joint sealing work. We decided that we were to spend the time, effort and money to seal the cracks, it should be done in a manner to provide the greatest possible long term benefit. We therefore called for sawing all joints less than 1/2" wide to a 1/2" width, placing backer rod and placing the best quality sealer that we could identify through our

laboratory testing process. Cracks wider than 1/2" were merely sandblasted clean and filled after a backer rod was placed. Cracks of less width were routed to 1/2", sandblasted and, after backer rod was placed, sealed to make the pavement surface as water tight as possible.

Four projects were completed in 1982, the largest one involving nearly 300,000 lineal feet of joint and crack sealing. The cost of this work including removal of the old sealant material, sawing and/or routing of the joint or crack, sandblasting the surface of the joint or crack to be sealed to provide an absolutely clean surface, placing the backer rod and filling with SOF-SEAL by W.R. Meadows was about $0.60 (60¢) a lineal foot. Smaller contracts showed low bids in the area of 80¢ to $1.10 per lineal foot. As mentioned before, the jury is still out on the cost effectiveness of this work. We are, however, confident enough in the procedure that a very extensive program of resealing joints is being scheduled for 1983.

The work of resealing joints in Iowa is probably very similar to that in other states.

66A Our specifications require that the old material be removed and this slide shows the contractor removing the old seal with a hook on a loader bucket.

67A Another picture of the same operation.

68A The joint is then sawed to 1/2 inch in width and about 1 1/4" inch in depth.

69A This shows a freshly sawed joint.

70A The joint is then blown clean.

71A And sandblasted so that the sides of the joint are cleaned of all sawing residue.

72A
73A Backer rod is placed in the joint to an elevation of about 3/4 of an inch below the surface of the pavement.

74A And the joint is sealed with hot pour material. We are currently using soft seal for this sealant.

75A This is a freshly sealed joint that we hope will give many years of service.

76A Random cracks are similarly treated except they are routed, sandblasted and backer rod is placed.

77A The joint is then sealed in the same manner as are the contraction joints.

78A Blank.

79A Another problem that has occurred on many of our Portland Cement pavements is the faulting of joints. We question the wisdom of merely resealing joints that are already faulted and pumping. Earlier this year the first project for undersealing and pavement jacking to eliminate faulting was completed. On this project the contraction joints had faulted up to 3/4". A contract for pressure grouting with flyash was awarded to Hosapple Mud-Jacking Company of Topeka, Kansas. The pressure grouting under this contract was performed through two inch diameter holes drilled in a pattern selected by the contractor with concurrence from the contracting authority. This six mile project cost about $40,000 a mile exclusive of some sub-drain work that was done in conjunction with the undersealing. Type I cement was used with three parts of Type F flyash per one part of cement. Water was added to produce a flow cone eflux of from 16 to 26 seconds. When the flyash was not setting quickly enough, a switch was made to a Type C flyash. The Type C flyash was blended in at a ratio of one part cement to four parts of flyash. The new proportions and different flyash set rapidly enough that the road could be opened to traffic within two hours.

80A The slide shows the drill used by the contractor. Substantial spalling on the underside of slab occurred with this drilling rig. Possibly hand-held, lighter duty equipment would have been more appropriate.

81A The slide shows the hole pattern that was used. To start with there were five holes per panel with three holes in the right wheel path and two holes in the inside wheel path. The holes were drilled through the concrete with minimal penetration into the subgrade.

82A The contractor used this truck-trailer combination equipped with hopper bins and a belt for proportioning the cement and flyash into a paddle mixer.

83A The flyash slurry was pumped through this hose and into the holes drilled in the pavement. It was obvious as the pumping operation began that there were voids under the pavement because of the large quantity of water that was flushed out as the grout was pumped in. You may also see the piano wire string line that was stretched along the outer edge of the pavement as control to reference slab movement.

84A This slide shows the water boiling up from the pavement joint as the operation began. It is hard to see but the water shot up about two inches from the full width of the joint.

85A As the grouting continued, the clear water changed to the grout color indicating that the void had been filled. Continued pumping would tend to raise the slab and eliminate the faulting condition. If aggregate interlock proved to be a problem, a

full depth saw cut was made through the joint to relieve the interlock.

86A Blank

We have a second undersealing and pavement jacking project underway on the interstate in eastern Iowa. The interstate slabs is not faulted at the dowel assembly contraction joints but instead at the intermediate random cracks. So far faulting has not been corrected because due to aggregate interlock, the pavement at these locations will not slip. Colder weather may cause the pavement to back off enough that the aggregate interlock will be decreased, and faulting lessened. A part of this contract also includes resealing the joints.

Again, long term benefits and cost benefit ratios cannot yet be determined on this work which we just started doing in 1982.

FORM 656027 4-72 H-30E79

PROPOSAL FORM

621

Type of Work CONCRETE PAVEMENT REPAIR

Proj. No. NP-1668--69-D1

System MAINTENANCE Miles County DISTRICT 1

Location and description ON U S 30 FROM U S 69 (STORY COUNTY) TO NEAR JCT. IOWA 234 (MARSHALL COUNTY)

ROUTING & CRACK SEALING

Proposal of _____
(name of bidder)

(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and [illegible] and the bidder understands that the quantities of work shown herein are approximate [illegible] and that all quantities of work, whether increased or decreased, are to be [illegible] the unit prices stipulated herein; the bidder proposes to furnish the necessary machinery, equipment, tools, labor and other means of construction and to furnish all materials specified and to do the work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

ESTIMATING

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$11,000.00	60 WORKING DAYS	OCT. 29, 1982	$140.00

PROPOSAL

To furnish a contract bond [illegible] not less than 100 [illegible] of contract award, as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and [illegible]

Enclosed herewith find certified check, cashier's check or bank draft [illegible] the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting APRIL 13, 1982 9 00 AM

Signed Not To Be Used For Bidding

MP-1668--69-01

CONTRACTOR'S NUMBER

SCHEDULE OF PRICES DISTRICT 1
CONCRETE PAVEMENT REPAIR

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX.XXX	XXXXX		
1	CLASS 1 CRACKS, ROUTING & SEALING PER LIN. FT.	6,600 LIN. FT.				
2	CLASS 2 CRACKS, CLEANING & SEALING PER LIN. FT.	1,400 LIN. FT.				
3	CLASS 3 JOINTS, SAWING & SEALING PER LIN. FT.	222,000 LIN. FT.				
4	CLASS 4 JOINTS, CLEANING & SEALING PER LIN. FT.	42,000 LIN. FT.				
5	TRAFFIC CONTROL	LUMP SUM				
	TOTAL					

SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS

501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION -- SERIES OF 1977

#899 FEBRUARY 16, 1982 GENERAL SUPPLEMENTAL SPECIFICATION

#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)

#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS

SP-395 APRIL 13, 1982 SPECIAL PROVISIONS FOR CRACK AND JOINT CLEANING AND SEALING (PORTLAND CEMENT CONCRET PAVEMENT)

502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.

518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.

ARTICLE 1109.03 DOES NOT APPLY

SEE ADDITIONAL ATTACHED REQUIREMENTS

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION ON U S 30 FROM U S 69 (STORY COUNTY) TO NEAR JCT. IOWA 234
6A MILES (MARSHALL COUNTY)

BID ORDER NO. 506

COUNTY DISTRICT 1
TYPE OF WORK CONCRETE PAVEMENT REPAIR
PROJECT NO. MP-1668--69-D1
DATE OF LETTING APRIL 13, 1982

NO.	ITEM	QUANTITY	UNIT	STA-BILT CONSTR. CO. HARLAN, IOWA UNIT PRICE	STA-BILT CONSTR. CO. HARLAN, IOWA AMOUNT	HIGHWAY SERVICES, INC. MINNEAPOLIS, MINNESOTA UNIT PRICE	HIGHWAY SERVICES, INC. MINNEAPOLIS, MINNESOTA AMOUNT	WATERLOO CONSTR. CO. INC WATERLOO, IOWA UNIT PRICE	WATERLOO CONSTR. CO. INC WATERLOO, IOWA AMOUNT
1	CLASS 1 CRACKS, ROUTING & SEALING	6600	LIN. FT	.72	4,752 00	.70	4,620 00	.87700	5,788 20
2	CLASS 2 CRACKS, CLEANING & SEALING	1400	LIN. FT	.60	840 00	.70	980 00	.62600	876 40
3	CLASS 3 JOINTS, SAWING & SEALING	222000	LIN. FT	.61	135,420 00	.64	142,080 00	.74	164,280 00
4	CLASS 4 JOINTS, CLEANING & SEALING	42000	LIN. FT	.60	25,200 00	.73	30,660 00	.74500	31,290 00
5	TRAFFIC CONTROL	LUMP SUM			2,000 00		14,000 00		17,220 00
	TOTAL				$168,212 00		$192,340 00		$219,454 60

NO TIES OR RESERVATIONS

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION ON U S 30 FROM U S 69 (STORY COUNTY) TO NEAR JCT. IOWA 234

6B MILES (MARSHALL COUNTY)

BID ORDER NO. 506

COUNTY DISTRICT 1
TYPE OF WORK CONCRETE PAVEMENT REPAIR
PROJECT NO. MP-1668--69-D1
DATE OF LETTING APRIL 13, 1982

NO.	ITEM	QUANTITY	UNIT	ALLSTATE PAVING, INC. MAPLE GROVE, MINN. UNIT PRICE	ALLSTATE PAVING, INC. MAPLE GROVE, MINN. AMOUNT	HAINES AND MAY, INC. TOPEKA, KANSAS UNIT PRICE	HAINES AND MAY, INC. TOPEKA, KANSAS AMOUNT	L. M. BATEMAN CONSTRUCTION CO. MASON, MICHIGAN UNIT PRICE	L. M. BATEMAN CONSTRUCTION CO. MASON, MICHIGAN AMOUNT
1	CLASS 1 CRACKS, ROUTING & SEALING	6600	LIN. FT	.90	5,940.00	1.26	8,316.00	1.00	6,600.00
2	CLASS 2 CRACKS, CLEANING & SEALING	1400	LIN. FT	.42	588.00	1.26	1,764.00	.85	1,190.00
3	CLASS 3 JOINTS, SAWING & SEALING	222000	LIN. FT	.80	177,600.00	.90	199,800.00	1.35	299,700.00
4	CLASS 4 JOINTS, CLEANING & SEALING	42000	LIN. FT	.43	18,060.00	.90	37,800.00	.85	35,700.00
5	TRAFFIC CONTROL	LUMP SUM			19,881.00		20,000.00		29,000.00
	TOTAL				$222,069.00		$267,680.00		$372,190.00

NO TIES OR RESERVATIONS

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION ON U S 30 FROM U S 69 (STORY COUNTY) TO NEAR JCT. IOWA 234
6C MILES (MARSHALL COUNTY)

BID ORDER NO. 506

COUNTY DISTRICT 1
TYPE OF WORK CONCRETE PAVEMENT REPAIR
PROJECT NO. MP-1668--69-D1
DATE OF LETTING APRIL 13, 1982

NO.	ITEM	QUANTITY	UNIT	PROGRESSIVE CONTR., INC. OSSEO, MINNESOTA UNIT PRICE	PROGRESSIVE CONTR., INC. OSSEO, MINNESOTA AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
1	CLASS 1 CRACKS, ROUTING & SEALING	6600	LIN. FT	1.40	9,240.00				
2	CLASS 2 CRACKS, CLEANING & SEALING	1400	LIN. FT	1.75	2,450.00				
3	CLASS 3 JOINTS, SAWING & SEALING	222000	LIN. FT	1.45	321,900.00				
4	CLASS 4 JOINTS, CLEANING & SEALING	42000	LIN. FT	1.45	60,900.00				
5	TRAFFIC CONTROL	LUMP SUM			40,000.00				
	TOTAL				$434,490.00				

NO TIES OR RESERVATIONS

IOWA DEPARTMENT OF TRANSPORTATION

Ames, Iowa

SPECIAL PROVISIONS
FOR
CRACK AND JOINT CLEANING AND SEALING
(PORTLAND CEMENT CONCRETE PAVEMENT)

April 13, 1982

395.01 DESCRIPTION. This work shall consist of routing or sawing and cleaning of random cracks and existing transverse and longitudinal joints in portland cement concrete pavement and sealing the prepared cracks and joints with an approved sealing material.

395.02 MATERIALS. Joint sealer and backer rope shall meet requirements of 4136.02A (see General Supplemental Specifications). The diameter of the backer rope shall be a minimum of one nominal size larger than the prepared reservoir for the crack or joint to be sealed.

395.03 EQUIPMENT. Routing equipment, where required, shall be mechanical and power driven, capable of cutting the cracks to the required dimensions without excessive spalling of the adjacent surface.

Sawing equipment, where required, shall be power driven (wet or dry) capable of sawing the sealant reservoir to the dimensions shown on the plans.

Water cleaning equipment shall be capable of delivering water with a pressure of 2,000 psi from a nozzle to the crack or joint being cleaned, to remove existing joint sealer, debris, and loose material from the crack or joint.

Sand blast equipment shall be capable of removing the existing sealant, saw slurry, silt or other foreign material form the vertical face of the crack or joint to the specified depth, leaving a clean, newly exposed concrete surface.

Air compressors shall be of sufficient size to blow sand and other foreign material from the prepared crack or joint prior to placing the sealant material.

Equipment used for heating and placing hot-pour sealant material shall be an oil-jacketed, double boiler type, heating kettle or other thermostatically controlled equipment of a type approved by the engineer, capable of heating the material to 400°F. and pumping the material into the prepared crack or joint.

Auxiliary equipment, such as brooms, scrapers, etc., shall be provided as necessary to perform the work.

395.04 CONSTRUCTION.

A. Class I Cracks. Random cracks having an average opening of less than 1/2 inch shall be routed to provide a sealer reservoir as shown on the plans. Sides of the sealer reservoir shall be near vertical. Prior to placing sealer, light sand blasting will be required to remove latent material, dust, etc.

B. Class II Cracks. Random cracks having an average opening of 1/2 inch or greater will not require routing, but they shall be thoroughly cleaned with high-pressure water or compressed air. Following the initial cleaning, each crack shall be sand blasted to a minimum depth of one inch, leaving a clean, newly exposed concrete surface on the vertical faces.

C. Class III Joints. Existing joints having an average opening of less than 1/2 inch shall be sawed (wet or dry) to provide a sealer reservoir as shown on the plans. Existing joint sealer may need to be removed by high-pressure water or other methods approved by the engineer prior to sawing. Prior to placing sealer, light sand blasting will be required to remove latent material, dust, etc.

D. Class IV Joints. Existing joints having an average opening of 1/2 inch or greater will not require sawing, but the existing joint sealer shall be removed from the joint by high-pressure water or other methods approved by the engineer. Following removal of the existing sealer, each joint shall be sand blasted to a minimum depth of one inch, leaving a clean, newly exposed, concrete surface on the vertical faces.

Cracks and joints shall be dry and blown clean with compressed air prior to placing the backer rope and joint sealer. Cracks and joints shall be filled to the level shown on the plans.

Sealer material shall be heated, handled, and applied according to the manufacturer's recommendations.

395.05 TRAFFIC CONTROL. All signs and traffic control devices, such as flaggers, barricades, traffic cones, warning lights, and pilot car signs (when required) shall be furnished by the contractor. All traffic control devices are to be erected, maintained, and removed by the contractor.

The work shall be conducted on only one-half the pavement width at a time.

The work schedule shall be adjusted so that all barricades and equipment are removed from the roadbed from 30 minutes before sunset to 30 minutes after sunrise. No work will be permitted on Sundays or holidays described in 1108.03.

Articles 1107.08 and 1107.09 shall apply.

395.06 METHOD OF MEASUREMENT. The engineer will compute from measurements the lengths of cracks and joints satisfactorily cleaned and sealed in each of the following categories:

Class I Cracks;
Class II Cracks;
Class III Joints;
Class IV Joints.

395.07 BASIS OF PAYMENT.

A. Class I Cracks, Routing and Sealing. For the number of linear feet of Class I Cracks, Routing and Sealing, the contractor will be paid for the contract price per linear foot. This payment shall be full compensation for all labor, equipment, materials and incidentals required for crack routing, cleaning, sand blasting, and furnishing and placing backer rope and sealer.

B. Class II Cracks, Cleaning and Sealing. For the number of linear feet of Class II Cracks, Cleaning and Sealing, the contractor will be paid the contract price per linear foot. This payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning, sand blasting, and furnishing and placing backer rope and sealer.

C. Class III Joints, Sawing and Sealing. For the number of linear feet of Class III Joints, Sawing and Sealing, the contractor will be paid the contract price per linear foot. This payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning, sawing, sand blasting, and furnishing and placing backer rope and sealer.

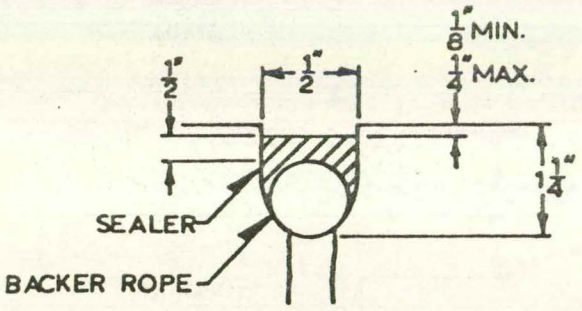
D. Class IV Joints, Cleaning and Sealing. For the number of linear feet of Class IV Joints, Cleaning and Sealing, the contractor will be paid the contract price per foot. This payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning, sand blasting, and furnishing and placing backer rope and sealer.

E. Traffic Control. For traffic control, the contractor will be paid the lump-sum contract price. This payment shall be full compensation for furnishing all signs, barricades, flaggers, and other traffic-control devices required for this work.

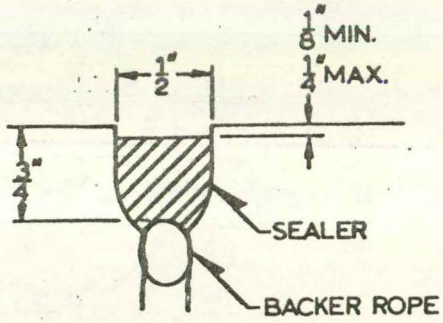
(Story-Marshall County) DISTRICT 1
Concrete Pavement Repair
MP-1668--69-D1

CLASS I CRACK

(RANDOM CRACK LESS THAN $\frac{1}{2}$" IN WIDTH)



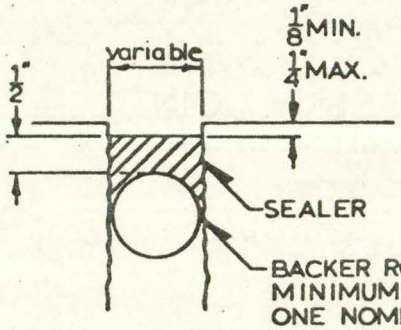
ALTERNATE 1



ALTERNATE 2

CLASS II CRACK

(RANDOM CRACK $\frac{1}{2}$" OR WIDER)

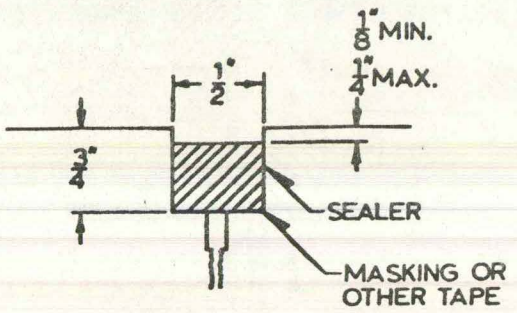


(Story-Marshall County)
Concrete Pavement Repair
MP-1668--69-D1

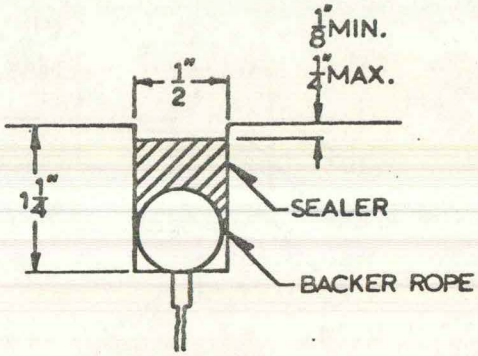
DISTRICT 1

CLASS III JOINT

(EXISTING JOINT LESS THAN $\frac{1}{2}$" WIDE)



ALTERNATE 1

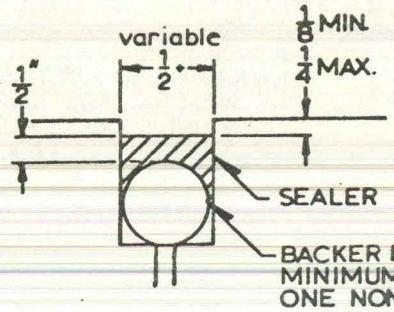


ALTERNATE 2

NOTE: CENTER $\frac{1}{2}$" SAW CUT OVER EXISTING JOINT

CLASS IV JOINT

(EXISTING VARIABLE WIDTH JOINT $\frac{1}{2}$" OR GREATER)



FORM 650027 4-72 H-10279

PROPOSAL FORM

Type of Work 608 CONCRETE PAVEMENT REPAIR

Proj. No. MP-6923--69-D6

System MAINTENANCE

Miles

County DISTRICT 6

Location and description AT VARIOUS LOCATIONS IN IOWA, JOHNSON AND CEDAR COUNTIES

PRESSURE RELIEF JOINTS

Proposal of ____
(name of bidder)

____
(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

ESTIMATING

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract form, including the special provisions contained herein, and of the site of the work and the bidder understands that the quantities of work shown herein are approximations only and are subject to increase or decrease, and further understands that all quantities of work, whether increased or decreased, are to be performed at the unit prices stipulated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials specified in the manner and at the time prescribed and to do the work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$4,000.00	50 WORKING DAYS	DEC. 1, 1981	$105.00

PROPOSAL

To furnish a contract bond in an amount not less than 100 percent of contract award, as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check, or bank draft on a solvent bank or a bid bond in the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting JUNE 23, 1981 9 00 AM

Signed Not To Be Used
For Bidding

Form 650026 8-70 H-10279

MP-6923--69-D6

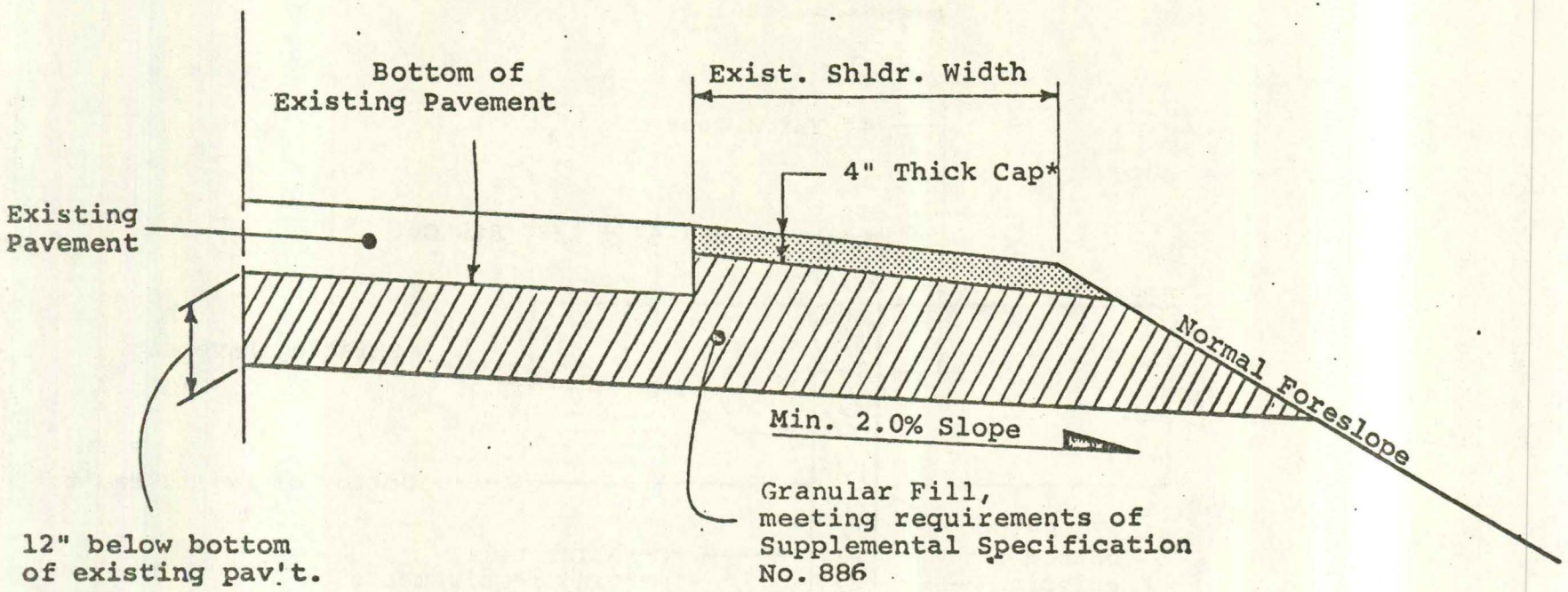
608 (1-2-3) 41 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES DISTRICT 6
CONCRETE PAVEMENT REPAIR

(11-12-13) (15–25)

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX.XXX	XXXXXX		
1	JOINT, PRESSURE RELIEF PER LIN. FT.	4,436 LIN. FT.				
	TOTAL					
	SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS					
	501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION - SERIES OF 1977					
	#874 DECEMBER 16, 1980 GENERAL SUPPLEMENTAL SPECIFICATION					
	#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#876 DECEMBER 16, 1980 ADDENDUM TO TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS					
	#886 MAY 27, 1981 PAVEMENT REPAIR					
	SP-293 APRIL 22, 1980 CONSTRUCTING PRESSURE-RELIEF JOINTS					
	502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.					
	518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.					
	ALL CUTS TO BE MADE ARE IN NON-REINFORCED CONCRETE					
	SEE ADDITIONAL ATTACHED REQUIREMENTS					

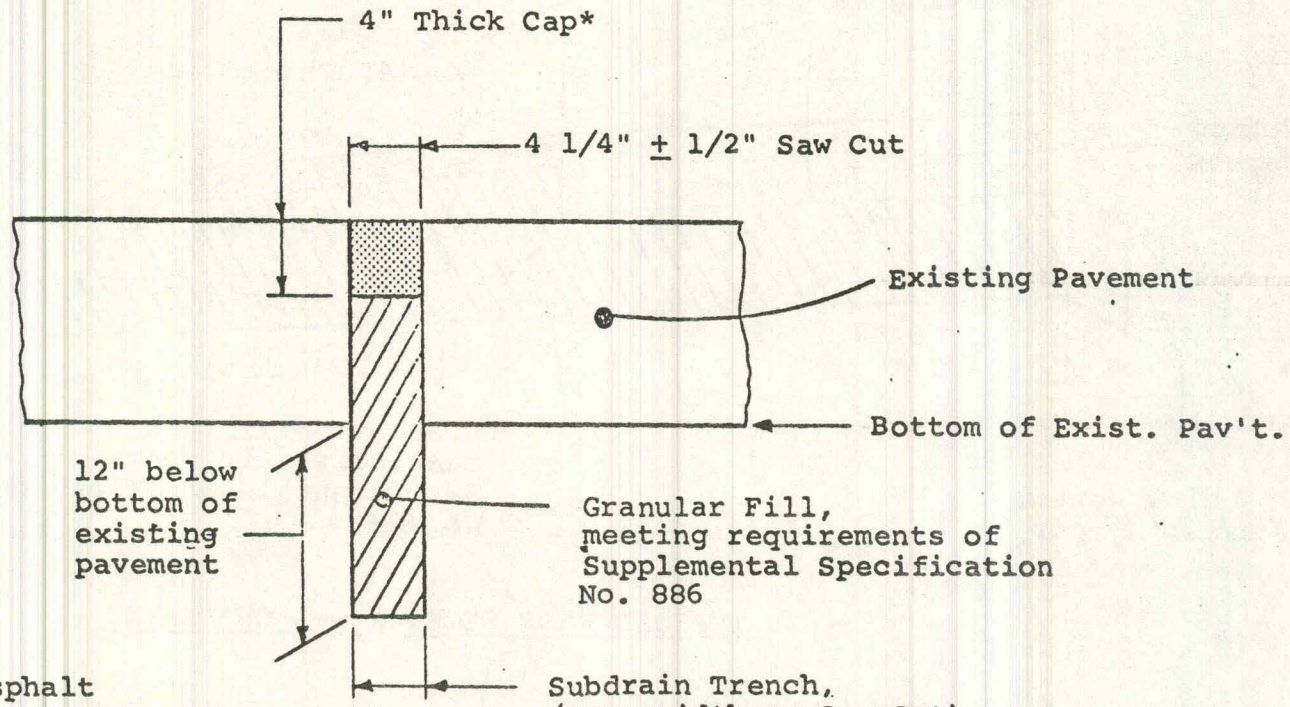


TYPICAL HALF SECTION --- SUBDRAIN

* Paved Shoulder - 4" Thick Asphalt Cement Concrete Cap. (Commercially Available Mix)

* Stabilized Shoulder - Fill to Existing Shoulder Level With Granular Fill.

* Earth Shoulder - Plastic Film, or other silt barrier material to be placed on top of coarse aggregate. Backfill and capped with 4" of existing earth.

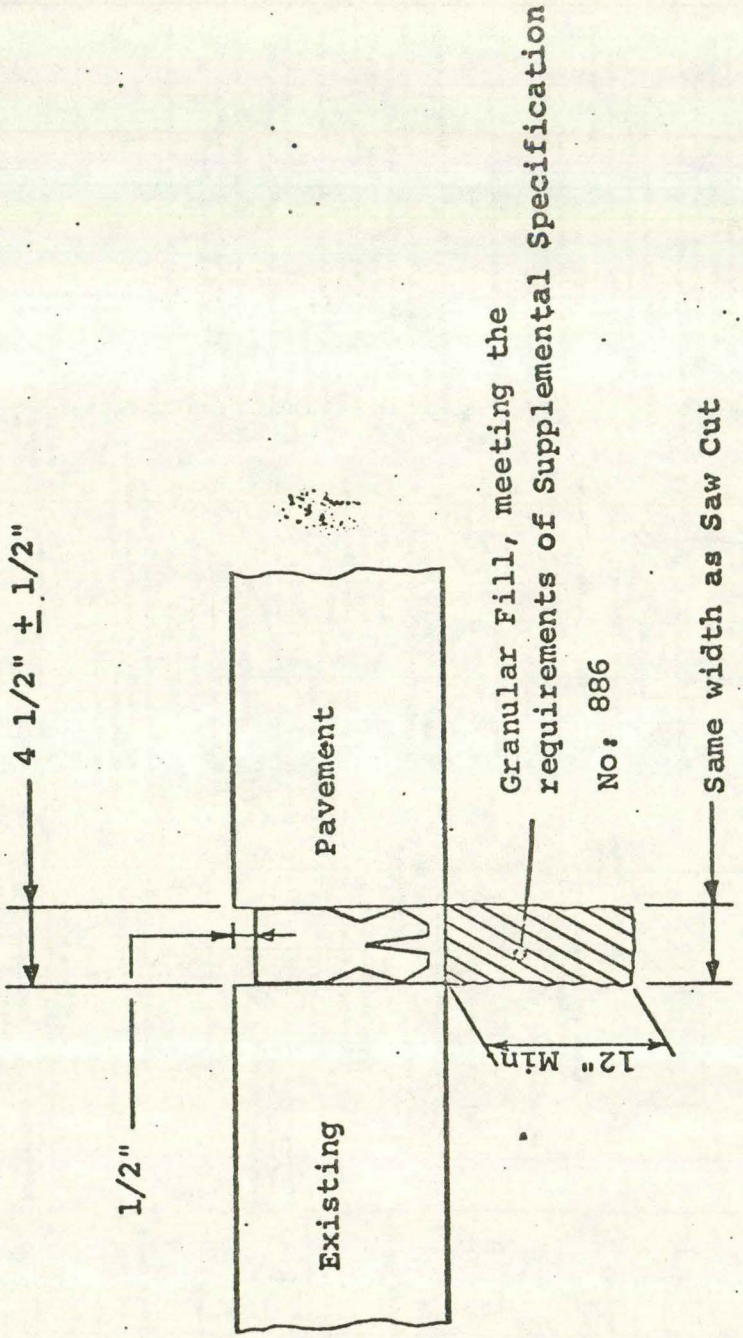


CROSS SECTION --- SHOULDER SUBDRAIN

* Paved Shoulder - 4" Thick Asphalt Cement Concrete Cap. (Commercially Available Mix)

* Stabilized Shoulder - Fill to Existing Shoulder Level With Granular Fill.

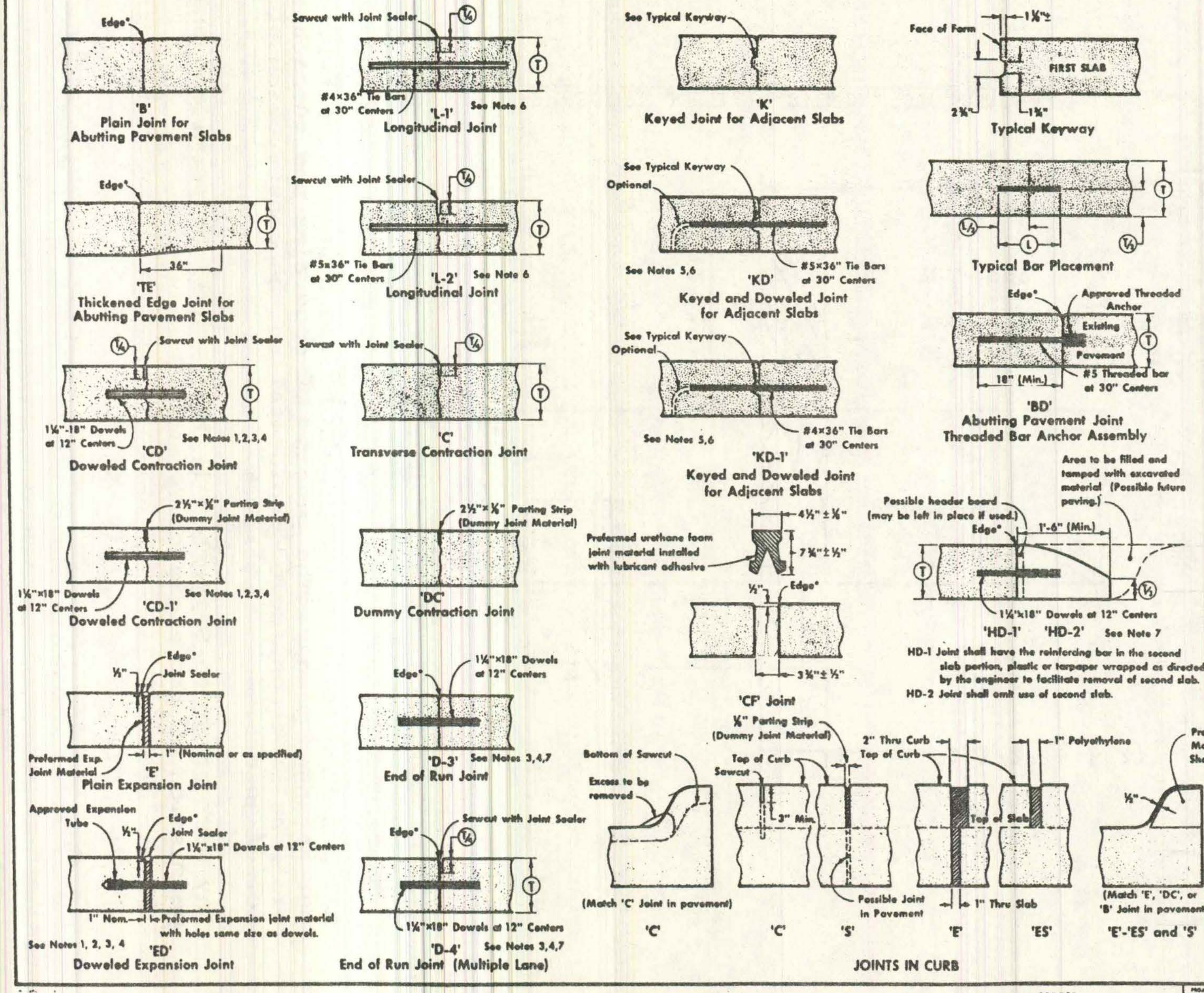
* Earth Shoulder - Plastic Film, or other silt barrier material to be placed on top of coarse aggregate. Backfill and capped with 4" of existing earth.



PRESSURE RELIEF JOINT WITH SUBDRAIN

All pressure relief joints shall be constructed with subdrains as per attached plans. The placing of subdrains and furnishing granular fill shall be considered incidental to the construction of pressure relief joints.

Any work prior to September 1, 1981, shall be permitted only by permission of the engineer.



GENERAL NOTES:

All materials and construction features used in the construction of pavement joint shall conform to the requirements of current Standard Specifications. Refer to appropriate other Standard Road Plans and project plans for additional information. Alternate methods for construction of joints may be submitted to the engineer for consideration. All methods of construction shall be such that a joint substantially as indicated hereon results.

Dowels for "CD","CD-1" and "ED" joints shall be properly positioned by the use of an approved support assembly. Tie bars shall be held in place by approved devices or methods approved by the engineer. Bars placed after concrete slab is poured shall be installed prior to vibration of pavement slab. Width of saw cut in pavement shall be a minimum of ⅛ inch.

All preformed joint material shall be installed perpendicular to pavement surface and care shall be exercised throughout the construction of the pavement to ensure that such joint material remains in proper position upon completion of paving operation.

An "End of Run" joint shall be as detailed hereon for a "D-3" joint except use as a D-4 joint when adjacent to an existing joint in multiple lane pavement.

*Edge with ¼" radius tool for length of joint indicated.

SPECIAL NOTES:

1. Alternate ends of dowels shall be free moving in the support assembly.
2. The free end half of dowel bar shall be coated as directed by the engineer to prevent bond with that portion of pavement.
3. The contractor may, at his option, install high density polyethylene coated dowel bars of ⅛ inch less dia. Details of such installation shall be direct by the engineer.
4. Where "T" is 7" or less, dowel bar diam. may be reduced to not less than ⅝ inch.
5. In lieu of using an approved bar support, a bar of appropriate length may be bent as indicated with the tip supporting bar in proper position.
6. Bar dimensions shown are for deformed steel. Smooth steel bars of 60 inches in length may be substituted. Bar diameter and spacing shall remain the same unless otherwise directed by the engineer.
7 Contractor may, at his option, substitute #10 rebars of the same length.

Highway Division	
Department of Transportation, Iowa	STANDARD ROAD PLAN — RH-2
RECOMMENDED	George F. Sisson, Road Design Engineer, 7/3/78
APPROVED	Deputy Chief Engineer, 7/10/78
LAST REVISION / ADD NOTES 1 & 4 TO 'ED' JOINT	No. 14, Date 8-4-78

P.C. CONCRETE PAVEMENT JOINTS

COUNTY

Highway No.	Depth	Location	New Cut Lengths	Recut Lengths
I-80	10"	M.P. 205-225	41 @ 24' = 984'	44 @ 24' = 1056'
		Ramps	6 @ 20' = 180'	16 @ 20' = 320'
Ia.149	10"	I-80 Interchange		4 @ 24' = 96'
I-80	10"	M.P. 240-280	22 @ 24' = 528'	27 @ 24' = 648'
Bridge Ends:				
I-80	10"	218 Inter.(240) to West Branch Inter.(254)	1 @ 24' = 24'	4 @ 24' = 96'
Ia.1	10"	Ia.22 - NCL Ia.City	2 @ 24' = 48'	1 @ 24' = 24'
U.S.6	10"	Ia.City - West Liberty	4 @ 24' = 96'	1 @ 24' = 24'
U.S.218	10"	North Liberty-Swisher	2 @ 24' = 48'	
I-80	10"	Atalissa Inter.(265) to Wilton Inter.(271)	2 @ 24' = 48'	
Ia.38	10"	Wilton - Tipton		8 @ 24' = 192'
U.S.30	10"	Clarence - Lowden	1 @ 24' = 24'	
		Totals	1980'	2456'

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION AT VARIOUS LOCATIONS IN IOWA, JOHNSON AND CEDAR COUNTIES

10A MILES

BID ORDER NO. 510

COUNTY DISTRICT 6
TYPE OF WORK CONCRETE PAVEMENT REPAIR
PROJECT NO. MP-6923--69-D6
DATE OF LETTING JUNE 23, 1981

NO.	ITEM	QUANTITY	UNIT	HENNIES CONSTR., CO. DONNELLSON, IOWA UNIT PRICE	HENNIES CONSTR., CO. DONNELLSON, IOWA AMOUNT	GRADY UNLIMITED, INC DES MOINES, IOWA UNIT PRICE	GRADY UNLIMITED, INC DES MOINES, IOWA AMOUNT	SHEER CONSTRUCTION, INC. IDA GROVE, IOWA UNIT PRICE	SHEER CONSTRUCTION, INC. IDA GROVE, IOWA AMOUNT
1	JOINT, PRESSURE RELIEF	4436	LIN. FT	16 85	74,746 60	17 36	77,008 96	18 10	80,291 60
	TOTAL				$74,746 60		$77,008 96		$80,291 60

NO TIES OR RESERVATIONS

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION AT VARIOUS LOCATIONS IN IOWA, JOHNSON AND CEDAR COUNTIES

10.8 MILES

BID ORDER NO. 510

COUNTY DISTRICT 6
TYPE OF WORK CONCRETE PAVEMENT REPAIR
PROJECT NO. MP-6923--69-D6
DATE OF LETTING JUNE 23, 1981

NO.	ITEM	QUANTITY	UNIT	KENNY'S SERVICE MARENGO, IOWA UNIT PRICE	KENNY'S SERVICE MARENGO, IOWA AMOUNT	PROGRESSIVE CONTR., INC. OSSEO, MINNESOTA UNIT PRICE	PROGRESSIVE CONTR., INC. OSSEO, MINNESOTA AMOUNT	UNIT PRICE	AMOUNT
1	JOINT, PRESSURE RELIEF	4436	LIN. FT	22.50	99,810.00	41.75	185,203.00		
	TOTAL				$99,810.00		$185,203.00		

NO TIES OR RESERVATIONS

SP-293
Replaces SP-196

IOWA DEPARTMENT OF TRANSPORTATION
Ames, Iowa

SPECIAL PROVISIONS
for

CONSTRUCTING PRESSURE-RELIEF JOINTS

April 22, 1980

THE STANDARD SPECIFICATIONS, SERIES 1977, ARE AMENDED BY THE FOLLOWING SPECIAL PROVISIONS. THESE SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS.

The contractor shall construct "CF" joints (Standard Road Plan RH-2) by cutting across the full width of portland cement concrete pavement at approximately 1000-foot intervals at locations indicated by the engineer. Joints that close to less than 3" prior to completion of cutting the joint full width of the pavement shall be recut before placing joint material.

Joints are to be cut full depth of pavement and may be cut with either "concrete cutter" or diamond blade saw.

Joints shall be filled with preformed urethane foam expansion-joint filler meeting requirements of 4136.03D and Standard Road Plan RH-2.

Damage to paved shoulders caused by the cutting operation shall be repaired with either cold mix or hot mix bituminous material. Damage to earth or aggregate surfaced shoulders shall be repaired with Class B gravel or Class A crushed stone.

Material removed from the joint shall be disposed of by the contractor. Disposal within the right-of-way may be approved by the engineer.

It is intended that joints be constructed in only one lane at a time with an operation of short duration, and within the work area protected in accord with Supplemental Specification 854 - Two-lane roadway, Figure 6-6; four-lane divided roadway, Figure 6-9. Cutting across additional lanes may be permitted by the engineer if the contractor has an adequate plan and can demonstrate that traffic can be safely controlled as required by Supplemental Specification 854.

The contractor shall use every reasonable means to protect persons and vehicles from injury or damage that might occur because of his operations. The road shall be kept open to traffic.

The schedule of working hours shall be adjusted so that all barricades and equipment will be removed from the roadbed from 30 minutes before sunset to 30 minutes after sunrise. No work will be permitted on Sundays or holidays described in 1108.03.

The contractor shall provide competent flagmen, barricades, and cones to adequately protect his work, to control and direct traffic, and to provide safety to the traveling public.

All signs necessary for protection of the work and the traveling public in accordance with Specification 854, dated October 2, 1979, will be furnished to the contractor free of charge at the maintenance garage in the maintenance area where the work is scheduled. The contractor will be responsible for obtaining these signs at the maintenance garage, hauling the signs to the job site, erecting and maintaining the signs, and returning them to the maintenance garage when the project is completed. The contractor shall notify the local foreman two days in advance of the date the signs will be needed.

After commencement of work, the contractor shall work continuously during working hours, except for weekends and holidays as provided herein, and except for unavoidable delays, to the completion of the project.

The engineer will compute the length of pressure-relief joints constructed from count and pavement width at each location.

For the number of feet of pressure-relief joint constructed, the contractor will be paid the contract price per foot, which price shall be full payment for cutting the joint, furnishing and installing the joint material, repair of the shoulder, and traffic control.

When recutting of a joint is required, payment will be made at half the contract price per linear foot for pressure-relief joints.

FORM 650027 4-72 H-10279

PROPOSAL FORM

Proj. No. MP-6945--69-31

024

Type of Work PAVEMENT REPAIR

System MAINTENANCE Miles 5.380 County DUBUQUE

Location and description ON U S 151 FROM JCT. SEC. RD. Y31, IN SEC. 15-87-1E, NORTHEASTERLY APPROX. 6 MILES

CONCRETE PAVEMENT JACKING BY PRESSURE GROUTING

Proposal of ______________________________
(name of bidder)

(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

ESTIMATING

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and c[illegible] the bidder understands that the quantities of work shown herein are approximate only and are subject [illegible] increase or decrease, and further understand that all quantities of work, whether increased or decreased, are to be [illegible] the unit prices [illegible] machinery, equipment, tools, labor and other means of constructi[illegible] k at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$8,000.00	SEPT 8, 1981	50 WORKING DAYS	$140.00

PROPOSAL

To furnish a contract bond [illegible] the construction and completion of the work awarded the bidder in accordance with [illegible] contract.

Enclosed herewith find ce[illegible] the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting AUGUST 18, 1981
9 00 AM

Signed Not To Be Used
For Bidding

Form 6500xx 8-70 H-10279

MP-6945--69-31

024 (1-2-3) 19 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES — DUBUQUE PAVEMENT REPAIR

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX,XXX	XXXXX		
1	HOLES (FOR PRESSURE GROUTING) EACH	12,000 ONLY				
2	PORTLAND CEMENT (FOR PRESSURE GROUTING) PER TON	340 TONS				
3	SUBDRAIN, (LONGITUDINAL) AS PER PLAN PER LIN. FT.	3,150 LIN. FT.				
4	TRAFFIC CONTROL	LUMP SUM				
	TOTAL					

SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS

#874 DECEMBER 16, 1980 GENERAL SUPPLEMENTAL SPECIFICATION
#890 JULY 21, 1981 ADDENDUM TO GENERAL SUPPLEMENTAL SPECIFICATIONS

#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)

#876 DECEMBER 16, 1980 ADDENDUM TO TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)

#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS

SP-379 — Now SP401 AUGUST 18, 1981 SPECIAL PROVISIONS FOR CONCRETE PAVEMENT JACKING BY PRESSURE GROUTING

#859 JANUARY 16, 1980 LONGITUDINAL SUBDRAINS (NOTE POROUS BACKFILL GRADATION REQUIREMENT)

137 LOW BIDDER SHOULD BE PREPARED TO FILE THE CONTRACT BOND AND CERTIFICATE OF INSURANCE AS SOON AFTER THE LETTING AS POSSIBLE TO FACILITATE THE STARTING OF CONSTRUCTION.

524 QUALIFICATION OF BIDDERS - THE FOLLOWING SHALL APPLY IN LIEU OF ARTICLE 1102.01.
BIDDERS SUBMITTING PROPOSALS ON THIS WORK MUST BE RECOGNIZED CONTRACTORS ACTUALLY ENGAGED IN THE CLASS OF WORK PROVIDED FOR IN THE PLANS AND SPECIFICATIONS, MUST POSSESS SUFFICIENT RESOURCES, AND BEFORE THE CONTRACT IS AWARDED, THE SUCCESSFUL BIDDER MAY BE REQUIRED TO FURNISH EVIDENCE TO THE SATISFACTION OF THE COMMISSION OF HIS ABILITY TO PERFORM AND COMPLETE THE CONTRACT.

Form 650028 8-70 H-10279

MP-6945--69-31

024 (1-2-3) 19 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES

DUBUQUE
PAVEMENT REPAIR

11-12-13 | 15 | 25

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
	101 UNIT BIDS MUST BE TYPED OR SHOWN IN INK ~~OR THE BID~~ WILL BE REJECTED.					
	103 NO TIES OR RESERVATIONS WILL BE PERMITTED BETWEEN GROUPS (IF APPLICABLE) OR PROJECTS. EACH GROUP AND/OR PROJECT SHALL BE BID INDEPENDENTLY.					
	NOTE: PROJECT PLANS ARE AVAILABLE AT THE IOWA D.O.T. UPON REQUEST.					

IOWA DEPARTMENT OF TRANSPORTATION
Ames, Iowa

SPECIAL PROVISIONS
for

CONCRETE PAVEMENT JACKING BY PRESSURE GROUTING

August 18, 1981

THE STANDARD SPECIFICATIONS, SERIES OF 1977, ARE AMENDED BY THE FOLLOWING PROVISIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

379.01 DESCRIPTION. This work will consist of raising and supporting the concrete pavement to the specified grade tolerances by drilling and injecting cement/fly ash grout under the faulted areas shown on the plans. The specific locations will be identified by the engineer.

This work is to be done in accordance with the Standard Specifications and Supplemental Specifications, the plans, and this specification.

379.02 CONTRACTOR QUALIFICATION. In addition to other prequalification requirements, the bidder must be competent in concrete pavement jacking. Before receiving a bid proposal, a prospective bidder must submit to the Contracts Engineer evidence of his competence and previous experience with this type of work.

379.03 MATERIALS.

A. Mix Design. The mix design for the pressure grout for subsealing is as follows:

One part (by volume) portland cement, Type I, Section 4101.
Three parts (by volume) fly ash. Fly ash shall be from a source approved by the engineer.
Water to achieve required fluidity.
Additives as approved by the engineer.

B. Fluidity of the grout slurry shall be measured by the Corps of Engineers flow cone method according to their specification CRD-C611-80. Time of efflux shall range from 16 to 26 seconds. A more fluid mix having a flow cone time of efflux of 9 to 15 seconds may be used during the initial injection at each hole. These measurements will be made by the engineer, normally at least once every 4 working hours.

C. Material Proposal. The contractor shall submit to the engineer his proposal for materials and additives to be used as shown in mix design above.

379.04 EQUIPMENT. The contractor shall furnish all equipment necessary or incidental to the adequate performance of the work of this contract. As a minimum, these are as follows:

A. Grout Plant. Mixing may be with a batch-type mixer, or other type of mixer, as approved by the engineer. The mixer shall have the capability of thoroughly mixing the various components of the grout in an approved manner.
The plant shall include a positive-action or pressure-controlled injection pump capable of forcing grout through a hole drilled in the pavement so that grout will fill voids and cavities beneath the pavement slab. The pump shall be capable of supplying a varying pressure up to at least 200 psi at the end of the discharge pipe so as to be able to lift the slab without damaging the pavement. The pressure shall be monitored by an accurate pressure gauge in the grout line.
The dry materials shall be measured by weight, if in bulk, or shall be packaged in uniform-volume sacks, and the water shall be batched through a meter or scale with a totalizer for the day's consumption.

B. Water Tanker. Water shall be supplied from a water truck with adequate capacity and pressure for delivery to the grout plant.

C. Drilling Equipment. An air compressor and rock drills or other device shall be furnished, which is capable of drilling the grout-injection holes through the pavement and subbase material, if any. The equipment shall be in good condition and shall be operated in such a manner that the holes are vertical and not "out-of-round". The rock drill shall not be heavier than 60 pounds, and the downfeed pressure, whether by hand or mechanical means, shall not exceed 200 pounds.

D. Transport. Necessary material transport and handling equipment shall be furnished.

E. Miscellaneous Equipment. The contractor shall furnish all necessary hoses, valving, and valve manifolds to control pressure and volume, pressure gauge protectors, expanding packers for the grout injection, wood plugs, hole-washing tools, drill steel, and bits. The contractor shall furnish any and all miscellaneous tools, equipment, and supplies that may be required to complete the work.

379.05 CONSTRUCTION. The engineer will designate specific locations for pavement jacking by pressure grouting. At his discretion, he may delete any location or he may add new locations.

A. Drilling Holes. Holes of 1½-inch diameter or other approved diameter shall be drilled through the concrete pavement at the locations designated by the engineer and in a pattern approved by the engineer. For holes nearest the edges of the slab, the joints, or a major crack, a maximum tolerance of 3 inches from the precisely marked location is considered to be reasonable. For other holes, a maximum tolerance of 6 inches is considered to be reasonable. Holes shall not be drilled directly over joints or cracks. The drills shall be rotated to avoid cracking the pavement and to provide satisfactory holes of the proper diameter for effective operations in pressure grouting. When drilling holes, the drills shall be held as nearly perpendicular as possible to the pavement surface. Irregular or unsatisfactory holes which cannot be satisfactorily used in pressure grouting shall be plugged by filling with the sealing mixture, and new holes shall be drilled.
At all panels requiring jacking, at least one hole shall be drilled in each 12- by 20-foot panel, near the midpoint of the panel and the outside wheeltrack, for the purpose of monitoring the flow of grout into all void areas under the slab.

B. Washing Holes. Holes may be washed to create a small cavity, allowing initial spread of grout.

C. Jacking. Longitudinal string lines will be established by the contractor from the pavement high points to monitor movement. An expanding rubber packer or other approved device connected to the discharge hose on the grout plant shall be lowered into the holes. The discharge openings of the device shall not extend below the lower surface of the concrete pavement. When jacking jointed panels of concrete pavement and bridge end panels, the contractor shall pump, and repump if necessary, in a pattern and in the amount required to raise the pavement to within plus or minus 0.03 foot of a 50-foot longitudinal string line grade and, in addition, individual transverse joints shall have a maximum differential of 0.015 ft. or as the engineer may authorize. The string line shall be located and relocated so the specific location being jacked is near the middle of the 50-foot guide line. Continuous pressures to 200 psi will be permitted.
When necessary to achieve the desired joint match, the contractor will be permitted to resaw existing transverse joints, subject to approval of the engineer.
If the engineer determines that continued grout injection at a specific location is no longer feasible due to major voids, he may direct the contractor to cease grout injection at that location.

D. Overjacking. Pavement raised above the tolerances listed above shall be brought within tolerance by grinding. Should the overjacking be greater than 0.10 foot, the engineer, at his option, may require removal and replacement of the pavement with portland cement concrete in accordance with the provisions of Section 2212 that he deems appropriate, and he will designate the area of pavement to be replaced.

E. Water Displacement. Water displaced from the void structure by the grout shall be allowed to flow out freely. Excessive loss of the grout through cracks, joints, or in the shoulder area will not be tolerated.

F. Radial Cracks. Cracks emanating radially from the grout injection holes will be presumed to have been caused by improper injection techniques by the contractor.

G. Hole Patching. Upon completion of the jacking, all drill holes shall be plugged by filling with a fast-setting sand-cement mixture subject to approval of the engineer. The plug shall be finished flush with the pavement surface.

379.06 LIMITATIONS OF OPERATIONS. Pavement jacking and pressure grouting shall not be done when the daytime temperature is below 35° F or when the subgrade or subbase material is frozen.
The work shall be conducted on only one-half the pavement width at a time.
Traffic shall be permitted to use the pavement during construction operations, and all operations shall be so conducted as to provide a minimum of inconvenience to traffic.
The work schedule shall be adjusted so that all traffic lanes can be opened to public traffic at the end of the workday. No more holes shall be drilled during a day's operation than can be grouted during the same day, unless specific approval is given by the engineer. If unforseen conditions should result in uncompleted sections being left overnight, a sufficient number of flagmen shall be assigned to warn and direct traffic, from the time construction operations have stopped until they have resumed again. No extra payment will be made for the necessary flagmen.
The work schedule shall also be adjusted so that all barricades and equipment will be removed from the roadbed from 30 minutes before sunset to 30 minutes after sunrise. No work will be permitted on Sundays or holidays described in 1108.03.

The contractor shall furnish, erect, and maintain all signs, barricades, and other traffic-control devices required by the plans and specifications. Article 1107.08 and 1107.09 shall apply.

Debris from the contractor's operations shall be removed from the traffic lanes and shoulders as the work progresses and before the traffic lane is opened to public traffic.

Shoulder adjustments will be made by the contracting authority, as the engineer deems appropriate. The engineer will provide and maintain signing, as he deems appropriate, for vertical dropoffs at the pavement edges that remain after the contractor has completed his jacking by pressure grouting operation. The contractor will be responsible for signing, barricades, and other traffic control required by the plans and specifications for shoulder while his work at the specific location remains uncompleted.

397.07 ACCEPTANCE. Before final acceptance, all waste material shall be cleaned up and the surrounding areas shall be left in a neat and orderly condition as provided in 1104.08.

379.08 METHOD OF MEASUREMENT. The work of pavement jacking by pressure grouting will be measured for payment by the engineer as follows:

A. Holes (for Pressure Grouting) drilled through the pavement at locations designated by the engineer will be counted. Irregular or unsatisfactory holes which can not be satisfactorily used in pressure grouting will not be included in the count.

B. Portland Cement (for Pressure Grouting). The weight will be calculated from the bulk weight or number of sacks of cement furnished and used in the work. This will include the quantity used in pressure grouting and in filling drilled holes.

When grouting is discontinued at any specific location, as directed by the engineer, the holes drilled and the portland cement used will be included in the measured quantities.

Water and fly ash and sawing of existing transverse joints will not be measured for payment.

Grinding or replacement of pavement sections made necessary by overjacking will not be measured for payment; however, the holes and portland cement used in the jacking operation will be included in measured quantities.

379.09 BASIS OF PAYMENT. The work of pavement jacking by pressure grouting, satisfactorily completed, will be paid for as follows:

A. Holes (for Pressure Grouting). For the number of holes drilled, the contractor will be paid the contract price.

B. Portland Cement (for Pressure Grouting). For the number of tons of cement used in the work, the contractor will be paid the contract price per ton.

When the contract includes an item for traffic control, the contractor will be paid the lump-sum contract price.

When the jacking operation results in radial cracking, payment to the contractor will be reduced by fifty cents ($0.50) for each linear foot of crack, measured by the engineer to the nearest foot.

The payment described herein shall be considered full compensation to the contractor for furnishing all materials, including fly ash and water and hole-sealing mixture, for proportioning and mixing, for drilling holes, for pumping and repumping, for filling the holes, for resawing existing transverse joints, for all traffic control, and for furnishing all equipment, tools, labor, and incidentals necessary to complete the work in accord with the plans and specifications.

The quantities indicated in the contract are based on certain assumptions, as indicated on the plans, and the quantities needed may vary from that. The provisions of 1109.03 will not apply to this work.

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

149,17 5.380 MILES

LOCATION ON U S 151 FROM JCT. SEC. RD. Y31, IN SEC. 15-87-1E, NORTHEASTERLY APPROX. 6 MILES

BID ORDER NO. 649

COUNTY DUBUQUE
TYPE OF WORK PAVEMENT REPAIR
PROJECT NO MP-6945--69-31
DATE OF LETTING AUGUST 18, 1981

NO	ITEM	QUANTITY	UNIT	HOLSAPPLE MUD JACKING CO INC. TOPEKA, KANSAS UNIT PRICE	HOLSAPPLE MUD JACKING CO INC. TOPEKA, KANSAS AMOUNT	DEL VAL INC. TIGARD, OREGON UNIT PRICE	DEL VAL INC. TIGARD, OREGON AMOUNT	W.G. JAQUES CO., INC. DES MOINES, IOWA UNIT PRICE	W.G. JAQUES CO., INC. DES MOINES, IOWA AMOUNT
1	HOLES (FOR PRESSURE GROUTING)	12000	ONLY	5 00	60,000 00	6 00	72,000 00	25 00	300,000 00
2	PORTLAND CEMENT (FOR PRESSURE GROUTING)	340	TONS	609 00	207,060 00	879 00	298,860 00	1192 00	405,280 00
3	SUBDRAIN, (LONGITUDINAL) AS PER PLAN	3150	LIN. FT	8 80	27,720 00	10 00	31,500 00	9 00	28,350 00
4	TRAFFIC CONTROL	LUMP SUM			14,649 00		40,000 00		18,000 00
	TOTAL				$309,429 00		$442,360 00		$751,630 00

NO TIES OR RESERVATIONS

SHOULDER MAINTENANCE
BITUMINOUS SHOULDERS WITH CONCRETE PAVEMENT AND
CONCRETE SHOULDERS WITH CONCRETE PAVEMENT

Slide No.

I'll cover the second half of this topic first: "Concrete Shoulders with Concrete Pavement", since Iowa has no appreciable amount of this type of construction. One interstate project several years ago was constructed with concrete shoulders, but as of this time it has required no maintenance. Maybe that's the reason that the latest design standard which has just been approved provides for all future paved shoulders to be Portland Concrete cement when they are adjacent to a Portland Concrete cement pavement. Our design calls for these shoulders to be built the same thickness as the pavement, that is, 10 inches at the edge of the slab and then tapering to an edge thickness of about 7 1/2 inches for a 10 foot shoulder.

Other than this one project all shoulders on our Freeway-Expressway System are asphalt. These shoulders have required different kinds of maintenance depending upon their design and construction.

Some earlier paved shoulders were built with about 2 inches of hot mix asphalt layed over a rolled stone base. The asphalt surface on these shoulders tends to shell off if heavy loads are applied during unstable subgrade conditions.

Later construction consisted of building full depth asphalt treated base shoulders with a thin high type asphalt surface. These would have been fine had sufficient asphalt been used in the base, but in an effort to economize only four or five percent bitumen was used with a low grade absortive aggregate. These shoulders require continual sealing and surface repairs to maintain a stable shoulder.

We do have a shoulder maintenance program that is very flexible and tends to meet the needs of most of the situations that exist.

87A For full width surface maintenance we try to detect dry and raveling surface problems as soon as they begin to appear so that a fog coat can be applied. Fog seals have proven to be quite beneficial under the right circumstances. They must, however, be properly applied with the proper materials and the proper application rate. With too light an application rate or without proper adjusting of the equipment, the seal will serve little purpose.

88A
89A These shoulders were sealed with a 4:1 dilution of water and grade SS-1 emulsion applied at about 0.2 of a gallon per square yeard. The intent was to apply as much material as could be retained on the surface without flowing off onto the foreslop. This dilution rate provided a material that was fluid enough to flow into the cracks and voids and seal the underlying surface. On a 22 1/2 mile interstate project this fog seal cost about $2,311 per centerline mile. Since this fog seal was placed we have decreased the dilution rate from

Slide No.

4:12 to a 2:1 with water and are applying at the maximum application possible to avoid excess runoff, about .2 gallons per square yard.

Sand seals and sealcoats are used on more deteriorated shoulder surfaces. The sand seal is used for conditions somewhat worse than can be corrected with a fog coat and where there is not sufficient elevation difference between the shoulder and the pavement to allow for the seal coat aggregate to be placed. Sand seals are costing about $5,500 per centerline mile using emulsion as the bitumen content.

On paved shoulders that are somewhat structurally weak and show extensive map cracking and block cracking, a seal coat is the most appropriate maintenance unless there is room for another overlay thickness which is seldom the case. Sealcoats are placed using 3/8" aggregate and CRS2 emulsion. They cost about 14,000 per centerline mile.

Before any full width shoulder treatment is applied, all of the cracks and deteriorated areas are repaired and/or filled. This work is generally performed by the local maintenance crew as time permits during the fall or early spring prior to the contract surface treatment.

90A
91A
92A
93A
94A

Open transverse cracks in paved shoulders are cleaned with either compressed air or high pressure water. The high pressure unit puts out 2,000 pounds per square inch pressure and uses about 10 1/2 gallons of water per minute. Holding the wand on this water is a two handed operation, but it does a very effective job of cleaning grass and dirt from the shoulder cracks. A crack that has been cleaned by this method is ready for almost any kind of joint sealing from a straight undiluted emulsion to a higher type sealing compound. Generally a straight emulsion is used when sealing transverse shoulder cracks.

95A
96A
97A

Another problem we experience with asphalt shoulders is that they tend to pull away from the concrete pavement. Vegetation grows within these cracks at the edge of the pavement and water seeps in to make the subgrade unstable and to further accelerate the shoulder deterioration. These cracks can likewise be cleaned with the high pressure water or with compressed air and filled with liquid emulsion. Cracks filled in this manner on a 25 mile stretch of interstate in the Ames area have never opened up sufficiently to warrant any other type of repair. The crack filling has been performed every two years by the local crew. The method developed allows four-man crews to seal 100 miles of shoulder cracks in five working days. In other areas where the crews have not been so diligent more serious deterioration has occurred requiring more extensive and costly repairs.

98A
99A
100A
101A

An example is a situation where the shoulder has moved away from the pavement and secondary cracks are beginning to develop. These secondary cracks will progress into spalls in the shoulder surface that require surface patching or a continuous slurry treatment. The

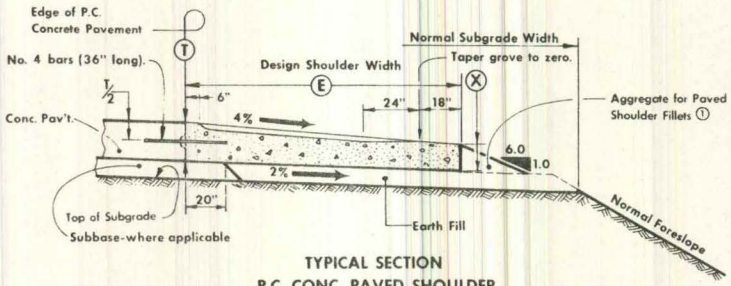
Slide No.

102A
103A slurry operation is a three-man operation with a truck driver, machine operator and squeegee box operator. The cracks are blown or flushed free of debris prior to the slurry being placed. The slurry quite effectively fills the voids and adjacent cracks along with correcting the pavement to shoulder drop off. The result is neat looking and very effective. These slurry wedges do tend to become a little brittle over a period of 2-3 years and will require a fog seal to keep them from deteriorating.

104A
105A
106A
107A
108A Cracks between the pavement and shoulder have been a problem and are often 1 inch wide on the mainline. Sometimes we find them as much as 3 or 4 inches wide on the inside of tight circle ramps. Again, this type of crack is very effectively taken care of with the slurry operation and production has reached as much as 10 miles a day sealing cracks such as this.

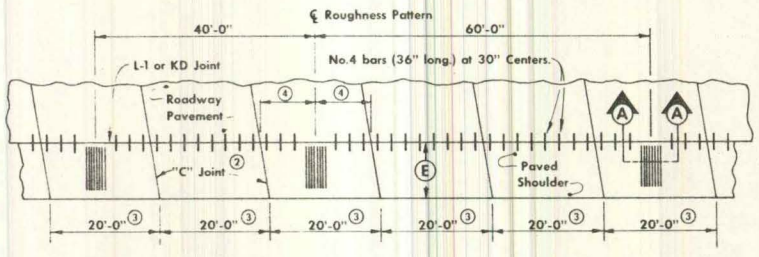
109A
110A Another treatment that is used on shoulders prior to any full width surface treatment is the edge sealing. This is taken care of with about a two foot width of straight CRS2 emulsion, applied as heavily as possible without the material flowing off the shoulder. Shoulder edge sealing is also performed routinely every two-three years to discourage the growth of vegetation in the outer edge of shoulders and to reseal the outer edge as it weathers and deteriorates.

Bituminous shoulders also receive full width sand, chip and slurry seals for the same reasons and using the same procedures as for asphalt pavement surfaces. The cost of these various seal treatments averaged 42¢ per sq. yd. in 1982 when done with state forces. Contract work approximated $1.00/sy for slurry seal, 30¢/sy for sand seal, 85¢/sy for chip seal and 12-15¢ per sy for fog seal.



TYPICAL SECTION
P.C. CONC. PAVED SHOULDER

① Material shall be placed and compacted as directed by the engineer.



TYPICAL PLAN
P.C. CONCRETE PAVED SHOULDER

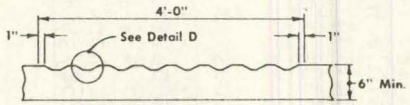
② "C" Joint shall continue the alignment of adjacent pavement
③ Or same spacing as adjacent pavement
④ ½ Joint Spacing

DESIGN QUANTITY TABLE ⑤

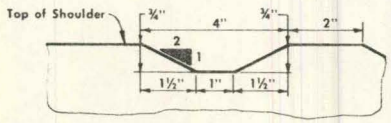
Ⓣ	Ⓔ	Ⓧ	SURFACE AREA Sq. Yds.	VOLUME Cu. Yds.	AGGREGATE FOR PAVED SHOULDER FILLETS Tons ⑥
10"	10'	7.5"	111.11	27.01	8.99
10"	6'	8.5"	66.67	17.13	11.53
8.5"	6'	7"	66.67	14.34	7.81
8.5"	4'	7.5"	44.44	9.87	8.99

⑤ Rates indicated are for design purposes and may be adjusted at time of construction if so directed by the engineer. Quantities listed are for one shoulder per station.

⑥ Quantities have been determined on the basis of a design weight of 135lbs/cu. ft.



SECTION A-A
P.C. CONCRETE PAVED SHOULDERS



DETAIL D

GENERAL NOTES:

Details indicated hereon illustrate the general requirements for construction of a P.C. Concrete shoulder.

Construction of paved shoulders shall conform to the requirements of current specifications for the items involved.

Slopes, dimensions and quanitities indicated hereon are for a normal section as shown and are for design purposes. Shoulder construction details may be modified through superelevated curves or other areas specifically designated by the engineer. Refer to Typical Cross Sections and Standard Road Plans for superelevation.

Any special shaping of subgrade necessary, prior to construction of paved shoulder, shall be accomplished as directed by the engineer. Any material removed due to this special shaping shall be uniformly spread on the foreslopes or otherwise disposed of in the adjacent area.

The roughness pattern shown on this plan is typical and is required on 6' and 10' wide shoulders only. Alternate proposals will be considered for approval.

The subgrade beneath Class 1 Paved shoulders shall be constructed in conformance with specifications for Natural Subgrade. Any material required for earth fill shall be subject to the approval of the engineer and shall be obtained from adjacent areas as directed by the engineer or provided by the contractor from locations approved by the engineer.

The price bid for "Class 1 Paved Shoulders (Portland Cement Concrete)" in sq. yds. shall be considered full compensation for the construction of shoulder as detailed hereon. Joint construction, aggregate for paved shoulder fillet, roughness pattern, earth fill and/or special shaping shall be considered incidental to the price bid for Class 1 Paved Shoulders.

DETAILS FOR
P.C. CONCRETE PAVED SHOULDERS

COUNTY

PROJECT NUMBER		STATE	FED. ROAD DIST. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
		IOWA	1			

FORM 650027 4-72 H-10279

PROPOSAL FORM

Proj No. MP-3037--69-43

Type of Work 508 BITUMINOUS SURFACING

System MAINTENANCE Miles 14.006 County HARRISON

Location and description ON I-29 FROM THE U S 30 INTERCHANGE NORTHERLY TO THE MONDAMIN INTERCHANGE

SHOULDER REPAIR

Proposal of _____
(name of bidder)

_____ _____ _____ _____
(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract form; including the special provisions contained herein, and of the site of the work, and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease; and further understand that all quantities of work, whether increased or decreased, are to be performed at the unit prices stipulated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials specified in the manner and the time prescribed and to do the Work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$12,000.00	45 WORKING DAYS	SEPT 30, 1980	$140.00

To furnish a contract bond in an amount not less than 100 percent of contract award, as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check, or bank draft on a solvent bank, or a bid bond in the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting JUNE 17, 1980 9 00 AM

Signed Not To Be Used

Form 650028 8-70 H-1378

MP-3037--69-43

608 (1-2-3) 04 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES

HARRISON
BITUMINOUS SURFACING

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars (xxx,xxx)	Unit Price Cents (xxxxx)	Amount Dollars	Amount Cents
1	ASPHALT EMULSION FOR SLURRY SEAL PER GAL.	30,061 GALS.				
2	AGGREGATE FOR SLURRY SEAL PER TON	634 TONS				
3	BINDER BITUMEN, FURNISH & APPLY MC-3000 OR CRS-2 PER GAL.	119,081 GALS.				
4	AGGREGATE, COVER, FURNISH & APPLY 1/2 IN. PER TON	4,157 TONS				
	TOTAL					

SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS

501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION - SERIES OF 1977

#852 OCTOBER 2, 1979 GENERAL SUPPLEMENTAL SPECIFICATION
#857 NOVEMBER 18, 1979 ADDENDUM TO GENERAL SUPPLEMENTAL SPECIFICATIONS

#861 APRIL 1, 1980 ADDENDUM TO SPECIFICATION #857

#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)

#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS

#820 NOVEMBER 8, 1977 BITUMINOUS SLURRY SURFACE TREATMENT

502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

524 QUALIFICATION OF BIDDERS - THE FOLLOWING SHALL APPLY IN LIEU OF ARTICLE 1102.01.
BIDDERS SUBMITTING PROPOSALS ON THIS WORK MUST BE RECOGNIZED CONTRACTORS ACTUALLY ENGAGED IN THE CLASS OF WORK PROVIDED FOR IN THE PLANS AND SPECIFICATIONS, MUST POSSESS SUFFICIENT RESOURCES, AND BEFORE THE CONTRACT IS AWARDED, THE SUCCESSFUL BIDDER MAY BE REQUIRED TO FURNISH EVIDENCE TO THE SATISFACTION OF THE COMMISSION OF HIS ABILITY TO PERFORM AND COMPLETE THE CONTRACT.

530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.

Form 650028 8-70 H-1378

MP-3037--69-43

608 (2-3) 04 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES

HARRISON
BITUMINOUS SURFACING

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
	518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.					
	SEE ADDITIONAL ATTACHED REQUIREMENTS					

Special provisions for CRS-2 emulsified asphalt

Delete the second sentence of 2307.02B.1.

Delete the reference to emulsion grade in the third sentence of 2307.02B.1.

Add the following to AASHTO designation M-208-72. The average absolute viscosity at 140°F (60°C) of the residue from distillation shall exceed 600 Poises.

Proposed Work 1980

Single course, 1 foot wide, wedge shaped, asphaltic slurry mix (Type I) fillets will be applied to 36,218 sq. yds. of the shoulders at the approximate rate of 35 lbs. (dry aggregate basis) per sq. yd. after which a single course bituminous seal coat of 277,152 sq. yds. will be applied using 0.38 gal. CRS-2 or MC-3000 per sq. yd. and 30 lbs. of 1/2" cover aggregate per sq. yd.

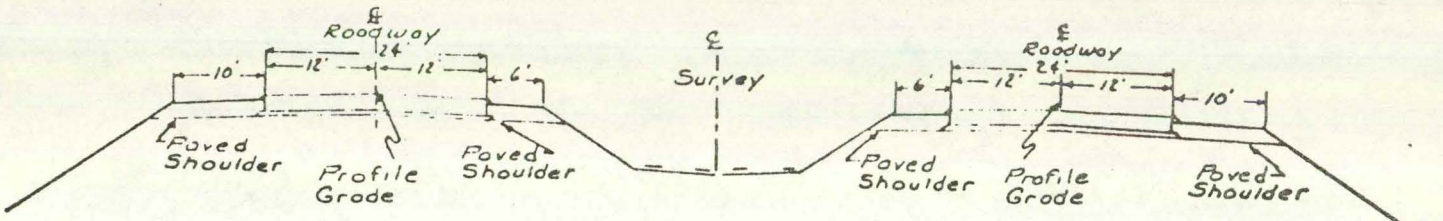
Estimated Quantities

Slurry Binder (Cationic) - - - - - - - - - - - - - -	30,061 Gals.
Aggregate for Slurry (Type I) - - - - - - - - - - -	634 Tons
Binder Bitumen (Seal Coat) - - - - - - - - - - - - -	119,081 Gals
1/2" Cover Aggregate - - - - - - - - - - - - - - - -	4,157 Tons

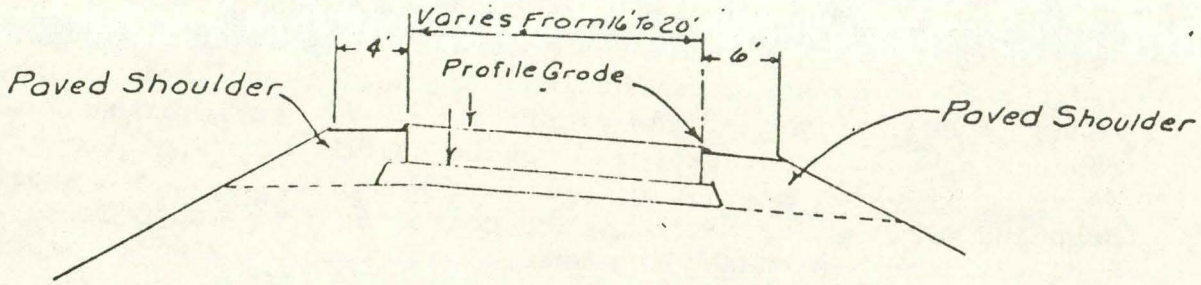
MC-3000 shall be used as the Binder Bitumen when using crushed limestone for cover aggregate.

CRS-2 shall be used as the Binder Bitumen when using washed gravel for cover aggregate.

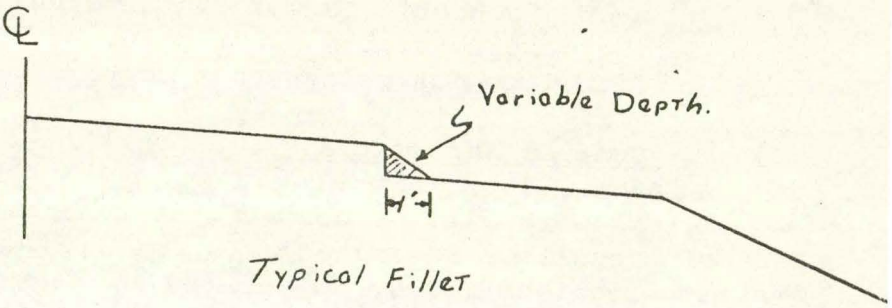
The approximately 1 foot wide asphaltic concrete foreslopes on the outside of the shoulders will have binder bitumen applied at the same time and at the same rate specified for the bituminous seal coat. No cover aggregate will be placed on these foreslopes and no rolling will be necessary.



TYPICAL Cross Section
MAINLINE



Ramp or Loop
TYPICAL Cross Section



Typical Fillet

Harrison County MP-3037--69-43

(Special Provisions Continued)

Nature of Work

Bituminous Slurry Surface Treatment

Progress of Work

The roads that are to be surfaced will be repaired and prepared for the surfacing by the Department of Transportation - Highway Division in advance of the contract work. Some roads in each district will be ready by June 15th so that the contractor may start promptly. Additional roads will be made ready by the several maintenance crews ahead of the arrival of the contractor as the work progresses. The contractor shall contact the District Maintenance Engineer for the district in which he will do contract work and arrange a starting date and place. Furthermore, the contractor, in cooperation with the District Maintenance Engineer, shall prepare a work progress schedule for the entire district, to assure proper coordination of the work by the maintenance crews with the contract work. If such a schedule is not prepared because of neglect on the part of the contractor, the Department of Transportation will not assume liability for delays that occur for want of such schedule.

General Information

No work will be permitted in the business districts of cities and towns, or in state parks, on Saturday afternoons, Sundays and legal holidays.

Note: There are __1__ plats attached showing location of proposed work on this project.

Bidders submitting proposals on this work must be recognized contractors actually engaged in the class of work provided for in the plans and specifications, must possess sufficient resources, and before the contract is awarded the successful bidder may be required to furnish evidence to the satisfaction of the Commission of his ability to perform and complete the contract. Bidders are not required to file a Financial-Experience-Equipment Statement with the Iowa Department of Transportation prior to bidding on these projects.

Harrison County
Project No. MP-3037--69-43

(Special Provisions Continued)

Nature of Work

BITUMINOUS SEAL COAT

The plats indicate the character of the work at each location and an estimate of the bid quantities required, the rates of application, the grades of bitumen and size of aggregate. The bitumen for seal coat work may be MC-3000 or CRS-2 Cationic, unless otherwise noted. The cover aggregate for seal coat work will be ½" cover aggregate as noted.

Progress of Work

The roads that are to be surfaced will be repaired and prepared for the surfacing by the Department of Transportation - Highway Division in advance of the contract work. Some roads in each district will be ready by June 15th so that the contractor may start promptly. Additional roads will be made ready by the several maintenance crews ahead of the arrival of the contractor as the work progresses. The contractor shall contact the District Maintenance Engineer for the district in which he will do contract work and arrange a starting date and place. Furthermore, the contractor, in cooperation with the District Maintenance Engineer, shall prepare a work progress schedule for the entire district, to assure proper coordination of the work by the maintenance crews with the contract work. If such a schedule is not prepared because of neglect on the part of the contractor, the Department of Transportation will not assume liability for delays that occur for want of such schedule.

General Information

No work will be permitted in the business districts of cities and towns, or in state parks, on Saturday afternoons, Sundays and legal holidays.

Note: There are 1 plats attached showing location of proposed work on this project.

Section 2307.04 Paragraph C-3 Joints. Add: Building paper to be minimum 30#.

(Special Provisions Continued)

Supplemental Specification 820, dated November 8, 1977, shall apply to this work except as herein modified.

Delete all of 820.02A and substitute the following in lieu thereof:

A. Asphalt Emulsion. The emulsified asphalt shall meet the requirements of AASHTO M-208, Type CSS-1, except the Saybolt Furol Viscosity at 77 degrees F shall not be less than 15 seconds or more than 50 seconds, and the cement mixing test will not be required. The emulsified asphalt shall meet the requirements of the stripping test in AASHTO T-182. The aggregate to be used for the project shall be used as the standard aggregate. Certified analysis of each lot of material shall be furnished at time of delivery.

Delete all of 820.02B and substitute the following in lieu thereof:

B. Aggregate. The mineral aggregate shall be composed of a combination of crushed stone and mineral filler or crushed gravel and mineral filler meeting the following requirements:

Crushed Stone or Gravel shall be produced from sources which normally show an abrasion loss not greater than 40 (grading A or B) and a freezing-and-thawing loss not greater than 10 (Laboratory Test Method 211, Method A) when tested using aggregate crushed to 3/4 inch maximum size. When crushed gravel is used, it shall be produced as a separate operation by crushing gravel particles to the extent that 90 percent or more will pass the sieve on which 90 percent or more was retained before crushing. The screen size used to separate material prior to crushing shall be increased as necessary to compensate for screening efficiency and material variability. It shall be free of vegatative matter and other deleterious materials.

Mineral Filler is required to obtain the necessary gradation and the desired mixture consistency, and the addition rate will be established by the engineer, based on laboratory or field trials. Mineral filler shall meet the requirements for Type 1 Portland Cement.

When tested by means of laboratory sieves, the composite aggregate, excluding mineral filler, shall meet the following requirements for the type specified on the plans:

(Special Provisions Continued)

Sieve Size	Type I Percent Passings* Min.	Type I Max.	Type II Percent Passing* Min.	Type II Max.
3/8	100		100	
No. 4	90	100	70	90
No. 8	65	90	45	70
No. 16	45	70	28	58
No. 30	30	50	19	34
No. 50	18	30	12	25
No. 100	10	21	7	18
No. 200	5	15	5	15

* Based on washed gradation

Delete the first paragraph of 820.03A and substitute in lieu thereof the following:

A. Slurry Mixing Equipment. The slurry mixing machine shall be a continuous flow mixing unit and be capable of delivering accurately a predetermined proportion of aggregate, water and asphalt emulsion to the mixing chamber and discharging the thoroughly mixed product on a continuous basis. The aggregate shall be prewetted immediately prior to mixing with the emulsion. The Pugmill shall be capable of thoroughly blending all ingredients together. No violent mixing shall be permitted.

Delete the fourth sentence of 820.03B and substitute the following in lieu thereof:

Delete 3rd sentence of 820.06.

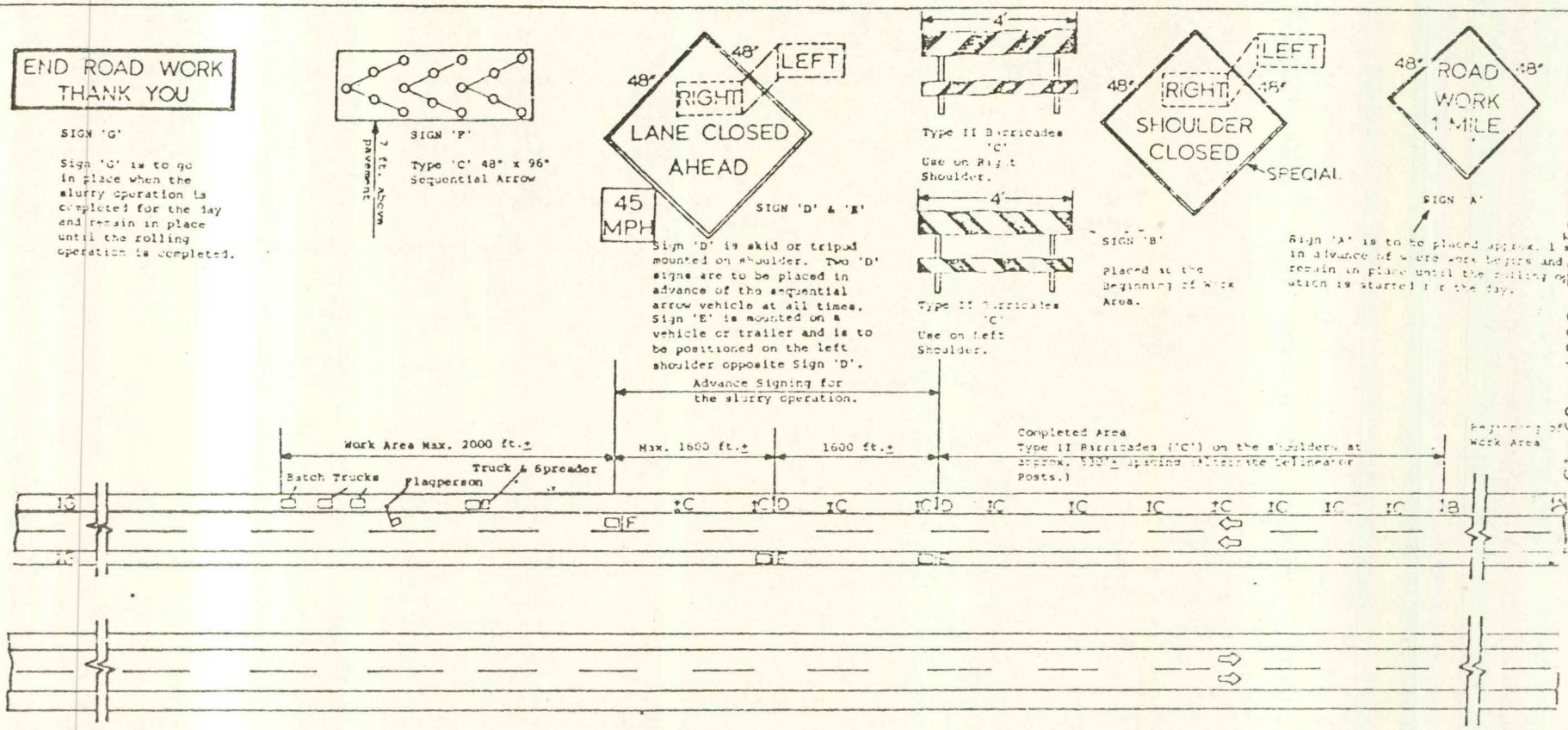
Delete all of 820.08 and substitute the following in lieu thereof:

Maintenance of Traffic. Suitable methods, such as signs, barricades, flagmen, etc., shall be used to protect the public and the uncured slurry surface from all types of traffic. Any damage to the uncured slurry will be the responsibility of the contractor. The road will not be closed for construction; normal traffic shall be maintained

(Special Provisions Continued)

on the project at all times, and a detour will not be provided. Traffic shall not be delayed unnecessarily. The provisions for handling traffic are to be according to 1107.09 and attached Special Provisions.

Flagman's stop and slow signs will be furnished by the contractor. Placement of warning signs and flagman procedure shall be in accord with Supplemental Specification for Traffic Controls, a separate specification and attached Special Provisions for signing.



TRAFFIC CONTROL SIGNS SHALL BE FURNISHED AND MAINTAINED IN ACCORDANCE WITH THE IOWA MUTCD AND CURRENT HIGHWAY DIVISION SPECIFICATIONS.

ALL SIGNS ARE TO BE FURNISHED BY THE IOWA HIGHWAY DIVISION MAINTENANCE DEPARTMENT EXCEPT AS NOTED AND WILL BE MADE AVAILABLE AT A NEARBY MAINTENANCE YARD DESIGNATED BY THE ENGINEER. THE CONTRACTOR SHALL RETURN THEM WHEN THE WORK IS COMPLETED.

All Type II barricades are to be furnished and maintained by the contractor.

The Contractor is responsible for any damage to the signs due to negligence on the part of his employees. Signs struck and damaged by others, excluding the Contractor and his employees, will be replaced by the Highway Division.

The vehicle mounted arrow is to be placed at a height of 7'+ clearance between the bottom of the arrow and the pavement.

Parking of private vehicles on Interstate Right-of-Way will not be allowed.

Equipment shall not be stored within 30 ft. of the mainline roadway when not in use.

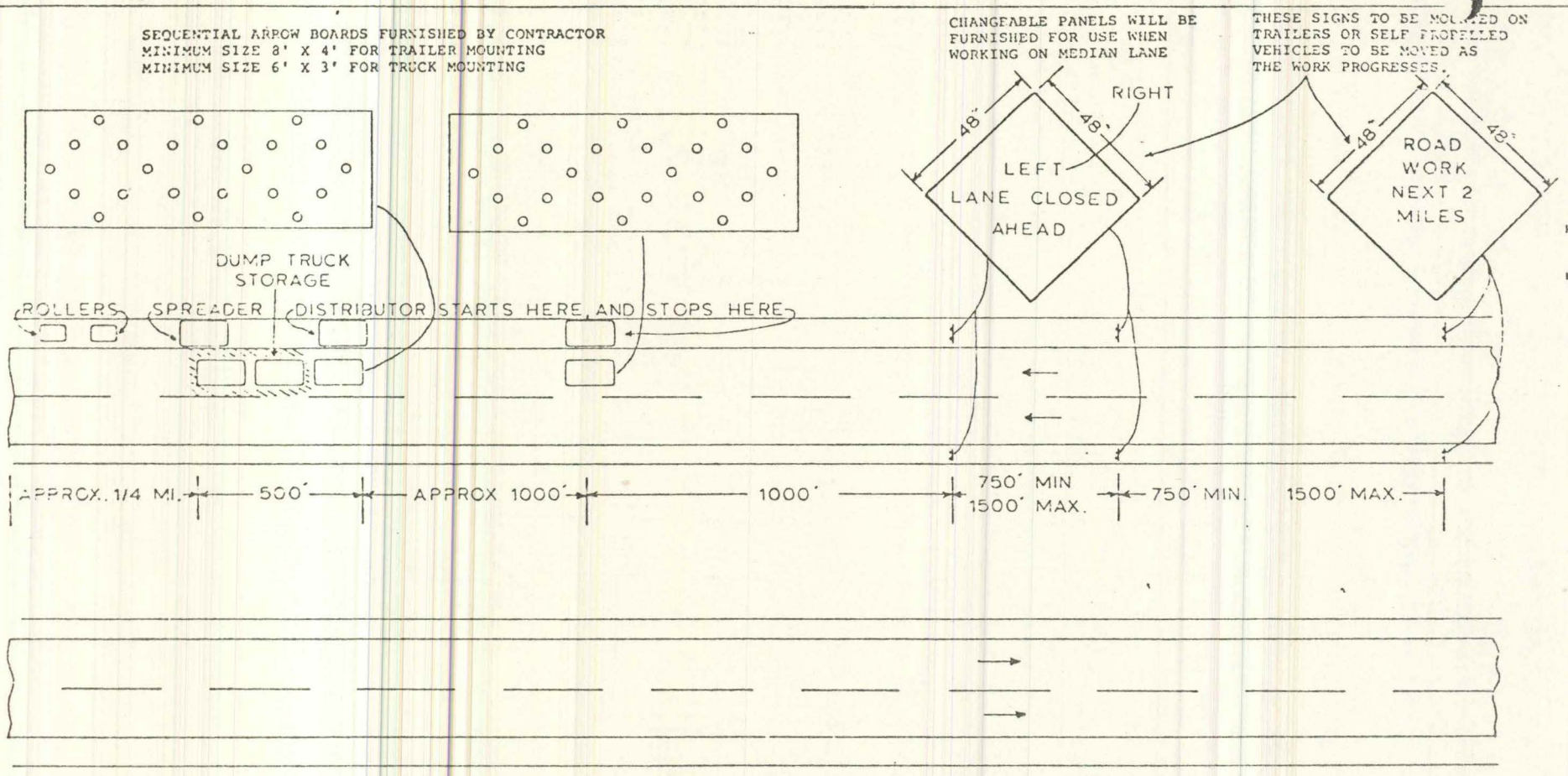
NOTE: THE SEQUENTIAL ARROW SIGN IS TO BE FURNISHED AND MAINTAINED DURING A LANE CLOSURE BY THE CONTRACTOR AND IS CONSIDERED INCIDENTAL AND NO PAYMENT WILL BE MADE.

The signing layout is a typical example. The exact location of any of these traffic controls shall be determined as field conditions warrant and their placement are subject to modification with approval of the Engineer.

When the operation is moved to the Left Shoulder, the appropriate signs will be changed.

SIGNING FOR SHOULDER SLURRY COATING ON 4 LANE DIVIDED HIGHWAYS

April 14, 1980



All signs to be furnished and delivered to the job site by the Iowa Department of Transportation

The signs are to be placed, cleaned and kept in their proper position by the Contractor. The Contractor is held responsible for any damage to the signs due to negligence on the part of his employees. Signs struck and damaged by others excluding the Contractor and his employees will be replaced by the Iowa Department of Transportation.

When no longer needed, or at the completion of the project, the contractor shall return the signs to the Iowa Department of Transportation Maintenance garage.

The vehicle mounted arrows to be placed at a height with 7' clearance between the bottom of the arrow and the pavement.

SIGNING FOR
SHOULDER SEAL COATING
ON 4 LANE DIVIDED HIGHWAY

MAY 20,1977

Harrison County Mp-3037--69-43 Bit. Surfacing

#061721

Iowa Department of Transportation
Highway Division
Ames, Iowa

Date of Letting: June 17, 1980
Date of Addendum: June 11, 1980

Harrison County Bituminous Surfacing Project MP-3037--69-43

As shown on Pages 8 and 9 of the Proposal Form, certain signs are to be vehicle or trailer mounted. The vehicles or trailers are to be provided by the contractor, and will be considered incidental to other work on the project.

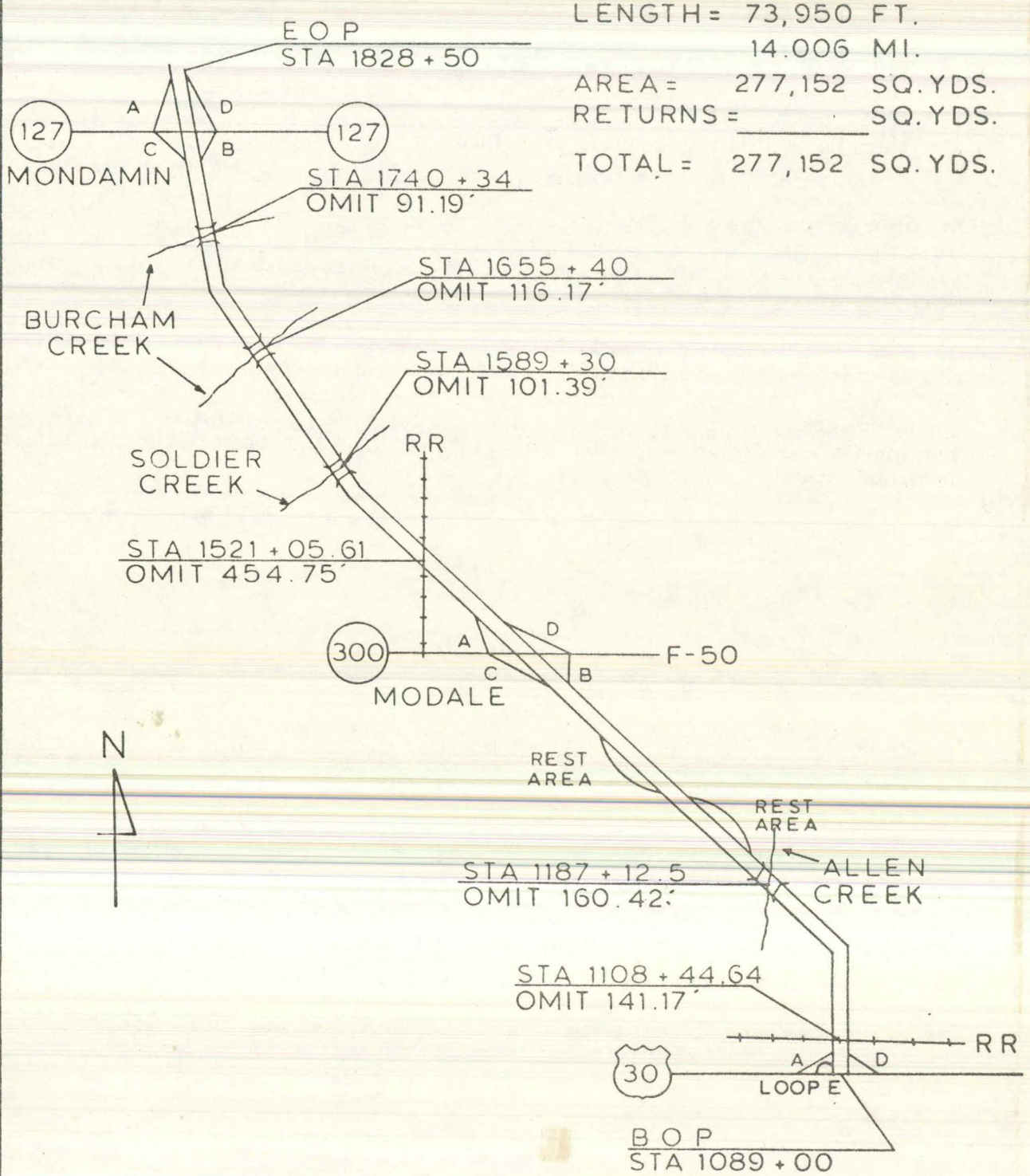
On Page 9 of the Proposal delete the note "All signs to be furnished and delivered to the job site by the Iowa Department of Transportation" and add "All signs are to be furnished by the Iowa Highway Division Maintenance Department except as noted and will be made available at a nearby maintenance yard designated by the engineer. The contractor shall return them when the work is completed."

IOWA DEPARTMENT OF TRANSPORTATION

OFFICE OF MAINTENANCE 1980 BITUMINOUS WORK

I-29 FROM US 30 N. TO THE N. EDGE OF MONDAMIN
(SHOULDERS ONLY)

HARRISON COUNTY
PROJECT NO. MP-3037--69-43
DIVISION NO.
DISTRICT NO. 3
LENGTH = 73,950 FT.
14.006 MI.
AREA = 277,152 SQ.YDS.
RETURNS = SQ.YDS.
TOTAL = 277,152 SQ.YDS.



DATE STARTED DATE FINISHED

FORM 5478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION ON I-29 FROM THE U S 30 INTERCHANGE NORTHERLY TO THE MONDAMIN INTERCHANGE

BID ORDER NO. 502

2A 14.026 MILES

COUNTY HARRISON
TYPE OF WORK BITUMINOUS SURFACING
PROJECT NO MP-3037--69-43
DATE OF LETTING 4562048200980

		QUANTITY	UNIT	MONARCH ASPHALT OILS INC. OMAHA, NEBRASKA UNIT PRICE	AMOUNT	STA-BILT CONSTR., CO. HARLAN, IOWA UNIT PRICE	AMOUNT	MANATTS, INC. BROOKLYN, IOWA UNIT PRICE	AMOUNT
1	ASPHALT EMULSION FOR SLURRY SEAL	30061	GALS.	1 00	30,061 00	1 40	42,085 40	74	22,245 14
2	AGGREGATE FOR SLURRY SEAL	634	TONS	41 00	25,994 00	38 00	24,092 00	71 50	45,331 00
3	BINDER BITUMEN, FURNISH & APPLY MC-3000 OR CRS-2	119081	GALS.	80	95,264 80	87	103,600 47	97	115,508 57
4	AGGREGATE, COVER, FURNISH & APPLY 1/2 IN.	4157	TONS	3043	126,497 51	2850	118,474 50	2650	110,160 50
	TOTAL				$277,817 31		$288,252 37		$293,245 21

NO TIES OR RESERVATIONS

6-78 F 154-4

IOWA DEPARTMENT OF TRANSPORTATION

28 14.006 MILES

LOCATION ON I-29 FROM THE U S 30 INTERCHANGE NORTHERLY TO THE MONDAMIN INTERCHANGE

COUNTY HARRISON
TYPE OF WORK BITUMINOUS SURFACING
PROJECT NO. MP-3037--69--43
DATE OF LETTING 456504820980

FORT DODGE ASPHALT COMPANY, INC.
FORT DODGE, IOWA

NO	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
1	ASPHALT EMULSION FOR SLURRY SEAL	30061	GALS.	185	55,612 85		
2	AGGREGATE FOR SLURRY SEAL	634	TONS	5000	31,700 00		
3	BINDER BITUMEN, FURNISH & APPLY MC-3000 OR CRS-2	119081	GALS.	92	109,554 52		
4	AGGREGATE, COVER, FURNISH & APPLY 1/2 IN.	4157	TONS	2500	103,925 00		
	TOTAL	. . . . .			$300,792 37		

NO TIES OR RESERVATIONS

99

FORM 650027 4-72 H-10279

PROPOSAL FORM

Proj. No. MP-4894--69-D4

Type of Work 616 BITUMINOUS SURFACING

System MAINTENANCE Miles 22.492 County DISTRICT 4

Location and description ON I-29 FROM FREMONT COUNTY LINE NORTH TO I-80

FOG SEAL OF SHOULDERS

Proposal of ______________________________
(name of bidder)

____
(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

ESTIMATING

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract form, including the special provisions contained herein, and of the site of the work, and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease; and further understands that all quantities of work, whether increased or decreased, are to be performed at the unit prices stipulated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials specified in the manner and at the time prescribed and to do the work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$3,000.00	25 WORKING DAYS	SEPT 1, 1982	$105.00

PROPOSAL

To furnish a contract bond in an amount not less than 100 percent of contract award as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check or bank draft on a solvent bank, or a bid bond in the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting JUNE 8, 1982
9 00 AM

Signed Not To Be Used
For Bidding

Form 650028 8-70 H-10279

MP-4894--69-D4

616 (1-2-3) 04 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES DISTRICT 4
BITUMINOUS SURFACING

11-12-13 | 15 — 25

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX.XXX	XXXXX		
1	ASPHALT EMULSION FOR FOG SEAL PER GAL.	28,149 GALS.				
2	TRAFFIC CONTROL	LUMP SUM				
	TOTAL					
	SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS					
	501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION - SERIES OF 1977					
	#899 FEBRUARY 16, 1982 GENERAL SUPPLEMENTAL SPECIFICATION #902 JUNE 8, 1982 ADDENDUM TO GENERAL SUPPLEMENTAL SPECIFICATION FOR CONSTRUCTION PROJECTS					
	#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS					
	502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.					
	530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.					
	518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.					
	SEE ADDITIONAL ATTACHED REQUIREMENTS					

SUPPLEMENTAL SPECIFICATIONS FOR FOG SEAL

(PAVED SHOULDERS)

1. DESCRIPTION. The work shall consist of applying diluted asphalt emulsion to the entire shoulder surface by means of a bituminous distributor.

2. MATERIALS. Asphalt emulsion grade CSS-1 or SS-1 shall be used unless directed otherwise by the engineer.

3. EQUIPMENT. The equipment shall meet the requirements of section 2001 and specifically 2001.12 and 2001.14.

4. DILUTION. The asphalt emulsion is to be mixed with water prior to application to the roadway. The mixing rate is one part of asphalt emulsion to two parts of water. The engineer will require documentation to his satisfaction that the mixing is properly done.

5. APPLICATION. The diluted asphalt emulsion is to be uniformly applied at the rate of 0.20 gallon per square yard of roadway surface.

   Safety and convenience to the public without soiling their vehicles shall be a controlling factor.

   Application widths shall be such that the entire shoulder surface is covered in one application.

   Care shall be taken that no asphalt emulsion is applied to bridge decks, P.C. Concrete Gore area or the adjacent paved surface.

6. LIMITATIONS. No asphalt emulsion shall be placed on a damp or wet surface except as approved by the engineer. Work will not be allowed on Saturdays, Sundays or holidays unless approved by the engineer.

   Asphalt emulsion shall be applied at such air and roadway temperatures that satisfactory application can be obtained.

7. GENERAL. The asphalt emulsion as applied shall have an appearance satisfactory to the engineer. If such is not obtained, the work will be stopped until the appearance is improved to the satisfaction of the engineer. Dilution rate and application rate may need to be adjusted to accomplished desired results.

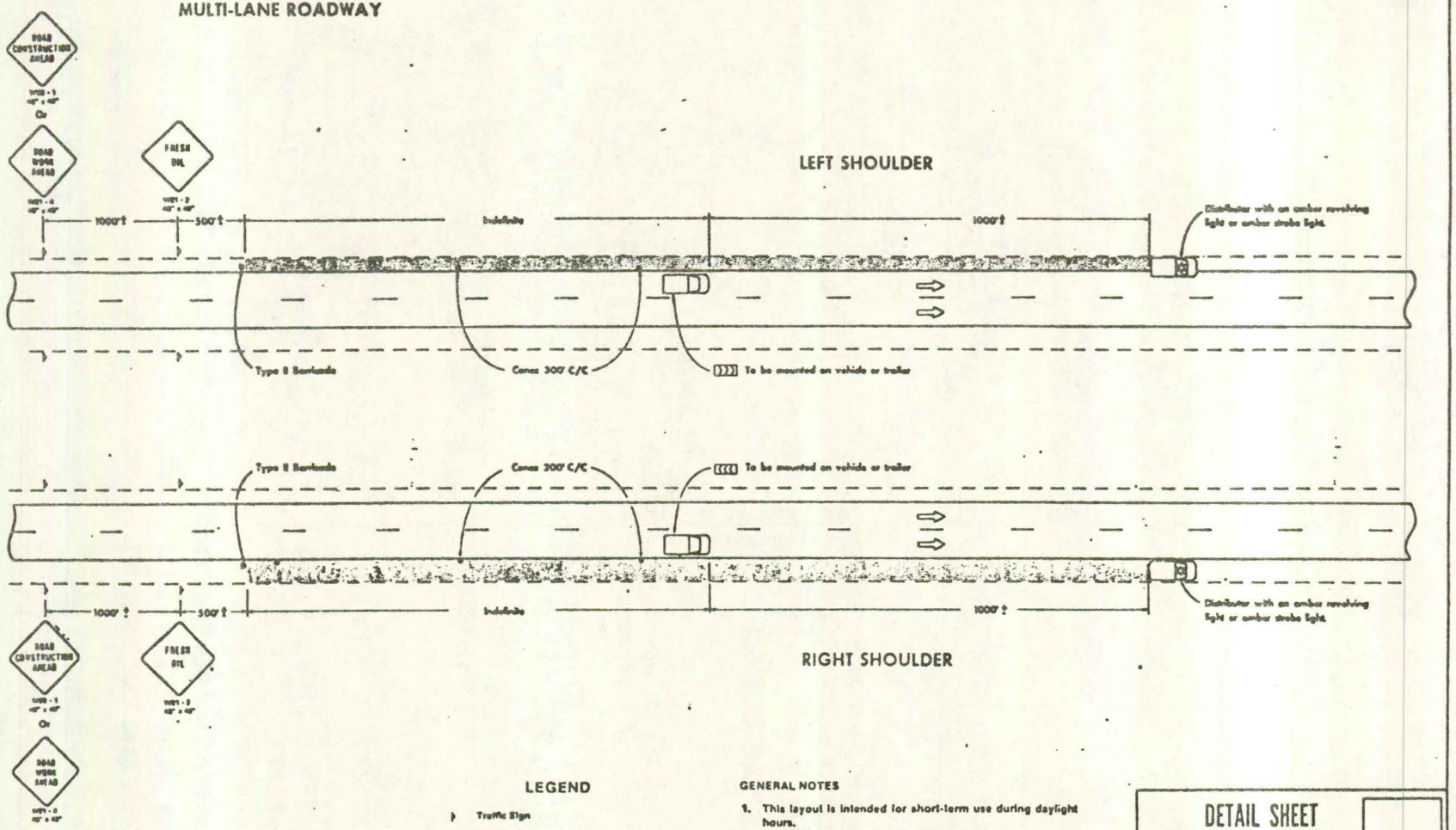
   The contractor shall calibrate bituminous distributor spread rate to the 0.20 gallon per square yard target in a nearby D.O.T. maintenance yard prior to start of work on the roadway surface.

8. METHOD OF MEASUREMENT. The undiluted asphalt emulsion will be measured as provided in 2307.06B.

9. BASIS OF PAYMENT. Payment shall be made for the quantity of undiluted asphalt emulsion that is mixed and used on the project. Diluted asphalt emulsion that is delivered to the jobsite but not applied to the roadway surface will not be considered for payment.

10. TRAFFIC CONTROL. For traffic control, the contractor will be paid the lump sum contract price. This payment shall be full compensation for furnishing all signs, barricades, flaggers, and other traffic-control devices required for this work.

MULTI-LANE ROADWAY



LEGEND

- Traffic Sign
- Type II Barricade
- Sequencing Arrow (Type "C")
- Work Area
- Cones

GENERAL NOTES

1. This layout is intended for short-term use during daylight hours.
2. Amber revolving light to be visible to traffic at all times.
3. If an entrance ramp falls within the work area, a "Fresh Oil" sign shall be placed on the ramp 500 feet in advance of the gore area and a "Road Construction Ahead" or "Road Work Ahead" sign shall be placed on the ramp 1000 feet in advance of the gore area.

DETAIL SHEET

Revision Date

TRAFFIC CONTROL FOR FOG SEALING OF SHOULDERS

COUNTY

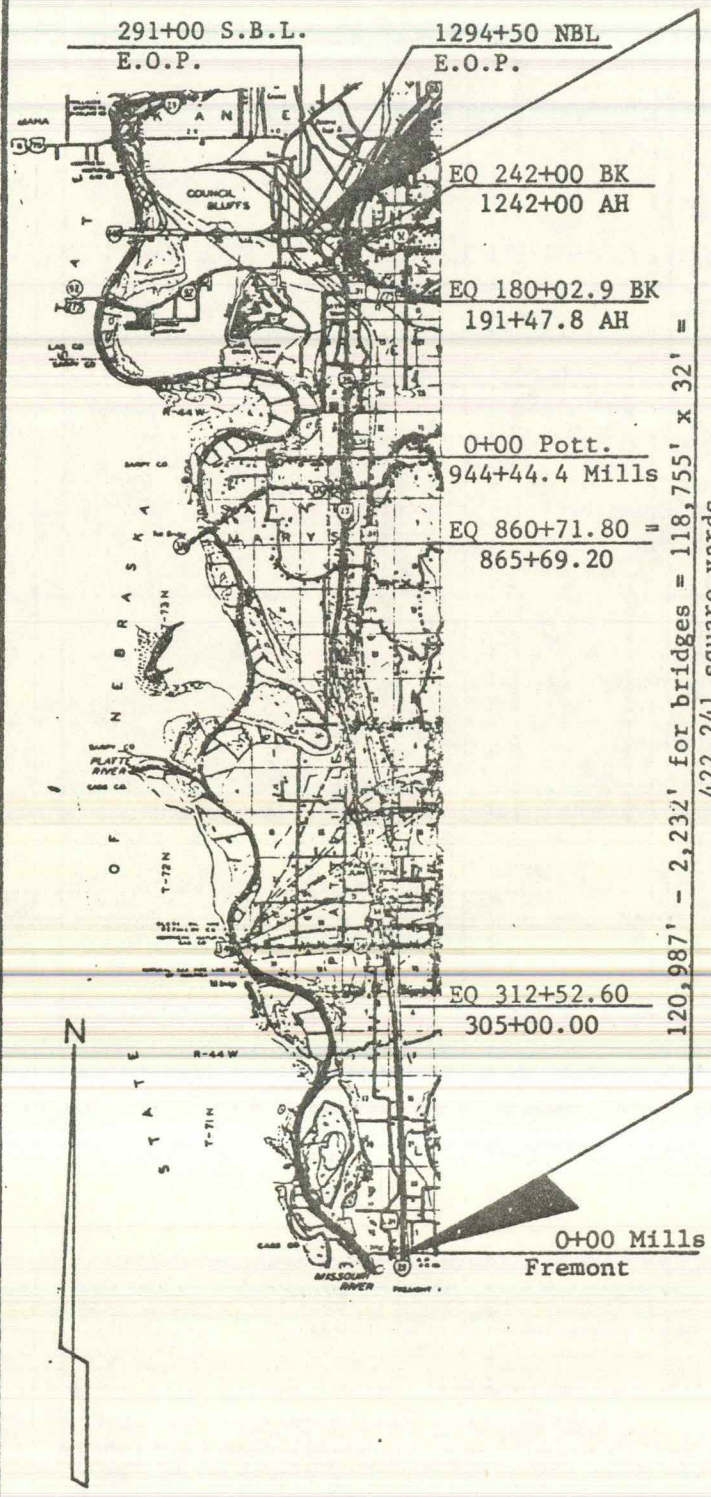
IOWA DEPARTMENT OF TRANSPORTATION

OFFICE OF MAINTENANCE 1982 BITUMINOUS WORK

I-29 from Fremont Co. line north to the junction with I-80

(Shoulders Only)

COUNTY (District 4 Mills-Pottawattamie)
ROUTE I-29
PROJECT NO. MP-4894--69-D4
DIVISION NO.
DISTRICT NO. 4
LENGTH = 118,755 FT.
22.492 MI.
AREA = 422,240 SQ.YDS.
RETURNS = None SQ.YDS.
TOTAL = 422,241 SQ.YDS.



Shoulder Widths

Mainline -
Outside = 10'
Inside = 6'
Ramps -
Outside = 6'
Inside = 4'

PROPOSED WORK 1982

Apply diluted Emulsion (1 part emulsion, 2 parts water) Fog Seal to 422,241 square yards.

ESTIMATED QUANTITY

Asphalt Emulsion for Fog Seal - - - - - 28,149 gal.

DATE STARTED: DATE FINISHED:

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

LOCATION ON I-_1 FROM FREMONT COUNTY LINE NORTH TO I-80

22.492 MILES

BID ORDER NO 2A 502

COUNTY DISTRICT 4
TYPE OF WORK BITUMINOUS SURFACING
PROJECT NO. MP-4894--69-D4
DATE OF LETTING JUNE 08, 1982

NO.	ITEM	QUANTITY	UNIT	KLAASMEYER BROS., INC. OMAHA, NEBRASKA UNIT PRICE	KLAASMEYER BROS., INC. OMAHA, NEBRASKA AMOUNT	STA-BILT CONSTR., CO. HARLAN, IOWA UNIT PRICE	STA-BILT CONSTR., CO. HARLAN, IOWA AMOUNT	MANATTS INC. & SUBSIDIARY BROOKLYN, IOWA UNIT PRICE	MANATTS INC. & SUBSIDIARY BROOKLYN, IOWA AMOUNT
1	ASPHALT EMULSION FOR FOG SEAL	28149	GALS.	174	48,979 26	168	47,290 32	172	48,416 28
2	TRAFFIC CONTROL	LUMP SUM			2,600 00		5,000 00		7,250 00
	TOTAL				$51,579 26		$52,290 32		$55,666 28

NO TIES OR RESERVATIONS

FORM 650027 4-72 H-10279

PROPOSAL FORM

Type of Work 606 BITUMINOUS SURFACING Proj. No. MP-1689--69-D1

System MAINTENANCE Miles 25.051 County DISTRICT 1

Location and description ON I-80 (SHOULDERS ONLY) FROM MITCHELLVILLE INTERCHANGE TO KELLOGG INTERCHANGE

SAND SEAL OF SHOULDERS

Proposal of _____
(name of bidder)

(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract, including the special provisions contained therein, and of the site of the work and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease; and further understands that all quantities of work, whether increased or decreased, are to be performed at the unit prices stated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction in the manner specified, and to complete the work within the time proposed to do the work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

ESTIMATING

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$7,000.00	50 WORKING DAYS	SEPT 15, 1982	$140.00

PROPOSAL

To furnish a contract bond in the sum of not less than one-half of the amount bid as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check or bank draft on a solvent state or national bank in the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting MAY 11, 1982 9 00 AM

Signed Not To Be Used For Bidding

Form 650028 8-70 H-10279

MP-1689--69-01

606 (1-2-3) 04 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES

DISTRICT 1
BITUMINOUS SURFACING

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX.XXX	XXXXX		
1	BINDER BITUMEN. FURNISH & APPLY. AS PER PLAN. PER GAL.	92,227 GALS.				
2	AGGREGATE. COVER - SAND PER TON	2,306 TONS				
3	TRAFFIC CONTROL	LUMP SUM				
	TOTAL					

SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS

501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION. DEPARTMENT OF TRANSPORTATION - SERIES OF 1977

#899 FEBRUARY 16. 1982 GENERAL SUPPLEMENTAL SPECIFICATION

#854 OCTOBER 2. 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)

#815 OCTOBER 11. 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS

502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.

518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.

BITUMINOUS SURFACING WORK WILL NEED TO BE COORDINATED WITH OTHER CONTRACTORS WORKING IN THIS AREA.

SEE ADDITIONAL ATTACHED REQUIREMENTS

(Special Provisions Continued)

Nature of Work

BITUMINOUS SEAL COAT

The plats indicate the character of the work at each location and an estimate of the bid quantities required, the rates of application, the grades of bitumen and size of aggregate. The bitumen for seal coat work shall be CRS-1 Cationic, unless otherwise noted. The cover aggregate for seal coat work will be sand.

Progress of Work

The roads that are to be surfaced will be repaired and prepared for the surfacing by the Department of Transportation - Highway Division in advance of the contract work. Some roads in each district will be ready by June 15th so that the contractor may start promptly. Additional roads will be made ready by the several maintenance crews ahead of the arrival of the contractor as the work progresses. The contractor shall contact the District Maintenance Engineer for the district in which he will do contract work and arrange a starting date and place. Furthermore, the contractor, in cooperation with the District Maintenance Engineer, shall prepare a work progress schedule for the entire district, to assure proper coordination of the work by the maintenance crews with the contract work. If such a schedule is not prepared because of neglect on the part of the contractor, the Department of Transportation will not assume liability for delays that occur for want of such schedule.

General Information

No work will be permitted in the business districts of cities and towns, or in state parks, on Saturday afternoons, Sundays and legal holidays.

Note: There are 1 plats attached showing location of proposed work on this project.

Section 2307.04 Paragraph C-3 Joints. Add: Building paper to be minimum 30#.

TRAFFIC CONTROL PLAN

1. Through traffic will be maintained on the project at all times.

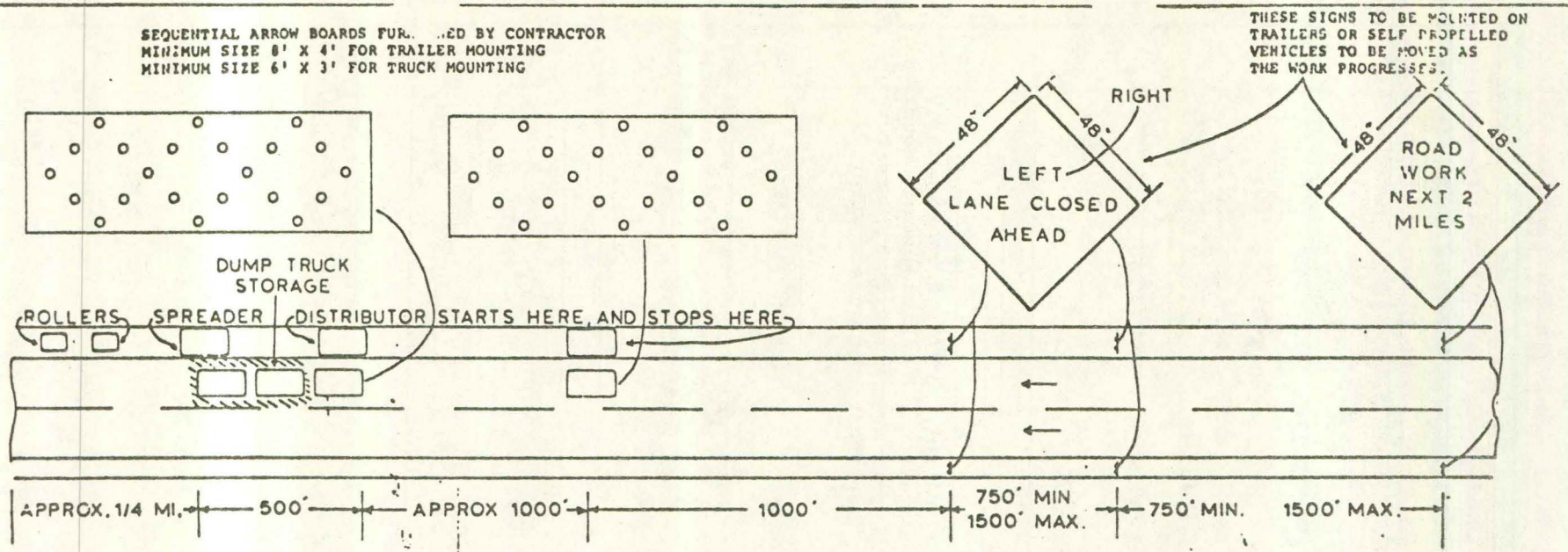
2. Traffic control on this project shall be in accordance with Supplemental Specification 854 and Detail Sheets attached hereto.

3. All traffic control devices shall be furnished, erected, maintained, and removed by the contractor.

4. The location for storage of equipment by the contractor during non-working hours will be as approved by the engineer in charge of construction.

5. Proposed sign spacing may be modified, as approved by the engineer, to meet existing field restrictions or to prevent obstruction of the motorist's view of permanent signing.

6. Proposed changes in the traffic control plan (including layout sheets) shall be reviewed with the Office of Construction before changes are made.



TRAFFIC CONTROL FOR
SHOULDER SEAL COATING
ON 4 LANE DIVIDED HIGHWAY

The vehicle mounted arrows to be placed at a height with 7' clearance between the bottom of the arrow and the pavement.

IOWA DEPARTMENT OF TRANSPORTATION

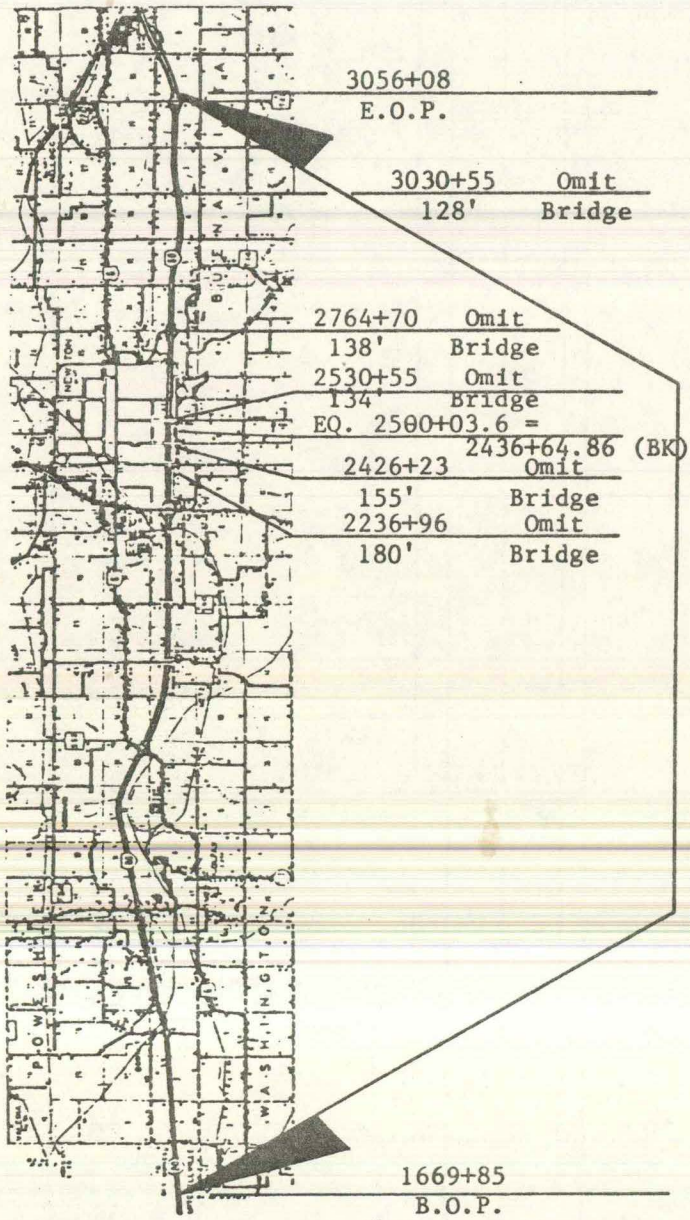
OFFICE OF MAINTENANCE 1982 BITUMINOUS WORK

I-80 Mitchellville to Kellogg
(SHOULDERS ONLY)

COUNTY Polk-Jasper
ROUTE I-80
PROJECT NO. MP-1689--69-D1
DIVISION NO.
DISTRICT NO. 1
LENGTH = 132,267 FT.
25.051 MI.
AREA = 459,084 SQ.YDS.
RETURNS = 2,049 SQ.YDS.
TOTAL = 461,133 SQ.YDS.

Shoulder Widths

Mainline	Ramps
Outside - 8',10',12'	Outside - 6'
Inside - 6'	Inside - 4'



PROPOSED WORK 1982

Single course bituminous seal coat of 461,133 square yards using 0.20 gallon CRS-1 emulsion per square yard and 10 pounds of sand cover aggregate per square yard.

ESTIMATED QUANTITIES

Binder Bitumen - - - - 92,227 gals.

Sand Cover Aggregate - 2,306 tons

DATE STARTED: DATE FINISHED:

FORM 650016
6-78 H-5478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

(Begin Mainf)
25.051 MILES

LOCATION ON 1[illegible] (SHOULDERS ONLY) FROM MITCHELLVILLE INTERCHANGE TO KELLOGG INTERCHANGE

BID ORDER NO. 501

1A

COUNTY DISTRICT 1
TYPE OF WORK BITUMINOUS SURFACING
PROJECT NO. MP-1689--69-D1
DATE OF LETTING MAY 11, 1982

NO.	ITEM	QUANTITY	UNIT	DES MOINES ASPHALT & PAVING CO., INC. WEST DES MOINES, IOWA UNIT PRICE	DES MOINES ASPHALT & PAVING CO., INC. WEST DES MOINES, IOWA AMOUNT	KLAASMEYER BROS., INC. OMAHA, NEBRASKA UNIT PRICE	KLAASMEYER BROS., INC. OMAHA, NEBRASKA AMOUNT	STA-BILT CONSTR., CO. HARLAN, IOWA UNIT PRICE	STA-BILT CONSTR., CO. HARLAN, IOWA AMOUNT
1	BINDER BITUMEN, FURNISH & APPLY, AS PER PLAN.	92227	GALS.	106	97,760 62	110	101,449 70	102	94,071 54
2	AGGREGATE, COVER - SAND	2306	TONS	900	20,754 00	1400	32,284 00	1990	45,889 40
3	TRAFFIC CONTROL	LUMP SUM			15,000 00		1,000 00		25,000 00
	TOTAL				$133,514 62		$134,733 70		$164,960 94

NO TIES OR RESERVATIONS

80

FORM 850018
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

1B 25.051 MILES LOCATION ON I-[illegible] (SHOULDERS ONLY) FROM MITCHELLVILLE INTERCHANGE TO KELLOGG INTERCHANGE

BID ORDER NO. 501

COUNTY DISTRICT 1
TYPE OF WORK BITUMINOUS SURFACING
PROJECT NO. MP-1689--69-D1
DATE OF LETTING MAY 11, 1982

NO.	ITEM	QUANTITY	UNIT	MANATTS INC. & SUBSIDIARY BROOKLYN, IOWA UNIT PRICE	MANATTS INC. & SUBSIDIARY BROOKLYN, IOWA AMOUNT	IOWA ROAD BUILDERS CO. & SUBSIDIARY DES MOINES, IOWA UNIT PRICE	IOWA ROAD BUILDERS CO. & SUBSIDIARY DES MOINES, IOWA AMOUNT	UNIT PRICE	AMOUNT
1	BINDER BITUMEN, FURNISH & APPLY, AS PER PLAN.	92227	GALS.	1.30	119,895.10	1.32	121,739.64		
2	AGGREGATE, COVER - SAND	2306	TONS	16.50	38,049.00	21.48	49,532.88		
3	TRAFFIC CONTROL	LUMP SUM			15,000.00		7,500.00		
	TOTAL				$172,944.10		$178,772.52		

NO TIES OR RESERVATIONS

81

FORM 650027 4-72 H-10279

PROPOSAL FORM

618

Type of Work BITUMINOUS SURFACING

Proj. No. MP-1615--69-77

System MAINTENANCE Miles 18.314 County POLK

Location and description ON I-35 & I-80 FROM JCT. IOWA 5 TO C & NW R.R. BRIDGE JUST EAST OF U S 69

SEAL COAT OF SHOULDERS

Proposal of ______________________________
(name of bidder)

(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

ESTIMATING

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract form, including the special provisions contained herein, and of the site of the work and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease; and further understands that all quantities of work, whether increased or decreased, are to be performed at the unit prices stipulated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction and to furnish all materials specified in the manner and at the time prescribed and to do the work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$11,000.00	30 WORKING DAYS	SEPT 15, 1981	$140.00

PROPOSAL

To furnish a contract bond in an amount not less than 100 percent of contract award, as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check, or bank draft on a solvent bank, or a bid bond in the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting JUNE 23, 1981
9 00 AM

Signed Not To Be Used
For Bidding

Form 650028 8-70 H-10279

MP-1615--69-77

618 (1-2-3) 04 (4-5)

CONTRACTOR'S NUMBER (6 7 8 9 10)

SCHEDULE OF PRICES

POLK
BITUMINOUS SURFACING

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
			XXX.XXX	XXXXX		
1	BINDER BITUMIN. FURNISH & APPLY CRS-2 CATIONIC ONLY PER GAL.	130,988 GALS.				
2	AGGREGATE, COVER, FURNISH & APPLY 1/2 IN. PER TON	4,912 TONS				
	TOTAL					
	SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS					
	501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION - SERIES OF 1977					
	#874 DECEMBER 16, 1980 GENERAL SUPPLEMENTAL SPECIFICATION					
	#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#876 DECEMBER 16, 1980 ADDENDUM TO TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)					
	#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS					
	502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.					
	530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.					
	114 COMBINATION BID: THE FOLLOWING PROJECTS ARE TIED. NO OTHER TIES OR RESERVATIONS WILL BE PERMITTED.					
	POLK COUNTY BITUMINOUS SURFACING PROJECT MP-1615--69-77 AND DISTRICT 1 BITUMINOUS SURFACING PROJECT MP-1616--69-D1					
	SEE ADDITIONAL ATTACHED REQUIREMENTS					

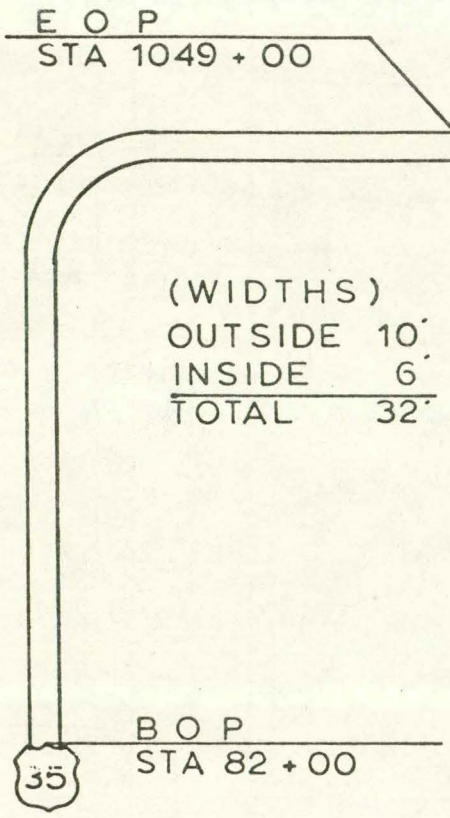
IOWA DEPARTMENT OF TRANSPORTATION

MAINTENANCE DEPT. 1981 BITUMINOUS WORK

I-35 I-80 FROM JCT IA.5
TO BRIDGE OVER R.R.E.
OF US.69

(SHOULDERS ONLY)

POLK COUNTY
PROJECT NO. MP-1615--69-77
DIVISION NO.
DISTRICT NO. 1
LENGTH= 96,700FT.
18,314 MI.
AREA= 327,469 SQ.YDS.
RETURNS= SQ.YDS.
TOTAL= 327,469 SQ.YDS.



Proposed Work 1981

Single course bituminous seal coat of 327,469 sq. yds. using 0.40 gallons CRS-2 (Cationic) per sq. yd. and 30 lbs. of ½" cover aggregate per sq. yd.

Estimated Quantities

Binder Bitumen - - 130,988 gals.
½" Cover Aggregate - 4,912 tons

NOTE:

Omit 10 ft. shoulders -

East Bound Sta. 831+65 to 852+65
West Bound Sta. 831+35 to 852+35

Omit 10 ft. and 6 ft. shoulders -

East Bound and West Bound from Sta. 922+13 to 955+00

(1 of 4)

DATE STARTED: DATE FINISHED:

SPECIAL LIMITATIONS
for
Polk County Interstate Shoulder Work
Bituminous Surfacing and Fog Seal

I-35 and I-35/I-80 from Iowa 5 to Iowa 401 - No northbound or eastbound lane may be closed before 8:30 a.m. All southbound or westbound lanes shall be open by 3:30 p.m.

I-35/I-80 from Iowa 401 to E. Jct. I-235 - All lanes shall be open by 2:00 p.m.

I-80 from E. Jct. I-235/*35 to Jasper County Line - Only one lane in each direction may be closed at any one time.

I-35 from E. Jct. I-235/I-80 to Story County Line - No southbound lane may be closed before 8:30 a.m. and all northbound lanes must be open by 3:30 p.m.

All lane closures must be made in coordination with other contractors in the area.

The lane closure restrictions may be altered upon approval by the engineer.

(Special Provisions Continued)

Add the following sentence to 2307.02B.1

The absolute viscosity @ 140° F. (60°C.) of the residue from distillation shall be a minimum of 600 poises for CRS-2 used between June 15 and August 15 and a minimum of 400 poises for CRS-2 used prior to June 15 and after August 15.

Delete the fourth paragraph of 2307.04C2 and the following in lieu thereof:

The length of any spread shall not be more than can be covered with aggregate within 5 minutes after the bitumen spread has been completed and more than can be completely rolled within 30 minutes after the bitumen spread has been completed.

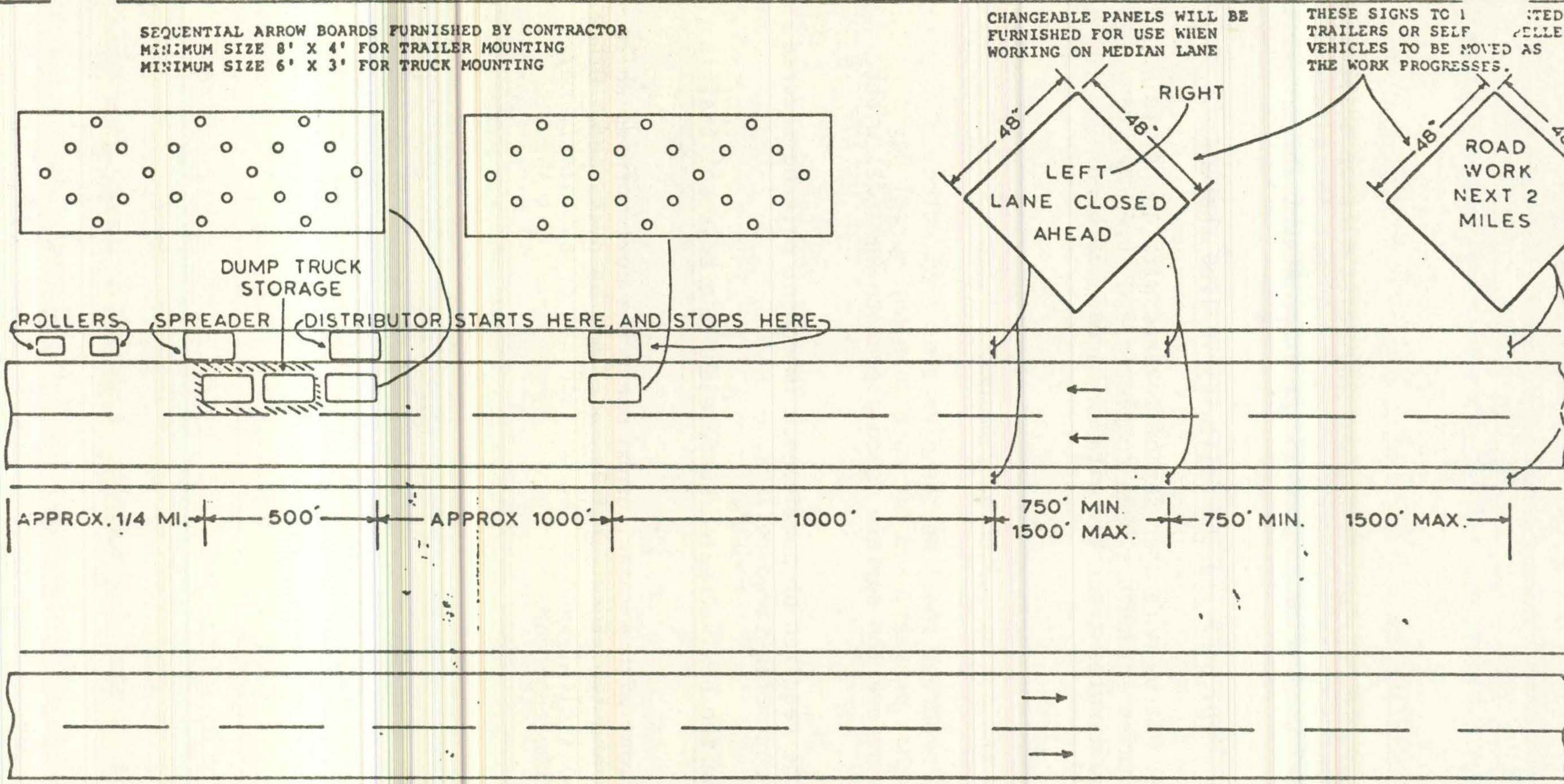
Add the following sentence to the 4th paragraph of 2307.04C2.

In addition, the direction of progress shall be the direction from which aggregate is to be hauled to the spreader, and not more than one normal day's run shall be made on one side before the surface is completed to the full width.

Steel-tired rollers will not be required or permitted. Imbedment will be secured by eight coverages made with pneumatic-tired rollers.

To remove loose particles from the newly treated surface and the adjacent traffic lane:

The surface shall be GENTLY swept with a rotary broom early the next morning while the bituminous binder is hard and the stuck particles will not be disturbed. Other means of removing the loose particles, such as vacuum machines or air blast, may be used with the approval of the engineer.



All signs except the Sequential Arrows are to be furnished by the Iowa Department of Transportation and made available at a nearby Maintenance Garage.

The signs are to be placed, cleaned and kept in their proper position by the Contractor. The Contractor is held responsible for any damage to the signs due to negligence on the part of his employees. Signs struck and damaged by others excluding the Contractor and his employees will be replaced by the Iowa Department of Transportation.

When no longer needed, or at the completion of the project, the contractor shall return the signs to the Iowa Department of Transportation Maintenance garage.

The vehicle mounted arrows to be placed at a height with 7' clearance between the bottom of the arrow and the pavement.

SIGNING FOR SHOULDER SEAL COATING ON 4 LANE DIVIDED HIGHWAY

FORM 850016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION ON I-35 & I-80 FROM JCT. IOWA 5 TO C & NW R.R. BRIDGE JUST EAST OF U S 69

2A 18.314 MILES

BID ORDER NO. 502

COUNTY	POLK											
TYPE OF WORK	BITUMINOUS SURFACING				IOWA ROAD BUILDERS CO. DES MOINES, IOWA.		MANATTS, INC. BROOKLYN, IOWA		DES MOINES ASPHALT & PAVING CO., INC. WEST DES MOINES, IOWA	
PROJECT NO.	MP-1615--69-77									
DATE OF LETTING	JUNE 23, 1981									
NO.	ITEM	QUANTITY		UNIT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
1	BINDER BITUMIN, FURNISH & APPLY CRS-2 CATIONIC ONLY	130988		GALS.	132	172,904 16	149	195,172 12	137	179,453 56
2	AGGREGATE, COVER, FURNISH & APPLY 1/2 IN.	4912		TONS	1995	97,994 40	2250	110,520 00	2970	145,886 40
	TOTAL					$270,898 56		$305,692 12		$325,339 96

POLK COUNTY BITUMINOUS SURFACING PROJECT MP-1615--69-77 AND DISTRICT 1 BITUMINOUS SURFACING PROJECT MP-1616--69-D1

REPAIR OF CONCRETE JOINTS AND SPALL AREAS
IOWA PRESENTATION

Slide No.

In early years of getting out of the mud Iowa was blessed with abundant supplies of concrete aggregate and a strong concrete paving industry. We built many miles of concrete pavement utilizing local aggregates. It wasn't until after a major part of the highway system was paved that it was fully realized there were problems that were inherent in some of these aggregates. As a result we are maintaining many miles of highway with severe "D" cracking aggregates in the concrete.

Our first line of attack in repairing these highways is with asphalt surface patches.

1B This first slide shows how "D" cracking begins at the joints where water can enter the pavement.

2B The next slide shows the "D" cracking progressing along the joints both longitudinally and transversely and out into the slab until, in the later stages of deterioration, the entire slab is cracked. "D" cracking not only attacks the top of the pavement but it also attacks the bottom with deterioration working both directions towards the center of the slab.

3B Another minor problem that seems to be prevalent over a great part of our interstate system where have dowel basket assemblies is joint deterioration at the dowel baskets. This slide shows this type of deterioration where possibley the dowels failed to function as designed and the pavement fractures beyond the end of the assembly. For both the "D" cracking and early states of dowel joint failures, surface patching is our first maintenance operation.

4B In making repairs with either our local maintenance forces or by contract, we endeavor to square up the spall or deteriorated area with a jackhammer to remove all of the deteriorated concrete back to sound concrete.

5B This slide shows where the deterioration has been removed and the holes tacked ready to receive an asphalt surface patch.

6B
7B The asphalt material used is a high quality hot mix either purchased from a local plant or manufactured on the job with a small portable plant. The material is placed in lifts not to exceed three inches in depth with the last lift being placed slightly higher than the pavement surface.

8B
9B The last lift is rolled with a vibrating steel roller leaving a smooth patch that if properly prepared, cannot be felt by the motorist. We have patches such as this that were placed five years ago that are still serving without adidtional maintenance.

Slide No.

10B When surface and joint problems get this bad, they are beyond the contract surface patching concept and the local crew merely plugs the holes until full depth repair or resurfacing can be accomplished.

11B Blank.

Full depth concrete pavement repair in Iowa has been going through an evolution of changes over the past few years and I'm not sure that we have the proper answer to all of the problems yet. We do, however, have another new specification this year which is totally different from previous years and we are hopeful that at least many of the problems that we have experienced in the past will be overcome by this specification.

The biggest problem that we have had the last few years has been the premature breaking up of concrete pavement patches. The patches would either fracture, crumble or settle to the point where they have to be replaced. This was probably caused by a combination of circumstances.

First, we are experiencing heavier and more frequent truck loading on all of our highways.

Secondly, we have gone to specifications which allow for same day opening of patched areas by the use of concrete mixes that will set and supposedly carry loads within four hours.

Thirdly, we have been cutting many pressure relief joints in our highways to eliminate blow-ups and possibly this has caused our pavements to relax to the point where patches are no longer held in place by aggregate interlock. Since we do not replace load transfer devices, we do rely on aggregate interlock.

We have some slides that will show the type of pavement repair that we are now making.

12B Full depth patches are made with either full depth PC concrete, full
13B depth asphalt or with Portland Cement concrete capped with about 2" of asphalt, depending upon the type of highway being repaired and the intended purpose of the patch.

14B The full depth Portland Cement concrete patches are placed in relative new concrete highways that we intend to retain as a concrete driving surface. These patches are placed no less than 9 nor more than 12 inches in depth and the surface of the patch is edged and sealed. We normally specify a minimum 4 foot width to the patch and it is normally full lane width.

15B The deteriorated concrete limits are located and sounded to identify the limits of the deterioration. The limits are marked.

16B The contractor is then allowed to saw for patch removal.

Slide No.

17B Two saw cuts can be made. The first saw cut at the outer limit of the patch is to be made a nominal 1 1/2" deep, the second saw cut is to be made at least 1 inch inside of the first saw cut and it can be full depth. The reason for this is that we want the broken or deteriorated area removed without disturbing the existing pavement. Since load transfer devices are not replaced, we must rely on aggregate interlock and this necessitates hand removal by small jack hammers of the 1" of material between the full depth saw cut and the 1 1/2" saw cut.

18B The contractor may elect to make the second full depth saw cut with a wheel saw as is shown in this picture to facilitate removal.

19B This shows a patch with the full depth wheel saw cuts having been made on each side of the patch. The 1 1/2" deep diamond saw cut has been made approximately 1" each side of the full depth cuts.

20B The concrete in between the full depth saw cuts can be removed by whatever means the contractor chooses. In Iowa, they generally choose to break it up with large hydraulically operated backhoe mounted jack hammers.

21B This shows an area where the center portion has been removed.

22B
23B Then lightweight jack hammers are used to remove the 1" minimum of material that remains to provide for the aggregate interlock that is desired. This small hammper can be no heavier than a 15 pound air chisel unless the contractor can show that a 30 pound air chisel will not produce significant underbreakage.

24B The concrete has been removed in this picture.

25B We then require that the edge be formed and the subgrade compacted with a vibrating tamper.

26B
27B At this point, if it is determined that the location is where there is unstable subgrade, a filter blanket is installed under the patched area to drain the excess moisture from the subgrade and provide a stable patch. Filter blanket is used to prevent pumping of the subgrade soil into the granular backfill and a 3" pipe is used to outlet the water. Granular material is carried to the foreslop to facilitate drainage.

The four foot minimum patch is often exceeded where longer sections of pavement have been broken up adn substantially longer patches are allowed.

28B The concrete is poured and well vibrated into the area being repaired. The concrete is brought to the site or mixed on the site where 2.5 gallongs of 38 percent solution calcium chloride liquor is added just before the pour is made. The surface is textured and the top of the patch is edged for subsequent sealing with a high quality hot pour sealant. Patches are immediately covered with plastic film and the plastic film covered with insulation board. After curing,

Slide No.

the edges are sealed, the shoulder is repaired and the patches are opened to traffic after a minimum of five hour cure time.

29B There is also a long patch section where patches are being placed in a four-lane divided facility where one lane can handle the traffic and the lane being patched can be closed temporarily. The contractor need not use calcium chloride additive when a longer cure period is available. These patches are cured a minimum of 30 hours.

30B Another type of full depth pavement repair is where there is an asphalt overlay of an existing concrete pavement. In such cases, the repair is made in the same manner as just discussed, but do requre the top two inches to be of asphalt concrete to provide the same type driving surface.

31B A third method is the full depth asphalt patch. These are placed in Portland Cement concrete pavements where the pavement is going to be resurfaced and/or has already been resurfaced. These patches are desirable where there is a need for pressure relief. This type patch itself provides this relief and can be planed off with a motor grader if it humps up due to pavement pressure.

32B
33B These full depth asphalt patches are located and marked by the inspector and the area removed after the pavement has been sawed full depth with either a concrete cutter or a diamond saw. Again the full depth sawing is done to prevent underbreaking of the concrete that is to remain. The bottom of the trench is compacted and drainable material installed if necessary. The edge of the remaining concrete is tacked.

34B As is the subgrade.

35B The asphalt is placed in lifts.

36B And compacted with a vibrating compactor.

37B The last lift placed with the vibrating compactor should be left somewhat low.

38B The final lift is placed.

39B And rolled with a steel roller.

40B The riding surface that results is to be leveled to not more than 1/4" above the adjacent pavement.

Spall patching by state personnel with asphalt mixes cost about $196/ton and full depth patching about $57/sy in 1982.

Contract full depth patching cost from $65-$100/sy and partial depth about $8.25/S.F. Comparison of spall or partial depth patching costs is difficult because of the differences in units of measurements.

FORM 650027 4-72 H-10279

PROPOSAL FORM

Proj. No. MP-4877--69-04

Type of Work 636 CONCRETE PAVEMENT REPAIR

System MAINTENANCE Miles County DISTRICT 4

Location and description ON IOWA 92 FROM JCT. IOWA 148 (CASS COUNTY) EAST TO FONTANELLE (ADAIR COUNTY)

FULL DEPTH PATCHES, SURFACE PATCHES & ROUTING & CRACK SEALING

Proposal of _____
(name of bidder)

_____
(Street Address) (Town) (State) (Zip)

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

The bidder hereby certifies that he or they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract form, including the special provisions contained herein, and of the site of the work, and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease; and further understand that all quantities of work, whether increased or decreased, are to be performed at the unit prices stipulated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials specified in the manner and the time prescribed and to do the work at the prices hereinafter set out, and that it is not in violation of the provisions of Section 314.2 Code of Iowa, 1971 as amended (Interest in contract prohibited), and 324.17(8) of the 1971 Code of Iowa as amended (Refund to non licensee-fuel used other than in motor vehicles).

We further propose:

To do all "Extra Work" which may be required to complete the work contemplated, at unit prices or lump sums to be agreed upon in writing prior to starting such work, or if such prices or sums cannot be agreed upon to perform such work on a force account basis, as provided in the Specifications.

To execute formal contract within fifteen days or forfeit the proposal guaranty furnished herewith.

To begin work by the date specified and to complete the same within the contract period, or to pay the liquidated damages stipulated below accruing for each calendar or working day elapsing after the expiration of the contract period, before completion of the work.

Group or Division Number	Amount of Proposal Guaranty	Approx. or Specified Starting Date or Number of Working Days	Specified Completion Date or Number of Working Days	Liquidated Damages Per Day
	$6,000.00	85 WORKING DAYS	OCT. 15, 1982	$140.00

To furnish a contract bond in an amount not less than 100 percent of contract award, as security for the construction and completion of the work awarded the bidder in accordance with the plans, specifications and contract.

Enclosed herewith find certified check, cashier's check, or bank draft on a solvent bank, or a bid bond in the penal sum as shown in the contract document as a proposal guaranty, which it is understood will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable.

Signatures are to be by authorized agent; if joint venture, each should sign.

Date of Letting MAY 11, 1982 9:00 AM

Signed Not To Be Used

Form 650028 8-70 H-10279

MP-4877--69-D4

~~436~~ 1-2-3 ~~41~~ 4-5

CONTRACTOR'S NUMBER 6 7 8 9 10

SCHEDULE OF PRICES DISTRICT 4
CONCRETE PAVEMENT REPAIR

11-12-13 | 15—25

Item No.	Item and Unit on which bid is based. Bidder shall show unit price and extension for each item and total for each group.	Quantity	Unit Price Dollars (xxx.xxx)	Unit Price Cents (xxxxx)	Amount Dollars	Amount Cents
1	PATCHES, FULL DEPTH, BY COUNT EACH	86 ONLY				
2	PATCHES, FULL DEPTH, P.C.C. TYPE 1 PER SQ. YD.	601.300 SQ. YDS.				
3	PATCHES, ASPHALT CEMENT CONCRETE, SURFACE PER SQ. FT.	7,000 SQ. FT.				
4	CLASS 1 CRACKS, ROUTING & SEALING PER LIN. FT.	16,500 LIN. FT.				
5	CLASS 2 CRACKS, CLEANING & SEALING PER LIN. FT.	34,440 LIN. FT.				
6	TRAFFIC CONTROL	LUMP SUM				
	TOTAL					

SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS

501 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, DEPARTMENT OF TRANSPORTATION - SERIES OF 1977

#899 FEBRUARY 16, 1982 GENERAL SUPPLEMENTAL SPECIFICATION

#854 OCTOBER 2, 1979 TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS (PART 6)

#815 OCTOBER 11, 1977 EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES ON NON-FEDERAL AID PROJECTS

#896 FEBRUARY 16, 1982 PAVEMENT REPAIR (FULL-DEPTH PCC PATCHES)

SP-395 APRIL 13, 1982 SPECIAL PROVISIONS FOR CRACK AND JOINT CLEANING AND SEALING (PORTLAND CEMENT CONCRET PAVEMENT)

502 UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

530 CONTRACTOR SHALL BID ON ALL ITEMS OF THIS PROPOSAL OR HIS BID WILL BE REJECTED.

518 THIS PROJECT SHALL NOT BE BID IN COMBINATION WITH ANY OTHER PROJECT. NO TIES OR RESERVATIONS WILL BE PERMITTED.

TRAFFIC CONTROL BID ITEM APPLIES TO ITEMS 3-5

SEE ADDITIONAL ATTACHED REQUIREMENTS

SPECIAL PROVISIONS CONTINUED

1. Asphalt Concrete Surface Patches. In areas where spalled concrete or old patching material is removed for a depth greater than one inch but less than the total thickness of the old pavement, the depressions shall be given a tack coat and filled with hot asphalt concrete. This mixture shall be deposited in layers which, after compaction, will not exceed 3 inches in thickness. Each layer shall be thoroughly compacted, while hot, by tamping with a mechanical tamper, until it has attained a density satisfactory to the engineer. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. The final surface shall be rolled with a self-propelled, smooth, steel-tired roller or a self-propelled vibratory roller. The final compacted surface shall be level with, or not in excess of approximately ¼ inch above, the surrounding surface. The patch shall not be opened to traffic until the mixture has cooled sufficiently to provide stability. If an asphalt concrete patch becomes seriously distorted because it has been opened to traffic before it was completely cooled or settled below surrounding surface within 5 days from time of placement, the contractor shall smooth the surface by blading, scraping or by adding additional material and compacting.

2. Primer or Tack-Coat Bitumen shall be MC-70, RC-70, SS-1, SS-1H, CSS-1, and CSS-1H meeting requirements or Section 4138 or 4140. Mixing of CSS and SS grades will not be permitted. Tack coats shall be applied when the surface on which the coat is to be applied is clean and free of moisture. They may be applied at such base temperature that satisfactory application can be obtained, except they shall not be applied when the temperature on the base being covered is less than 25 degrees F.

3. No pavement shall be disturbed for surface patching unless the patch can be completed before the end of the working day. No patch shall be less than 2 square feet in area.

4. The top 2" of the area removed shall be cut reasonably vertical by a pneumatic hammer having a maximum weight of 60 lbs. to prevent damage to surrounding pavement. All areas excavated shall be a minimum of 3 inches in thickness and shall be removed to a normal depth of 4 inches, or to the existing wire mesh or dowel bars, or as directed by the engineer.

5. The asphalt cement concrete shall conform to specifications for ½" Type A mixture or an equivalent mix approved by the engineer, with the plant location being within 30 haul miles of the job site. The asphalt cement content may be increased as much as .5 percent, as directed by the engineer.

6. The work area shall not extend more than 2 feet into the second lane at any time, if the section to be removed extends beyond a single lane width.

SPECIAL PROVISIONS CONTINUED

7. All traffic control devices such as, sequencing arrows, signs, skids, barricades, traffic cones and warning lights shall be furnished by the contractor. All traffic control devices are to be furnished, erected, maintained and removed by the contractor. Additional arrow boards on skids shall be placed within the lane closure extending beyond 1 mile at the direction of the Engineer.

8. Method of Measurement. The engineer will measure the quantities of old patches and old pavement removed and its replacement with Asphalt Cement Concrete will be computed in square feet.

9. Basis of payment. For the number of square feet of patches placed the contractor will be paid the contract price per square foot. This price shall be full compensation for removal and disposal of the old pavement and for all materials and other items involved in construction of such patches.

10. Traffic control will be paid for in a lump sum.

District 4
Concrete Pavement Repair
MP-4877--69-D4

97

TABULATION OF P.C. CONCRETE PATCHES

o.	LOCATION STATION to STATION	LANE L-R-B	TYPE	PROPOSED PATCH THICKNESS	DOWEL ASSEMBLIES No. (non-bid)	FULL DEPTH PATCHES sq. yds.	SUBDRAIN PIPE lin. ft.	OUTLETS No.	Removal of Anchor Lugs No.	Granular Fill sq. yds.	REMARKS
1	1194+80	B	1			12.2					
2	1197	B				12.2					
3	1228+60	B				22.0					
4	1251+54	B				29.3					
5	1283+45	B				9.8					
6	1295+75	R				4.9					
7	1316+60	B				9.8					
8	1333+30	B				9.8					
9	1334+50	L				4.9					
10	1338+90	B				18.3					
11	18+25	B				12.2					
12	26+75	B				12.2					
13	27+80	B				22.0					
14	31+90	B				9.8					
15	46+54	B				9.8					
16	51+40	B				9.8					
17	65+85	B				14.7					
18	67+30	L				4.9					
19	69+50	R				4.9					
20	72+45	B				26.9					
21	83+70	B				17.1					
22	84+70	B				17.1					
23	90	B				9.8					
24	95	B				17.1					
25	104+20	B				9.8					
26	111+90	L				4.9					
27	117+55	L				5.3					
28	126+30	B				9.8					
29	128	B				17.1					
30	148+45	L				5.8					
31	150	R				9.8					
32	178+80	B				9.8					
33	191+55	R				4.9					
34	207+20	B				22.0					
											1-19-78

District 4
Concrete Pavement Repair
MP-4877--69-D4

TABULATION OF P.C. CONCRETE PATCHES

No.	LOCATION STATION to STATION	LANE L-R-B	TYPE	PROPOSED PATCH THICKNESS	DOWEL ASSEMBLIES No. (non-bid)	FULL DEPTH PATCHES sq. yds.	SUBDRAIN PIPE lin. ft.	OUTLETS No.	Removal of Anchor Lugs No.	Granular Fill sq. yds.	REMARKS
35	212+25	B	1			22.0					
36	228+70	B				9.8					
37	237+25	B				9.8					
38	240+25	R				4.9					
39	241+27	L				4.9					
40	241+80	R				4.9					
41	242+95	R				5.7					
42	257+15	B				9.8					
43	261+80	L				5.7					
44	266+60	R				5.7					
45	269+20	L				5.7					
46	270	B				9.8					
47	272+30	B				14.7					
48	312+25	B				12.2					
49	337+60	R				14.7					
50	346+40	B				9.8					
51	377+30	B				25.6					
52	378+05	R				4.9					

TABULATION OF EXISTING PAVEMENT

No.	LOCATION	EXISTING PAVEMENT TYPE	COARSE AGGREGATE TYPE	PAVEMENT THICKNESS inches	REINFORCE-MENT	DETAIL TYPICAL
92	From jct. Iowa 148 E. to Fontanelle	PCC	Gravel	10"-8"-10"	Longitudinal - 4-5/8" bars 6" from pavement edge and either side of center joint. Transverse - ½" bars beneath longitudinal bars @ 4' centers. Expansion joints - ¾" welded dowel assemblies with ½" bar wire tied to each expansion tube and dowel.	

FORM 650016
6-78 H 15478

TABULATION OF CONSTRUCTION AND MATERIAL BIDS
IOWA DEPARTMENT OF TRANSPORTATION

LOCATION ON IOWA 92 FROM JCT. IOWA 148 (CASS COUNTY) EAST TO FONTANELLE (ADAIR COUNTY)

87A MILES

BID ORDER NO. 587

COUNTY DISTRICT 4
TYPE OF WORK CONCRETE PAVEMENT REPAIR
PROJECT NO. MP-4877--69-D4
DATE OF LETTING MAY 11, 1982

NO	ITEM	QUANTITY	UNIT	KENNY'S SERVICE MARENGO, IOWA UNIT PRICE	KENNY'S SERVICE MARENGO, IOWA AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
1	PATCHES, FULL DEPTH, BY COUNT	86	ONLY	9800	8,428 00				
2	PATCHES, FULL DEPTH, P.C.C. TYPE 1	6013.00	SQ. YDS	6500	39,084 50				
3	PATCHES, ASPHALT CEMENT CONCRETE, SURFACE	7000	SQ. FT.	805	56,350 00				
4	CLASS 1 CRACKS, ROUTING & SEALING	16500	LIN. FT	110	18,150 00				
5	CLASS 2 CRACKS, CLEANING & SEALING	34440	LIN. FT	80	27,552 00				
6	TRAFFIC CONTROL	LUMP SUM			2,350 00				
	TOTAL	. . . . .		. . . . .	$151,914 50				

NO TIES OR RESERVATIONS

IOWA DEPARTMENT OF TRANSPORTATION

Ames, Iowa

SPECIAL PROVISIONS
FOR
CRACK AND JOINT CLEANING AND SEALING
(PORTLAND CEMENT CONCRETE PAVEMENT)

April 13, 1982

395.01 DESCRIPTION. This work shall consist of routing or sawing and cleaning of random cracks and existing transverse and longitudinal joints in portland cement concrete pavement and sealing the prepared cracks and joints with an approved sealing material.

395.02 MATERIALS. Joint sealer and backer rope shall meet requirements of 4136.02A (see General Supplemental Specifications). The diameter of the backer rope shall be a minimum of one nominal size larger than the prepared reservoir for the crack or joint to be sealed.

395.03 EQUIPMENT. Routing equipment, where required, shall be mechanical and power driven, capable of cutting the cracks to the required dimensions without excessive spalling of the adjacent surface.

Sawing equipment, where required, shall be power driven (wet or dry) capable of sawing the sealant reservoir to the dimensions shown on the plans.

Water cleaning equipment shall be capable of delivering water with a pressure of 2,000 psi from a nozzle to the crack or joint being cleaned, to remove existing joint sealer, debris, and loose material from the crack or joint.

Sand blast equipment shall be capable of removing the existing sealant, saw slurry, silt or other foreign material form the vertical face of the crack or joint to the specified depth, leaving a clean, newly exposed concrete surface.

Air compressors shall be of sufficient size to blow sand and other foreign material from the prepared crack or joint prior to placing the sealant material.

Equipment used for heating and placing hot-pour sealant material shall be an oil-jacketed, double boiler type, heating kettle or other thermostatically controlled equipment of a type approved by the engineer, capable of heating the material to 400°F. and pumping the material into the prepared crack or joint.

Auxiliary equipment, such as brooms, scrapers, etc., shall be provided as necessary to perform the work.

395.04 CONSTRUCTION.

A. Class I Cracks. Random cracks having an average opening of less than 1/2 inch shall be routed to provide a sealer reservoir as shown on the plans. Sides of the sealer reservoir shall be near vertical. Prior to placing sealer, light sand blasting will be required to remove latent material, dust, etc.

B. Class II Cracks. Random cracks having an average opening of 1/2 inch or greater will not require routing, but they shall be thoroughly cleaned with high-pressure water or compressed air. Following the initial cleaning, each crack shall be sand blasted to a minimum depth of one inch, leaving a clean, newly exposed concrete surface on the vertical faces.

C. Class III Joints. Existing joints having an average opening of less than 1/2 inch shall be sawed (wet or dry) to provide a sealer reservoir as shown on the plans. Existing joint sealer may need to be removed by high-pressure water or other methods approved by the engineer prior to sawing. Prior to placing sealer, light sand blasting will be required to remove latent material, dust, etc.

D. Class IV Joints. Existing joints having an average opening of 1/2 inch or greater will not require sawing, but the existing joint sealer shall be removed from the joint by high-pressure water or other methods approved by the engineer. Following removal of the existing sealer, each joint shall be sand blasted to a minimum depth of one inch, leaving a clean, newly exposed, concrete surface on the vertical faces.

Cracks and joints shall be dry and blown clean with compressed air prior to placing the backer rope and joint sealer. Cracks and joints shall be filled to the level shown on the plans.

Sealer material shall be heated, handled, and applied according to the manufacturer's recommendations.

395.05 TRAFFIC CONTROL. All signs and traffic control devices, such as flaggers, barricades, traffic cones, warning lights, and pilot car signs (when required) shall be furnished by the contractor. All traffic control devices are to be erected, maintained, and removed by the contractor.

The work shall be conducted on only one-half the pavement width at a time.

The work schedule shall be adjusted so that all barricades and equipment are removed from the roadbed from 30 minutes before sunset to 30 minutes after sunrise. No work will be permitted on Sundays or holidays described in 1108.03.

Articles 1107.08 and 1107.09 shall apply.

395.06 METHOD OF MEASUREMENT. The engineer will compute from measurements the lengths of cracks and joints satisfactorily cleaned and sealed in each of the following categories:

Class I Cracks;
Class II Cracks;
Class III Joints;
Class IV Joints.

395.07 BASIS OF PAYMENT.

A. Class I Cracks, Routing and Sealing. For the number of linear feet of Class I Cracks, Routing and Sealing, the contractor will be paid for the contract price per linear foot. This payment shall be full compensation for all labor, equipment, materials and incidentals required for crack routing, cleaning, sand blasting, and furnishing and placing backer rope and sealer.

B. Class II Cracks, Cleaning and Sealing. For the number of linear feet of Class II Cracks, Cleaning and Sealing, the contractor will be paid the contract price per linear foot. This payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning, sand blasting, and furnishing and placing backer rope and sealer.

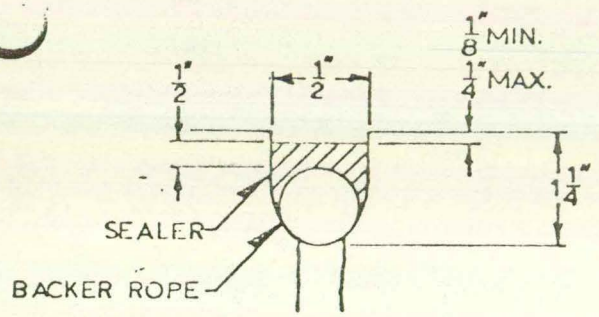
C. Class III Joints, Sawing and Sealing. For the number of linear feet of Class III Joints, Sawing and Sealing, the contractor will be paid the contract price per linear foot. This payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning, sawing, sand blasting, and furnishing and placing backer rope and sealer.

D. Class IV Joints, Cleaning and Sealing. For the number of linear feet of Class IV Joints, Cleaning and Sealing, the contractor will be paid the contract price per foot. This payment shall be full compensation for all labor, equipment, materials, and incidentals required for cleaning, sand blasting, and furnishing and placing backer rope and sealer.

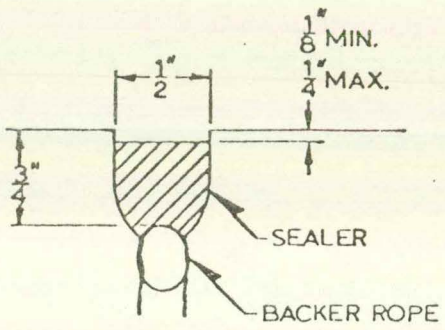
E. Traffic Control. For traffic control, the contractor will be paid the lump-sum contract price. This payment shall be full compensation for furnishing all signs, barricades, flaggers, and other traffic-control devices required for this work.

CLASS I CRACK

(RANDOM CRACK LESS THAN $\frac{1}{2}$" IN WIDTH)



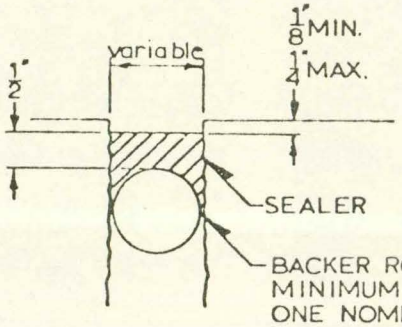
ALTERNATE 1



ALTERNATE 2

CLASS II CRACK

(RANDOM CRACK $\frac{1}{2}$" OR WIDER)



BACKER ROPE:
MINIMUM DIAMETER SHALL BE ONE NOMINAL SIZE LARGER THAN THE EXISTING CRACK.

Specification 896
Replaces part of 886

IOWA DEPARTMENT OF TRANSPORTATION
Ames, Iowa

SUPPLEMENTAL SPECIFICATIONS
for

PAVEMENT REPAIR
(Full-Depth PCC Patches)

February 16, 1982

THE STANDARD SPECIFICATIONS, SERIES OF 1977, SHALL APPLY. THIS IS A SUPPLEMENTAL SPECIFICATION MODIFYING REQUIREMENTS FOR FULL-DEPTH PCC PATCHES IN SECTION 2212, AND THESE REQUIREMENTS SHALL PREVAIL OVER THOSE IN THE STANDARD SPECIFICATIONS.

896.01 DESCRIPTION. This specification applies to full-depth PCC patches for contracts to which this specification is applied, whether the type of patching material is designated in the contract documents or is the contractor's option.

This work shall consist of the following: Removing the pavement in the area designated by the engineer to be patched; restoring the subbase or subgrade and, if shown on the plans or required by the engineer, removal of a portion of the subbase or subgrade and furnishing and placing engineering fabric and granular fill material; furnishing dowels or restoring reinforcement, if required; furnishing and placing PCC patching material, and covering with ACC, if required; constructing transverse subdrains through the shoulder and restoring the shoulder area; and controlling traffic during the construction and curing period, as shown on the plans. This work is intended to provide a new, permanent traffic surface in the patch area.

The plans will include a tabulation of patches showing location and approximate area. The patch thickness and the type of patch material may be included. The plans will identify the existing pavement type, type of coarse aggregate, thickness, and reinforcement. A detail, typical of each type of patch, will be shown.

The contractor has the option of constructing patches on multi-lane highways according to a long-patch-area option in the areas he designates. This option allows for lane diversions for longer distances and for an extended time, and optional use of calcium chloride for patches within this area, whether the patches are large or small, all subject to special requirements on the plans and details in this specification. This option may be withheld or further restricted by special provisions on the proposal. When the contractor exercises this option, all patching in the area shall be done according to this option.

The plans may also designate a long-patch option for two-lane highways. When so designated, the plans will also designate the traffic-control plan for these areas.

When the plans indicate the work is to include reconstruction of gore areas, this work may be done as a separate operation. The contractor may elect to use the mixture described in 896.02, with or without calcium chloride, if the concrete is cured as specified for the mixture used.

896.02 MATERIALS.

A. Portland Cement Concrete. It is the intention to obtain concrete with a high strength for early opening to traffic. The concrete shall meet requirements of 2301.04E, Mix No. M-4 or C1V-M, with the following modifications:

1. **Slump**, measured in accordance with AASHTO T 119, prior to addition of calcium chloride solution if to be added, shall be as specified in 2403.03E; that is, between 1 and 3 inches as a target range, allowing a maximum of 4 inches as a tolerance, unless specifically modified by the engineer.
2. **Air Entrainment.** The entrained air content of the concrete will be determined according to AASHTO T 152 prior to addition of calcium chloride. The air entrainment shall be 5.0 percent with a tolerance of plus or minus 2.0 percent. When calcium chloride is not added, the air entrainment shall be 6.5 percent with a tolerance of plus or minus 1.5 percent.
3. **Temperature.** The temperature of the concrete, prior to the addition of calcium chloride if to be added, shall be within 10 degrees F of the temperature set by the engineer. In no case shall the concrete temperature be less than 70 degrees or more than 100 degrees F. Heating of water or aggregate or both may be necessary to meet this requirement, and this heating will be considered incidental.
4. **Cement** shall meet requirements of Section 4101 for Type I cement.
5. **Calcium Chloride** shall be furnished and added to the mix, at the job site, as follows:

SOLUTIONS EQUIVALENT TO 38% CALCIUM CHLORIDE LIQUOR

Type of Solid Calcium Chloride	Pounds Solid per gallon of water	Solution produced, gallons
Type 1 - Regular Flake (77% material)	8	1.4
Type 2 - Conc. flake or pellets (94% material)	5 2/3	1.2

The solutions shown above are equivalent to 38% calcium chloride liquor; the contractor may elect to furnish a commercial 38% solution.

If the solution is prepared by the contractor, the above proportions shall be used, and the solution shall be added at the rate of 2.5 gallons per cubic yard of concrete.

Cautions. The mixture should be agitated until the calcium chloride is completely in solution, and agitation shall be continued, as necessary, to maintain uniformity. The calcium chloride will crystallize out of this solution at 50 degrees F., so the solution must be maintained at a higher temperature at all times.

Except when using equipment conforming to 2001.21D, the calcium chloride solution shall be present in the mix for at least 2 minutes of mixing.

Continuous mixing equipment using volumetric proportioning may be used in accord with 2001.21; except for the limitation described in 2001.20E, use will be the contractor's option.

Calcium chloride will not be required for individual patches over 30 feet in length or when smaller patches are constructed according to the long-patch-area option.

If the contractor's placement operation does not result in a surface in reasonably close conformity with smoothness requirements, the engineer may require the remaining patches to be placed with no calcium chloride and with a 30-hour cure, with no additional compensation.

6. **Aggregate Durability.** Unless otherwise specified, coarse aggregate shall have a class 2 durability, as defined in Section 4115.

7. **Ready-Mixed Concrete** shall be from a plant from which the concrete can be delivered and placed within 60 minutes of the time the cement is placed in contact with the aggregate, or the time may be extended to 90 minutes when a retarding adminxture, used in accordance with IM 403 at the contractor's expense, is added at the plant; the work shall be appropriately scheduled.

B. Granular Fill shall meet requirements for one of the following aggregates; porous backfill (Section 4131); coarse aggregate for concrete (gradation 3, 4, or 5); or 1/2-inch cover aggregate, either crushed stone or gravel.

C. Joint-Sealing Material. The joint sealer shall be of the hot-pour type, composed of petropolymers and supplied in solid form, and it shall meet requirements of ASTM D 3405 with the following modifications:

Penetration @ 77F (25C)	110-150
Bond @ -20F (-29C), standard specimen, 3 cycles, 100% extension	passes
Bond @ -20F (-29C) modified specimen (Note 1), 1 cycle, 300% extension	passes
Resilience @ 77F (25C) minimum	75%

Note: Specimen dimensions modified to 1/4 inch by 2 inches by 2 inches.

Cold-applied sealers meeting the above physical requirements may also be approved by the engineer.

Backer rope used in conjunction with this sealer shall be made of cellulose, cotton, or plastic foam. When used with hot-poured sealers, the rope must withstand, without damage, the high temperatures inherent to these sealers. The rope shall be of a size that compression is required for installation in the joint so that it maintains its position during the filling process.

D. Subdrain Pipe for subdrain outlets shall be slotted pipe meeting requirements of 4142.01B and of the diameter and length shown on the plans.

E. Asphalt Cement Concrete to be used for covering patches shall meet requirements of Section 2203, 2303, or 2304. Any of these mixtures with the basic or job-mix asphalt content will be acceptable.

Paragraph 2212.01C shall apply to tack-coat bitumen.

F. Engineering Fabric shall meet requirements of 4191.09B.

896.03 PATCH THICKNESS. The patch shall be constructed as shown on the plans. The thickness may be shown on the plans; if not shown, the thickness shall be according to the following table:

PCC pavement: Pavement thickness, but not less than 10 inches for continuously reinforced pavement and not less than 9 inches for other pavements; not more than 12 inches will be required.

PCC pavement resurfaced or to be resurfaced with ACC: Pavement thickness, but not less than 9 inches; not more than 12 inches will be required. When ACC resurfacing of 2 inches or more is not part of the contract, the patch shall be covered with 2 inches of ACC, and this covering will be considered part of the patch thickness. (If full-depth removal extends below 12 inches and granular fill is not required, additional patching material may be placed (up to 3 inches) or granular surfacing material, Section 4120, may be placed and compacted to the proper elevation; the contractor will be paid for the cost of the additional material).

896.04 REMOVAL.

A. Jointed Pavement. This method applies to PCC patches for jointed PCC pavement, including resurfaced PCC pavement and PCC pavement that is to be resurfaced as part of this contract.

Except where an existing joint forms an edge of the patch, the edges of the patch shall be sawn with a diamond (or carborundum) blade to a nominal depth of 1 1/2 inches. The diamond saw cut may be the initial operation, or it may be delayed until most of the existing pavement material has been removed.

Pavement in removal areas may be broken by use of a drop hammer, hydrohammer, or other heavy equipment, but the pavement to be removed shall first be severed from that which is to remain, by a full-depth cut at least 1 inch inside the 1 1/2-inch saw cut or saw cut line specified above. When the pavement exceeds 10 inches in thickness, a 10-inch saw cut will be considered full depth. This work shall be done in such a manner as not to damage concrete that is to remain. Heavy equipment shall not be used adjacent to new concrete until the specified curing is completed.

A reasonable effort shall be made to preserve tie bars at longitudinal joints, unless the tie bars are to be replaced in connection with a patch in the adjacent lane. Other reinforcement may be removed.

Preparation of the patch area shall be completed using equipment no heavier than a 15-pound air chisel* at the edges. The finished edge is to be sawn to 1 1/2 inches as specified above. The shoulder at the bottom of the 1 1/2-inch saw cut shall be removed, and the edge below the saw cut shall be reasonably vertical, tapered to the interior of the patch area, and shall have a rough surface to promote interlock. Undercutting shall be avoided. The saw cut shall be reconstructed, if necessary, so the edge at the pavement surface is not frayed or spalled.

Unless specifically noted on the plans, all patches will be full-lane width and the length of each patch, measured parallel to the centerline, will not be less than 4 feet.

* A 30-pound air chisel may be used if its use does not result in significant undercutting of the pavement.

B. Continuously Reinforced Pavement. Removal shall be by one of the following methods, according to the type of patch designated on the plans.

1. **Reinforcement Not to be Restored.** When restoration of longitudinal reinforcement is not designated on the plans, pavement shall be removed according to Paragraph A, above.

2. **Reinforcement to be Restored.** This method shall apply to Type 3 patches; for these, restoration of longitudinal reinforcement is required.

   The edges will normally be skewed 1 to 4 across the pavement, so that traffic will first contact the patch area with the wheels nearest the centerline. Exceptions will be made when the edge abuts a sound construction joint.

   The edges of the patch, except joints, shall be sawn with a diamond (or carborundum) blade to a nominal depth of 1 1/2 inches, avoiding cutting longitudinal reinforcement.

   The pavement shall be severed full-depth inside the 1 1/2-inch sawcut, and this severance will be located so as to leave a minimum of 20 inches of longitudinal steel protruding into the patch area.

Pavement within the severance area may be broken by use of a heavy drop hammer, hydrohammer, or other heavy equipment. This work shall be done in such a manner as not to damage concrete that is to remain. Heavy equipment shall not be used adjacent to new concrete until the specified curing is completed.

Pavement between the 1 1/2-inch sawcut and the severance shall be removed with jackhammers or other hand equipment; however, the edge of the patch at the 1 1/2-inch sawcut shall be completed using equipment no heavier than a 15-pound air chisel*. The shoulder at the bottom of the 1 1/2-inch saw cut shall be removed, and the edge below the saw cut shall be reasonably vertical, tapered to the interior of the patch, and shall have a rough surface to promote interlock. Undercutting shall be avoided. The sawcut shall be reconstructed, if necessary, so the edge at the pavement surface is not frayed or spalled. Pavement shall be broken and removed in such a manner that protruding longitudinal steel is not unduly disturbed. Reasonable care shall be taken to preserve the 20-inch length of longitudinal steel; it shall not be bent more than the minimum necessary for concrete removal.

Should a significant number of longitudinal bars or wires be rusted beyond salvage, the engineer may extend the patch limits.

A reasonable effort shall be made to preserve tie bars at longitudinal joints, unless the tie bars are to be replaced in connection with a patch in the adjacent lane.

Unless otherwise specified on the proposal, each patch will be full-lane width, and the length, measured parallel to the centerline, will not be less than 7 feet.

* A 30-pound air chisel may be used if its use does not result in significant undercutting of the pavement.

When repairing PCC pavement, even though the pavement may have been resurfaced with ACC, material shall be removed for the full pavement depth, unless otherwise designated. Excavation will not be required except as necessary for the patch thickness and, if required, the granular fill.

The plans will include an estimate of the number of anchor lugs to be removed. When an anchor lug is encountered within an area to be patched, the anchor lug shall be broken down to approximately 6 inches below the bottom of the pavement, all exposed anchor-lug reinforcing shall be removed, and the concrete shall be replaced with granular fill, compacted as required in 896.05, to the level of the bottom of the patch.

All material removed and not designated for salvage shall be disposed of in accordance with 1104.08.

896.05 RESTORING SUBBASE OR SUBGRADE. When granular fill is specifically designated on the plans or when required by the engineer, the exposed subbase or subgrade shall be removed and replaced as follows:

Remove 4 inches below the bottom of the new patch, and replace with granular fill material placed over an engineering fabric, as approved by the engineer. When unstable material or excessive moisture is encountered in the subgrade, the engineer may order an additional thickness of granular fill, and his order may include additional depth for the transverse subdrains.

When a stabilized subbase is damaged during removal operations and granular fill is not required, the subbase shall be restored, or it shall be leveled with a taper for drainage and filled full depth with patching material, at the contractor's expense. For other patches, when granular fill is not required, overdepth removal up to 4 inches below the bottom of the patch shall be replaced with the patching mixture; if greater than 4 inches, granular fill material and engineering fabric shall be placed, including the transverse subdrain, at the contractor's expense.

The exposed subgrade or subbase shall be compacted by a minimum of two complete coverages with a vibratory compactor.

Granular fill shall be placed with a field optimum moisture content established by the engineer at the beginning of the work. Granular fill shall be placed in lifts not exceeding a nominal compacted thickness of 4 inches; compaction shall be by a minimum of two complete coverages with a vibratory compactor and such additional coverages as are necessary to assure a maximum density. The compaction procedure for granular fill normally will be established by the engineer using the initial granular fill area as a trial section.

896.06 RESTORING REINFORCEMENT. Tie bars that can not be salvaged for patches shorter than 30 feet need not be replaced. If the patch is 30 feet or more in length, measured along the line of tie bars, the tie bars shall be restored or replaced, as necessary, so there are at least two tie bars per 10 feet. For patching on both sides of a line of tie bars, a bent bar may be placed in a keyway and later straightened.

A. When Dowels Are Required by the plans, all patches 30 feet or more in length shall have at least one "CD" joint, skewed 1:6, located near the center of the patch. Patches 45 feet or more in length shall have two or more "CD" joints, skewed 1:6, spaced at 15 to 20 feet between joints and from the joints to the beginning or end of the patch. The patch length normally will be determined at the centerline for two-lane pavement. When the area to be patched is in more than one traffic lane, the joints shall be extended through the remaining patch areas when the adjacent patches are placed.

Dowels shall be furnished in approved assemblies suitable for skewed joints as shown on the plans. Dowels shall have an epoxy coating applied by the electrostatic fluidized-bed method in conformance with the requirements of AASHTO M 254, Type B. The coating material shall be a powdered epoxy approved by the engineer. The dowel bars may be cut from a coated bar before being fabricated into an assembly. The sawed ends need not be coated. The assemblies shall be dipped in MC-70, RC-70, RC-250, HFMS-2, HFMS-2h, or HFMS-2s prior to delivery to the grade. Alternate bituminous- or paraffin-base bond brakers may be approved by the Office of Materials. Application methods of alternate materials are also subject to approval.

The dowel assemblies shall be placed and secured in proper position before the concrete is placed.

Patches more than 20 and less than 30 feet in length shall be jointed as required in Paragraph B, below.

B. When Dowels Are Not Required by the plans, all patches 20 feet or more in length shall have at least one "C" joint, skewed 1:6, located near the center of the patch. Patches 30 feet or more in length shall have two or more "C" joints, skewed 1:6, spaced at 10 to 15 feet between joints and from the joints to the beginning or end of the patch. The patch length normally will be determined at the centerline for two-lane pavement. When the area to be patched is in more than one traffic lane, the joints shall be extended through the remaining patch areas when the adjacent patches are placed.

C. When Restoration of Longitudinal Reinforcement is Required, restoration shall be as follows:

After the granular fill, if required, is in place, new reinforcement shall be set. Protruding longitudinal reinforcement ends shall be made as true as practical and shall be cleaned of loose concrete and concrete which would interfere with close placement of new reinforcement.

Longitudinal reinforcement shall be restored using bars or mesh of the same size and spacing as in the original pavement, and of the quality specified for continuously reinforced pavement. The plans will describe the reinforcement in the pavement. At the contractor's option, wire mats may be replaced with bars tied to each longitudinal wire, and the bars shall be of a size at least equal to the wire size.

New longitudinal reinforcement shall be set to connect the longitudinal reinforcement across the repair area, lapping the protruding reinforcement approximately 18 inches. The new reinforcement shall be set next to the protruding reinforcement at the same elevation and wire-tied at least twice. Reinforcement 40 feet and shorter shall be furnished in one piece. Longer reinforcement may be furnished in more than one piece with bars lapped at least 25 diameters, and mesh at least 24 inches. New longitudinal reinforcement not supported by protruding reinforcement shall be supported by chairs at 4-foot intervals or by transverse steel supported by chairs at 4-foot intervals.

896.07 FORMS. Forms shall be used on all exposed edges and also along the centerline for patches that extend into an adjacent lane. Wood forms may be used in lieu of steel by using 2-inch lumber the full depth of concrete on the outside edge. Where old pavement has a curb, the forms shall extend from bottom of patch to top of curb. Forms along the centerline may be 1" x 10" for patches up to seven feet and 2" x 10" for patches longer than seven feet, measured along the centerline. All wood forms shall be staked sufficiently to hold the forms in place and in proper alignment.

896.08 TRANSVERSE SUBDRAINS. When granular fill material is required by the plans or the engineer, transverse subdrains shall be constructed using granular fill through the shoulder to outlet the low point of each patch. Patches shall have one drain for each 50 feet or fraction thereof of patch length. The trench width and depth and shoulder restoration shall be as shown on the plans.

The plans may require subdrain pipe to be placed for the subdrain outlet.

The transverse subdrain shall be constructed at or prior to the time the patch is constructed.

896.09 PORTLAND CEMENT CONCRETE, FULL-DEPTH PATCHES. Placing, consolidation, finishing, and curing of the concrete shall be as provided in Section 2301, except as follows:

The subbase, subgrade, or granular fill shall be moistened or covered with a single layer of plastic film meeting requirements of Section 4107.

Except for preplanned joints, placement shall be continuous until the patch is completed, and the work shall be so scheduled. When a delay of 45 minutes can not be avoided, a D-3 or D-4 joint shall be constructed using a split header board.

The concrete shall be dumped or conveyed into the patch area so as to avoid segregation of the aggregates and cement, then spread into place, vibrated with a mechanical vibrator, and smoothed. Excessive vibrating shall be avoided. Full-lane-width patches over 30 feet in length and to be finished flush with adjacent pavement shall be finished with a suitable finishing machine that has at least one vibrating screed. All patches finished flush with adjacent pavement shall be straightedged to ensure a smooth-riding surface, and shall be textured by finishing with a burlap, carpet drag, or rake, the intention being to re-create the texture of the adjacent surface; these patches shall be checked with a 10-foot straightedge before the concrete has set, and spots that are 1/8-inch high or low, as shown by the straightedge, shall be corrected. Patches to be surfaced with ACC shall be finished smooth to a tolerance of 1/4-inch in 10 feet.

All edges and ends of patches finished flush with adjacent pavement shall be finished with an edging tool. Where joint sealing is required by 896.10 the lane edges and ends shall be constructed to a depth of approximately 1 inch, leaving an opening of at least 1/4 inch to provide a reservoir for joint sealer. The 1/4 inch opening may be constructed by hand methods or may be sawn. When white-pigmented curing compound is used, the opening shall be protected with tape or other suitable material.

Immediately after the concrete has been finished and just after the surface water has disappeared, the concrete shall be cured as follows:

A. Concrete with Calcium Chloride shall be covered immediately with plastic film described in 4106.02, placed in contact with the concrete surface, and the plastic film shall be covered with insulation board. The insulation board shall be cellulosic fiber sheathing with a nominal 25/32-inch thickness, similar to that specified in ASTM C 208-72. The insulation board may be wrapped with plastic film to protect it from rain. The insulation board shall be tightly placed over the patch area so as to retain all possible heat in the concrete; however, when the concrete is finished 2 inches below the adjacent surface and tight placement is not entirely practicable, the insulation board shall be tightly placed at the transverse edges of the patch. The insulation board shall be weighted to protect it from the traffic and weather.

These patches shall be cured a minimum of 5 hours or as directed by the engineer.

B. Concrete Without Calcium Chloride shall be cured according to Paragraph A, except when covered immediately with white-pigmented curing compound, the specified cure may be delayed as much as 2 hours.

These patches shall be cured a minimum of 30 hours or as directed by the engineer.

Patches that are damaged in any manner during the curing period shall be replaced by the contractor at his expense.

"C" and "CD" joints, described in 896.06 shall be sawn. Timing is critical for this operation. It should be done as soon as possible without excessive raveling of the saw-cut edges.

896.10 JOINT SEALING. For patches finished flush with the adjacent pavement, "C" and "CD" joints and the edged reservoir formed by edging or sawing shall be cleaned and filled in accord with 2301.30 when the joints are dry, using the materials specified in 896.02C. This includes a backer rope.

896.11 COVERING WITH ASPHALT CEMENT CONCRETE. When patches are to be covered with ACC, the patch area and edges shall be lightly tacked, and the mixture shall be placed in the remaining 2-inch depth and compacted while hot to provide a dense, smooth-riding surface. A steel-tired finish roller meeting requirements of 2001.05B or F shall be used: a roller meeting requirements of 2001.05F may be a smaller roller suitable for this type of operation. The final compacted surface shall be level with, or not more than approximately 1/4 inch above, the surrounding pavement.

The patch shall not be opened to traffic until the mixture has cooled sufficiently to provide stability, except that barricades shall not be left in place overnight. If the patch becomes seriously distorted for any reason, the contractor shall smooth the surface the next working day by blading, scraping, filling, or by other approved means.

Before final acceptance, the patch shall be level with, or not more than 1/8 inch above, the adjacent pavement.

896.12 AREA RESTORATION. When the patch is completed, the forms shall be removed and the trench shall be backfilled. To safeguard traffic, space between the patch and adjacent travel lane shall be filled with concrete spalls or other suitable material that will not soften from rains or be displaced by traffic. The excavated space along the outside pavement edge shall be filled with material similar to that in the remainder of the existing shoulder, satisfactory to the engineer, and thoroughly compacted before the section is opened to traffic.

896.13 LIMITATIONS OF OPERATIONS. Unless the road is closed, traffic shall be permitted to use the pavement during construction operations, and all operations shall be so conducted as to provide a minimum of inconvenience to traffic.

The work schedule shall be adjusted so that all the excavating, backfilling, compacting, and finishing of each patch will be completed in one day. If unforeseen conditions should result in excavated sections being left overnight, a sufficient number of flaggers shall be assigned to warn and direct traffic, from the time construction operations have stopped until they have resumed again. No extra payment will be made for the necessary flaggers.

When pressure-relief joints are required as a part of the contract work, the pressure-relief joints shall be constructed on both sides of the patch area at least 48 hours before removal operations are started in that area. As much as practical, pressure-relief joints will be located at least 100 feet from a patch area, or as designated on the plans.

The work schedule shall also be adjusted so that all barricades and equipment will be removed from the roadbed from 30 minutes before sunset to 30 minutes after sunrise; exception will be made for traffic control necessary to protect patches in long-patch areas during the specified curing time. During working hours, operations shall be confined to one traffic lane of the highway except for minor encroachment on the adjacent lane, such as for sawing and installing forms. Except as permitted for long-patch areas, during nonworking hours, all travel lanes and shoulder shall be free of debris or obstructions and shall be kept clear for use by traffic.

After commencement of the work, the contractor shall work continuously during working hours, except for unavoidable delays, to the completion of the project. Except where an accelerated work schedule is required, no work will be permitted on Sundays and holidays.

Patches may be opened to traffic as soon as conditions permit their safe use, but in no case before the end of the curing period. During such curing period, the contractor shall maintain signs, barricades, and lights, and he shall be responsible for all safety measures.

If a D-3 joint occurs at the end of the working day, the area following the joint shall be filled with a suitable hot or cold paving mixture (not granular material) so the lane can be opened to traffic, and that material shall be removed when the remaining area of the patch is being prepared.

Joints and patch edges to be filled in accord with 2301.30 may be cleaned and filled after the patching required for the project is completed.

When the work is to be done according to the long-patch-area option, calcium chloride is optional and the curing time may be extended as specified. Overnight lane closures shall be accomplished according to Detail Sheet 521-2. This traffic control shall be maintained for the lane closure during the curing period and shall be removed promptly thereafter. For each day, the lane closure shall be so established and the sequence of operations shall be such that the lane closure is of the minimum length and for the minimum time necessary for an efficient operation. Long-patch areas shall not extend through points of access at interchanges, intersections, or drives or within 150 feet on the approaches to these points of access where either a left or right turn is allowed. When lane closures that are in use are repeated, there shall be a refuge area with a distance of at least 1,000 feet from the end of the lane closure to the beginning of the taper for the next lane closure; in such cases, the sequencing arrow, the merge signs (W4-2 with advisory speed plate), and the LEFT (RIGHT) LANE CLOSED AHEAD signs (W20-5) shall be repeated, each with a spacing of 500 feet, in the approach to the next taper.

Articles 1107.08 and 1107.09 shall also apply.

896.14 METHOD OF MEASUREMENT. The engineer will measure the quantities of the various items involved in full-depth pavement repair as follows:

A. Full-Depth Patches. The number of individual, full-depth patches placed will be determined by count; patches in each traffic lane will be individually counted. Also, the areas of Type 1, Type 2, and Type 3 PCC patches will be computed in square yards from measurements of the areas of pavement removed and replaced, except that each patch which is less than 18 square feet in area will be counted as 2 square yards. The length will be measured parallel to the centerline. Areas associated with anchor-lug removal will be included.

B. Granular Fill. When granular fill and engineering fabric are placed in patch areas, as specifically required by the plans or the engineer, the engineer will compute the area of granular fill placed, as provided in Paragraph A, above. The engineer will not include areas where granular fill material was used in transverse drains or was used at the contractor's option.

The engineer will compute separately areas where granular fill was placed to a depth greater than specified herein, at his direction.

C. Subdrain Pipe. Where subdrain pipe is required for outlets of transverse drains, the engineer will compute the length of subdrain pipe used from the length of subdrain pipe shown on the plans and a count of transverse drains in which the subdrain pipe is used.

D. Removal of Anchor Lugs. The engineer will count the number of anchor lugs removed in each traffic lane.

896.15 BASIS OF PAYMENT. For construction of the various items involved in pavement repair, the contractor will be paid as follows:

A. Full-Depth Patches. For the number of individual, full-depth patches placed, the contractor will be paid the contract price for each, and for the number of square yards of full-depth PCC patches placed, in each of the following categories, the contractor will be paid the contract price per square yard.

1. Full-Depth Patches, by Count.
   This payment shall be full compensation for sawing or cutting necessary for each patch area and for traffic control associated with that patch.
2. Full-Depth Patches, by area, will be identified by the following categories.
   a. Full-Depth PCC Patches, Type 1, for patches 30 feet and shorter;
   b. Full-Depth PCC Patches, Type 2, for patches longer than 30 feet;
   c. Full-Depth PCC Patches, Type 3, continuously reinforced, of any length, when restoration of longitudinal reinforcement is required.

This price shall be full compensation for removal and disposal of the old pavement, restoring the subgrade or subbase; furnishing and installation of tie bars and dowel assemblies as required, restoring longitudinal reinforcement for Type 3 patches, furnishing and placing the patching material, including tack coat and ACC when required, curing, joint sealing, and backfilling the disturbed area.

B. Granular Fill. For the number of square yards of granular fill furnished and placed, the contractor will be paid the contract price per square yard. This price will be full compensation for furnishing and installing granular fill material and engineering fabric, the additional excavation necessary for this placement and disposal of excavated material, construction of transverse drains, and backfilling the disturbed shoulder area.

When the granular fill has been placed to a greater depth than specified herein, at the engineer's direction, payment per square yard for those areas will be increased by 20 percent for each inch of increased depth. This increased payment shall be full compensation for additional excavation and granular fill material, associated compaction, and if so ordered, additional depth for the transverse subdrain.

C. Subdrain Pipe. For the number of feet of subdrain pipe furnished and placed as subdrain outlets, the contractor will be paid the contract price per foot.

D. Removal of Anchor Lugs. For the number of anchor lugs removed, the contractor will be paid the contract price therefor. Such payment shall be full compensation for removal and for furnishing and placing granular fill material, as specified.

When a PCC patch is required to be finished low and covered with ACC but not so identified in the tabulation of patches, the additional, associated cost will be paid for as extra work.

When reconstruction of gore areas is required, payment will be made according to Section 2301.

When the Supplemental Specification for Pavement Smoothness applies to this work, full-depth patches greater than 250-feet in length will be indexed and evaluated as for patches between 250 feet and 50 feet in length, and the adjusted payment, if appropriate, will be on that basis, according to Paragraph B of the Schedule of Payment in that specification.

Specification 897
Replaces part of 886

IOWA DEPARTMENT OF TRANSPORTATION
Ames, Iowa

SUPPLEMENTAL SPECIFICATIONS
for

PAVEMENT REPAIR
(Full-Depth ACC Patches)

February 16, 1982

THE STANDARAD SPECIFICATIONS, SERIES OF 1977, SHALL APPLY. THIS IS A SUPPLEMENTAL SPECIFICATION MODIFYING REQUIREMENTS FOR FULL-DEPTH ACC PATCHES IN SECTION 2212, AND THESE REQUIREMENTS SHALL PREVAIL OVER THOSE IN THE STANDARD SPECIFICATIONS.

897.01 DESCRIPTION. This specification applies to full-depth ACC patches for contracts to which the specification is applied, whether the type of patching material is designated in the contract or is the contractor's option.

This work shall consist of the following: Removing pavement in areas designated by the engineer to be patched; restoring the subbase or subgrade to a usable condition, and, if shown on the plans or required by the engineer, removal of a portion of the subbase or subgrade and furnishing and placing engineering fabric and granular fill material; furnishing and placing ACC patching material; constructing transverse subdrains through the shoulder; restoring the shoulder area; and controlling traffic during the construction period, as shown on the plans. This work is intended to provide a new, permanent traffic surface in the patch area.

The plans will include a tabulation of patches showing location, and approximate area. The patch thickness and type of patch material may be included. The plans will identify the existing pavement type, the thickness, and for PCC pavement, the reinforcement and type of coarse aggregate.

The plans may indicate patching is to include reconstruction of a gore area. When included, the details will be shown on the plans.

897.02 MATERIALS.

A. Asphalt Cement Concrete to be used for patching shall meet requirements of Section 2203, 2303, or 2304. Any of these mixtures with the basic or job-mix asphalt content will be acceptable.

B. Primer or Tack-Coat Bitumen. Paragraph 2212.02C shall apply.

C. Granular Fill shall meet requirements for one of the following aggregates: porous backfill (Section 4131); coarse aggregate for concrete (gradation 3, 4, or 5); or 1/2-inch cover aggregate, either crushed stone or gravel.

D. Subdrain Pipe for subdrain outlets shall be perforated pipe meeting requirements of 4142.01B and of the diameter and length shown on the plans.

E. Engineering Fabric shall meet requirements of 4191.09B.

897.03 PATCH THICKNESS. The patch shall be constructed as shown on the plans. The thickness may be shown on the plan; if not shown, the thickness shall be according to the following table:

Rigid pavement: Thickness of pavement but not less than 9 inches; not more than 12 inches will be required.

Rigid pavement resurfaced or to be resurfaced with ACC: Pavement thickness, including resurfacing, but not less than 9 inches; not more than 12 inches will be required. (If full-depth removal extends below 12 inches and granular fill is not required, additional patching material may be placed (up to 3 inches) or granular surfacing material, Section 4120, may be placed and compacted to the proper elevation; the contractor will be paid for the cost of the additional material).

Flexible pavement: Thickness of surface and base course, but not less than 9 inches; for thicknesses greater than 12 inches, the thickness of the patches will be designated.

897.04 PAVEMENT REMOVAL. Except where an existing joint forms an edge of the patch, the edges of the patch shall be severed by sawing full depth; a saw, a concrete cutter, or other equipment that will result in a reasonably vertical edge may be used. When the pavement exceeds 10 inches in thickness, a 10-inch severence will be considered full depth. After this severence is made, a drop hammer, hydrohammer, or other heavy equipment may be used. This work shall be done in such a way as not to damage pavement that is to remain.

Reinforcement shall be removed from the patch area, and to approximately 1 inch or less from the concrete that is to remain.

Unless otherwise shown on the proposal, all patches will be full-lane width and the length of each patch, measured parallel to the centerline, will not be less than 4 feet.

When repairing flexible pavement, excavation will not be required to be to a depth greater than necessary for the patch thickness, and, if required, the granular fill.

When repairing PCC pavement, even though the pavement may have been resurfaced with ACC, material shall be removed for the full depth of the pavement, unless otherwise designated. Excavation will not be required to be to a depth greater than for the patch thickness, and, if required, the granular fill.

All material removed and not designated for salvage shall be disposed of in accordance with 1104.08.

897.05 RESTORING THE SUBBASE OR SUBGRADE. When specifically required by the plans, or when required by the engineer, the exposed granular subbase or subgrade shall be removed and replaced as follows:

Remove 4 inches below the bottom of the new patch, and replace with a granular fill material placed over an engineering fabric, as approved by the engineer. Wehn unstable material or excessive moisture is encountered in the subgrade, the engineer may order an additional thickness of granular fill, and his order may include additional depth for the transverse subdrains.

When a stabilized base or subbase is damaged during removal operations, the base or subbase shall be restored, or it shall be leveled with a taper for drainage and filled full depth with patching material, at the contractor's expense.

For other patches, when granular fill is not required, overdepth removal up to 4 inches below the bottom of the patch shall be replaced with the patching mixture; if greater than 4 inches, granular fill material and engineering fabric shall be placed, including the transverse subdrain, at the contractor's expense.

The exposed subgrade or subbase shall be compacted by a minimum of two complete coverages with a vibratory compactor. Granular fill shall be placed with a field optimum moisture content established by the engineer at the beginning of the work. Granular fill shall be placed in lifts not exceeding a nominal compacted thickness of 4 inches; compaction shall be by a minimum of two complete coverages with a vibratory compactor and such additional coverages as are necessary to assure a maximum density. The compaction procedure for granular fill normally will be established by the engineer using the initial granular fill area as a trial section.

897.06 TRANSVERSE SUBDRAINS. When granular fill material is required by the plans or the engineer, transverse subdrains shall be constructed using granular fill through the shoulder to outlet the low point of each patch. Patches shall have one drain for each 50 feet or fraction thereof of patch length. The trench width and depth and shoulder restoration shall be as shown on the plans.

The plans may require subdrain pipe to be placed for the subdrain outlet.

The transverse subdrain shall be constructed at or prior to the time the patch is constructed.

897.07 ASPHALT CEMENT CONCRETE, FULL-DEPTH PATCHES. After removal of the old pavement, the edges of the old pavement and the adjacent one foot of subgrade shall be lightly tacked.

The ACC patch mixture shall be deposited in layers; the upper 6 inches shall be deposited in at least two layers, each not exceeding 3 inches in thickness, when compacted. Each layer shall be thoroughly compacted while hot, by rolling or tamping with mechanical tampers, to provide a dense, smooth-riding surface. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. The final layer shall be compacted with a steel-tired finish roller meeting requirements of 2001.05B or F; a roller meeting requirements of 2001.05F may be a small roller suitable for this type of operation. The engineer may require a reasonable number of test cores for density and depth be taken, with no additional payment, to verify that the contractor's construction method is satisfactory. The final compacted surface shall be level with, or not more than approximately 1/4 inch above, the surrounding pavement.

The patch shall not be opened to traffic until the mixture has cooled sufficiently to provide stability, except that barricades shall not be left in place overnight. If the patch becomes seriously distorted for any reason, the contractor shall smooth the surface the next working day, by blading, scraping, filling, or by other approved means.

Prior to resurfacing or before final acceptance, the patch shall be level with, or not more than 1/8 inch above, the adjacent pavement.

897.08 AREA RESTORATION. When the patch is completed, the excavated space along the outside pavement edge shall be filled with material similar to that in the remainder of the existing shoulder, satisfactory to the engineer, and thoroughly compacted before the section is opened to traffic.

897.09 LIMITATIONS OF OPERATIONS. Unless the road is closed, traffic shall be permitted to use the pavement during construction operations, and all operations shall be so conducted as to provide a minimum of inconvenience to traffic.

The work schedule shall be adjusted so that all the excavating, backfilling, compacting, and finishing of each patch will be completed in one working day. If unforeseen conditions should result in excavated sections being left overnight, a sufficient number of flaggers shall be assigned to warn and direct traffic, from the time construction operations have stopped until they have resumed again. No extra payment will be made for the necessary flaggers.

The work schedule shall also be adjusted so that all barricades and equipment will be removed from the roadbed from 30 minutes before sunset to 30 minutes after sunrise. During working hours, operations shall be confined to one traffic lane of the highway except for minor encroachment on the adjacent lane, such as for sawing. During nonworking hours, all travel lanes and shoulder shall be free of debris or obstructions and shall be kept clear for use by traffic.

After commencement of the work, the contractor shall work continually during working hours, except for unavoidable delays, to the completion of the project. Except where an accelerated work schedule is required, no work will be permitted on Sundays and holidays.

Patches may be opened to traffic as soon as conditions permit their safe use. During closure, the contractor shall maintain signs, barricades, and lights, and he shall be responsible for all safety measures.

Articles 1107.08, 1107.09, and 2303.15 shall also apply.

897.10 METHOD OF MEASUREMENT. The the engineer will measure the quantities of the various items involved in full-depth pavement repair as follows.

A. Full-Depth Patches. The number of individual, full-depth patches will be determined by count; patches in each traffic lane will be individually counted. Also, the areas of Type 1 and Type 2 ACC patches will be computed in square yards from measurements of the areas of pavement removed and replaced, except that each patch which is less than 18 square feet in area will be counted as 2 square yards. The length will be measured parallel to the centerline.

B. Granular Fill. Where granular fill and engineering fabric are placed in patch areas, as specifically required by the plans or the engineer, the engineer will compute the area of granular fill placed as provided in Paragraph A, above. The engineer will not include areas where granular fill material was used in transverse drains or was used at the contractor's option.

The engineer will compute separately areas where granular fill was placed to a depth greater than specified herein, at his direction.

C. Subdrain Pipe. Where subdrain pipe is required for outlets of transverse drains, the engineer will compute the length of subdrain pipe used from the length of subdrain pipe shown on the plans and a count of transverse drains in which the subdrain pipe is used.

897.11 BASIS OF PAYMENT. For construction of the various items involved in pavement repair, the contractor will be paid as follows:

A. Full-Depth Patches. For the number of individual, full-depth patches placed, the contractor will be paid the contract price for each, and for the number of square yards of full-depth ACC patches placed, in each of the following categories, the contractor will be paid the contract price per square yard.

1. Full-Depth Patches, by Count.
   This payment shall be full compensation for sawing or cutting necessary for each patch area and for traffic control associated with that patch.
2. Full-Depth Patches, by area, will be identified by the following categories.
   a. Full-Depth ACC Patches, Type 1, for patches 30 feet and shorter;
   b. Full-Depth ACC Patches, Type 2, for patches longer than 30 feet.
   This price shall be full compensation for removal and disposal of the old pavement, restoring the subgrade or subbase, furnishing and placing the patching material and the tack-coat, and backfilling the disturbed area.

B. Granular Fill. For the number of square yards of granular fill furnished and placed, the contractor will be paid the contract price per square yard. This price will be full compensation for furnishing and installing granular fill material and engineering fabric, the additional excavation necessary for this placement and disposal of excavated material, construction of transverse subdrains, and backfilling the distrubed shoulder area.

When granular fill has been placed to a greater depth than specified herein, at the engineer's direction, payment per square yard for those areas will be increased by 20 percent for each inch of increased depth. This increased payment shall be full compensation for additional excavation and granular fill material, associated compaction, and if so ordered, additional depth for the transverse subdrain.

C. Subdrain Pipe. For the number of feet of subdrain pipe furnished and placed as subdrain outlets, the contractor will be paid the contract price per foot.

When reconstruction of gore areas is required as a part of the contract, the basis of payment will be as shown on the plans.

When the Supplemental Specification for Pavement Smoothness applies to this work, full-depth patches greater than 250 feet in length will be indexed and evaluated as for patches between 250 feet and 50 feet in length, and the adjusted payment, if appropriate, will be on that basis, according to Paragraph B of the Schedule of Payment in that Specification.

Specification 898
Replaces 859

IOWA DEPARTMENT OF TRANSPORTATION
Ames, Iowa

SUPPLEMENTAL SPECIFICATIONS
for

LONGITUDINAL SUBDRAINS

January 19, 1982

THE STANDARD SPECIFICATIONS, SERIES OF 1977, ARE AMENDED BY THE FOLLOWING ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

898.01 GENERAL. Construction of longitudinal subdrains shall consist of excavation, furnishing and placing longitudinal subdrains, associated lateral subdrains and subdrain outlets, backfilling, and restoration, all in accord with the plans and these specifications.

898.02 MATERIALS. All materials shall meet requirements for the respective items in Part IV of the Standard Specifications, with the following exceptions:

A. Perforated Subdrains. Subdrain pipe shall be polyethylene corrugated tubing complying with all requirements of ASTM F 405, Heavy Duty Tubing. The tubing shall not be or shall not have been stored in direct sunlight for a total of more than 6 months.

The water inlet perforations shall be cleanly cut and shall be cut at right angles to the pitch of the corrugations, and they shall be placed in the center of valleys. The length of the individual slots shall not exceed 10 percent of the inside nominal circumference of the tubing. The width of the slots shall be between 1/16 inch and 1/10 inch. The slot area shall be a minimum of 0.75 percent of the area of the envelope enclosing the outer surface of the drain tube (Nominal O.D.).

B. Subdrain Outlets through the shoulder shall be perforated tubing specified in Paragraph A, above, with ends of corrugated pipe meeting requirements of 4141.01, as shown on the plans, including tapered ends when shown on the plans.

When special connections are required for subdrain outlets, these will be detailed on the plans.

C. Outlet Covering. The outlet covering shall be 1/2-inch mesh, galvanized hardware cloth screen, or other rodent guard approved by the engineer. The covering shall be securely attached, in a manner approved by the engineer, such that it is readily removable for cleaning.

D. Engineering Fabric, when required by the plans to be used in the subdrains, shall meet requirements of 4191.09. (See General Supplemental Specifications.) Inspection and acceptance shall be in accord with IM 491.14.

E. Backfill for Longitudinal and Lateral Drains. Aggregate for subdrain backfill shall meet requirements of Section 4131. (See General Supplemental Specifications.)

F. Granular Material at Subdrain Outlets and the covering of RL-13 subdrains shall be Class A crushed stone meeting requirements of 4120.04.

898.03 CONSTRUCTION. Continuous longitudinal subdrains shall be placed as shown on the plans. Outlets through the shoulder shall be installed as shown on the plans at approximately 1,000-foot intervals. Additional outlets shall be provided at the low point of sag in vertical curves. Outlet locations may be adjusted by the engineer. The outlet end of each subdrain shall be covered with the specified outlet covering. Class A crushed stone shall be placed over porous backfill for RL-13 subdrains and at other subdrain outlets as shown on the plans, and shall be well compacted by tamping or vibration. Other outlets may be by special connections which will be shown on the plans.

Longitudinal and lateral subdrains shall be constructed as shown on the plans. The aggregate for subdrain backfill will be placed in one or more lifts, as indicated on the plans, and each lift shall be compacted with vigorous vibration. The backfill material, together with any engineering fabric which may be included in the design, shall be kept protected and undisturbed during subsequent pavement removal, concrete placement, or other work, so as to prevent intrusion of foreign material into the porous backfill.

Shoulder subdrain work shall include restoration of the shoulder and foreslope area. Stabilized shoulders shall be finished with a minimum depth of 4 inches of stabilized shoulder material. Shoulders paved with ACC shall be finished with a minimum depth of 6 inches of ACC base, Class 1, (Section 2203) or better, placed in 3-inch lifts. Compaction shall be subject to approval of the engineer, and it may be accomplished with loaded truck tires. The material removed in the trenching operation may be wasted along the outside edge of the shoulder as required by the plans and subject to approval of the engineer; pieces larger than approximately 2 inches shall be removed and disposed of.

Backslope subdrains shall be covered with earth, as shown on the plans, after the porous backfill is placed and compacted. The earth covering shall be leveled to match the adjacent area, and compaction of the earth is not necessary. The material removed in the trenching operation may be wasted by spreading over the adjacent area, subject to approval of the engineer; boulders larger than 4 inches shall be removed and disposed of.

RL-13 subdrains shall be covered with granular material described in 898.02F, as shown on the plans, after the porous backfill is placed and compacted. The granular material shall be compacted in the same manner as the porous backfill. The material removed in the trenching operation may be wasted by spreading on the adjacent or nearby areas, subject to approval of the engineer, in a manner that leaves the slopes in the subdrain area as shown on the plans.

When the work is completed, all subdrain outlets shall be open, free of debris, and ready to function.

898.04 LIMITATIONS. When the road is open to public traffic during construction, work or uncompleted work that interferes with traffic shall be on only one side of the pavement at any location.

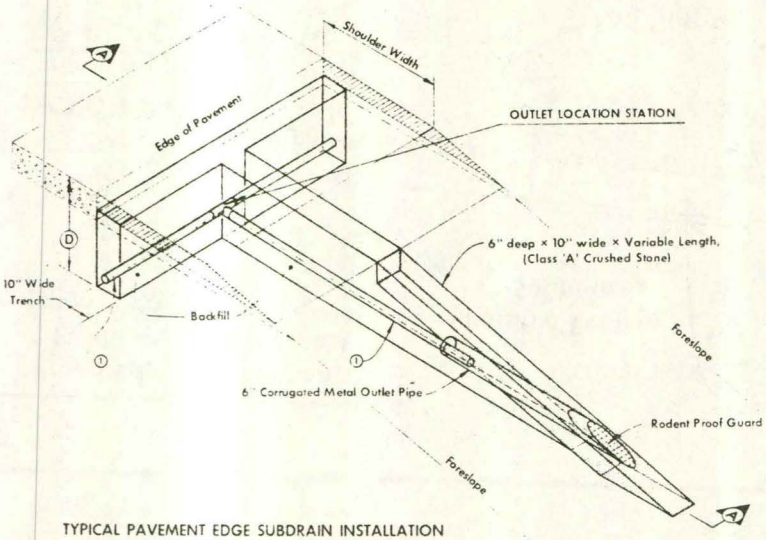
898.05 METHOD OF MEASUREMENT. The engineer will compute the lengths of subdrain and the outlets to be measured for payment as follows:

1. Longitudinal Subdrain (Backslope). The measured lengths of backslope and RL-13 perforated subdrains placed of each size, with the measured lengths of perforated subdrain placed in laterals and outlets, including the 1-foot extension into the corrugated pipe, and excluding lengths of corrugated pipe.
2. Longitudinal Subdrain (Shoulders). The lengths of shoulder perforated subdrains placed of each size, calculated from centerline stationing, with the measured lengths of perforated subdrains placed in laterals and outlets, including the 1-foot extension into the corrugated pipe, and excluding lengths of corrugated pipe.
3. CMP Subdrain Outlets. A count of sections of corrugated pipe of each size placed in outlets.

898.06 BASIS OF PAYMENT. For the number of linear feet of longitudinal subdrain of each size placed, the contractor will be paid the contract price per linear foot, and for the number of subdrain outlets of each size placed, the contractor will be paid the contract price for each, as follows:

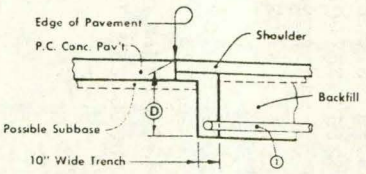
1. Longitudinal Subdrain (Backslope), including RL-13 subdrains.
2. Longitudinal Subdrain (Shoulder).
3. CMP Subdrain Outlets.

Payment for longitudinal subdrains shall be full compensation for cutting, removal, and disposal of trench material, including laterals and outlet locations; furnishing and placing subdrain pipe, laterals, elbows, tees, special connections, couplings, and adaptors in accordance with the manufacturer's recommendations; furnishing and placing porous backfill, and crushed stone for RL-13 subdrains; furnishing and placing engineering fabric as required; restoring the shoulder of shoulder subdrains and covering backslope subdrains with earth, including shoulder outlet locations; and necessary traffic control when not included in a separate item. Payment for CMP Subdrain Outlets shall be full compensation for furnishing and installing corrugated culverts at outlets, including the outlet coverings, grouted joints and special connections, drilling or forming into an existing drainage facility, and associated excavation, backfill with specified material, and restoration.

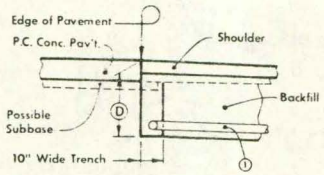


TYPICAL PAVEMENT EDGE SUBDRAIN INSTALLATION
(EXISTING PAVEMENT OR NEW CONSTRUCTION)

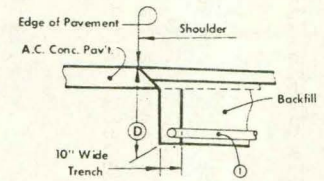
① 4" Perforated Subdrain (Polyethylene, Corrugated Tubing)



P.C.C. Pavement (Option 1)

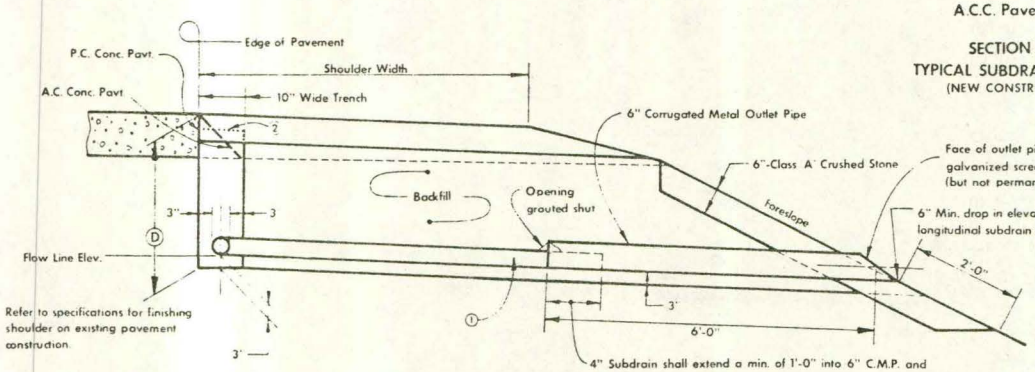


P.C.C. Pavement (Option 2)



A.C.C. Pavement

SECTION A-A
TYPICAL SUBDRAIN OUTLET
(NEW CONSTRUCTION)

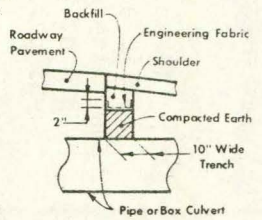


2. Refer to specifications for finishing shoulder on existing pavement construction.

Face of outlet pipe shall be cut at 3:1 slope. ½" mesh galvanized screen or an approved rodent guard fastened (but not permanently) to outlet pipe.

4" Subdrain shall extend a min. of 1'-0" into 6" C.M.P. and the External Joint shall be grouted shut, or the contractor has the option of furnishing an adaptor (non-pay item).

SECTION A-A
TYPICAL SUBDRAIN OUTLET
(EXISTING PAVEMENT)



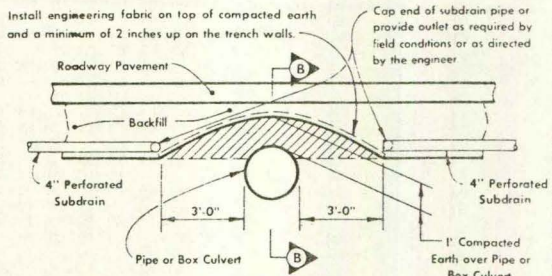
SECTION B-B

GENERAL NOTES:
Details indicated hereon are for the construction of longitudinal subdrains and outlets. All work and materials used in the installation shall be in conformance with applicable Standard Road Plans, current Standard and Supplemental Specifications. Refer to "Tabulation Of Longitudinal Subdrains" for details of individual subdrain installations.

Each outlet shall be covered with ½" mesh galvanized screen or an approved commercial rodent guard. The guard shall be securely fastened (but not permanently) to the outlet pipe end by means approved by the engineer.

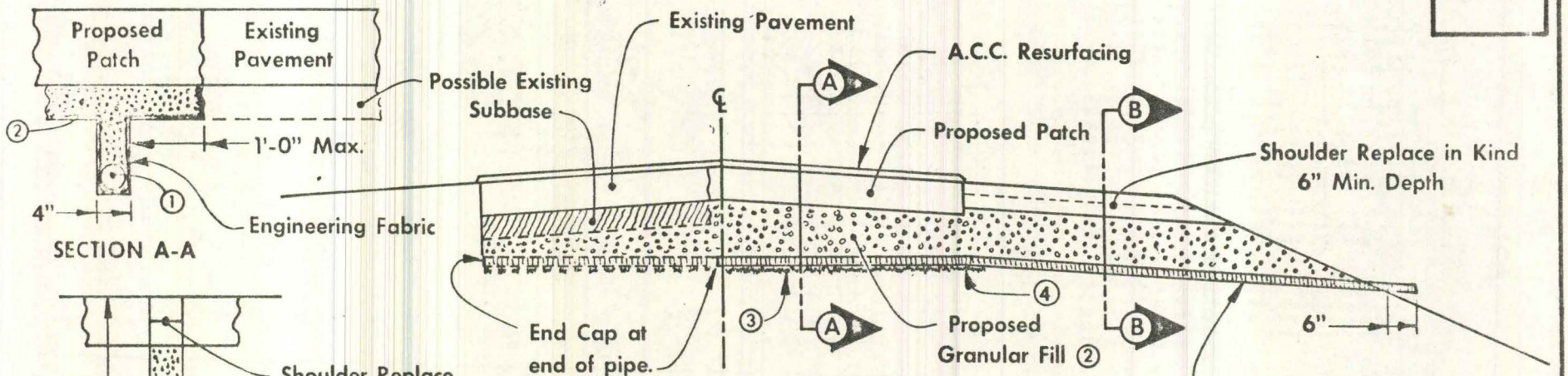
Subdrain trench shall be located adjacent to edge of roadway pavement. On new construction projects, the subdrain shall be placed after the mainline paving and prior to shoulder placement. On new projects with tied P.C.C. Shoulders, trench location shall be as determined by the engineer. On existing roadways, the trench shall be capped with material per current Standard and Supplemental Specifications.

Price bid for "Longitudinal Subdrain, As Per Plan" (in lin. ft.) and "C.M.P. Subdrain Outlet" (No.) shall be considered full compensation for all installation work and materials necessary as detailed hereon, included in current Standard and Supplemental Specifications and as required by project plans.



TYPICAL DETAILS
SUBDRAIN INSTALLATION AT
R.C.B. CULVERTS OR RF-1 CONCRETE PIPE CULVERTS
(If culvert is 1 ft. or more below trench bottom, no subdrain outlets should be provided. Carry subdrain over culvert.)

DETAIL SHEET	500-7
Revision Date 7-9-82	
DETAILS OF LONGITUDINAL SUBDRAINS	



③ Use engineering fabric full width under pavement when granular subbase is used.

④ Placement of engineering fabric shall extend 1 foot beyond the edge of pavement around outlet installation.

TRANSVERSE SUBDRAIN OUTLET FOR FULL DEPTH PAVEMENT PATCHING

BRIDGE APPROACH SETTLEMENT CORRECTION FOR THE PAVEMENT AND SHOULDER

Bridge approach maintenance has been a continuing problem in Iowa. Over the years we have tried many different approaches to solving these problems and are still trying new ideas.

The current design for a bridge approach section is shown as Standard Road Plan RK-11. It was designed with a minimum 20 ft. heavily reinforced section of pavement immediately adjacent to the bridge and resting on the bridge abutment paving notch. It was intended that this section would be sufficiently rigid to carry heavy loads onto the bridge with minimum impact if the approach settled. The approach always seems to settle. Three 20 ft. sections of concrete pavement were placed adjacent to this approach section with two 4 inch pressure relief joints spaced 20 ft. apart immediately ahead of this 60 ft. section.

It was intended that this approach section would provide the flexibility we needed for mud pumping to raise the pavement should the embankment subside. It was also designed to provide the necessary pressure relief to avoid damage to backwalls from expanding concrete pavements.

Over the years we have pumped a lot of bridge approach sections in order to level them up and generally succeeded in breaking them up. Our past experience has been using mud pumps with a mixture of cement and dirt as the fill material. There seems to be a tendency to mix this material too dry and build pyramids under the slab which did raise the slab, but did not give adequate support.

Over the last few years we have used our mud pumps more to fill voids under the slabs than to raise them and to level the settled slab with an asphalt overlay.

The asphalt overlays were generally placed with one of the Department's two asphalt laydown machines that are operated out of the central office, as requested by field supervisors. We try to cover the entire state each year with these machines and smooth up bridge approaches, level dips over culverts and strengthen weak pavement sections. We limit the length of an asphalt leveling course to 600 ft. except for special situations. Our crews have become experts in placing these leveling courses.

The pressure relief joints that we show within about 80-100 ft. of the end of the bridge in our detail RK-11 often times fell within the area of the asphalt overlay. The result was that the pressure relief joint reflected up through the asphalt very quickly and then the asphalt spalled back on both sides of the pressure relief joint causing a substantial dip or bump. Patching these spalled areas was extremely difficult because of the unstable nature of the joint filler in the pressure relief joint.

We know that it is important to maintain the pressure relief on bridges because where we've neglected to do this we have broken backwalls and even moved bridge decks several inches.

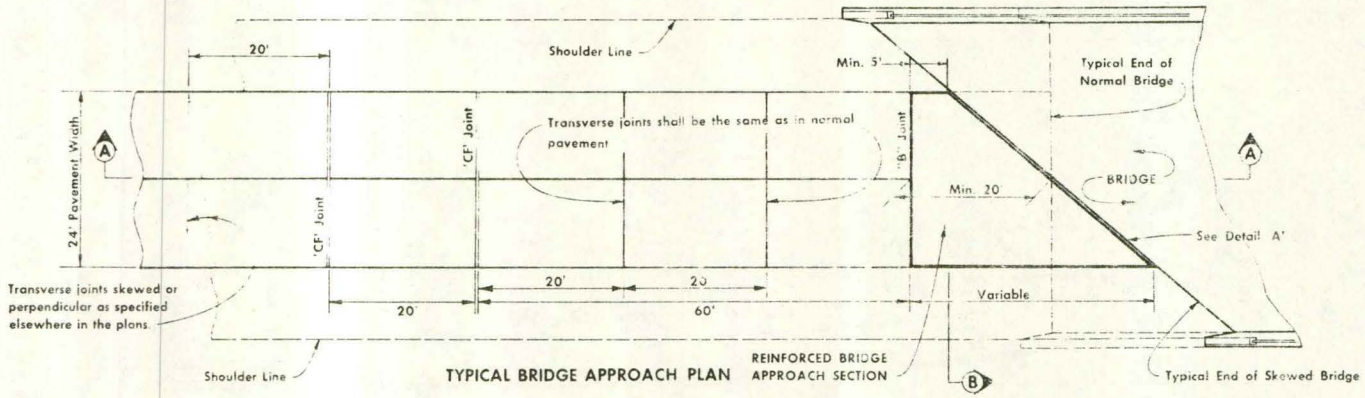
In an effort to eliminate the problem of the joint reflecting through the leveling course, we have now moved the pressure relief joint up beyond the

normal limits of the leveling course and at the same time have filled the pressure relief joints that lie within the leveling course and causing us problems.

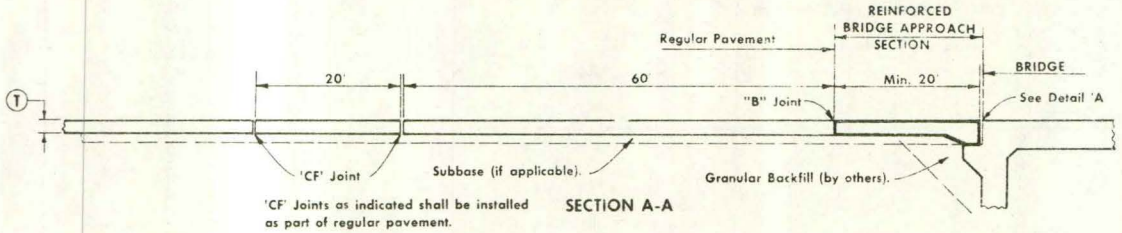
You will also find attached to this paper a copy of a new preliminary plan for a bridge approach section that some people feel will solve all of our problems. This section has not yet been tried, but plans are in design stage for the first installation to be in 1983.

This approach section relies heavily on new bridge techniques that our Soils Design Section feels have practically eliminated bridge approach berm subsidence. If we have eliminated the subsidence, then our major problem is eliminating the pavement pumping and faulting that occurs at these approaches. The pavement pumping and faulting should be reduced by a 4 inch lift of open graded granular backfill and the drainage system placed in conjunction with this blanket. There is also a filter fabric membrane placed under the granular backfill to prevent the pumping of the subgrade material up into the granular backfill. This fabric is also intended to allow us to mud pump the approaches to take care of any settlement without contaminating the granular backfill.

There was a lot of though given to this design, but its success must still be proved. The 1982 cost of raising pavement with state crews by use of Koehring mud pumps was about $88 per c.y. of material pumped. The cost of leveling by asphalt paver was about $40 per ton of material placed.



TYPICAL BRIDGE APPROACH PLAN



'CF' Joints as indicated shall be installed as part of regular pavement.

SECTION A-A

GENERAL NOTES :

Details indicated hereon are typical and shall be used for all situations where directly applicable.

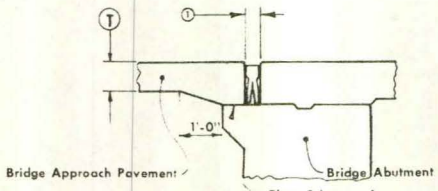
The concrete used for construction of bridge approach section as indicated shall be the same as for remainder of pavement and shall be placed as required for pavement, unless otherwise directed by the Engineer.

For individual locations requiring dimensions other than those indicated, construction procedure shall be similar, with appropriate modifications as directed by the Engineer. Quantities shall be as indicated on plans.

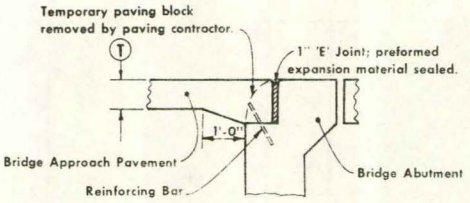
Price bid for "Reinforced Bridge Approach Section" shall be considered full compensation for construction as detailed hereon, and as shown on detail plans.

Quanity for 20' long approach section for 24' pavement is 53.33 sq. yds. of "Reinforced Bridge Approach Section".

① To be constructed same as CF-Joint. Refer to standard plan RH-2 for additional details of pavement joints.



MOVABLE ABUTMENT BRIDGE

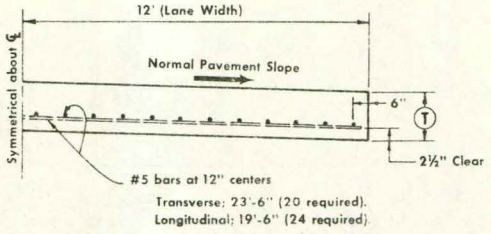


FIXED ABUTMENT BRIDGE

DETAIL 'A'

NOTE: Joint treatment at bridge end shall be as directed by the Engineer.

NOTE: "T" is same thickness as is required for remainder of project pavement.



TYPICAL HALF SECTION B

NO.	DATE	LAST REVISION
8	7-16-76	Added Skewed Joint Note

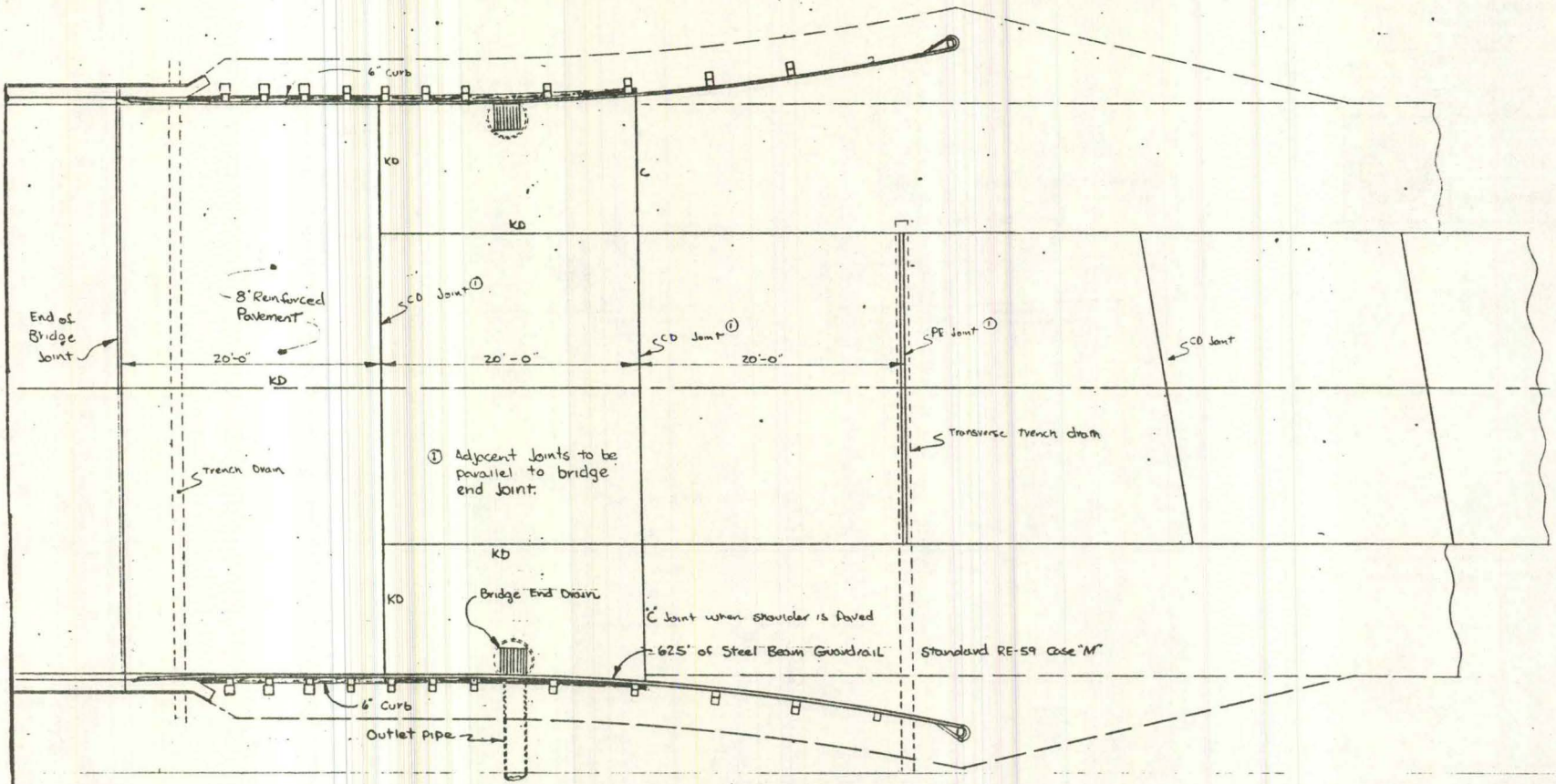
DEPARTMENT OF TRANSPORTATION — IOWA

Highway Division

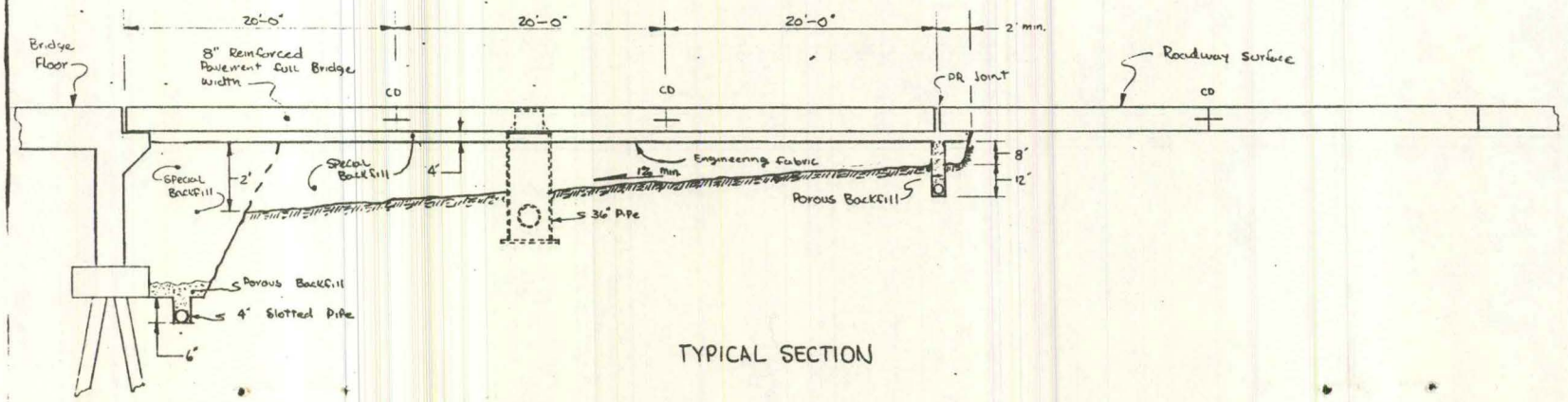
STANDARD ROAD PLAN **RK-11**

RECOMMENDED	ASST. ROAD DESIGN ENGINEER	DATE 7-14-76
	ROAD DESIGN ENGINEER	DATE 7-19-76
APPROVED	DEPUTY CHIEF ENGINEER	DATE 7-13-76

BRIDGE APPROACH DETAILS
(TWO-LANE)
STANDARD CONCRETE PAVEMENT



PLAN VIEW



TYPICAL SECTION