ARIZONA DEPARTMENT OF TRANSPORTATION

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SPS-6: REHABILITATION OF JOINTED PORTLAND CEMENT CONCRETE PAVEMENTS

Construction Report

Prepared by:
Austin Research Engineers, Inc.
2600 Dellana Lane
Austin, Texas 78746

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206 South 17th Avenue
Phoenix, Arizona 85007
in cooperation with
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16. Abstract

Nineteen test sections were constructed by the Arizona Department of Transportation (ADOT) as part of Strategic Highway Research Program (SHRP) Specific Pavement Studies (SPS)-6 experiment. The SPS-6 program addresses the rehabilitation of jointed portland cement concrete pavement. The objective of the SPS-6 experiment is to develop improved performance prediction models to be used for determining the additional pavement life that can be expected from the application of a variety of JCP pavement rehabilitation methods, ranging from minimal to maximum investment.

Construction of the 19 SPS-6 test sections was successfully incorporated in ADOT project IR-40-4(123) on I-40 at Flagstaff. Eight of the 19 test sections meet the basic SHRP requirements for the experiment. The additional 11 sections were designed by ADOT to evaluate features that are not included in the SHRP experiment design. The 8 SHRP sections include 3 different types of surface preparation of the existing JCP 1)crack and seat, 2) minimum restoration, and 3) maximum restoration. They also include two different asphalt overlay thicknesses - 4" and 8", two sections with no overlay, and one control section which is to receive only routine ADOT maintenance. The 11 ADOT sections include an additional surface preparation procedure - rubblizing the existing JCP - as well as an unbonded JCP overlay, asphalt overlay with fabric, various thickness combinations of asphalt rubber and conventional asphalt overlays, and asphalt rubber asphalt concrete friction course. The 19 test sections were constructed in an approximate 2.6 mile segment of the 10 mile long I-40 rehabilitation project. Average test section length is 500'. Design and construction data from these sections, along with future performance data, will be an important contribution to achieving the goals of the SPS-6 program.

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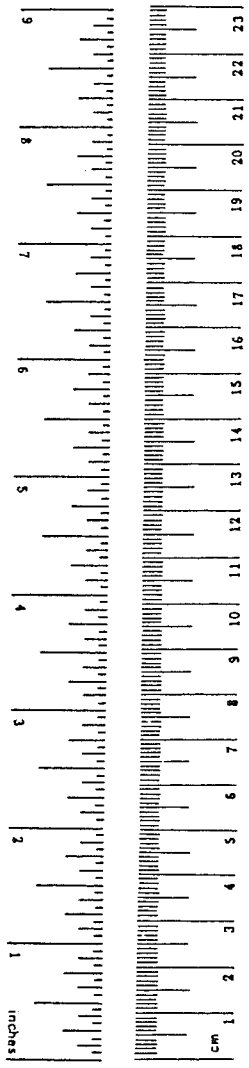
METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	2.54	centimetres	cm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km
	AREA			
in^2	square inches	645.2	centimetres squared	cm^2
ft^2	square feet	0.0929	metres squared	m^2
yd^2	square yards	0.836	metres squared	m^2
mi^2	square miles	2.59	kilometres squared	km^2
ac	acres	0.395	hectares	ha
	MASS (weight)			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
	VOLUME			
fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
ft^3	cubic feet	0.0328	metres cubed	m^3
yd^3	cubic yards	0.0765	metres cubed	m^3

NOTE: Volumes greater than 1000 L shall be shown in m^3.

	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi
	AREA			
mm^2	millimetres squared	0.0016	square inches	in^2
m^2	metres squared	10.764	square feet	ft^2
km^2	kilometres squared	0.39	square miles	mi^2
ha	hectores (10 000 m^2)	2.53	acres	ac
	MASS (weight)			
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T
	VOLUME			
mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m^3	metres cubed	35.315	cubic feet	ft^3
m^3	metres cubed	1.308	cubic yards	yd^3
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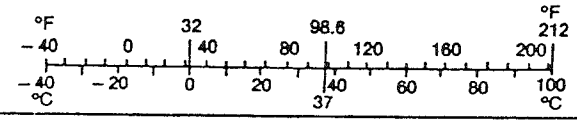
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

EXECUTIVE SUMMARY

Nineteen test sections were constructed by the Arizona Department of Transportation (ADOT) as part of Strategic Highway Research Program (SHRP) Specific Pavement Studies (SPS) -6 experiment. The SPS-6 program addresses the rehabilitation of jointed portland cement concrete pavement. The objective of the SPS-6 experiment is to develop improved performance prediction models to be used for determining the additional pavement life that can be expected from the application of a variety of JCP and JRCP pavement rehabilitation methods and strategies, ranging from minimal to maximum investment in the rehabilitation treatment. The test sections in this ADOT project deal with JCP only.

EXPERIMENTAL FEATURES

Eight of the nineteen test sections meet the basic SHRP requirements for the experiment. The additional eleven sections were designed by ADOT to evaluate features that are not included in the SHRP experiment design.

The 8 SHRP sections include 3 different types of surface preparation of the existing JCP - 1) crack and seat, 2) minimum restoration, and 3) maximum restoration. They also include two different conventional asphalt overlay thicknesses - 4" and 8", two sections with no overlay, and one control section which is to receive only routine ADOT maintenance procedures.

The 11 ADOT sections include an additional surface preparation procedure - rubblizing the existing JCP - as well as an unbonded JCP overlay, asphalt overlay with fabric, various thickness combinations of asphalt rubber and conventional asphalt overlays, and asphalt rubber asphalt concrete friction course.

EXISTING PROJECT DESCRIPTION

The test sections were incorporated in ADOT construction project IR-40-4(123) on I-40 at Flagstaff, which extends from U.S. 89A (MP 195) to the Walnut Canyon Interchange (MP 205) in the eastbound direction. Total project length is 10 miles.

The existing pavement is a 38' roadway, consisting of two 12' travel lanes, a 10' outside shoulder and 4' inside shoulder. Travel lanes are 8" to 9" thick JCP and the shoulders are 2.5" to 3" AC. ADT ranges from 4,000 to 8,000, depending on the time of year. Truck average speed is 61 to 64 mph.

Pavement distress in the outside lane of the existing JCP consists of joint and crack spalling, longitudinal, transverse, and random direction cracking, and shattered slabs. Approximately 80% - 90% of the slabs exhibit some type of distress. Approximately 50% of the joints have spalling, 35% to 40% have longitudinal/transverse cracking, and 5% to 15% of the slabs are shattered (broken into 3 or more pieces).

CONSTRUCTION PROJECT DESCRIPTION

All the SHRP test sections were designed following the ideas in the SHRP "Specific Pavement Studies Experimental Design and Research Plan for Experiment SPS-6, Rehabilitation of Jointed Portland Cement Concrete Pavements." The SHRP guidelines for construction details "Construction Guidelines for Experiment SPS-6, Rehabilitation of Jointed Portland Cement Concrete Pavements" were followed as closely as possible in construction.

Repairs and other activities on the control section were limited by SHRP to only routine maintenance needed to keep the section in a safe and functional condition. In general, the maintenance activities were required to be limited to those permitted in SHRP "Guidelines for Maintenance of General Pavement Studies (GPS) Test Sections."

The minimum level of pavement restoration includes joint and crack sealing, partial and full-depth patching, and full surface diamond grinding. The maximum level of restoration includes removing and replacing existing joint and crack sealing, performing additional joint and crack sealing, removing and replacing existing partial and full-depth patching, performing additional partial and full-depth patching, correcting poor load transfer at joints, full surface diamond grinding, retrofitting subsurface edge drains, and undersealing. These activities were to be performed only if warranted.

The crack and seat procedure for the SHRP sections was intended to produce a nominal crack spacing of 3' x 3'. The pavement was then rolled until the broken pieces were seated. Crack and seat on some of the ADOT sections was intended to produce a 4' x 6' cracking pattern. A tack coat was to be placed prior to overlay.

The rubblizing procedure on the ADOT sections was intended to break the pavement into nominal 1" to 2" pieces. It was then to be compacted with a vibratory roller and primed prior to overlay with asphaltic concrete.

Sections to receive 4" overlays were placed in two 2" lifts, the 8" overlay was placed in two 3" and one 2" lift, and 5" overlays were placed in one 3" and one 2" lift. Tack coats were applied between lifts. The unbonded PCC overlay in ADOT Section 2 was poured on 2" of asphalt concrete.

The asphalt concrete friction course (ACFC) was intended to be 5/8" thick on some of the sections (the SHRP limit is 0.75"), and the asphalt rubber asphalt concrete friction course (AR-ACFC) was intended to be 0.50" thick on the additional ADOT sections.

The design of asphalt concrete mixes were specified to be done in compliance with guidelines in FHWA Technical Advisory T-5040.27. Only virgin aggregates are allowed and they are expected to be of highest quality. Asphalt cement was to be selected by ADOT based on normal practice. No deviations from SHRP design and construction guidelines were allowed unless accepted by SHRP.

CHARACTERISTICS OF MATERIALS

The virgin asphalt concrete mix design was a 3/4" mix consisting of basalt coarse aggregate, basalt intermediate aggregate, basalt fine aggregate, Flagstaff cinders, Mahan concrete sand, and Winslow sand. Asphalt cement was AC-20 at 4.6% by weight of mix. Mineral admixture was hydrated lime at 1.5% by weight of aggregate.

The asphalt rubber asphalt concrete mix design included 20% granulated rubber of Type C 106 and AC-10 asphalt cement. Bituminous content was 6.5% by weight of mix. The mineral admixture was lime, used at a rate of 1% by weight of aggregate.

The asphalt concrete friction course (ACFC) consisted of 90% 3/8" aggregate, 4% CR Fines, 6% W-Fines, and 6.8% AC-20.

Spall repair material was CALTRANS Formula SET 45, a rapid setting patch material, with 25 lbs of rock per bag of SET 45. A 3/4" maximum size aggregate was used.

Concrete for the full-depth repairs and unbonded overlay complied with ADOT specification 1006. A Class P 4,000 psi concrete was specified. Cement was Type II Low Alkali and fly ash was Class F. Entrained air was specified to be 4% to 7%, and slump 2.5" to 4.5". Aggregate size was specified as 1.5" maximum. Actual gradation used was 1" maximum. A wax based curing compound was used. Concrete joint sealant was a silicone.

CONSTRUCTION OVERVIEW

The nineteen test sections were constructed in an approximate 2.6 mile segment of the 10 mile long I-40 rehabilitation project. Average test section length is approximately 500', excluding transitions between sections.

The test sections were constructed between mid-June and mid-October of 1990. Efforts from mid-June through the end of July concentrated primarily on minimum and maximum surface preparations and the trench drain. Crack and seat and rubblizing was done from August 1 through August 5 and the bulk of the asphalt paving was from August 5 through August 12. The unbonded PCC overlay was placed on September 4 in the passing lane and September 24 in the travel lane. The ACFC and AR-ACFC were placed in mid-October.

Crack and seat was accomplished with a guillotine type pavement breaker and seating was done with one pass of a 50 ton roller. For the rubblized sections a PB4 resonant breaker was used in longitudinal passes approximately 7" to 12" wide with a steel shoe using a 2,000 lb force at 44 times/minute.

The asphalt concrete mix was produced in a drum mixer plant and placed in typical 12' wide lanes. Breakdown rolling was one pass of a 12.5 ton double drum vibratory roller. Intermediate rolling was 4 passes of a pneumatic. Finish rolling was one pass of a 12.5 ton vibratory and two passes of a 12.5 ton static roller. Tack coat was an SS-1H applied at .08 gal/SY.

Tests run on the construction materials indicate they were in compliance with the specifications. Asphalt content ranged from 4.5% to 4.9%. Air voids ranged from 3.9% to 5.1% and stability was generally between 3,000 and 4,000.

The portland cement concrete 28-day average compressive strength ranged from 4,400 to 5,100 psi, with air entrainment average from 5.2% to 5.5%. Slump was in the average range of 3.6" to 4.6"

CONCLUSIONS

Design and construction of the SPS-6 test sections were successfully incorporated in ADOT construction project IR-40-4(123) on I-40 at Flagstaff. All features of the SHRP required SPS-6 experiment design were included in eight basic test sections. Design and construction data from these sections, along with future performance data that will be collected, will be a meaningful and important contribution to achieving the goals of the SPS-6 program.

In addition to the eight required SHRP sections, ADOT included eleven more test sections which were designed to incorporate features that are not in the SHRP SPS-6 experiment design. Continued study of these sections will provide valuable input to ADOT in its desires to develop the most effective and economical types of pavement design and construction for rehabilitation of jointed PCC pavements.

TABLE OF CONTENTS

PAGE

EXECUTIVE SUMMARY

I. INTRODUCTION 1
GENERAL 1
PROBLEM STATEMENT 3
OBJECTIVE 4

II. DESCRIPTION OF SPS-6 EXPERIMENT 6
INTRODUCTION 6
EXPERIMENT DESIGN 6
TEST SECTION LAYOUT AND FEATURES 6

III. EXISTING PROJECT DESCRIPTION 12
LOCATION 12
PAVEMENT SECTION 12
CLIMATE 12

IV. EXISTING PAVEMENT PERFORMANCE 19
TRAFFIC 19
FUNCTIONAL PERFORMANCE 19
STRUCTURAL PAVEMENT PERFORMANCE 22
MATERIAL RELATED PROBLEMS 22

V. CONSTRUCTION PROJECT DESCRIPTION 23
SECTION DESIGNS AND SPECIFICATIONS 23
DISCUSSION OF SHRP DESIGN AND CONSTRUCTION
GUIDELINES FOR TEST SECTIONS 36

TABLE OF CONTENTS

(continued)

PAGE

TYPICAL SECTIONS 36
ACTIVITIES ON CONTROL SECTION 36
PAVEMENT PREPARATION 37
MINIMUM RESTORATION 37
MAXIMUM RESTORATION 37
CRACK AND SEAT 38
SPECIAL CONSIDERATIONS 38
ASPHALT CONCRETE MIX DESIGN 38
CONSTRUCTION OPERATIONS 39
DEVIATION FROM GUIDELINES 39

VI. EVALUATION OF EXISTING PAVEMENT 40
SAMPLING OF EXISTING PAVEMENT 40
SURVEY OF CRACKING 41

VII. CHARACTERISTICS OF MATERIALS 45
VIRGIN ASPHALT CONCRETE MIX (END PRODUCT) DESIGN 45
ASPHALT RUBBER ASPHALT CONCRETE (AR-AC) MIX DESIGN 45
ASPHALT CONCRETE FRICTION COURSE (ACFC) 49
ASPHALT RUBBER ASPHALT CONCRETE FRICTION COURSE (AR-ACFC) 49
PAVING FABRIC 55
AGGREGATE TRENCH EDGE DRAIN 56
SPALL REPAIR MATERIAL 57

TABLE OF CONTENTS

(continued)

PAGE

CONCRETE FOR UNBONDED OVERLAY AND FULL-DEPTH REPAIRS 58
CONCRETE CURING MATERIAL 61
CONCRETE JOINT SEALANT 61
CRACK AND EDGE SEALANT 61

VIII. CONSTRUCTION OVERVIEW 63
SEQUENCE 63
METHOD AND EQUIPMENT 64
QUALITY CONTROL OF MATERIALS 66

IX. CONCLUSIONS 70

REFERENCES 71

APPENDIX A SHRP EXPERIMENT DESIGN
APPENDIX B SPECIAL PROVISIONS AND ADDENDUMS
APPENDIX C SHRP CONSTRUCTION GUIDELINES
APPENDIX D MAPS OF PAVEMENT DISTRESS, SAMPLE LOCATIONS AND DEFLECTION TEST LOCATIONS
APPENDIX E MIX DESIGNS FOR MATERIALS

LIST OF TABLES

TABLE		PAGE
1	Experimental Design for SPS-6, Rehabilitation of Jointed Portland Cement Concrete Pavements	7
2	SPS-6 Test Section Features	9
2A	Local Climatological Data	16
3	Correspondence Between Sample Area and SPS-6 Test Sections	42
4	SPS-6 Preconstruction Sampling Locations	43
5	Summary of Distress in Travel Lane Prior to Construction of Test Sections	44
6	Aggregate Properties for 3/4" AC Mix	46
7	Gradation for 3/4" AC Mix	47
8	Mix Design Criteria (3/4" AC Mix)	48
9	Aggregate Properties for ARAC	50
10	Aggregate Gradation for ARAC	51
11	Mix Design Properties of Asphalt Rubber Asphalt Concrete (ARAC)	52
12	Aggregate Properties for ACFC	53
13	Aggregate Gradation for ACFC	54
14	Silicone Joint Sealant, Dow Corning 888, Lot No. ET030082	62

LIST OF FIGURES

TABLE		PAGE
1	Layout of Test Sections	10
2	Existing Pavement Section	13
3	Temperatures During Construction Period	14
4	Precipitation During Construction Period	15
5	ADT on Test Sections	20
6	Average Truck Speed on Test Sections	21
7	Typical Construction Sections	24
8	Pavement Structural Sections	25
9	Test Section Layout Sequence	27
10	Typical Vertical Taper Treatment	28
11	Pavement Restoration Details	32

I. INTRODUCTION

GENERAL

As the nation's highway infrastructure is growing older, reconstruction and rehabilitation of the vast road network have become increasingly important. Today, a major share of highway funds is being used up in maintenance, rehabilitation and reconstruction of the pavements. In 1985, it was estimated that four hundred billion dollars will be spent on replacing and rehabilitating existing pavements around the nation over the next fifteen years (2). The costs to the road users of poor pavement conditions will probably be several times this amount in the same period. The Strategic Highway Research Program (SHRP), a five year, $150 million result oriented research effort was initiated in 1987 in order to cope with the rapidly deteriorating highway infrastructure of the nation. The program was authorized by the U.S. Congress with the passage of the Surface Transportation and Urban Relocation Act in 1987. SHRP is a highly focused research program directed at four specific technical areas: Pavement Performance, Asphalt, Highway Operation, and Concrete and Structures. Research in Pavement Performance is being conducted by SHRP and SHRP contractors in cooperation with the States and the Federal Highway Administration. Although current funding for this research is for five years, the program is designed as a twenty year program. As such it has been named the Long Term Pavement Performance (LTPP) Study.

SHRP's LTPP program is designed to develop better and longer lasting pavements. To accomplish this SHRP will test and evaluate approximately 800 in-service pavements and 1100 newly surfaced pavements constructed as test sections. The LTPP program will evaluate pavement performance over a broad range of materials, pavement types, climates, traffic loadings, subbase, and pavement ages. The LTPP program is focused on two major areas of study. The first study area which evaluates the performance of existing pavements is known as the General Pavement Studies (GPS). The second area which investigates the performance of pavements constructed as part

of an experiment is the Specific Pavement Studies (SPS). The SPS projects are aimed at attaining LTPP objectives which cannot be completely met by the GPS studies, simply because existing pavement sections do not provide all the necessary comparisons to evaluate the dominant factors in pavement distress and performance. With greater experimental control, SPS can provide much more precise answers for pavement design and performance prediction. The SPS program presently consists of seven programs grouped into three categories. It will eventually consist of ten programs grouped into five categories as shown below:

CURRENT:

Structural Factors:

SPS-1: Strategic Study of Structural Factors for A.C. Pavements

SPS-2: Strategic Study of Structural Factors for Concrete Pavements

Pavement Maintenance:

SPS-3: Preventative Maintenance Effectiveness of Flexible Pavements

SPS-4: Preventative Maintenance Effectiveness of Rigid Pavements

Pavement Rehabilitation:

SPS-5: Rehabilitation of Asphalt Concrete Pavements

SPS-6: Rehabilitation of Jointed Portland Cement Concrete Pavements

SPS-7: Bonded Concrete Overlays of Concrete Pavements

FUTURE:

Environmental Effects:

SPS-8: Study of Environmental Effects in the Absence of Heavy Loads

Materials Validation Testing:

SPS-9: Asphalt Concrete Materials

SPS-10: Portland Cement Concrete Materials

This report discusses the construction of test sections for SPS-6: Rehabilitation of Jointed Portland Cement Concrete Pavements.

The experimental designs and research plans (3) for SPS-6 were adapted from the Specific Pavement Studies on restoration of jointed concrete pavements (JCP) and pretreated JCP with AC overlay originally described in the May 1986 Strategic Highway Research Program Research Plans issued by the Transportation Research Board. Some of the original experimental design factors have been revised based on state and province desires and budget limitations. This research plan was to be used by highway agencies and SHRP as a guide for selecting candidate projects to be considered for inclusion in the SPS-6 experiment and for design and construction of the test sections.

PROBLEM STATEMENT

Many United States and Canadian highway agencies are faced with the difficult task of determining the best way to treat existing aging and deteriorating jointed concrete pavements. Not only must they determine which rehabilitation procedures work best under which circumstances, but they must also determine the most appropriate time to apply such rehabilitation treatments. The problem is further complicated by the need to address an entire network of pavements at various levels of condition and age with limited funding resources.

There are a variety of rehabilitation techniques that can be applied to jointed concrete pavements (JCP) to restore condition and extend service life. These techniques involve a combination of levels and types of pavement preparation with and without the application of asphalt concrete (AC) overlays.

Pavement preparation approaches range from minimal treatment of the original PCC pavement to full "Concrete Pavement Restoration" (CPR) as well as cracking/breaking and seating. Pavement preparation can include diamond grinding, subsealing, full-depth repair, partial-depth spall repair, restoration of load transfer, resealing of transverse joints, resealing of longitudinal lane/shoulder joints, pressure relief joints, retrofit tied PCC concrete shoulders, and longitudinal subdrains. Depending on the extent and type of pavement preparation, asphalt concrete overlays of appropriate thicknesses may or may not be applied.

The long term performance of such rehabilitated pavements has not been systematically monitored and evaluated. There are no analytical design procedures for PCC rehabilitation and there are many unanswered questions regarding the appropriate rehabilitation techniques to use for a given pavement condition, traffic level, and climate as well as the proper timing of rehabilitation treatments.

One of the major LTPP objectives is "To Develop Improved Design Methodologies and Strategies for the Rehabilitation of Existing Pavements." A generally accepted approach for making cost effective decisions on pavement maintenance and rehabilitation is the use of pavement management concepts including life-cycle cost analyses of construction and rehabilitation activities. The ability to predict the performance and life expectancy of various rehabilitation strategies, with and without overlays, is essential to pavement management and life-cycle cost analyses. Consequently, the development of improved performance predictions models for various rehabilitation strategies is essential to achieving the LTPP objectives and should be one of the early products of research.

OBJECTIVE

The objective of the SPS-6 experiment is to develop improved performance prediction models to be used for determining the additional pavement life that can be expected from the application of a variety of JPC and JRC pavement rehabilitation

methods and strategies ranging from minimal to maximum investment in the rehabilitation treatment. The treatments being studied include combinations of surface preparations, with and without AC overlay, as well as crack and seat preparation with AC overlay. The study objective includes a determination of the influence of environmental region and initial pavement condition on the effectiveness of rehabilitation methods. Accomplishing this objective will provide substantially improved "tools" for use in pavement management and life-cycle cost analysis activities.

II. DESCRIPTION OF SPS-6 EXPERIMENT

INTRODUCTION

This experiment design is a coordinated research plan intended to produce data and performance information for a variety of rehabilitation and overlay procedures constructed to extend the life of existing jointed PCC pavements. The primary factors being studied are: (1) the extent of preparation and restoration of the existing pavement, (2) thickness of AC overlay, and (3) environmental (climatic) factors. Other considerations are: (1) existing condition of pavement, (2) pavement type, (3) subgrade soil, and (4) traffic volume and load. In addition, the experiment includes other test sections desired by ADOT to evaluate local practices or innovative features. These include PCC overlay, asphalt rubber AC, and variations in surface preparation.

EXPERIMENT DESIGN

The SHRP recommended experiment design is shown in Table 1. It identifies the primary experimental factors and their relationships with each other. Table 1 identifies site related factors across the top and rehabilitation treatments down the side. Each column in this arrangement represents either one or two project locations each of which incorporates several test sections. Each row represents a series of test sections with specific features to be constructed at each project location. The ADOT project falls in the Dry-No Freeze JPCP category.

TEST SECTION LAYOUT AND FEATURES

Originally eight SHRP test sections and five ADOT test sections were designed as part of ADOT construction project IR-40-4(123). These test sections are located on the eastbound travel lane of I-40 near Flagstaff beginning at milepost 202.16 and extending through milepost 204.20 (2.04 miles). ADOT added six more sections during the construction phase, which were not in the original design. These sections extend

Table 1. Experimental design for SPS-6, rehabilitation of jointed portland cement concrete pavements.

Rehabilitation Procedures \ Factors for Moisture, Temperature, Pavement Type, and Pavement Condition		WET FREEZE				WET, NO FREEZE				DRY FREEZE				DRY, NO FREEZE	
		JPCP		JRCP		JPCP		JRCP		JPCP		JRCP		JPCP	
		FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR
PREPARATION	OVERLAY THICKNESS														
Routine Maintenance (Control)	0	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
Minimum Restoration	0	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	4"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	4" •	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
Maximum Restoration (CPR)	0	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	4"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
Crack/Break and Seat	4"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	8"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x

• with saw AC overlay joints above JCP joints and seal

Subgrade Soil: Fine
Traffic: >200 KESAL/Year

Each "x" designates a test section.

from MP 204.21 to MP 204.84 (.57 miles). The construction was a part of rehabilitation of the existing I-40 PCC pavement from milepost 195.08 to milepost 205.20.

Test section identification and features are listed in Table 2. The layout of the test sections with transitions is in Figure 1.

SHRP 040601 is the control section or part of the existing pavement left as it was. This section is to receive only routine maintenance. Each test section has a SHRP test section sign along with the experimental feature at the beginning of the test section on the shoulder and also by the fence on the right-of-way. Also, SHRP test section numbers were painted on the shoulder for each test section. Delimiters with blue reflectors were also used to delineate the beginning and end of the test sections.

TABLE 2. SPS-6 TEST SECTION FEATURES

SHRP ID	ADOT No.	Location From	Location To	Length ft.	Surface Preparation	Overlay Material	Overlay Thickness, inches
ADOT 040609	1*	0+00	4+94	494	Rubblize	AC	8
ADOT 040613	2*	6+63	11+62	499	Crack and Seat	PCC/AC	10/2
SHRP 040608	3	14+42	19+38	496	Crack and Seat	AC	8
SHRP 040607	4	22+18	27+14	496	Crack and Seat	AC	4
SHRP 040606	5	29+74	34+69	495	Maximum	AC	4
ADOT 040610	6*	37+70	43+67	597	Fabric/Crack and Seat	AC	4
ADOT 040611	7*	45+38	49+75	437	Crack and Seat	ARAC/AC	2/2
SHRP 040604	8	51+24	56+21	497	Saw and Seal/Minimum	AC	4
ADOT 040612	9*	61+40	66+64	524	Crack and Seat	AC/ARAC	2/2
SHRP 040603	10	72+96	78+02	506	Minimum	AC	4
SHRP 040605	11	80+15	90+09	994	Maximum	None	None
SHRP 040602	12	95+92	101+63	571	Minimum	None	None
SHRP 040601	13	103+47	108+48	501	Routine Maintenance	None	None (Control)
ADOT 040614	14*	112+02	117+02	500	None	AR-ACFC ARAC/AC	0.50 2/3
ADOT 040615	15*	117+02	123+24	622	Crack and Seat	AR-ACFC ARAC/AC	0.50 2/3
ADOT 040616	16*	123+24	128+24	500	Rubblize	AR-ACFC ARAC/AC	0.50 2/3
ADOT 040617	17*	128+24	133+24	500	Crack and Seat	AR-ACFC ARAC/AC	0.50 2/3
ADOT 040618	18*	133+24	137+24	400	None	AR-ACFC ARAC/AC	0.50 2/3
ADOT 040619	19*	137+24	142+24	500	Rubblize	AR-ACFC ARAC/AC	0.50 2/3

NOTE: Approximately one month after construction of Sections 1 - 13, a 5/8" thick ACFC was placed on Sections 3, 4, 5, 6, 7, 9, 10 to reduce concern about potential raveling and skid characteristics of AC surface.

* - ADOT Experimental Test Section
ARAC - Asphalt Rubber Asphalt Concrete
ACFC - Asphalt Concrete Friction Course
AR-ACFC - Asphalt Rubber Asphalt Concrete Friction Course

ARIZONA SPS-6
TEST SECTION FEATURES AND LENGTHS

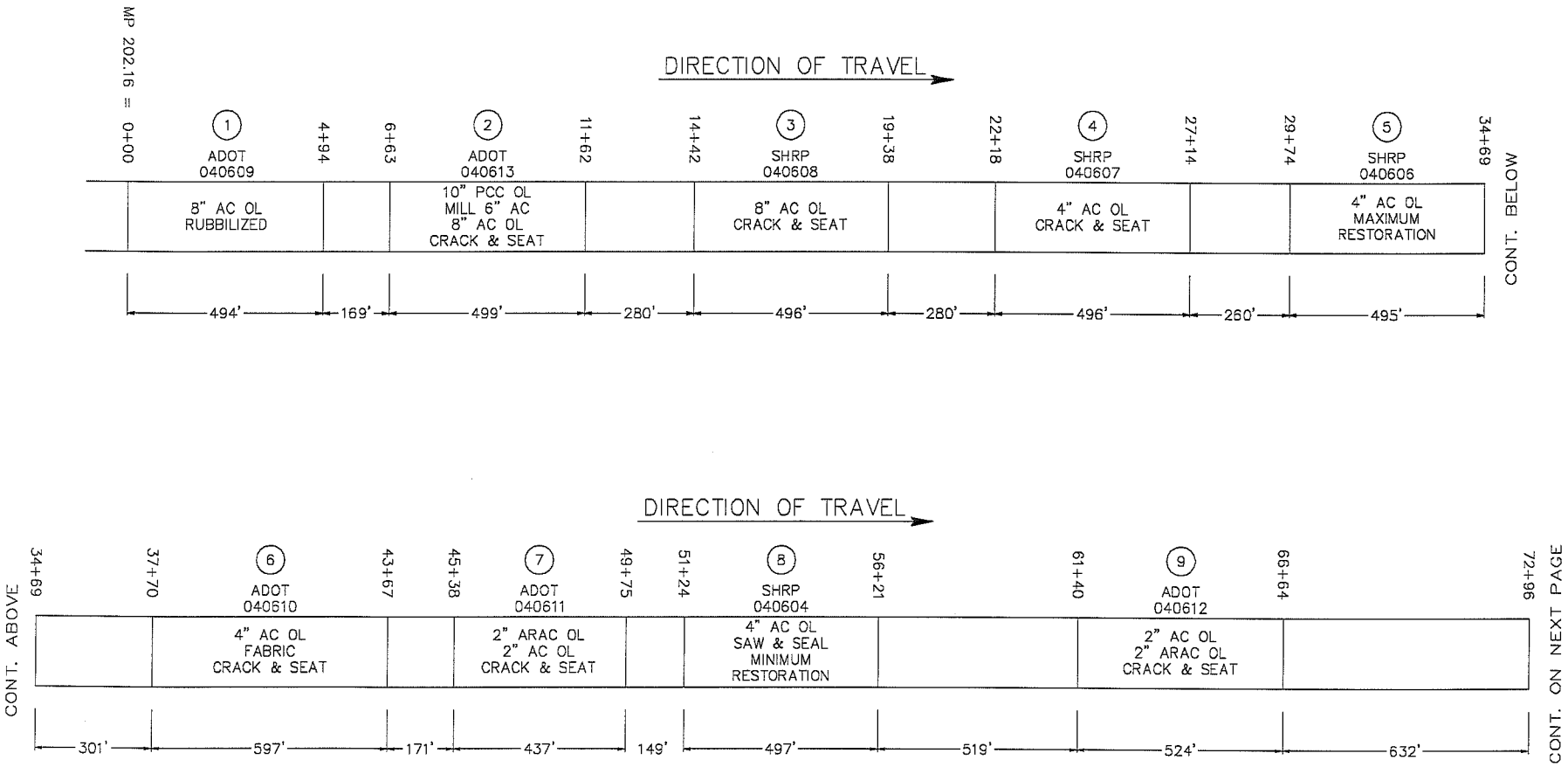


Figure 1. LAYOUT OF TEST SECTIONS

ARIZONA SPS-6
TEST SECTION FEATURES AND LENGTHS

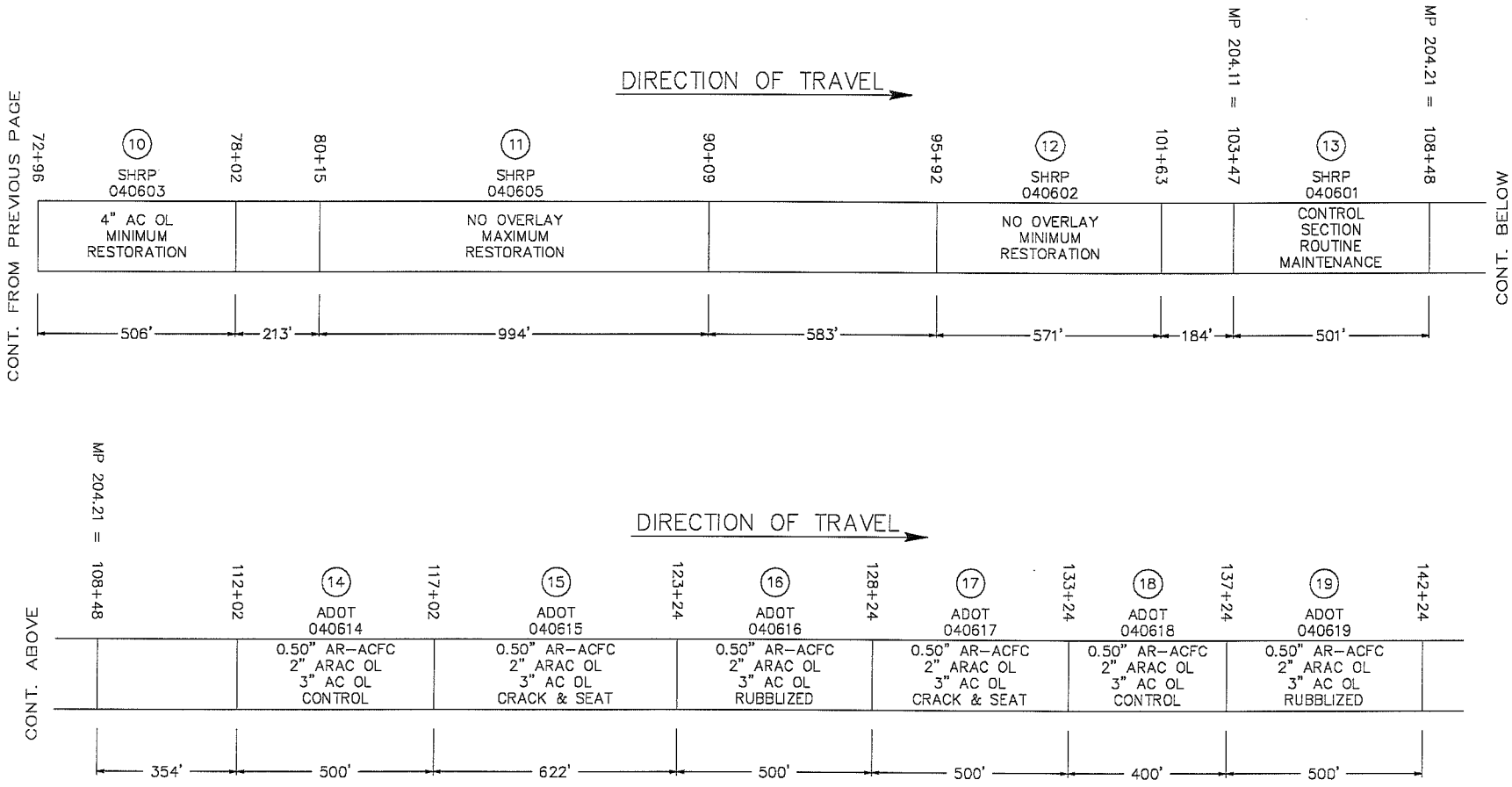


Figure 1. (continued)

III. EXISTING PROJECT DESCRIPTION

LOCATION

The project is located at Flagstaff in Central Arizona (Coconino County) extending from U.S. 89A (milepost 195) to the Walnut Canyon Interchange (milepost 205) in the eastbound direction of I-40. Total project length is 10 miles. It is located in ADOT District 4. Average project elevation is 6900'.

PAVEMENT SECTION

The existing project is a 38' roadway, consisting of two 12' wide travel lanes, a 10' outside shoulder, and 4' inside shoulder. The travel lanes are PCCP, 8" to 9" thick, and the shoulders are 2.5" to 3" of AC. Figure 2 shows the structural section of the existing pavement.

CLIMATE

The minimum and maximum daily temperatures during the period of test section construction, June through October of 1990, are shown graphically in Figure 3. The daily precipitation is graphed in Figure 4. A list of the temperatures and precipitation are in Table 2.

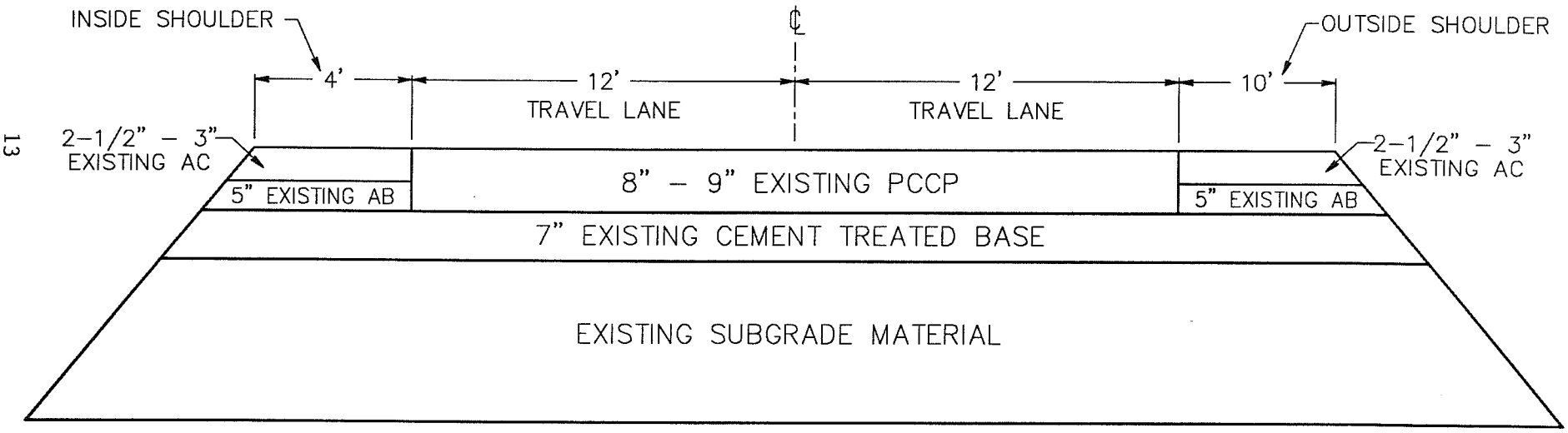


FIGURE 2. EXISTING PAVEMENT SECTION

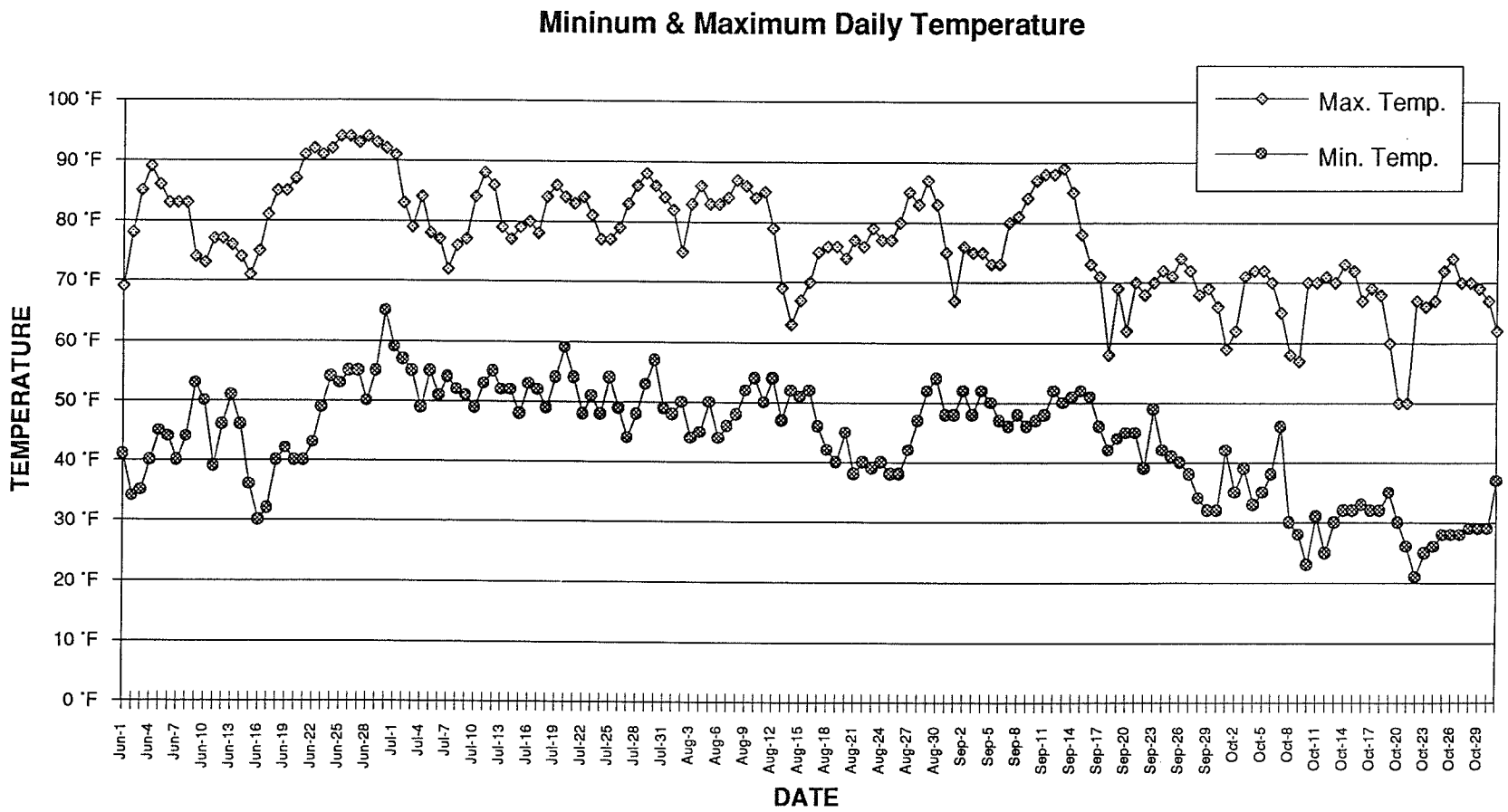


FIGURE 3. TEMPERATURES DURING CONSTRUCTION PERIOD

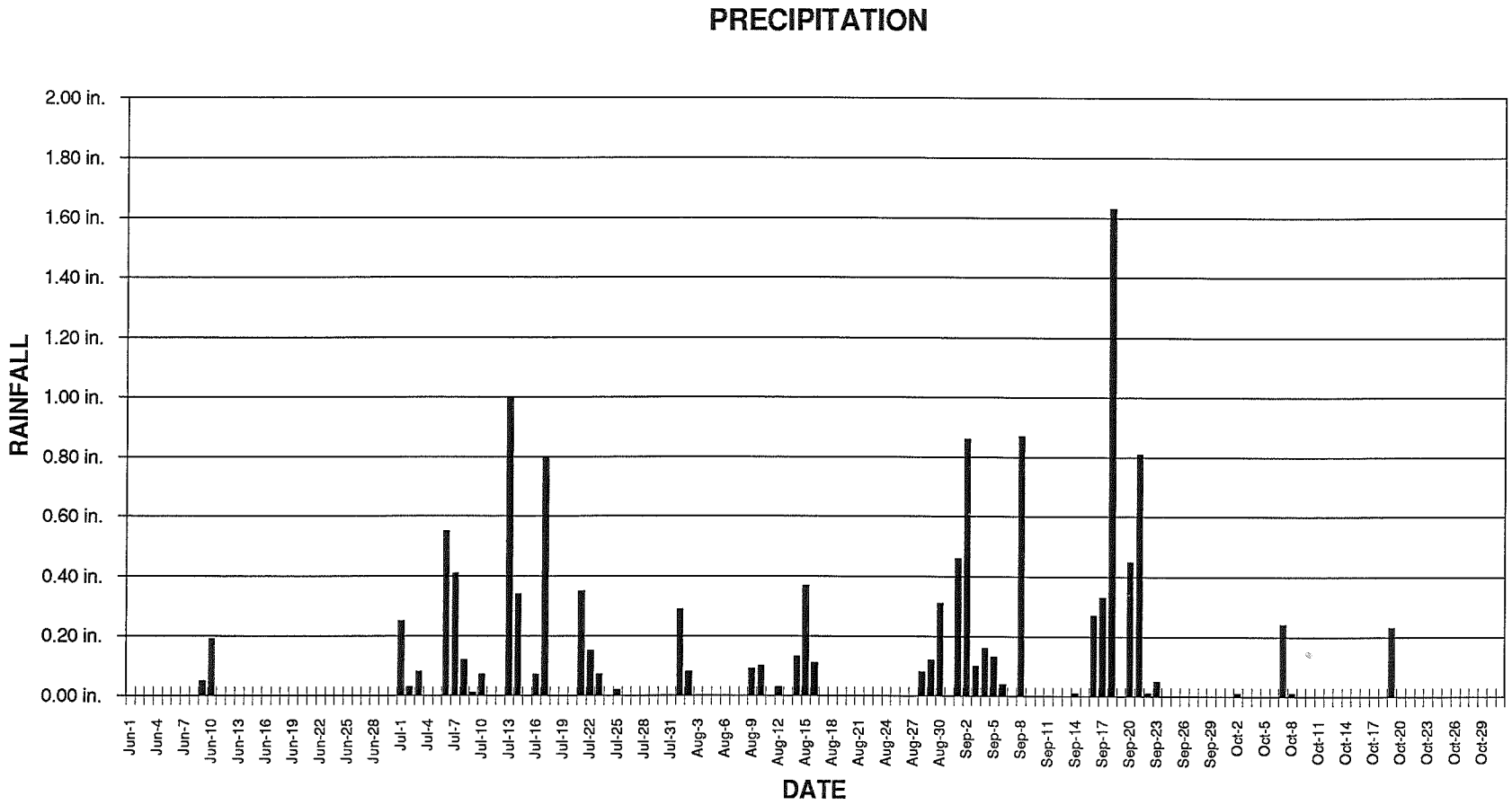


FIGURE 4. PRECIPITATION DURING CONSTRUCTION PERIOD

TABLE 2 a

LOCAL CLIMATOLOGICAL DATA

Source: NOAA Weather Station Pulliam Airport Flagstaff, AZ

Date	Max. Temp.	Min. Temp.	Precipitation
Jun-1	69 °F	41 °F	0.00 in.
Jun-2	78 °F	34 °F	0.00 in.
Jun-3	85 °F	35 °F	0.00 in.
Jun-4	89 °F	40 °F	0.00 in.
Jun-5	86 °F	45 °F	0.00 in.
Jun-6	83 °F	44 °F	0.00 in.
Jun-7	83 °F	40 °F	0.00 in.
Jun-8	83 °F	44 °F	0.00 in.
Jun-9	74 °F	53 °F	0.05 in.
Jun-10	73 °F	50 °F	0.19 in.
Jun-11	77 °F	39 °F	0.00 in.
Jun-12	77 °F	46 °F	0.00 in.
Jun-13	76 °F	51 °F	0.00 in.
Jun-14	74 °F	46 °F	0.00 in.
Jun-15	71 °F	36 °F	0.00 in.
Jun-16	75 °F	30 °F	0.00 in.
Jun-17	81 °F	32 °F	0.00 in.
Jun-18	85 °F	40 °F	0.00 in.
Jun-19	85 °F	42 °F	0.00 in.
Jun-20	87 °F	40 °F	0.00 in.
Jun-21	91 °F	40 °F	0.00 in.
Jun-22	92 °F	43 °F	0.00 in.
Jun-23	91 °F	49 °F	0.00 in.
Jun-24	92 °F	54 °F	0.00 in.
Jun-25	94 °F	53 °F	0.00 in.
Jun-26	94 °F	55 °F	0.00 in.
Jun-27	93 °F	55 °F	0.00 in.
Jun-28	94 °F	50 °F	0.00 in.
Jun-29	93 °F	55 °F	0.00 in.
Jun-30	92 °F	65 °F	0.00 in.
Jul-1	91 °F	59 °F	0.25 in.
Jul-2	83 °F	57 °F	0.03 in.
Jul-3	79 °F	55 °F	0.08 in.
Jul-4	84 °F	49 °F	0.00 in.
Jul-5	78 °F	55 °F	0.00 in.
Jul-6	77 °F	51 °F	0.55 in.
Jul-7	72 °F	54 °F	0.41 in.
Jul-8	76 °F	52 °F	0.12 in.
Jul-9	77 °F	51 °F	0.01 in.
Jul-10	84 °F	49 °F	0.07 in.
Jul-11	88 °F	53 °F	0.00 in.
Jul-12	86 °F	55 °F	0.00 in.
Jul-13	79 °F	52 °F	1.00 in.
Jul-14	77 °F	52 °F	0.34 in.
Jul-15	79 °F	48 °F	0.00 in.
Jul-16	80 °F	53 °F	0.07 in.
Jul-17	78 °F	52 °F	0.80 in.
Jul-18	84 °F	49 °F	0.00 in.
Jul-19	86 °F	54 °F	0.00 in.
Jul-20	84 °F	59 °F	0.00 in.
Jul-21	83 °F	54 °F	0.35 in.
Jul-22	84 °F	48 °F	0.15 in.
Jul-23	81 °F	51 °F	0.07 in.
Jul-24	77 °F	48 °F	0.00 in.
Jul-25	77 °F	54 °F	0.02 in.
Jul-26	79 °F	49 °F	0.00 in.
Jul-27	83 °F	44 °F	0.00 in.
Jul-28	86 °F	48 °F	0.00 in.
Jul-29	88 °F	53 °F	0.00 in.
Jul-30	86 °F	57 °F	0.00 in.
Jul-31	84 °F	49 °F	0.00 in.

TABLE 2 a (continued)

LOCAL CLIMATOLOGICAL DATA

Source: NOAA Weather Station Pulliam Airport Flagstaff, AZ

Date	Max. Temp.	Min. Temp.	Precipitation
Aug-1	82 °F	48 °F	0.29 in.
Aug-2	75 °F	50 °F	0.08 in.
Aug-3	83 °F	44 °F	0.00 in.
Aug-4	86 °F	45 °F	0.00 in.
Aug-5	83 °F	50 °F	0.00 in.
Aug-6	83 °F	44 °F	0.00 in.
Aug-7	84 °F	46 °F	0.00 in.
Aug-8	87 °F	48 °F	0.00 in.
Aug-9	86 °F	52 °F	0.09 in.
Aug-10	84 °F	54 °F	0.10 in.
Aug-11	85 °F	50 °F	0.00 in.
Aug-12	79 °F	54 °F	0.03 in.
Aug-13	69 °F	47 °F	0.00 in.
Aug-14	63 °F	52 °F	0.13 in.
Aug-15	67 °F	51 °F	0.37 in.
Aug-16	70 °F	52 °F	0.11 in.
Aug-17	75 °F	46 °F	0.00 in.
Aug-18	76 °F	42 °F	0.00 in.
Aug-19	76 °F	40 °F	0.00 in.
Aug-20	74 °F	45 °F	0.00 in.
Aug-21	77 °F	38 °F	0.00 in.
Aug-22	76 °F	40 °F	0.00 in.
Aug-23	79 °F	39 °F	0.00 in.
Aug-24	77 °F	40 °F	0.00 in.
Aug-25	77 °F	38 °F	0.00 in.
Aug-26	80 °F	38 °F	0.00 in.
Aug-27	85 °F	42 °F	0.00 in.
Aug-28	83 °F	47 °F	0.08 in.
Aug-29	87 °F	52 °F	0.12 in.
Aug-30	83 °F	54 °F	0.31 in.
Aug-31	75 °F	48 °F	0.00 in.
Sep-1	67 °F	48 °F	0.46 in.
Sep-2	76 °F	52 °F	0.86 in.
Sep-3	75 °F	48 °F	0.10 in.
Sep-4	75 °F	52 °F	0.16 in.
Sep-5	73 °F	50 °F	0.13 in.
Sep-6	73 °F	47 °F	0.04 in.
Sep-7	80 °F	46 °F	0.00 in.
Sep-8	81 °F	48 °F	0.87 in.
Sep-9	84 °F	46 °F	0.00 in.
Sep-10	87 °F	47 °F	0.00 in.
Sep-11	88 °F	48 °F	0.00 in.
Sep-12	88 °F	52 °F	0.00 in.
Sep-13	89 °F	50 °F	0.00 in.
Sep-14	85 °F	51 °F	0.01 in.
Sep-15	78 °F	52 °F	0.00 in.
Sep-16	73 °F	51 °F	0.27 in.
Sep-17	71 °F	46 °F	0.33 in.
Sep-18	58 °F	42 °F	1.63 in.
Sep-19	69 °F	44 °F	0.00 in.
Sep-20	62 °F	45 °F	0.45 in.
Sep-21	70 °F	45 °F	0.81 in.
Sep-22	68 °F	39 °F	0.01 in.
Sep-23	70 °F	49 °F	0.05 in.
Sep-24	72 °F	42 °F	0.00 in.
Sep-25	71 °F	41 °F	0.00 in.
Sep-26	74 °F	40 °F	0.00 in.
Sep-27	72 °F	38 °F	0.00 in.
Sep-28	68 °F	34 °F	0.00 in.
Sep-29	69 °F	32 °F	0.00 in.
Sep-30	66 °F	32 °F	0.00 in.

TABLE 2a (continued)

LOCAL CLIMATOLOGICAL DATA

Source: NOAA Weather Station Pulliam Airport Flagstaff, AZ

Date	*Max. Temp.*	*Min. Temp.*	*Precipitation*
Oct-1	59 °F	42 °F	0.00 in.
Oct-2	62 °F	35 °F	0.01 in.
Oct-3	71 °F	39 °F	0.00 in.
Oct-4	72 °F	33 °F	0.00 in.
Oct-5	72 °F	35 °F	0.00 in.
Oct-6	70 °F	38 °F	0.00 in.
Oct-7	65 °F	46 °F	0.24 in.
Oct-8	58 °F	30 °F	0.01 in.
Oct-9	57 °F	28 °F	0.00 in.
Oct-10	70 °F	23 °F	0.00 in.
Oct-11	70 °F	31 °F	0.00 in.
Oct-12	71 °F	25 °F	0.00 in.
Oct-13	70 °F	30 °F	0.00 in.
Oct-14	73 °F	32 °F	0.00 in.
Oct-15	72 °F	32 °F	0.00 in.
Oct-16	67 °F	33 °F	0.00 in.
Oct-17	69 °F	32 °F	0.00 in.
Oct-18	68 °F	32 °F	0.00 in.
Oct-19	60 °F	35 °F	0.23 in.
Oct-20	50 °F	30 °F	0.00 in.
Oct-21	50 °F	26 °F	0.00 in.
Oct-22	67 °F	21 °F	0.00 in.
Oct-23	66 °F	25 °F	0.00 in.
Oct-24	67 °F	26 °F	0.00 in.
Oct-25	72 °F	28 °F	0.00 in.
Oct-26	74 °F	28 °F	0.00 in.
Oct-27	70 °F	28 °F	0.00 in.
Oct-28	70 °F	29 °F	0.00 in.
Oct-29	69 °F	29 °F	0.00 in.
Oct-30	67 °F	29 °F	0.00 in.
Oct-31	62 °F	37 °F	0.00 in.

IV. EXISTING PAVEMENT PERFORMANCE

TRAFFIC

Design data shown on the project rehabilitation plan drawings indicates 1990 ADT is 8000 and projected 2000 ADT is 12000. This a projected growth of 4.2% annually. Results of actual traffic measurements from the High Speed Weigh-in-Motion equipment installed in Test Section 2 are shown in Figure 5 (Ref. 4). This data was collected in January through July of 1991, a few months after construction of the test sections. ADT on eastbound I-40 in this period ranged from 4206 in January to 7816 in June. Figure 6 shows the truck average speed which is between 60 and 65 mph.

FUNCTIONAL PERFORMANCE

The functional performance of the roadway can best be described by its serviceability. Arizona performs an annual inventory of its highway network and records this information on a route-milepost basis. Roughness, skid, patching, and faulting are measured in the travel lane and entered into the pavement management system database.

Roughness is determined by a Mays Ride Meter (car) traveling at 50 mph which obtains continuous readings between mileposts. The readings are summarized in inches per mile and the results assigned to the milepost location at which the readings begin. Once the field data is obtained it is normalized to 1972 calibration values to provide consistency with time.

Skid (friction) is determined by a Mu-Meter which is a continuous recording friction measuring trailer. Continuous readings are obtained for a five hundred foot section of wet pavement starting at a milepost location. The readings are averaged and assigned to the milepost.

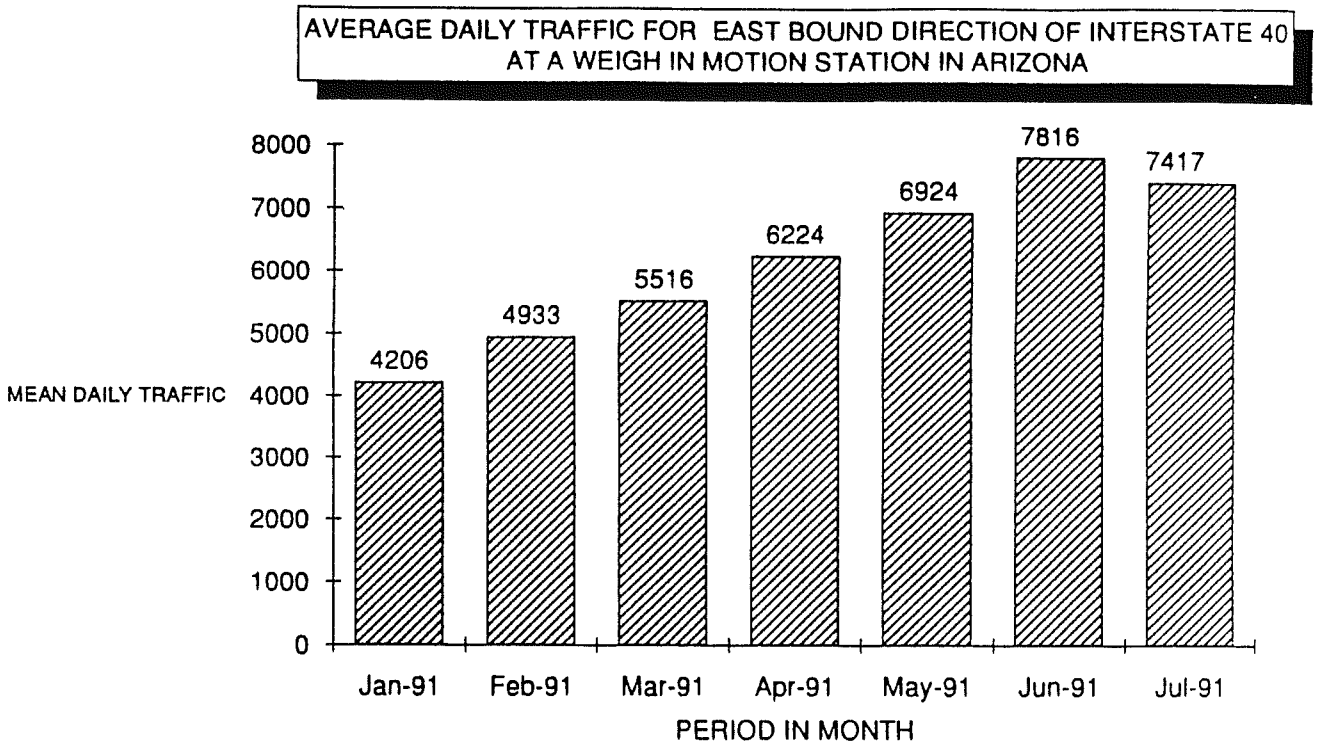


FIGURE 5. ADT ON TEST SECTIONS

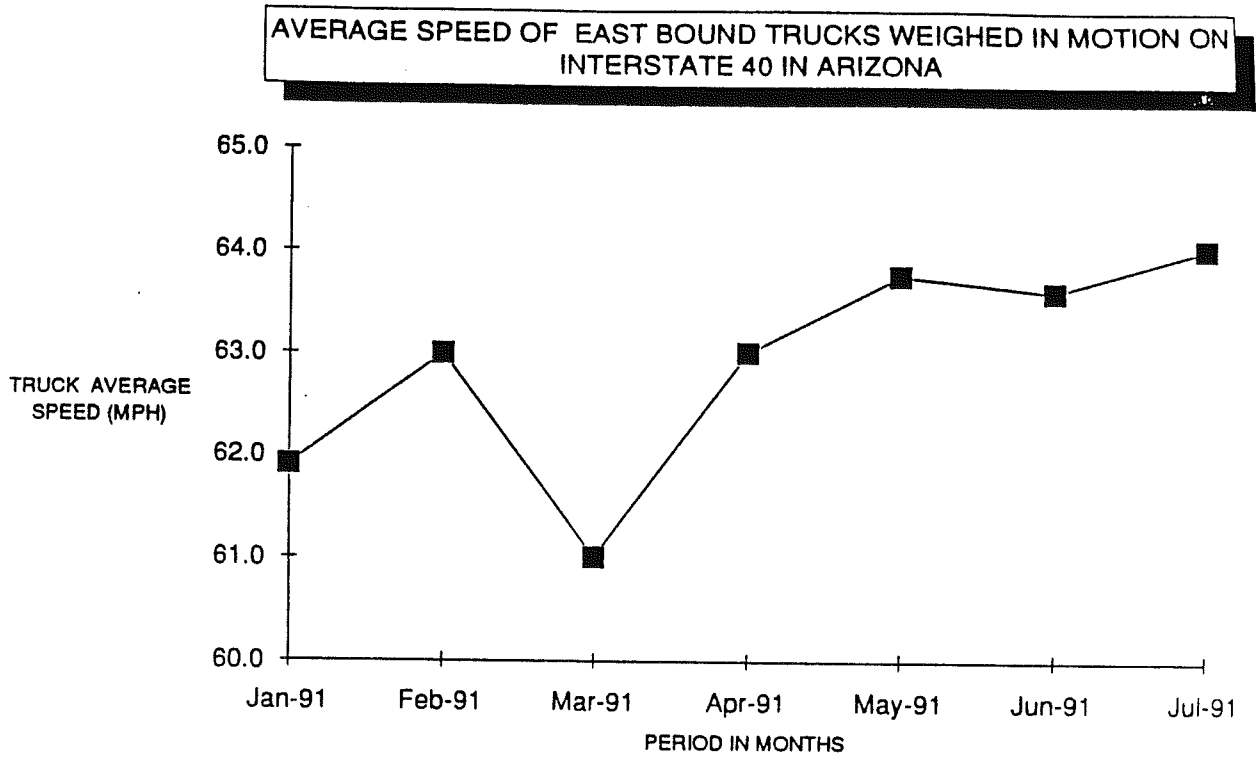


FIGURE 6. AVERAGE TRUCK SPEED ON TEST SECTIONS

Serviceability data prior to construction of the test sections was not made available for inclusion in this report. The ADOT PMS data base may be consulted for this information, if desired.

STRUCTURAL PAVEMENT PERFORMANCE

The structural condition of pavements are typically evaluated by ADOT in the form of pavement distress surveys, Dynaflect and Falling Weight Deflectometer tests. Historical structural data is available in ADOT's PMS database. Results of pavement distress surveys conducted prior to construction of the test sections are discussed in Section VI of this report.

MATERIAL RELATED PROBLEMS

Since ADOT's PMS does not report any material related distress, no records are available on the development of this distress. However, pre-construction inspection of this project did not reveal any problems.

V. CONSTRUCTION PROJECT DESCRIPTION

SECTION DESIGNS AND SPECIFICATIONS

All the SHRP test sections were designed following the ideas in the SHRP "Specific Pavement Studies Experimental Design and Research Plan for Experiment SPS-6 Rehabilitation of Jointed Portland Cement Concrete Pavements". A copy is included in Appendix A. The designs were included in ADOT construction project IR-40-4(123). Figure 7 shows the typical construction sections and Figure 8 shows the pavement structural sections for each test section. Test section numbers have been added to these construction plan sheets for ready reference. Figure 9 shows the test section layout sequence and Figure 10 shows the typical vertical taper treatment. It should be noted that actual constructed test section lengths differed somewhat from the lengths on these plan sheets. A brief description of design features is as follows:

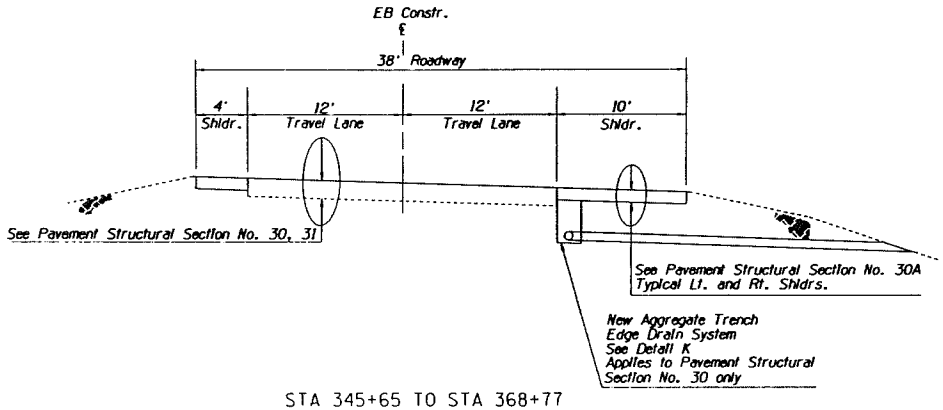
Test Section 1 (ADOT 040609): Rubblize the existing 8" to 9" PCCP according to project special provisions. The intent is to break-up the pavement into nominal 1" to 2" pieces. Compact with a vibratory roller and place prime coat prior to overlay. Overlay with asphaltic concrete (virgin AC 3/4) in 3 lifts - 3", 3", and 2" for final lift - for a total overlay thickness of 8". Place a tack coat between lifts.

Test Section 2 (ADOT 040613): Crack and seat the existing PCCP according to project special provisions. The nominal crack spacing should be 3' x 3'. The pavement should then be rolled until the broken pieces are seated. Place tack coat on top of PCCP. Place 8" thick AC overlay according to specifications. Place tack coat between lifts. Mill off 6" of the 8" overlay, leaving 2" in-place as an AC bondbreaker. Construct a new unbonded 10" PCCP overlay with dowels and tie bars as noted in plans.

SHRP EXPERIMENTAL SECTIONS SPS-6

"REHABILITATION OF PORTLAND CEMENT CONCRETE PAVEMENTS"

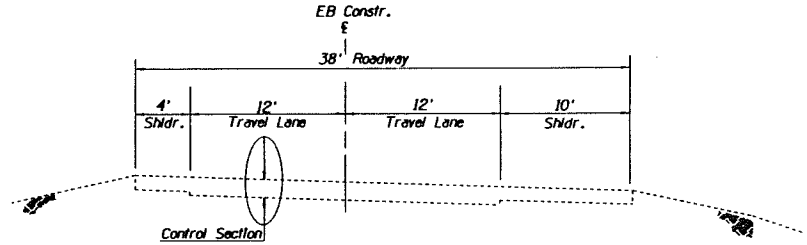
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	IR-40-4(123)	7	81	
		040 CN 195			



STA 345+65 TO STA 368+77

TYPICAL SECTION NO. 23

(Test Section No. 11, 12)



STA 368+77 TO STA 374+02

TYPICAL SECTION NO. 24

(Test Section No. 13)

See "SHRP VERTICAL TAPER TREATMENT" and "SHRP LAYOUT"

REDUCED SIZE DO NOT SCALE

	NAME	DATE	
DESIGN	M. THOMPSON	8/89	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION HIGHWAY PLANS SERVICES
DRAWN	M. THOMPSON	8/89	
CHECKED	B. LA JEUNESSE	8/89	DESIGN SHEET SHRP TYPICAL SECTIONS
TEAM LEADER	J. CARR	8/89	
ROUTE I-40	LOCATION US 89A OP - WALNUT CANYON TI (EB)		SHEET 6 OF 17

TRACS NO. H 0270 04C

FIGURE 7. TYPICAL CONSTRUCTION SECTIONS

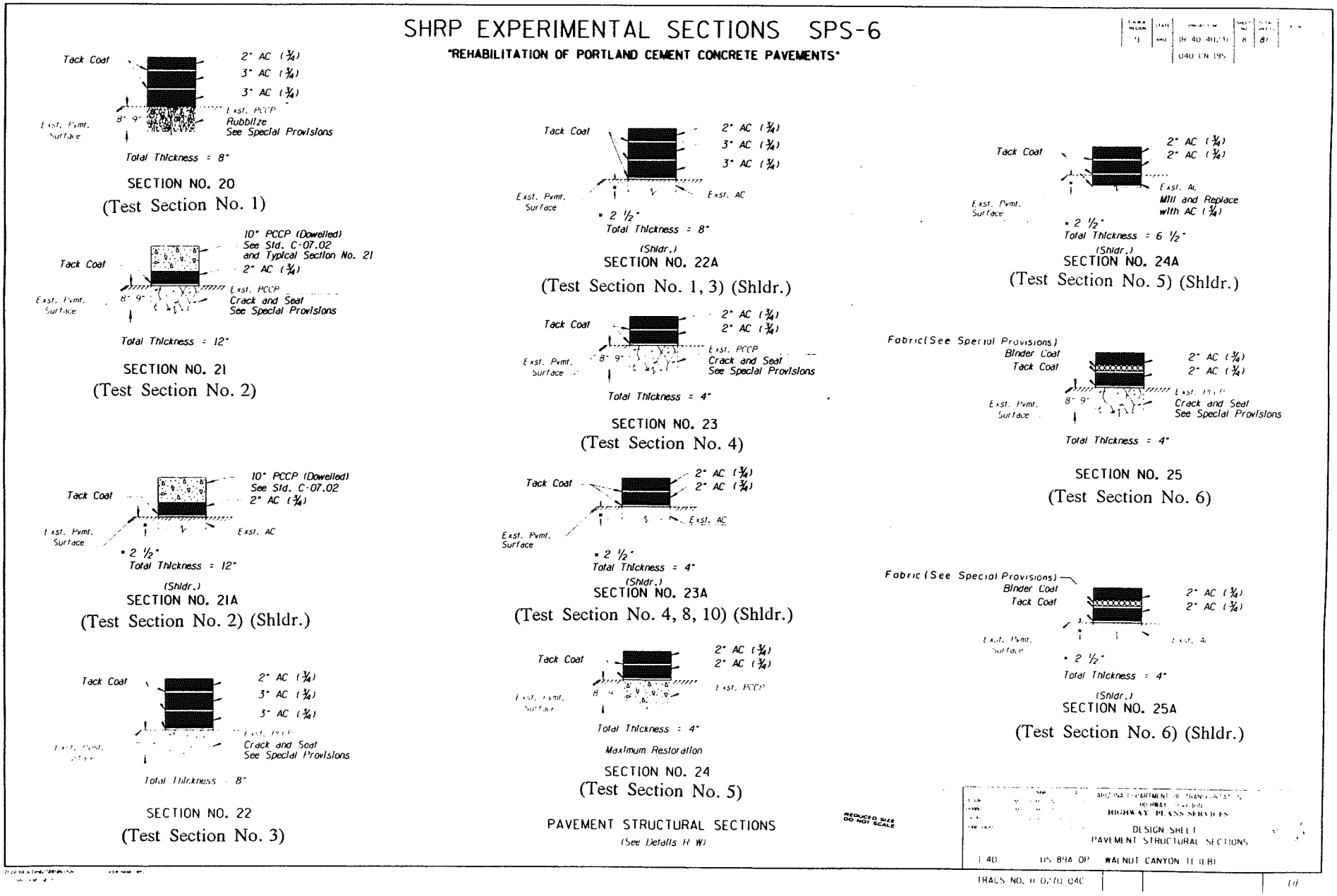
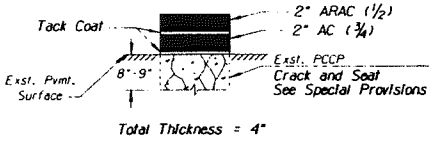


FIGURE 8. PAVEMENT STRUCTURAL SECTIONS

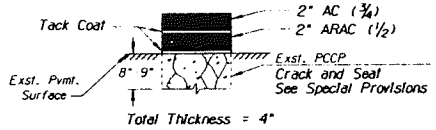
SHRP EXPERIMENTAL SECTIONS SPS-6

"REHABILITATION OF PORTLAND CEMENT CONCRETE PAVEMENTS"

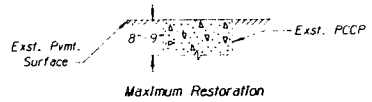
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	IR-40-4(123) 040 CN 195	3	81	



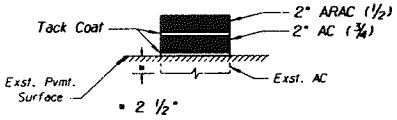
SECTION NO. 26
(Test Section No. 7)



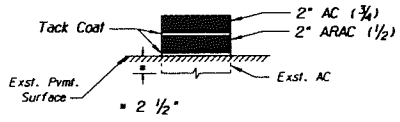
SECTION NO. 28
(Test Section No. 9)



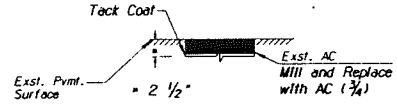
SECTION NO. 30
(Test Section No. 11)



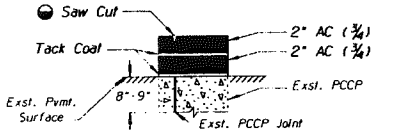
(Shldr.)
SECTION NO. 26A
(Test Section No. 7) (Shldr.)



(Shldr.)
SECTION NO. 28A
(Test Section No. 9) (Shldr.)

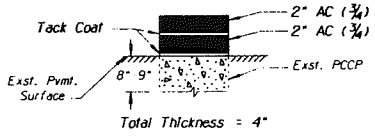


(Shldr.)
SECTION NO. 30A
(Test Section No. 11, 12) (Shldr.)



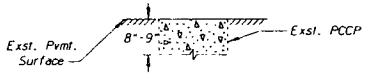
Saw Cut and Seal New Pvmt. directly above Exst. Transverse and Longitudinal Joints See Detail "W"
Total Thickness = 4"
Minimum Restoration

SECTION NO. 27
(Test Section No. 8)



Minimum Restoration

SECTION NO. 29
(Test Section No. 10)



Minimum Restoration

SECTION NO. 31
(Test Section No. 12)

PAVEMENT STRUCTURAL SECTIONS
(See Details R W)

REDUCED SIZE DO NOT SCALE

	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION HIGHWAY PLANS SERVICES
DESIGN	M. THOMPSON	8-89	DESIGN SHEET PAVEMENT STRUCTURAL SECTIONS
DRAWN	M. THOMPSON	8-89	
CHECKED	B. LA BUNDY	8-89	
TEAM LEADER	J. CARR	8-89	
ROUTE I-40	LOCATION US 89A OP - WALNUT CANYON TI (EB)		SHEET # OF #

TRACS NO. H 0270 04C

OF

FIGURE 8. PAVEMENT STRUCTURAL SECTIONS (continued)

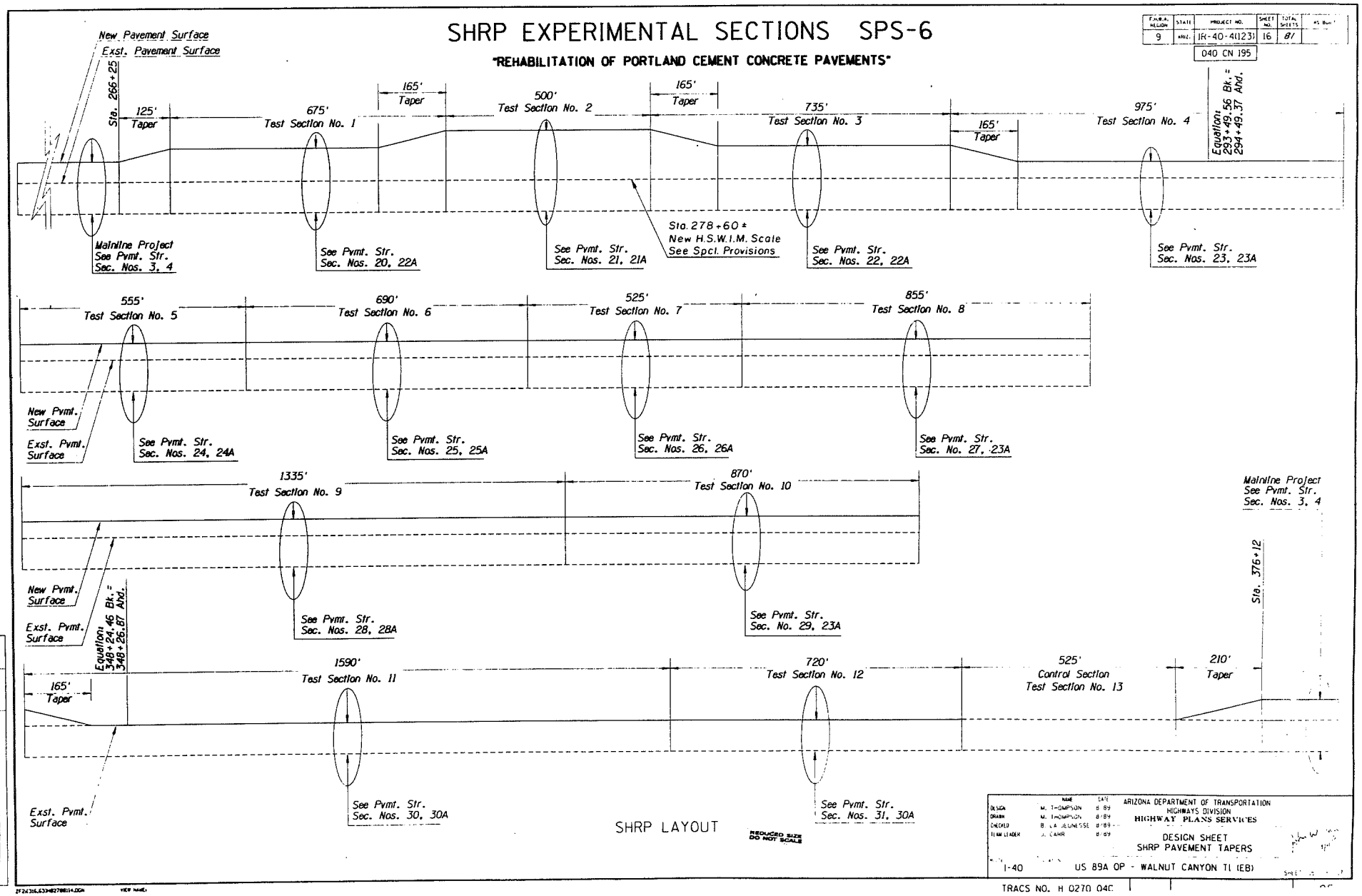


FIGURE 9. TEST SECTION LAYOUT SEQUENCE

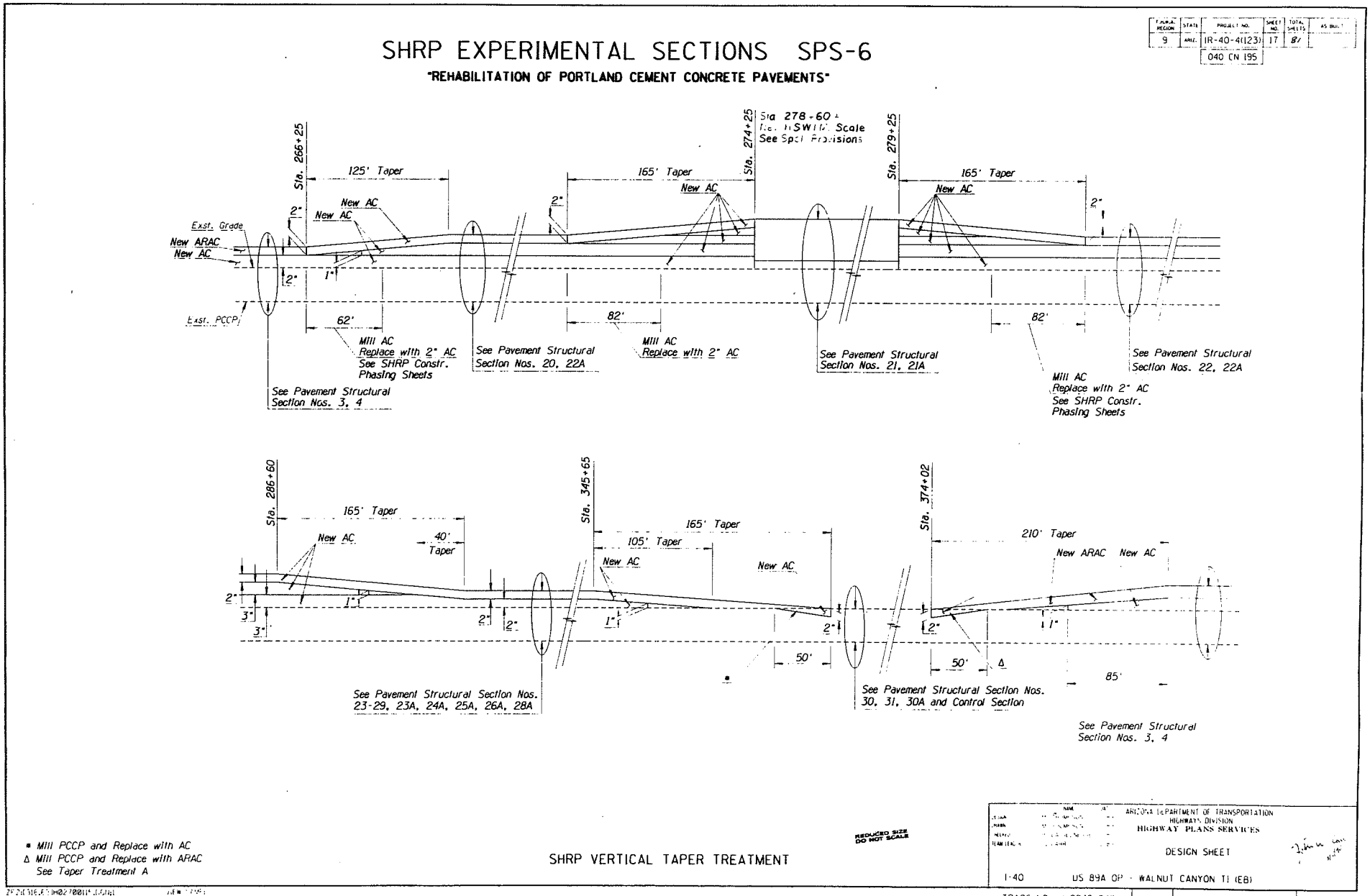


FIGURE 10. TYPICAL VERTICAL TAPER TREATMENT

Test Section 3 (SHRP 040608): Crack and seat the existing PCCP according to project special provisions. Apply a tack coat. Overlay with virgin AC (3/4) in 3 lifts - 3", 3", and 2" for total thickness of 8". Place tack coat between lifts. (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 4 (SHRP 040607): Crack and seat existing PCCP according to project special provisions. Apply tack coat. Overlay with AC (3/4) in two lifts - 2" and 2" - for total overlay thickness of 4". Place a tack coat between lifts. (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 5 (SHRP 040606): Prepare existing PCCP surface using maximum restoration procedures according to project special provisions and plans. Maximum restoration includes removing existing AC patches, full-depth removal and replacement of existing slabs (including dowels and tie bars), partial depth spall repair, and milling and replacing existing AC shoulders. Do not grind surface. After restoration place an AC (3/4) overlay in two lifts - 2" and 2" - for total overlay thickness of 4". Place a tack coat between lifts and on PCCP prior to overlay. (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 6 (ADOT 040610): Crack and seat existing PCCP according to special provisions. Apply tack coat. Place 2" lift of AC (3/4). Place binder coat and paving fabric. Place final 2" lift of AC (3/4), for total overlay thickness of 4". (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 7 (ADOT 040611): Crack and seat existing PCCP according to special provisions. Apply tack coat. Place 2" lift of AC (3/4) and 2" lift of asphalt rubber AC - ARAC (1/2), for a total overlay thickness of 4". Place tack coat between lifts. (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 8 (SHRP 040604): Prepare existing PCCP surface using minimum restoration procedures in project special provisions. Minimum restoration includes partial depth spall repair and partial and full-depth patching, if warranted. No joint or crack sealing should be done. Apply tack coat. Place AC (3/4) overlay in two 2" lifts, for total overlay thickness of 4". Place a tack coat between lifts. Saw and seal AC overlay to match underlying joints and working cracks in PCCP.

Test Section 9 (ADOT 040612): Crack and seat existing PCCP according to special provisions. Place tack coat and a 2" lift of ARAC (1/2). Place tack coat and 2" lift of AC (3/4), for total overlay thickness of 4". (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 10 (SHRP 040603): Prepare existing PCCP surface using minimum restoration procedures including spall repair and partial and full-depth patching, if warranted. Place AC (3/4)overlay in two lifts of 2" each, for a total overlay of 4". Place tack coat between lifts and on top of PCCP. (Note: Approximately one month after construction a 5/8" ACFC was added to this section).

Test Section 11 (SHRP 040605): Prepare existing surface with maximum restoration procedures which may include removing existing AC patches, removing and replacing slabs including tie bars and dowels, saw and seal new and existing joints, saw and seal cracks, saw and seal longitudinal joint at shoulder, perform partial depth spall repair, and grind full roadway surface for smoothness. No overlay is to be placed.

Test Section 12 (SHRP 040602): Prepare existing surface with minimum restoration, including partial depth spall repairs, joint and crack sealing touch-up, mill and replace existing shoulder, and seal joint between shoulder and existing PCCP. No overlay is to be placed.

Test Section 13 (SHRP 040601): This is the control section which receives no special surface preparation or overlay. It is to receive routine maintenance as typically performed by ADOT. Three to five years of service is desired out of this section.

Test Section 14 (ADOT 040614): Perform no preparation on existing surface. Apply tack coat. Place 3" AC (3/4), 2" ARAC, .50" AR-ACFC. Tack coat between lifts.

Test Section 15 (ADOT 040615): Crack and seat existing PCC (4' x 6'). Apply tack coat. Place 3" AC (3/4), 2" ARAC, .50" AR-ACFC. Tack coat between lifts.

Test Section 16 (ADOT 040616): Rubblize existing PCC surface. Apply tack coat. Place 3" AC (3/4), 2" ARAC, .50" AR-ACFC. Tack coat between lifts.

Test Section 17 (ADOT 040617): Crack and seat existing PCC (4'x6'). Apply tack coat. Place 3" AC (3/4), 2" ARAC, .50" AR-ACFC. Tack coat between lifts.

Test Section 18 (ADOT 040618): Perform no preparation on existing surface. Apply tack coat. Place 3" AC (3/4), 2" ARAC, .50" AR-ACFC. Tack coat between lifts.

Test Section 19 (ADOT 040619): Rubblize existing PCC surface. Apply tack coat. Place 3" AC (3/4), 2" ARAC, .50" AR-ACFC. Tack coat between lifts.

Detail drawings of the required pavement repairs are shown in Figure 11, taken from the project construction plans.

The mix designs, materials, and construction details were specified by ADOT Standard Specifications for Road and Bridge Construction (Ref. 5), Special Provisions for the project IR-40-4(123) and an Addendum to the Special Provisions. Special Provisions and the Addendum appear in Appendix B. FNF Construction, Inc. was the lowest bidder.

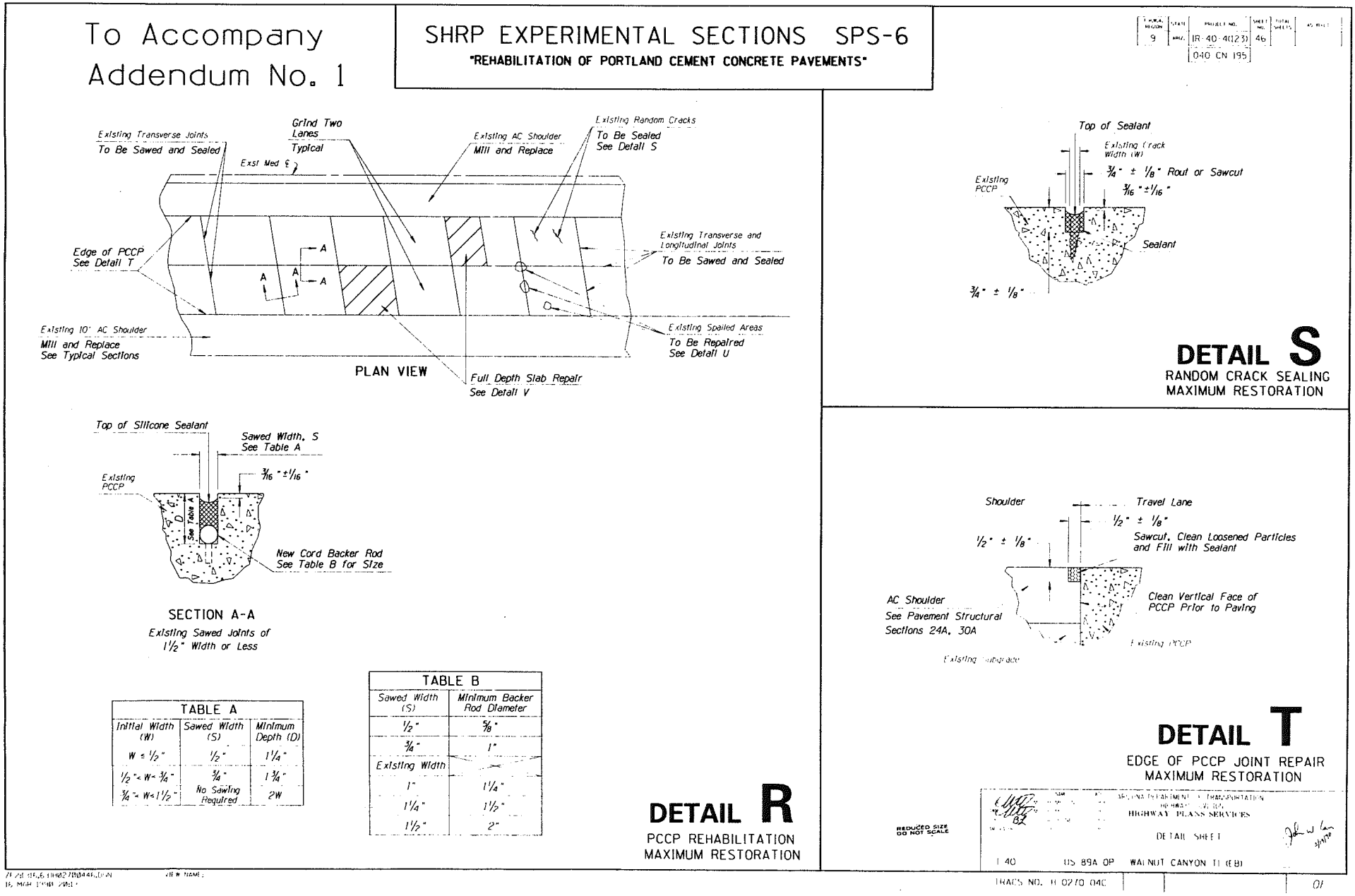
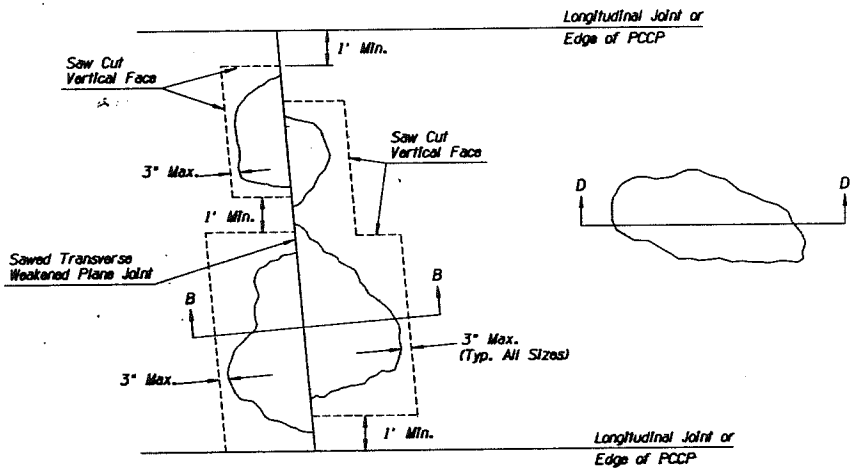


FIGURE 11. PAVEMENT RESTORATION DETAILS

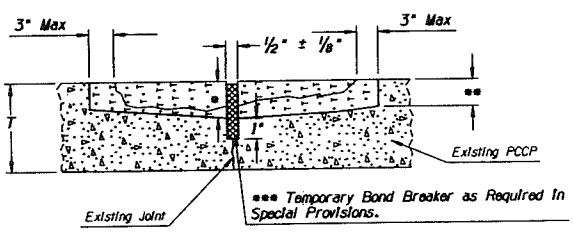
F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	IR-40-4(123)	47	81	
		040 CN 195			

SHRP EXPERIMENTAL SECTIONS SPS-6

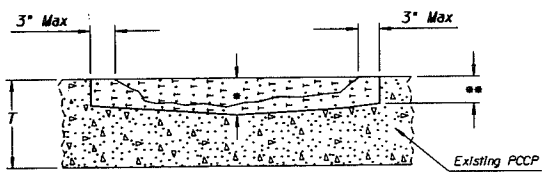
"REHABILITATION OF PORTLAND CEMENT CONCRETE PAVEMENTS"



PLAN VIEW



SECTION B-B



SECTION C-C

* Maximum Depth Cannot Exceed T/3. If Depth Exceeds T/3 Remove Full Slab.
** Saw Cut Minimum Depth Depends On Type of Patching Material. See Special Provisions.
*** Remove Temporary Bond Breaker and Seal As Shown In Detail V.

DETAIL U

TREATMENT AT SPALLED AREAS
MAXIMUM RESTORATION

	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION HIGHWAY PLANS SERVICES
DESIGN	M. THOMPSON	12-89	
DRAWN	M. THOMPSON	12-89	
CHECKED	B. LA JEUNESSE	12-89	DETAIL SHEET
TEAM LEADER	J. CARR	12-89	
ROUTE I-40	LOCATION US 89A OP - WALNUT CANYON TI (EB)		SHEET 22 OF 25

TRACS NO. H 0270 04C

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VIEW NAME:

FIGURE 11. PAVEMENT RESTORATION DETAILS (continued)

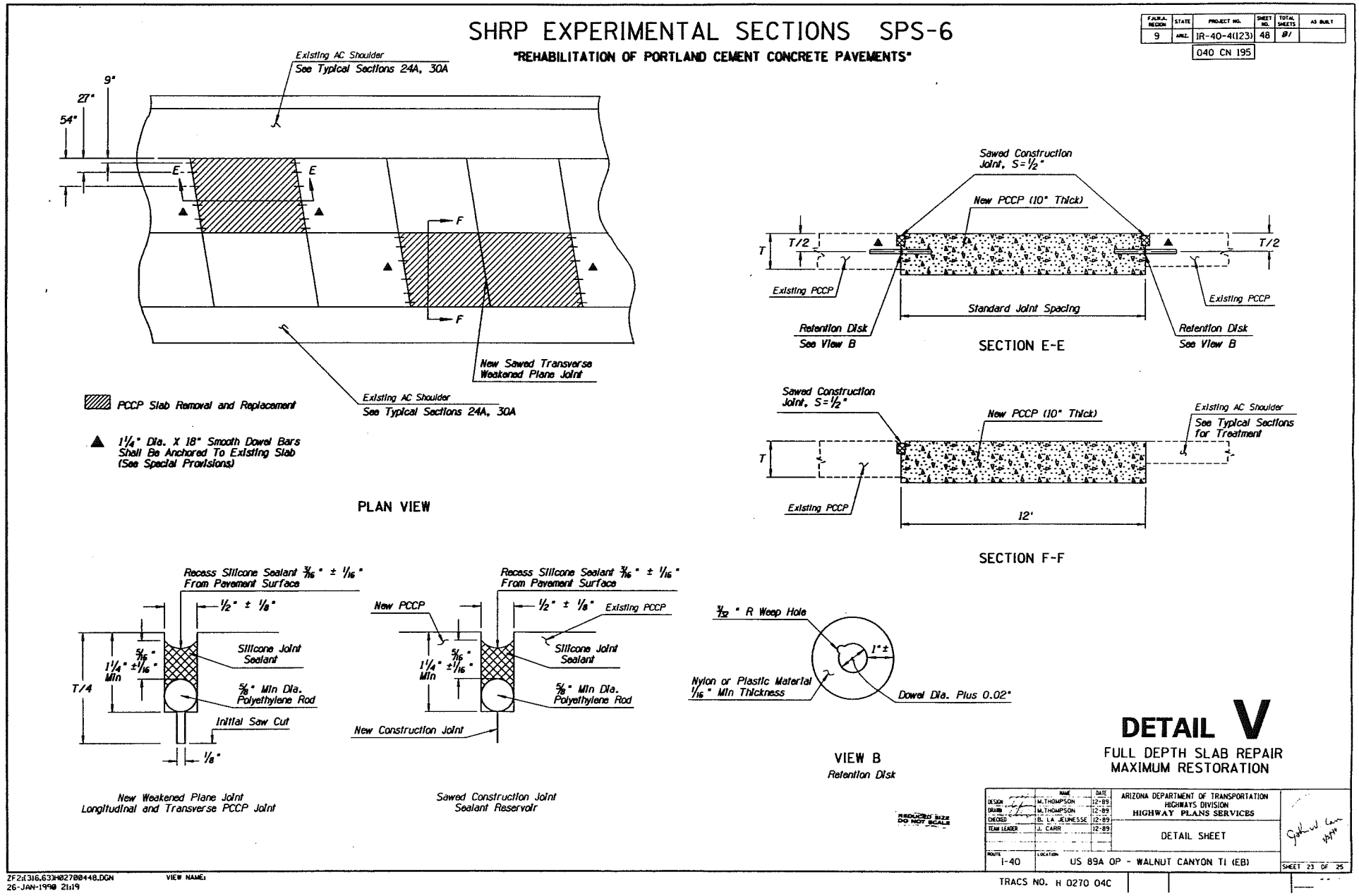
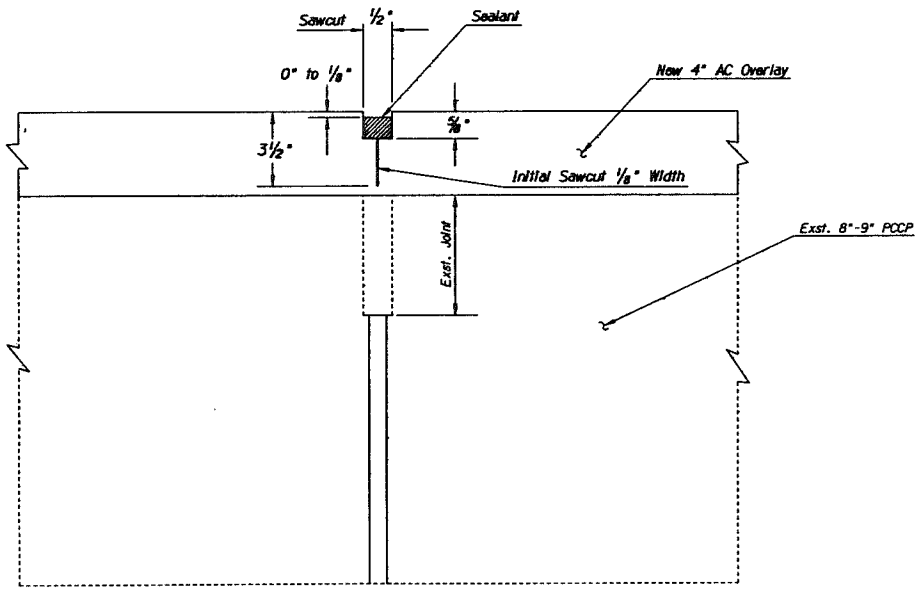


FIGURE 11. PAVEMENT RESTORATION DETAILS (continued)

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	IR-40-4(123)	49	81	
		040 CN 195			

SHRP EXPERIMENTAL SECTIONS SPS-6

"REHABILITATION OF PORTLAND CEMENT CONCRETE PAVEMENTS"



New Joints shall be constructed as follows:

1. *Over all transverse joints, full pavement width.*
2. *Over the longitudinal joint between travel lanes.*
3. *Over the longitudinal joint between right travel lane and 10' distress lane.*
4. *Over the longitudinal joint between left travel lane and 4' shoulder.*

DETAIL W

JOINT DETAIL IN AC OVERLAY
MAXIMUM RESTORATION

REDUCED SIZE DO NOT SCALE

	NAME	DATE
DESIGN	M. THOMPSON	12-89
DRAWN	M. THOMPSON	12-89
CHECKED	B. LA JEUNESSE	12-89
TEAM LEADER	J. CARR	12-89

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HIGHWAY PLANS SERVICES

DETAIL SHEET
SHRP DETAIL W

ROUTE	LOCATION
I-40	US 89A OP - WALNUT CANYON TI (EB)

SHEET 24 OF 25

TRACS NO. H 0270 04C

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VIEW NAME:

FIGURE 11. PAVEMENT RESTORATION DETAILS (continued)

DISCUSSION OF SHRP DESIGN AND CONSTRUCTION GUIDELINES FOR TEST SECTIONS

The SHRP Guidelines for construction details, "Construction Guidelines for Experiment SPS-6 Rehabilitation of Jointed Portland Cement Concrete Pavements" as of July 1990, were followed as closely as possible in the construction. Appendix C includes a copy of this working document. The document provides specific guidelines for activities on the control section, pavement surface preparation before overlay, special considerations regarding test section construction, asphalt concrete mix design, construction operations, and deviations from guidelines.

TYPICAL SECTIONS

Eight test sections were designed by SHRP as shown in Table 1 in the Appendix C. The typical cross sections of the test sections in the guidelines were developed for the hypothetical existing pavement structure shown in Figures A-1 through A-8 in the guide. A part of the existing pavement section was designated as the "control" section as shown as Section No. 1 in Figure A-1 in the Appendix C. Details of the other test sections can be found in the guide.

ACTIVITIES ON CONTROL SECTION

Repairs and other activities on the control section were limited by SHRP to only routine maintenance needed to keep the section in a safe and functional condition. In general, the maintenance activities were required to be limited to those permitted in "Guidelines for Maintenance of General Pavement Studies (GPS) Test Sections," SHRP-LTPP-OM-001, July, 1988. Maintenance activities are to be performed in accordance with standard ADOT procedures.

PAVEMENT PREPARATION

The preparation of the existing pavement prior to overlay is classified in three levels: minimum restoration, maximum restoration, and crack and seat. PCC slab replacement is the most significant difference between the minimum and maximum preparation levels.

MINIMUM RESTORATION

The minimum level of pavement restoration activities include:

SHRP 040602	Perform joint and crack sealing, if warranted.
	Perform partial and full-depth patching, if warranted.
	Perform full surface diamond grinding, if warranted.
SHRP 040603	Perform partial and full-depth patching, if warranted.
SHRP 040604	Perform partial and full-depth patching, if warranted.

MAXIMUM RESTORATION

The maximum level of pavement restoration activities include:

SHRP 040605	Remove and replace existing joint and crack sealing.
	Perform additional joint and crack sealing, if warranted.
	Remove and replace existing partial and full-depth patches.
	Perform additional partial and full-depth patching, if warranted.
	Correct poor load transfer at joints and/or working cracks by full-depth patching or retrofitting dowels.
	Perform full surface diamond grinding.
	Retrofit subsurface edge drainage system.
	Perform undersealing, if warranted.

SHRP 040606	Remove and replace existing partial and full-depth patches. Perform additional partial and full-depth patching, if warranted. Correct poor load transfer at joints and/or working cracks by full-depth patching or retrofitting dowels. Retrofit subsurface edge drainage system. Perform undersealing, if warranted.

CRACK AND SEAT

Crack and seat preparation was scheduled for two test sections, as follows:

SHRP 040607	Crack and seat existing PCC Retrofit subsurface edge drainage system.
SHRP 040608	Crack and seat existing PCC. Retrofit subsurface edge drainage system.

SPECIAL CONSIDERATIONS

Lane widening and geotextiles were prohibited on the SHRP SPS-6 test sections. However, ADOT included a supplemental section with paving fabric. Surface friction courses were permitted but the thickness of the course was limited to O.75" or less. These prohibitions were stated because it was believed that they would confound the measurement of the main factor effects in the experiment.

ASPHALT CONCRETE MIX DESIGN

The design of asphalt concrete mixes was specified to be done in compliance with the guidelines contained in the FHWA Technical Advisory T5040.27. Only virgin materials are to be used. Recycled pavement should not be used. The quality of aggregates were expected to be highest quality and additional specifications were

presented. The asphalt cement grade and characteristics were to be selected by ADOT based on normal practice. Additives routinely used by ADOT are permitted, but experimental additives or modifiers are prohibited.

CONSTRUCTION OPERATIONS

Construction guidelines were specified to be those in compliance with the guidelines presented in the FHWA Technical Advisory T5040.27 in conjunction with the high quality construction practice of the agency. Additional construction related guidelines were also outlined.

DEVIATION FROM GUIDELINES

No deviation from the guidelines was allowed, unless presented to and accepted by SHRP. Potential impact of non-compliance on the overall experiment must be evaluated by SHRP.

VI. EVALUATION OF EXISTING PAVEMENT

The existing section of pavement between mileposts 202.16 and 204.21 was evaluated to obtain information prior to construction of the test sections. Field investigations consisted of:

- Sampling and testing program
- Survey of cracking
- Deflection testing

Sample locations, deflection test point locations, and maps of the cracking are in Appendix D.

SAMPLING OF EXISTING PAVEMENT

Coring and drilling were completed on the existing pavement of the proposed SHRP SPS-6 test sections to retrieve samples of existing materials and to characterize them through laboratory testing. The sampling and testing plan was developed based on guidelines in SHRP Operational Memorandum No. SHRP-LTPP-OM-019, "Materials Sampling and Testing Requirements for Experiment SPS-6," January 1991 (Ref. 6).

Since the material sampling methods were destructive, they were planned close to, but outside the proposed test sections. The planned in-place material sampling and testing consisted of a combination of the following:

- 4" outside diameter cores of the original PCC surface layer. C-type cores.
- 6" outside diameter cores of PCC surface and treated layers. C-type cores.
- 6" outside diameter cores of PCC surface; augering of unbound granular base and subbase layers; split spoon sampling and/or thin-walled tube sampling as directed to 5' below top of subgrade. A-type cores/samples.

- 12" outside diameter cores of PCC surface; augering of unbound granular base, subbase layers and subgrade to 12" below top of untreated subgrade for bulk sample retrieval. BA-type cores/samples.

The plans followed in sampling are shown in Appendix D. The sample areas correspond to SHRP test sections as shown in Table 3. The sample locations are listed in Table 4. Stations are referenced to the beginning of each test section, which is 0+00.

SURVEY OF CRACKING

Films of the pavement were taken prior to construction of the test sections. Crack maps made from the film for the travel lane are in Appendix D. Data is available from only the eight SHRP sections. A summary of the distress is in Table 5.

TABLE 3. CORRESPONDENCE BETWEEN SAMPLE AREA AND SPS-6 TEST SECTIONS

Sample Area	SHRP ID	State ID
S1	040609	1
S2	040613	2
S3	040608	3
S4	040608	3
S5	040607	4
S6	040606	5
S7	040610	6
S8	040611	7
S9	040604	8
S10	040612	9
S11	040612	9
S12	040603	10
S13	040603	10
S14	040605	11
S15	040601	13
S16	040601	13

TABLE 4.

SPS-6 Preconstruction Sampling Locations

Section	Station	Offset	Core #
SHRP 040601 (SA S15)	-(0+05)	2	C30
	-(0+05)	3.5	C31
	-(0+05)	5	C32
SHRP 040601 (SA S16)	5+30	2	C33
	5+30	3.5	C34
	5+30	5	C35
	5+35	3	A12
SHRP 040603 (SA S12)	-(0+50)	2	C23
	-(0+50)	3.5	C24
	-(0+55)	5	A9
SHRP 040603 (SA S13)	10+30	3	A10
	10+35	3	C25
	10+35	6	C26
	10+40	3	BA10
	10+45	6	BA11
	10+50	3	BA12
SHRP 040604 (SA S9)	5+50	2	C17
	5+50	3.5	C18
	5+50	5	C19
SHRP 040605 (SA S14)	10+70	3	A11
	10+75	2	C27
	10+75	3.5	C28
	10+75	5	C29
SHRP 040606 (SA S6)	6+20	2	C12
SHRP 040607 (SA S5)	5+40	3	A5
	5+50	2	C9
	5+50	3.5	C10
	5+50	5	C11
SHRP 040608 (SA S3)	-(1+30)	3	A3
	-(1+35)	2	C5
	-(1+35)	3.5	C6
SHRP 040608 (SA S4)	5+45	2	C7
	5+45	3.5	C8
	5+50	3	A4
	5+55	3	BA1
	5+60	6	BA2
	5+65	3	BA3
SHRP 040609 (SA S1)	-(0+20)	2	C1
	-(0+20)	3.5	C2
	-(0+20)	5	C3
	-(0+25)	3	A1
SHRP 040610 (SA S7)	6+40	2	C13
	6+40	3.5	C14
SHRP 040611 (SA S8)	4+80	2	C15
	4+80	3.5	C16
	4+85	3	A6
	4+90	3	BA4
	4+95	6	BA5
	5+00	3	BA6
SHRP 040612 (SA S10)	-(0+50)	3.5	C20
	-(0+55)	3	A7
SHRP 040612 (SA S11)	5+54	2	C21
	5+54	3.5	C22
	5+60	3	A8
	5+65	3	BA7
	5+69	6	BA8
	5+75	3	BA9
SHRP 040613 (SA S2)	-(0+90)	2	C4
	-(0+95)	3	A2

TABLE 5. SUMMARY OF DISTRESS IN TRAVEL LANE PRIOR TO CONSTRUCTION OF TEST SECTIONS

SHRP ID	ADOT ID	No. of Slabs	% of Total Slabs with Distress	Joints with Spalling/Cracking %	Slabs with* Longitudinal/Transverse Cracking %	Shattered** Slabs %
040608	3	34	62	24	18	15
040607	4	34	64	35	32	6
040606	5	33	94	52	48	6
040604	8	32	84	50	38	19
040603	10	34	94	74	35	15
040605	11	33	94	70	33	3
040602	12	33	79	39	33	9
040601	13	34	82	59	38	6

*Slabs broken into two or less pieces

**Slabs broken into three or more pieces

VII. CHARACTERISTICS OF MATERIALS

Mix designs for some of the materials are included in Appendix E. Pertinent aspects of the designs are presented in this section of the report.

VIRGIN ASPHALT CONCRETE MIX (END PRODUCT) DESIGN

The mix design was a 3/4" asphalt concrete mix design performed by Speedie and Associates, Phoenix, Arizona, in June 1990. The samples of aggregate used in the design were obtained from stockpiles at Flagstaff Cinders, Coconino Cinders, and Winslow sand. The materials were designated as basalt coarse aggregate, basalt intermediate aggregate, basalt fine aggregate, Flagstaff cinders, Mahan concrete sand, and Winslow sand. The asphalt cement used was grade AC-20 supplied by Sahuaro Petroleum and Asphalt Company and produced at their Edgington refinery. The mineral admixture used was Type N hydrated lime supplied by Chemstar Lime. It was added wet to the mix at a rate of 1.5% by weight of the mineral aggregate. The material characteristics conform to those required in ADOT Standard Specifications for Road and Bridge Construction, edition of 1987 (5) and the special provisions of the project. Tables 6 and 7 show the properties and gradation of the aggregate.

The recommended bitumen content was found to be 4.6%. Table 8 shows the comparison between the required criteria of mix design and those obtained by design.

ASPHALT RUBBER ASPHALT CONCRETE (AR-AC) MIX DESIGN

The mix design for asphalt rubber asphalt concrete was done by the ADOT Central Materials Laboratory. The samples of aggregate used in the design were obtained from the Teepee Ready Mix pit in Casa Grande, Arizona. The materials were designated as a coarse aggregate, an intermediate aggregate and washed fine aggregate. Twenty percent granulated rubber of Type C 106 was used at a rate of 6.5% in the mix. The asphalt cement used was grade AC-10 supplied by SUNBELT refinery company and

TABLE 6. AGGREGATE PROPERTIES FOR 3/4" AC MIX

Property	Coarse	Fine	Combined	Specification
Bulk OD Sp Gr	2.768	2.639	2.703	2.35 - 2.85
SSD Sp Gr	2.815	2.675	2.744	
Apparent Sp Gr	2.903	2.738	2.819	
Absorption	1.678	1.358	1.517	0.00 - 2.50
Sand Equivalent			65	55 minimum
Plasticity Index			NP	
Crushed Faces			92	70 minimum
L.A. Abrasion "B":				
100 Rev. % Loss			5	9 maximum
500 Rev. % Loss				40 maximum

MATERIAL PERCENTAGES

Basalt Fines	21.7
Flagstaff Cinders	5.9
Concrete Sand	0.0
Winslow Sand	23.6
Basalt Intermediate	9.9
Basalt Coarse	37.4
Admixture	1.5

TABLE 7. GRADATION FOR 3/4" AC MIX

COMPOSITE GRADATION		
Sieve	% Passing	Spec Limits
1-1/2	100	100
1	100	100
3/4	95	85 - 95
1/2	78	
3/8	66	60 - 75
1/4	55	
#4	50	
#8	40	36 - 46
#10	39	
#16	33	
#30	24	
#40	18	11 - 19
#50	10	
#100	6	
#200	4.1	2.0 - 5.5

TABLE 8. MIX DESIGN CRITERIA (3/4" AC MIX)

Criteria	Required as per Specs	Achieved by Design
Voids in Mineral Aggregate (VMA, %)	14.5 - 17.0	14.5
Effective Air Voids (%)	5.5 ± 0.2	5.4
Index of Retained Strength (%, minimum)	70*	86
Wet Strength (psi, minimum)	150	542
Stability (lbs, minimum)	3000	4879
Flow (1/100")	8 - 16	12

*As per Special Provisions

produced at their Coolidge, Arizona plant. The mineral admixture used was lime supplied by Chemstar company. It was added to the mix at a rate of 1.0% by weight of the mineral aggregate. The specifications for materials characteristics conform to those required in ADOT Standard Specifications for Road and Bridge Construction, edition of 1987 (5), the special provisions and addendum to special provisions of the project. Tables 9 and 10 show the properties and gradation of the aggregate. Table 11 shows the properties of the mix achieved by the design.

ASPHALT CONCRETE FRICTION COURSE (ACFC)

The ACFC mix design was originated from ADOT Central Laboratory according to ADOT Spec 407. The design lab number is 89-450A, dated September 27, 1989. The aggregate proportions are as follows:

3/8"	90%
CR Fine	4%
W-Fine	6%

The aggregate source is United Metro Hill Pit, Commercial Pit No. CM0048. The asphalt cement is AC-20, supplied by Paramount Oil Co., and used in the mix at a rate of 6.8%. Aggregate properties and gradation are listed in Tables 12 and 13.

ASPHALT RUBBER ASPHALT CONCRETE FRICTION COURSE (AR-ACFC)

An AR-ACFC was added to ADOT Test Sections 14 through 19. Mix design information was not provided for inclusion in this report. However, one document indicated the adjusted bulk density was 130.6 lbs/CF.

TABLE 9. AGGREGATE PROPERTIES FOR ARAC

Property	Coarse	Fine	Combined	Specification*
Bulk OD Sp Gr	2.788	2.779	2.784	2.35 - 2.85
Water Absorption (%)			1.72	0.00 - 2.50
Sand Equivalent			95	55 minimum
Crushed Faces (%)			91	70 minimum
L.A. Abrasion:				
100 Rev. % Loss			6	9 maximum
500 Rev. % Loss			26	40 maximum

AGGREGATE PROPERTIONS

FNF 1/2" Chips	24%
FNF 3/8" Chips	12%
FNF Fines #1	21%
ACFC Chips	3%
B&B Intermediate	24%
B&B Washed Fines	16%

*As per addendum to special provisions

TABLE 10. AGGREGATE GRADATION FOR ARAC

Sieve Size	Gradation without Admixture	Gradation with Admixture	Gradation Specifications with Admixture
1/2"	100	100	100
3/8"	89	89	80 - 90
1/4"	57	57	40 - 60
#4	44	45	
#8	26	27	26 - 34
#10	22	23	
#16	14	15	
#30	9	10	
#40	8	9	5 - 15
#50	6	7	
#100	4	5	
#200	2.5	3.5	0 - 3.5

*As per addendum to Special Provisions

TABLE 11. MIX DESIGN PROPERTIES OF ASPHALT RUBBER ASPHALT CONCRETE (ARAC)

Property (with 6.5% AC-10/Rubber Mix)	Achieved by Design
Air Voids (%)	4.9
VMA (%)	18.1
Asphalt Absorption (%)	1.00
Bulk Density, pcf	151.6
Maximum Density, pcf	159.4
Stability (lbs, minimum)	2331
Flow (1/100")	18

TABLE 12. AGGREGATE PROPERTIES FOR ACFC

Property	Coarse	Fine	Combined
Specific Gravity	2.460	2.455	2.458
Water Absorption			2.81%
% Abrasion, 100 Rev.			7
% Abrasion, 500 Rev.			31
% Limestone			.20
Sand Equivalent			60
Flakiness Index			14
% Crushed Faces			100
Bulk Density, lbs/cu. ft.			122.4

TABLE 13. AGGREGATE GRADATION FOR ACFC

GRADATION (% PASSING)		
Sieve Size	Target Gradation	Gradation Band
1.5"		
1"		
3/4"		
1/2"		
3/8"	100	100
1/4"	68	
#4	36	35 - 55
#8	12	9 - 14
#10	11	
#16	8	
#30	6	
#40	5	
#50	4	
#100	3	
#200	2.1	0 - 2.5

PAVING FABRIC

The paving fabric used in Test Section No. 6 was Amopave 4597 Paving Fabric, manufactured by Amoco Fabrics and Fibers Company. Test results certified by Amoco are as follows:

Property	Minimum Roll Average Value	Special Provision Specifications
Grab Tensile, lbs.	120	100 minimum
Grab Elongation, %	50	40 minimum
Mullen Burst, psi	300	
Puncture, lbs.	90	
Trapezoid Tear, lbs.	45	
U.V. Resistance, % (strength retained)	70	
Asphalt Retention	.35	
Weight, oz/SY		5 to 8
Thickness		30 to 105 mils
Melting Point, °F		300 or greater

The asphalt binder used prior to placing the fabric was an AC-20 supplied by Sahuaro and applied at a rate of 0.19 gal/SY.

AGGREGATE TRENCH EDGE DRAIN

The aggregate trench edge drain consists of filter fabric, pipe, and aggregate. The filter fabric was Amoco CEF 4551 Geotextile Fabric, manufactured by Amoco Fabrics and Fibers company. Tests results were provided by Amoco as follows:

Property	Minimum Roll Average Value	Special Provision Specifications
Grab Tensile, lbs.	150	140
Grab Elongation, %	50	45 minimum 115 maximum
Mullen Burst, psi	350	220
Puncture, lbs.	90	50
Trapezoid Tear, lbs.	65	40
U.V. Resistance, % (strength retained)	70	70
EOS	70	50 - 100
Permittivity, (1/sec) gal/min/SF	.7 90	0.5

Pipe for the trenches was specified to be PVC 90° centigrade electric plastic conduit, EPC-40 or EPC-80.

The trench drain aggregate was from the Coconino Pit. Test results are as follows:

Sieve Size	Percent Passing 6/11 Sple.	6/15 Sple.	7/10 Sple.	Specifications
1-1/2"	100	100	100	100
1"	73	70	74	50 - 75
3/4"	47	40	42	
1/2"	30	18	21	20 - 50
3/8	22	9	13	
1/4"	12	2	5	
#4	9	1	3	0 - 15
#8	6	0.6	1	
#40	3	0.4	1	
#200	0.9	0.2	0.5	0 - 2.5
Bulk specific gravity				2.35 - 2.85
Water absorption				0 - 2.5
L.A. Abrasion at 500 revolutions				40% maximum

SPALL REPAIR MATERIAL

Spall repair and shallow depth patch material was specified to be CALTRANS Formula SET 45, a rapid-setting patch material. The design mix was stated to be one bag with 50% rock, producing a yield of 0.58 CF/bag.

1 bag SET 45

25 lbs. rock

= .58 CF/bag yield

Test results on the Tanner Plant aggregate used in the patching mix are as follows:

	Percent Passing		
Sieve Size	6/19 Sple.	8/2 Sple.	Specifications
3/4"	100	100	100
1/2"	93	89	90 - 100
3/8"	52	41	40 - 70
1/4"	8	7	
#4	4	5	0 - 15
#8	2	3	0 - 5
#40		2	
#200		1	

CONCRETE FOR UNBONDED OVERLAY AND FULL-DEPTH REPAIRS

Concrete was specified to comply with ADOT specification 1006 and the project special provisions. Test reports on fine and coarse aggregates indicate the materials are from the Tanner Plant, Hayfield and Superior pits. The concrete for the full-depth repairs was supplied by the United Metro Plant, and the concrete for the unbonded

overlay was supplied by the Tanner Plant. A Class P 4000 psi concrete was specified. Mix design for the full-depth repair concrete is as follows:

Material	Weight lbs/CY
Fly Ash (Class F)	102
Cement (Type II Low Alkali)	500
Sand	1184
Rock	1816
Water	283
Water Reducer (WRDA)	3 - 5 oz/CY
Air Entrainment (Micro Air)	1 - 3.5 oz/CY

Mix design for the unbonded overlay is the same as for the full-depth repairs, except that the water reducer amount is 4 oz/CY and the air entrainment is 2 oz/CY.

Concrete mix requirements are as follows:

Compressive Strength-28 day	- 4000 psi
Entrained air	- 4.0% to 7.0%
Slump	- 2.5" to 4.5"

The fine aggregate gradation is as follows:

Sieve No.	Percent Passing*	Specifications
3/8	100	100
4	100	95 - 100
8	86	
10	82	
16	65	45 - 80
30	42	
40	33	
50	20	0 - 30
100	8	0 - 10
200	2	0 - 4

*Approximate average of numerous tests

The coarse aggregate gradation is as follows:

Sieve No.	Percent Passing*	Specifications
1-1/2"	100	100
1"	100	95 - 100
3/4"	80	
1/2"	38	25 - 60
3/8"	12	
1/4"	2	
4	1	0 - 10
8	0.6	0 - 5
40	0.3	
200	0.1	0 - 1

*Approximate average of numerous tests

CONCRETE CURING MATERIAL

The concrete was cured with a white wax based curing compound supplied by Burke, with the following test results reported:

IR Scan:	AZ 1574	
	Non-volatiles at 110° -	25.7
	Non-volatiles at 450° -	4.6
	Non-Vol-Vehicle -	22.1

CONCRETE JOINT SEALANT

The joint sealant for concrete repairs was a silicone, Dow Corning 888, conforming to ADOT spec 1011-8, dated January 16, 1990. Test results are shown in Table 14. Dow Corning 888-SL was used for the joints in the unbonded PCC overlay.

CRACK AND EDGE SEALANT

Sealant for cracks and the edge between the asphalt shoulder and PCC was Crafco 231.

TABLE 14. SILICONE JOINT SEALANT, DOW CORNING 888, LOT NO. ET030082

Test	Test Method	Result	ADOT Sect. 1011-8 Material Requirements
*Tensile Stress: 150% Elongation (7-day cure), psi (average of 5)	ASTM D 412 (Method A Die C)	32.5	45 psi maximum
*Maximum Elongation at Failure, %	ASTM D 412 (Method A Die C)	**1116	700% minimum
Extrusion Rate, seconds	ASTM C 920 (Type S, Grade NS)	3	25 seconds maximum
Specific Gravity	ASTM D 792 (Method A)	1.496	1.15 to 1.515
Tack Free Time, minutes	ASTM C 679	37	120 minutes maximum
Durometer Hardness, Shore A (7-day cure at 50 ± 5% relative humidity)	ASTM D 2240	20	25 maximum
**Adhesion and Cohesion of Elastic Joint Sealants under Cyclic Movement	ASTM C 719 (Mortar Block)	No Cohesive Failure or Adhesion loss	±50%/-50% of joint width. Adhesive loss maximum 15% of surface area. No cohesive failure after 10 cycles at standard conditions.

*Sample was cured 7-days at 77 ± 2°F and 50 ± 5% relative humidity.

**Testing was conducted at 73.4 ± 3.6°F and 50 ± 5% relative humidity after the prescribed conditioning periods.

Results of the above testing indicates that the Silicone Joint Sealant Material, Lot. No. ET030082, meets the physical requirements as shown.

VIII. CONSTRUCTION OVERVIEW

SEQUENCE

The test sections were constructed between mid-June and mid-October of 1990. Work efforts from mid-June through the end of July concentrated primarily on the sections which were to receive minimum and maximum restoration, i.e., Sections 5, 8, 10, 11 and 12. The work consisted primarily of slab removal and replacement, spall repairs, and joint sealing. In addition, the trench drain was installed on these sections. Repairs and grinding on Sections 11 and 12 continued into late August. At the first of August, work started on rubblizing and crack-and-seat for Sections 1, 2, 3, 4, 6, 7, 9, 15, 16, 17 and 19. Asphalt paving followed-up immediately, with the bulk of the paving for all sections being completed from August 5 through August 12.

On September 12, milling of asphalt in the travel lane on Section 2 began in preparation for the unbonded PCC overlay. On September 24, the unbonded PCC was poured in the travel lane. The passing lane had previously been poured on September 4. Joint sawing and sealing continued on Section 2 until mid-October.

After the asphalt paving was completed, ADOT made a decision that placement of an ACFC was necessary on Test Sections 1, 3, 4, 5, 6,7, 8, 9 and 10 for the following reasons:

- Eliminate concern over a lack of frictional value through the test sections.

- Provide some pavement leveling through the length of the research section. Multiple variable thickness sections and tapers resulted in this reasoning.

- Provide sealing of areas where a marginal longitudinal joint was constructed and also areas where segregation of pavement aggregates was apparent.

The ACFC on these sections was placed in early October. Test Sections 14 through 19 received an AR-ACFC, which was already in production on the overall project. SHRP would not approve use of an AR-ACFC on Test Sections 1 through 13.

METHODS AND EQUIPMENT

The SHRP construction guidelines were followed and there were no significant deviations from the guidelines. Of the two sections which were to receive maximum restoration of the surface, i.e.,Sections 5 and 11, Section 11 received the most extensive repairs, including surface grinding. Section 5 received no surface grinding. The control section, Section 13, was also in a fairly deteriorated condition, and received slab replacements even though this was not originally planned. For the maximum restoration sections, SHRP/ADOT requested that an additional dowel bar be added in each wheel path, resulting in four 1-1/4" x 18" long epoxy coated dowel bars in each wheel path.

For the crack-and-seat sections, one pass of a guillotine type breaker was used, and seating was done with one pass of a 50 ton roller. The targeted crack pattern was 3' x 3' for Sections 2, 3 4, 6, 7 and 9, and 4' x 6' for ADOT's additional Sections 15 and 17.

For the rubblized sections a PB4 resonant pavement breaker was used. It made a series of longitudinal passes, 7" to 12" wide, breaking the pavement into 1" to 2" pieces with a steel shoe using a 2000 lb force applied at 44 times/minute. No seating was performed on the rubblized sections.

Some problems were encountered on Sections 1 and 16 as a result of the rubblizing operation. The vibratory nature of the rubblization process is believed to

have caused liquefaction of the subgrade's fines which, in turn, caused upward water migration. The newly placed asphaltic concrete cracked severely, prompting the temporary closure of Interstate 40 eastbound. An emergency asphaltic concrete 3" overlay was performed by the Contractor on August 5. In addition, a 150' length of the pavement of the travel lane of Test Section No. 1 was excavated 4' to 7' deep and replaced with graded crushed rock and overlaid. The travel lane was later blade-layered to return it to a grade which allowed final lift placement. The remaining 350' of Section 1 received no excavation and repair, so it should comply with the requirements of the experiment.

The asphaltic concrete mix for the project was produced in a drum mixer plant and placed with a Blaw Knox PF200 paver in 12' lane widths. Breakdown rolling was accomplished with one pass of a 12.5 ton double drum vibratory roller and one pass of a 12.5 ton double drum static roller. Intermediate rolling was 4 passes of a pneumatic roller. Finish rolling was one pass of a 12.5 ton vibratory and 2 passes of a 12.5 ton static roller. Haul distance was 4 to 6 miles and haul time was approximately 15 minutes. The tack coat applied prior to paving was an SS-1H at 50% dilution, mixed 1 part diluent to 1 part asphalt. The application rate was 0.08 gal/SY.

Existing PCC pavement areas for partial depth patching and spall repair were determined by visual inspection. A diamond blade saw was used to cut the boundaries of repair areas. Deteriorated concrete was removed with 15 lb. chipping hammers. Final cleaning prior to placing the Set 45 patch material was accomplished by sand blasting followed by air blasting. Curing was accomplished with a membrane curing compound, supplemented by polyethylene sheeting if there was a threat of rain. A wooden float was used for finishing. Joints were formed with fiberboard inserts, and sealed with Crafco 231 rubberized sealant.

Existing PCC joints to be resealed were resawed if the width ≤ 3/4", but not if the width was between 3/4" and 1.5". If the joint width exceeded 1.5",it was treated as a spall. Joints were cleaned by sandblasting and air blasting. A backer rod was placed prior to sealing with Dow 888 silicone sealant.

Existing PCC cracks to be sealed were cleaned by routing, followed by air blasting just prior to placement of the sealant. No bondbreaker was placed in the crack.

Existing PCC areas to receive full-depth patching were determined visually based on the degree of cracking in the slab. A diamond blade saw was used to cut out the area to be removed and replaced. Typical depth of sawcut was 6". A pneumatic air hammer and backhoe mounted hoe ram were used to break-up the slab prior to removal. Load transfer dowels were installed and cemented with an epoxy filler material. Dowels were 1-1/4" diameter, 18" long, spaced at 14". They were epoxy coated.

Reinforcing steel was not placed in the full-depth patches. A standard concrete mix, as previously described, was poured. A roller tamp and roller-screed were used in consolidation and finishing.

Prior to placing the unbonded PCC overlay in Section 2, the asphalt was milled with a CAT PR-450. A standard ADOT concrete mix, as previously described, was poured. Joints were sawcut and sealed with DOW 888-SL silicone sealant.

QUALITY CONTROL OF MATERIALS

Tests run on the construction materials indicate they were generally in compliance with the specifications. Some of the test results are given on the following pages. Results of in-place density tests were not made available for this report.

Asphalt Paving Mix (3/4" End Product)

				Average Test Results (Average of 4 Samples)					
Property	UL	Target Value	LL	Aug. 4 Lot 40	Aug. 5 Lot 41	Aug. 10 Lot 42	Aug. 12 Lot 43/44	Aug. 12 Lot 43/44	Aug. 13 Lot 45/46
3/8"	75	66	57	64	61	62	63	62	61
8	46	40	34	41	36	38	41	40	36
40	22	18	14	20	18	20	21	21	18
200	6.3	4.1	1.9	5.6	5.2	4.3	4.6	4.7	4.5
% AC	5.2	4.6	4.0	4.7	4.5	4.9	4.7	4.7	4.9
% Air Voids	7.7	5.4	3.1	5.1	4.6	4.7	5.1	4.5	3.9
Stability	-	4000	3000	3284	3914	3621	3338	5573	3510
Bulk Density	-	-	-	152.1	153.7	151.9	151.2	152.4	153.8
Rice Density	-	-	-	160.2	161.2	159.3	159.4	159.6	160.1

Concrete for Full-Depth Repairs

Property	Specification	Average Test Result	
		ADOT Section 5 (3 Tests)	ADOT Section 11 (10 Tests)
% Air Entrainment	4.0 - 7.0	5.2	5.3
Slump, in.	2.5 - 4.5	4.6	3.6
7-Day Comp. Strength, psi	-	3526 (5-day)	3723
28-Day Comp. Strength, psi	4000 min.	4436	4879

Concrete for Unbonded PCC Overlay

Property	Specification	Average Test Result
		ADOT Section 2 (7 Tests)
% Air Entrainment	4.0 - 7.0	5.5
Slump, in.	2.5 - 4.5	3.6
7-Day Comp. Strength, psi	-	4067
28-Day Comp. Strength, psi	4000 min.	5180

Asphalt Rubber AC

Test results from samples taken on August 8, 9, 10 are as follows:

Location	% AC	Bulk Density, pcf	Stability	Flow
Passing Lane EB	6.54	144.9	2178, 1021	14, 13
SHRP Section 7	7.13	146.0		
SHRP Section 9	7.09	144.7		

The % AC was determined with a nuclear gauge.

IX. CONCLUSIONS

Design and construction of the SPS-6 test sections were successfully incorporated in ADOT construction project IR-40-4(123) on I-40 at Flagstaff. All features of the SHRP required SPS-6 experiment design were included in eight basic test sections. Design and construction data from these sections, along with future performance data that will be collected, will be a meaningful and important contribution to achieving the goals of the SPS-6 program.

In addition to the eight required SHRP sections, ADOT included eleven more test sections which were designed to incorporate features that are not in the SHRP SPS-6 experiment design. Continued study of these sections will provide valuable input to ADOT in its desires to develop the most effective and economical types of pavement design and construction for rehabilitation of jointed PCC pavements.

Construction of the test sections complied very closely with the preset SHRP and ADOT guidelines and no significant deviations were allowed nor experienced. Quality control of materials was good, with test results indicating that construction was in compliance with the specifications.

Overall, construction of the test sections was successfully completed, and each individual section properly represents its role in the SPS-6 experiment.

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APPENDIX A

SHRP Experiment Design

National Research Council

STRATEGIC HIGHWAY RESEARCH PROGRAM

SPECIFIC PAVEMENT STUDIES
EXPERIMENTAL DESIGN AND RESEARCH PLAN
FOR EXPERIMENT SPS-6
REHABILITATION OF JOINTED PORTLAND
CEMENT CONCRETE PAVEMENTS

STRATEGIC HIGHWAY RESEARCH PROGRAM
818 Connecticut Avenue NW
Washington, DC 20006

April 1989

Specific Pavement Studies
Experimental Design and Research Plan
for Experiment SPS-6
Rehabilitation of Jointed Portland Cement Concrete Pavements

INTRODUCTION

The studies of rehabilitation and overlay techniques were the strongest contenders for inclusion in Specific Pavement Studies (SPS) as determined by previous balloting of highway agencies. Participation in and support of the research plans by the state and provincial highway agencies indicates enthusiasm for early implementation of the plan. Successful completion of the research project SPS-5 "Rehabilitation of Asphalt Concrete Pavements" and the research project SPS-6 "Rehabilitation of Jointed Portland Cement Concrete Pavements" will make major contributions to our ability to increase the life of the existing primary highway system of the United States and Canada through proper use of rehabilitation and overlay techniques.

The experimental designs and research plans presented here for SPS-6 were adapted from the Specific Pavement Studies on restoration of jointed concrete pavements (JCP) and pretreated JCP with AC overlay originally described in the May 1986 Strategic Highway Research Program Research Plans issued by the Transportation Research Board. Some of the original experimental design factors have been revised based on state and province desires and budget limitations. The plan has been prepared by the SHRP in cooperation with state and provincial highway agency personnel participating in various meetings including an SPS-6 workshop held in Washington, D.C., February 28 - March 1, 1989. The recommendations of the participants from 25 states and provinces and FHWA are incorporated into the experimental design and research plan described in this report. This research plan will be used by highway agencies and SHRP as a guide for selecting candidate projects to be considered for inclusion in the SPS-6 experiment and for design and construction of the test sections.

PROBLEM STATEMENT

Many United States and Canadian highway agencies are faced with the difficult task of determining the best way to treat existing aging and deteriorating jointed concrete pavements. Not only must they determine which rehabilitation procedures work best under which circumstances, but they must also determine the most appropriate time to apply such rehabilitation treatments. The problem is further complicated by the need to address an entire network of pavements at various levels of condition and age with limited funding resources.

There are a variety of rehabilitation techniques that can be applied to jointed concrete pavements (JCP) to restore condition and extend service life. These techniques involve a combination of levels and types of pavement preparation with and without the application of asphalt concrete (AC) overlays.

Pavement preparation approaches range from minimal treatment of the original PCC pavement to full "Concrete Pavement Restoration" (CPR) as well as cracking/breaking and seating. Pavement preparation can include diamond grinding, subsealing, full-depth repair, partial-depth spall repair, restoration of load transfer, resealing of transverse joints, resealing of longitudinal lane/shoulder joints, pressure relief joints, retrofit tied PCC concrete shoulders, and longitudinal subdrains. Depending on the extent and type of pavement preparation, asphalt concrete overlays of appropriate thicknesses may or may not be applied.

The long term performance of such rehabilitated pavements has not been systematically monitored and evaluated. There are no analytical design procedures for PCC rehabilitation and there are many unanswered questions regarding the appropriate rehabilitation techniques to use for a given pavement condition, traffic level, and climate as well as the proper timing of rehabilitation treatments.

One of the major LTPP objectives is "To Develop Improved Design Methodologies and Strategies for the Rehabilitation of Existing Pavements." A generally accepted approach for making cost effective decisions on pavement

maintenance and rehabilitation is the use of pavement management concepts including life-cycle cost analyses of construction and rehabilitation activities. The ability to predict the performance and life expectancy of various rehabilitation strategies, with and without overlays, is essential to pavement management and life-cycle cost analyses. Consequently, the development of improved performance predictions models for various rehabilitation strategies is essential to achieving the LTPP objectives and should be one of the early products of research.

OBJECTIVE

The objective of this study is to develop improved performance prediction models to be used for determining the additional pavement life that can be expected from the application of a variety of JPC and JRC pavement rehabilitation methods and strategies ranging from minimal to maximum investment in the rehabilitation treatment. The treatments being studied include combinations of surface preparations, with and without AC overlay, as well as crack and seat preparation with AC overlay. The study objective includes a determination of the influence of environmental region and initial pavement condition on the effectiveness of rehabilitation methods. Accomplishing this objective will provide substantially improved "tools" for use in pavement management and life-cycle cost analysis activities.

PRODUCTS

One of the primary specific products of this portion of SHRP LTPP research will be to evaluate and improve portions of the AASHTO Guide for Design of Pavement Structures that pertain to pavement rehabilitation design methods, life-cycle cost analysis, and pavement management. The SPS-5 and SPS-6 experiments will provide uniform and structured field performance data upon which "Part III - Pavement Design Procedures for Rehabilitation of Existing Pavements" and sections on pavement management and life-cycle cost analysis of the AASHTO Guide can be evaluated and improved. These products are a direct response to the first two objectives of the LTPP program, which are 1) to evaluate existing pavement design procedures and 2) develop improved pavement rehabilitation design methods and strategies.

The structural overlay method for rehabilitation of existing pavements that is included in the AASHTO Guide is based on a thickness or structural deficient approach that presumes the existing pavement is structurally inadequate for anticipated future traffic and climactic conditions. This experiment will provide means for the field verification of this design approach. In addition, these AASHTO design procedures are not applicable to non-structural deficiencies and other functional rehabilitation needs. However, these factors will be considered in this experiment.

This study will produce data concerning JPC and JRC pavement performance and extended life predictions, including the relative cost effectiveness of various rehabilitation methods and strategies, ranging from minimum restoration to extensive concrete pavement restoration with and without AC overlays plus crack/break and seat with AC overlay.

The key products from the proposed study will include the following:

1. Comparisons and development of empirical prediction models for performance of JPC and JRC pavements with different methods of surface preparation, with and without AC overlays, with sawed and sealed joints, and with crack/break and seat preparation and different AC overlay thickness.

2. Evaluation and field verification of the AASHTO Guide design procedures for rehabilitation of existing JPC and JRC pavements with and without AC overlay, and other analytical overlay design procedures for JPC and JRC pavements.

3. Determination of appropriate timing to rehabilitate JPC and JRC pavement in relation to existing condition and type of rehabilitation procedures.

4. Development of procedures to verify and update the pavement management and life-cycle cost concepts in the AASHTO Guide using the performance prediction models developed for rehabilitated JPC and JRC pavements.

5. Development of a comprehensive data base on the performance of rehabilitated jointed concrete pavements for used by state and provincial engineers and other researchers.

BENEFITS TO PARTICIPATING HIGHWAY AGENCIES

This experiment will provide the states and provinces with actual data on the cost and performance of alternative methods for portland cement concrete pavement rehabilitation. These data are necessary for the accurate use of pavement management systems including life-cycle cost analysis and predictions. In addition to these direct benefits, participating highway agencies will receive ancillary benefits as a result of direct involvement in the experiment. For example, the interactions between agency's personnel are the SHRP staff, contract researchers, and highway personnel from other agencies will produce valuable insights and exchange of ideas.

To evaluate innovative rehabilitation designs and local practices, sponsoring states and provinces can construct additional test sections on or near the SPS experiment projects containing factors of special interest. For example, an agency interested in evaluating the performance of a proprietary product such as geo-fabric to reduce reflective cracking, could construct additional test sections along with the SPS experiment test sections. SHRP will assist with the design, data collection, and performance evaluation of such experiments and will provide coordination for desired regional or partial experiments.

Another primary benefit to participating highway agencies is that a portion of the research will be conducted on the specific pavements and construction practices employed by the participating highway agency, allowing direct use of the results. Having test sections within a jurisdiction provides the opportunity to link performance measurements based on the local pavement evaluation techniques directly to the national pavement data base being developed by SHRP. For example, highway agencies using a Dynaflect or Roadrater deflection measurement device can develop correlations with the falling weight deflectometer measurements performed using SHRP equipment.

EXPERIMENTAL DESIGN

The recommended experimental design is shown in Table 1. It identifies the primary experimental factors and their relationships with each other. Table 1 identifies site related factors across the top and rehabilitation treatments down the side. Each column in this arrangement represents either one or two project locations each of which incorporates several test sections. Each row represents a series of test sections with specific features to be constructed at each project location.

This experimental design is a coordinated research plan intended to produce data and performance information for a variety of rehabilitation and overlay procedures constructed to extend the life of existing jointed PCC pavements. The primary factors being studied are: (1) the extent of preparation and restoration of the existing pavement, (2) thickness of AC overlay, and (3) environmental (climatic) factors. Other considerations are: (1) existing condition of pavement, (2) pavement type, (3) subgrade soil, and (4) traffic volume and load. In addition, the experiment will include other test sections desired by the highway agency to evaluate local practices or innovative features.

SHRP fully recognizes that no agency is able to continue in service any test section, even for research purposes, that becomes unsafe or disruptive to traffic flow. When in the judgment of the highway agency, a test section reaches such a condition, it should be treated as considered appropriate by the state or provincial highway agency. Such sections will be removed from the study and SHRP will endeavor to obtain final condition data prior to their treatments by the highway agency.

Site Related Factors

Site related factors include two pavement types (jointed plain concrete and jointed reinforced concrete) in both fair and poor conditions in three climatic regions (wet-freeze, wet-no freeze, and dry-freeze), and one pavement type (jointed plain concrete) in both fair and poor condition in the fourth climatic region (dry-no freeze). Jointed Reinforced Concrete pavement type is not a

Table 1. Experimental design for SPS-6, rehabilitation of jointed portland cement concrete pavements.

Rehabilitation Procedures	Factors for Moisture, Temperature, Pavement Type, and Pavement Condition	WET FREEZE				WET, NO FREEZE				DRY FREEZE				DRY, NO FREEZE	
		JPCP		JRCP		JPCP		JRCP		JPCP		JRCP		JPCP	
		FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR
PREPARATION	OVERLAY THICKNESS														
Routine Maintenance (Control)	0	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
Minimum Restoration	0	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	4"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	4" *	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
Maximum Restoration (CPR)	0	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	4"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
Crack/Break and Seat	4"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x
	8"	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x

* with saw AC overlay joints above JCP joints and seal

Subgrade Soil: Fine
Traffic: >200 KESAL/Year

Each "x" designates a test section.

study factor in the dry-no freeze region because it is not frequently built in this region.

These levels of climatic regions, pavement types, and pavement condition study factors will result in fourteen different study combinations. In addition, each test section, with the exception of JRC pavements in the dry-freeze and JPC pavements in the dry-no freeze climatic regions will be replicated. Thus, twenty-four project sites are needed for this experiment. Where ever possible, replication will take place in different jurisdictions to allow a greater range of practices to be studied.

Climatic Factors

The climatic regions are, for the most part the same as the environmental zones used in the General Pavement Studies (GPS) except they are not modified to correspond with state boundaries. Climatological factors at specific locations will be used for selection of SPS projects. For example, in this experiment a project in the south east portion of Kansas could fall in the wet-freeze climatic zone rather than in the dry-freeze zone as indicated on the GPS environmental zone map.

Wet climatic regions are considered to have a high potential for moisture presence in the entire pavement structure throughout most of the year. Dry climatic regions are considered to have very little and low seasonal fluctuation of moisture in the pavement structure. Freeze regions include locations with severe winters that result in long-term freezing of the subgrade. No freeze climatic regions are considered to have no long-term freezing of subgrade.

Pavement Type Factors

The two pavement types considered in this experiment are JPCP and JRCP. Although there are a wide range of joint spacings in existing pavements, no specific criteria has been established in this regard for the selection of projects to be included in this experiment. This factor will be given further consideration when candidate projects are being reviewed for final selection.

Pavement Condition Factors

The classification of existing pavement condition as fair or poor will be used primarily to screen candidate projects to provide a range of existing distress conditions. Distress condition surveys of all test sections will be made prior to rehabilitation to provide information for the data base. However, it is desirable to have some type of composite distress index be used by highway agencies to classify pavement condition when selecting projects for submittal to SHRP as candidates for the study. In view of the desire to immediately identify candidate projects for the 1989 construction season, agencies are urged to select projects that they classify as in fair or poor condition and provide details on the procedures used for such classification. This information will be used by the SHRP to further develop distress index classification procedures for use in selecting the remaining candidate projects for the 1990 construction season.

A structural based classification of present pavement condition will be used rather than roughness, ride quality, or skid resistance because these conditions are normally corrected by placement of thin overlays. The rehabilitation procedures being studied are intended to overcome structural inadequacy. The types of distress to be included in the classification include faulting, patching, spalling, pumping, joint deterioration, and slab cracking. The distress index will consider the extent and severity of each distress type. Although several types and degrees of distress may occur in a project, all test sections in a project are to be either in fair or poor condition and as the result of the same type of distress.

Other Site Factors

Other factors that contribute to pavement performance which are not included as study factors, will be considered in the test site selection process to keep the experiment within a practical implementable size.

This experimental design is intended for projects built on fine grained subgrade types and for traffic levels above 200 KESAL per year (per outside lane) because they represent the situation of greatest concern and provide a sterner test of rehabilitation strategies. If project sites meeting these criteria cannot be found, lower traffic levels and/or coarse grained subgrade types will be considered. However, all test sections in a site should have the same type of subgrade soil and traffic.

The proposed experimental design further constrains other factors through the site selection process as follows:

1. Performance period - Because quantification of the existing pavement condition is not possible for previously overlayed pavements, all test sections are to be located on pavements in their first performance period (i.e. no prior overlay). A section can be considered if a thin overlay or maintenance surface patch has been placed but will be removed prior to the rehabilitation and the current condition of the JCP can be determined. Existing open graded friction courses should be removed by milling if the pavement is to be considered as a candidate project. The addition of an open graded friction course to the new overlay for safety and/or agency policy requirements is allowed, but should not be considered part of the structural overlay thickness.

2. Pavement age - All projects should have been completed between 1965 and 1978 to avoid excessively young or old pavements and unusual performance.

3. Pavement thickness - All pavements shall be 8" to 10" thickness over a minimum of 3" stabilized or unstabilized subbase.

4. Project uniformity - All test sections in a project should have the same design details, materials, construction quality and should experience uniform traffic movement.

Pavement Preparation

Three levels of pavement preparation plus routine maintenance as a control section will be applied to the test sections prior to AC overlay. They are minimal restoration, intensive CPR, and crack/break and seat. Routine maintenance will consist of joint and crack sealing and limited patching.

The minimal restoration level will consist of routine maintenance including limited patching (filling pot holes), crack repair and sealing, and stabilization of joints. This level is typical of the current practice of many highway agencies prior to overlay.

The intensive CPR level will consist of several activities that will be done depending on pavement distress and condition. This intensive level represents a premium level of pavement preparation addressing grinding, subsealing, subdrainage, joint repair and sealing, full depth patching with restoration of load transfer, and shoulder rehabilitation. Surface grinding and joint and crack sealing will not be performed on test sections that will receive an AC overlay.

Due to the possible variation in existing pavement condition, 1,000 foot long test sections are recommended for the study of the minimum restoration and intensive CPR sections without an AC overlay.

Crack/break and seat is the process of using mechanical means to reduce slab size to minimize or eliminate reflective cracking in the asphalt concrete overlay. Crack and seat is the process used with plain (unreinforced) concrete pavement and break and seat is the process used with jointed reinforced concrete pavements. The cracking and breaking procedures need to be uniformly applied to their respective pavement types. The seating procedures also need to be controlled to ensure seating of the cracked or broken slabs.

If desired by the participating highway agency, additional sections incorporating other types of pavement preparation will be evaluated. These sections may include crack and seat with different crack spacing, rubblized pavements, or other features.

Overlay Factors

The study design includes three overlay thicknesses, (0, 4, and 8 inches). No overlay will be used on the control section and one each of the test sections that will receive minimum restoration and intensive CPR pavement preparation. The 4-inch thick overlays will be used on the test sections receiving the minimal restoration level of pavement preparation, the intensive CPR level of pavement preparation, and the crack/break and seat pavement preparation. The 8-inch thick overlay will be used on a test section that will involve crack/break and seat. In addition, a 4-inch overlay in which joints are sawed above the existing joints and then sealed will be applied to test sections receiving the minimum restoration treatment.

The overlays allowed for use on the test sections will be further constrained to insure a reasonable level of consistency as follows:

1. All overlays use virgin materials.
2. The application will not incorporate SAMI or any type of reinforcement (fibers, geotextiles, etc.).

If desired by the participating highway agency, additional sections incorporating other types of overlay design will be evaluated. These sections may include AC overlays with different thickness, portland cement concrete overlays, use of fabrics or fibers, or other features.

AC Mix Design

Problems will likely to develop if an agency or a contractor is required to design or build test sections that vary substantially from the normal practice and experience. For this reason, a standard AC overlay mix design is not required. However, to produce reasonably consistent mixes for the AC overlays using local materials and design procedures, the FHWA Technical Advisory T5040.27, "Asphalt Concrete Mix Design and Field Control" dated March 10, 1988

shall be used as a guide by the state and provincial highway agencies. This Advisory contains detailed recommendations for material selection, mix design, plant operation, and compaction.

TEST SECTION SEQUENCE

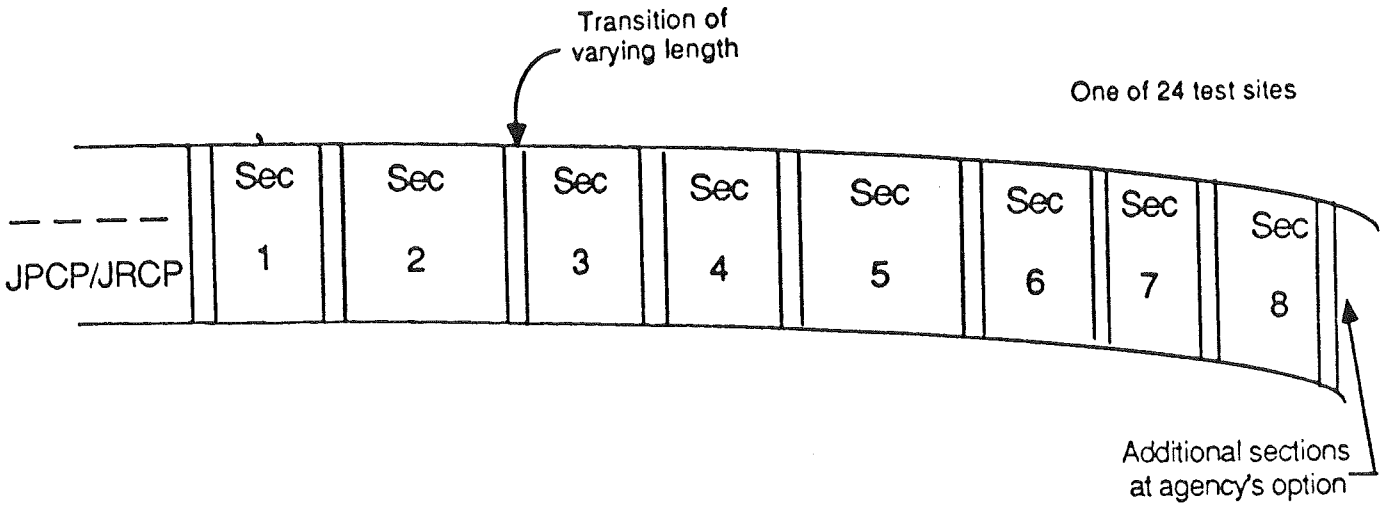
The sequence of sections depicted in Figure 1 are not random. They are organized based on construction considerations. It places test sections with similar pavement preparation levels adjacent to each other and minimizes abrupt changes in asphalt concrete overlay thicknesses. Under this approach the overlay thickness can be gradually modified over the transition area.

The sequence shown in Figure 1 is not fixed and may be varied to accommodate local construction conditions. Each test section will be 500 feet in length with the exception of the test sections that receive minimum restoration and full CPR preparation and no asphalt concrete overlay. These test sections will be 1,000 feet long. The sections will be separated by an appropriate transition length to meet practical construction considerations. Transition section length will vary based on site condition to assure cohesive test sections.

To help reduce the effort in identifying potential test sites for this experiment, several sources can be used. These include the agency's list of projects scheduled for rehabilitation, projects identified as candidates for GPS-7B, "New AC Overlay on Portland Cement Concrete Pavements", and projects in GPS-3, "Jointed Plain Concrete Pavement", and GPS-4, "Jointed Reinforced Concrete Pavement" that warrant rehabilitation. The use of GPS candidate projects will result in a reduced data collection effort.

CONSTRUCTION CONSIDERATIONS

Construction problems and variations as well as environmental conditions during construction could influence the performance of test sections to a greater extent than the design factors. Because construction procedures and control will be the responsibility of the many participating agencies, accurate records of actual construction procedures must be obtained (references to construction



SPS-6 SECTION	JC PAVEMENT PREPARATION	OTHER TREATMENTS	OVERLAY THICKNESS
1	Routine Maintenance		0
2	Minimum Restoration		0
3	Minimum Restoration		4-inch
4	Minimum Restoration	Saw and seal joints in AC	4-inch
5	Maximum Restoration (CPR)		0
6	Maximum Restoration (CPR)		4-inch
7	Crack/Break and Seat		4-inch
8	Crack/Break and Seat		8-inch

Figure 1. Illustrative Test Section Layout for SPS-6, Rehabilitation of Jointed Portland Cement Concrete Pavements.

specifications will not be adequate). In addition, records must be maintained of weather conditions and events such as equipment breakdowns and material contamination during the test section construction. Testing during construction of the AC overlays will be required to encourage as much uniformity as possible. Guidelines will be developed to cover such items as compaction and air voids content, profile or roughness specifications for the finished overlay, and minimum sampling and testing for quality assurance and control. Field experience gained during the initial projects completed in 1989 will be used to develop these guidelines.

Breaking the JRCP requires a considerably higher effort than cracking JPCP. For uniformity during cracking and breaking, guillotine hammer or pile driver equipment should be used. Crack spacing should be 3 feet by 6 feet for JPCP and 18 inches for JRCP. Tests should be performed to ensure full depth cracking. A minimum 30 ton roller should be used for seating, and field tests should be performed to determine the rolling pattern required to achieve proposed crack pattern and pavement seating. Test sections should receive the AC overlay as soon as possible after seating.

Although the test sections to be monitored are limited to the outside lane in one direction, it is desirable that all rehabilitation preparation activities and overlays be extended the full width of the pavement. Also to ensure uniformity, it is required that all test sections in each site be completed in one construction season.

Arrangements will be made for the collection of AC overlay samples for later testing by SHRP.

PARTICIPATING AGENCY RESPONSIBILITIES

Participating highway agencies will play the major role in the development and conduct of the Specific Pavement Studies, including the following activities:

- Participation in experimental design and implementation plans.
- Nomination of test sites.
- Preparation of plans and specifications.

- Selection of construction contractor.
- Construction of the test pavements.
- Construction inspection and management.
- Provision of traffic control for all test site data collection.
- Routine material sampling.
- Collection and reporting of pavement inventory data.
- Collecting periodic skid resistance measurements.
- Conducting and reporting maintenance activities.
- Collection and reporting of traffic and load data.

SHRP RESPONSIBILITIES

SHRP responsibilities will include the following:

- Development of the experimental design.
- Coordination among participating highway agencies.
- Final acceptance of test sites.
- Development of standard data collection forms.
- Assistance with special sampling requirements.
- Coordination of materials sampling and testing.
- Monitoring of pavement performance.
- Development of a comprehensive data base and data entry.
- Control of data quality.
- Data analysis and reporting.

IMPLEMENTATION AND SCHEDULE

This SPS-6 research plan and experimental design is ready for implementation. However, development was an evolutionary process and change is likely to continue with detailed adjustments as experience is gained from early projects.

Step one of implementation is the identification and submission by highway agencies of candidate projects for possible inclusion in the study. A total of 24 projects will be required to complete the experiment as planned. SHRP desires to select and construct test sections in at least 2 or 3 projects during the

1989 construction season. The remaining sections will be selected from the identified candidates and constructed in 1990. SHRP will assist the highway agencies in identifying candidate projects.

The existing condition of the test sections; in terms of distress, profile, deflections, and material characteristics; must be assessed prior to the rehabilitation and overlay activities. This will require extensive coordination between SHRP staff and regional offices, and the highway agencies. Traffic data must be collected at each site using WIM equipment. It will be desirable to install the WIM equipment at the time of rehabilitation work but, if this is not possible, it should be installed within a year of construction.

The proposed schedule of activities for this experiment is as follows:

Nomination of Candidate Projects:	
- For 1989 Construction Season	April 30, 1989
- For 1990 Construction Season	May 30, 1989
Review and Screening of Candidate Projects	As received
Notification of State/Provinces of Accepted Projects	
- For 1989 Construction Season	June 1, 1989
- For 1990 Construction Season	July 15, 1989
Supplementary Recruitment Activities (with individual agencies)	As needed
Implementation Workshop with Participating Agencies	
- For 1989 Construction Season (with individual agencies)	As required by Participating Agency
- For 1990 Construction Season	Mid-August 1989

APPENDIX B

Special Provisions and Addendums

ROSE MOFFORD
Governor

CHARLES L. MILLER
Director

ARIZONA DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

206 South Seventeenth Avenue Phoenix, Arizona 85007

CONTRACTS AND SPECIFICATIONS SERVICE
1651 West Jackson Street, 121F, Phoenix, Az. 85007

THOMAS A. BRYANT II
State Engineer

March 29, 1990

ADDENDUM

(1)

TO ALL CONTRACTORS AND OTHERS INTERESTED IN PROJECT

IR-17-2(111)
017 CN 339 H0212 04C
CORDES JUNCTION - FLAGSTAFF HIGHWAY
(Flagstaff T.I.)

AND

IR-40-4(123)
040 CN 195 H0270 04C
FLAGSTAFF - HOLBROOK HIGHWAY
(U.S. 89A Overpass - Walnut Canyon T.I. - Eastbound)

AND

IR-40-4(131)
040 CN 195 H0275 04C
FLAGSTAFF - HOLBROOK HIGHWAY
(U.S. 89A Overpass - Walnut Canyon T.I.- Westbound)

SCHEDULED FOR OPENING ON FRIDAY, APRIL 6, 1990 AT 11:00 A.M.

REVISIONS TO THE ADVERTISEMENT FOR BIDS:

The date for the opening of bids on the above referenced project is hereby changed from Friday, April 6, 1990 at 11:00 A.M. to FRIDAY, April 13, 1990 at 11:00 A.M..

Any reference listed in the Advertisement for Bids, Special Provisions (including proposal and contract documents) and the Project Plans to TRACS NO. 040 CN 195 H0200 01C shall be revised to read 040 CN 195 H0270 01C .

On Sheet 35 of 179:

Additional Requirements to PATCH REPAIR (MINIMUM RESTORATION): (SHRP):

Additional Requirements to JOINT SEALING (ASPHALT CONCRETE OVERLAY): (SHRP):

On Sheet 31 of 179 of the Special Provisions under Additional Requirements to ITEM 4020072 - REPAIR PORTLAND CEMENT CONCRETE PAVEMENT (Spalled Area): is modified to add:

The estimated quantity for spalled areas to be repaired is 1300 square feet. The estimated quantity is based on visual observations. The exact quantities may very from this estimate.

On Sheet 34 of 179 of the Special Provisions under Additional Requirements to ITEM 4020060 - SEAL CRACKS PORTLAND CEMENT CONCRETE PAVEMENT:

Delete the requirements listed under the estimated quantities of the joints and random cracks requiring renovation and sealing for Test Section Numbers 8, 10 and 12.

On Sheet 35 of 179 of the Special Provisions under Additional Requirements to ITEM 4020060 - JOINT AND CRACKS REPAIR (MINIMUM RESTORATION):

Delete the requirements listed under the estimated quantities of the joints and random cracks requiring renovation and sealing for Test Section Numbers 5 and 11 and replace with the following.

Test Section No.	Description	Lin. Ft. of Renovation
8, 11	No joint or crack sealing	0
12	All transverse and longitudinal joints except the outside edge joints	1350

On Sheet 35 of 179 of the Special Provisions under Additional Requirements to PATCH REPAIR (MINIMUM RESTORATION): is modified to add:

The estimated quantity for spalled areas to be repaired is 3100 square feet for Test Sections No.s 8, 10, and 12. The estimated quantity is based on visual observations. The exact quantities may very from this estimate.

SECTION 104 - SCOPE OF WORK:

On Sheet 43 of 179 of the Special Provisions under Traffic Control: the first paragraph is revised to read:

The contractor shall maintain a minimum of one lane of traffic per each direction at all times, unless otherwise permitted for roadway closures during blasting excavation. The contractor shall maintain two lanes of traffic per each direction of roadway on I-17 and I-40 during non-working unless otherwise directed and/or approved by the Engineer.

On Sheet 43 of 179 of the Special Provisions under Traffic Control for Blasting: delete the second sentence of the third paragraph.

On Sheet 43 of 179 of the Special Provisions under Traffic Control: the entire subsection Department of Public Safety - On Site: is revised to read:

Uniformed Law Enforcement Officers - On Site:

Uniformed law enforcement officers are encouraged to be present at the job site at all times in conjunction with and during traffic control and while the blasting work is in progress.

It is the responsibility of the contractor to make all necessary arrangements with the ADOT Engineer and the various law enforcement departments for the officers, according to the contractor's work schedule.

Contractor's use of uniformed law enforcement officers shall be in accordance with the applicable requirements of Section 701 of the Standard Specifications and the Special Provisions.

SECTION 108 - PROSECUTION AND PROGRESS:

On Sheet 57 of 179 of the Special Provisions:

STAGE I: Disincentive: of the Special Provisions is modified to add:

The disincentive shall apply until the completion of Stage I operations, or winter shutdown of paving operations, or November 15, 1990, which ever comes first. If paving operations are stopped prior to completion then disincentive will apply, beginning May 1, 1991 and continue thereafter to the completion of the Stage I operations.

If for any reason that paving operations cease prior to completion of mainline and ramp paving and it is prior to October 1, 1990, the contractor shall forfeited any payment of the incentive monies.

SECTION 109 - MEASUREMENT AND PAYMENT:

On Sheet 59 of 179 of the Special Provisions:

109.10 Lump Sum Payment for Structures: of the Special Provisions is revised to read for (X), (Y), and (Z) as follows:

(X)	99999906X	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE 1238 & 1239
(Y)	99999907Y	LUMP SUM STRUCTURE (TOTAL)	EASTBOUND STRUCTURES (4)
(Z)	99999908Z	LUMP SUM STRUCTURE (TOTAL)	WESTBOUND STRUCTURES (4)

ITEM 99999907Y - LUMP SUM STRUCTURE (TOTAL), EASTBOUND STRUCTURES (4)

Structure No. 1261	U.S. 89A Overpass E.B.
Structure No. 1263	I-17 T.I. Overpass E.B.
Structure No. 1265	Rio De Flag Bridge E.B.
Structure No. 1180	Lonetree Road Overpass E.B.

ITEM 99999908Z - LUMP SUM STRUCTURE (TOTAL), WESTBOUND STRUCTURES (4)

Structure No. 1262	U.S. 89A Overpass W.B.
Structure No. 1264	I-17 T.I. Overpass W.B.
Structure No. 1266	Rio De Flag Bridge W.B.
Structure No. 1181	Lonetree Road Overpass W.B.

SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS:

On Sheet 62 of 179 of the Special Provisions under ITEM 2020017 - Removal of ASPHALTIC CONCRETE (Patches): the Description is modified to add:

Removal of existing A.C.(Patches) shall be exclusive of those areas to be milled as described and paid for under Item 2020030 - Removal Asphaltic Concrete Pavement (Milling).

SECTION 401 - PORTLAND CEMENT CONCRETE PAVEMENT:

On Sheet 81 of 179 of the Special Provisions under ITEM 4010260 - RUBBLIZE EXISTING PORTLAND CEMENT CONCRETE PAVEMENT: the paragraph for Basis of Payment: is revised to read:

The accepted quantities of Rubblize Existing Portland Cement Concrete Pavement,measured as provided above, will be paid for at the contract unit price per square yard, which price shall be full compensation for the work complete including all labor, equipment, and materials necessary to rubblize, suppress dust, place and compact filler aggregate, compact and maintain the initial asphaltic concrete course.

SECTION 402 - PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS:

On Sheet 81 of 179 of the Special Provisions under ITEM 4020061 - SEAL EDGE OF PORTLAND CEMENT CONCRETE PAVEMENT: for Description is modified to add:

The material and construction requirements listed hereinafter apply only to the IR-17-2(111) portion of this contract.

SECTION 404 - BITUMINOUS TREATMENTS:

On Sheet 83 of 179 of the Special Provisions delete the requirements for Subsections 404-4 and 404-5 and replace with the following:

(BITR404, 0451/O, 03/01/90)

404-4 Method of Measurement: the seventh and eighth paragraphs of the Standard Specifications relating to time to apply provisional seal coat are hereby deleted.

404-5 Basis of Payment: the eighth paragraph of the Standard Specifications is revised to read:

The unit price for bituminous tack coat is deemed to be the cost to furnish, transport, and store asphalt cement or emulsified asphalt at the project location. Payment for bituminous tack coat will be made at the unit price multiplied by the respective payment factor, listed under Subsection 404-3.12, and adjusted to the nearest dollar.

404-5 Basis of Payment: the eleventh, twelfth, thirteenth and fourteenth paragraphs of the Standard Specifications are hereby deleted.

SECTION 406 - ASPHALTIC CONCRETE:

On Sheet 86 of 179 of the Special Provisions under Mineral Aggregate: is modified to add:

All fine mineral aggregate material used for asphaltic concrete shall be crushed aggregate. All mineral aggregate material passing the #4 sieve shall be removed prior to the crushing, screening, and washing operations necessary to produce the specified gradation. The contractor shall notify the Engineer a minimum of 48 hours in advance of crushing the material to be used as mineral aggregate, so all crushing operations are inspected. Existing stockpile material which has not been inspected during crushing will not be permitted for use. Any material inspected by the Department as crushed material shall be separated from the contractors other stockpiles and reserved for use by the Department.

On Sheet 87 of 179 of the Special Provisions under Mineral Admixture: delete the first paragraph and replace with the following:

The contractor shall use mineral admixture. Mineral admixture, in the amount of 1.0 percent by weight of the mineral aggregate, shall be lime conforming to the requirements of ASTM C 977.

On Sheet 89 of 179 of the Special Provisions under Compaction: the first paragraph is modified to read:

The temperature of asphaltic concrete just prior to compaction shall be at least 275 degrees F.. Asphaltic Concrete shall be placed only when the temperature of the surface on which the asphaltic concrete is to be placed is at least 65 degrees F.

On Sheet 90 of 179 of the Special Provisions under Compaction: the second paragraph is modified to add:

Steel Wheel compactors shall not be used in the vibratory mode for courses of 1 1/2" or less in nominal thickness.

On Sheet 94 of 179 of the Special Provisions under The mix design grading limits for mineral aggregate shall be as follows: is revised to read as follows:

Sieve Size	Percent Passing (includes Mineral Admixture)
3/8 inch	100
No. 4	30 - 60
No. 8	6 - 10
No. 200	0 - 3.5

On Sheet 98 of 179 of the Special Provisions under Compaction: the third paragraph is revised to read:

Static Steel Wheel compactors shall weigh not less than eight tons. The rollers shall be self-propelled and shall be operated with the drive wheel in the forward position. Vibratory rollers may be used in the Static mode only. All rollers shall be equipped with pads and a watering system to prevent sticking of the asphaltic concrete mix to the steel wheels.

On Sheet 98 of 179 of the Special Provisions under Method of Measurement: is modified to add:

Mineral admixture will be measured by the ton.

On Sheet 99 of 179 of the Special Provisions under Basis of Payment: is modified to add:

The accepted quantities of mineral admixture, measured as provided above, will be paid for at the contract unit price per ton for mineral admixture.

ADDITION AND REVISIONS TO THE PROJECT PLANS:

Additional requirements to the General Notes on Project IR-40-4(123): Pavement Structural Section No. 30A shall also to the (SHRP) Test Section No. 13.

Attached are the revised project plans sheets.

Project No.	Sheet No.s	Date of Changes	Addendum No.
IR-40-4(123)	2, 20, 21, 46, 55, & 56	Mar. 19, 1990	1
IR-40-4(131)	2, 15, 43 & 56	Mar. 19, 1990	1

REVISIONS TO THE BIDDING SCHEDULE:

Attached are the New Bidding Schedule Sheets 1, 4, 5, 31, 32 and 33 of 33.

The following items has been affected as noted:

Item No.	Type of Change
4020060	Revised Quantity
4040116	New Item
4060024	Unit Price
4060026	Unit Price
9999907Y	Item Description
9999908Z	Item Description

Please remove the existing Sheets 1, 4, 5, 31, 32 and 33 of 33 of the Bidding Schedule from your Proposal Pamphlet, attach the New Bidding Schedule Sheets 1, 4, 5, 31, 32 and 33 of 33 and be guided accordingly.

for David R. Allocco, P.E.
Engineer - Manager
Contracts and Specifications Services

DRA/TLBJ/0935X/tlbj:

Attachments: New Bidding Schedule Sheets 1, 4, 5, 31, 32, 33 of 33.
Revised Project Plan Sheets
Proj.. No. IR-40-4(123) Sheets 2, 20, 21, 46, 55, & 56
Proj.. No. IR-40-4(131) Sheets 2, 15, 43 & 56

ARIZONA DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

CONTRACTS AND SPECIFICATIONS SERVICES

DATE: 03/05/90

REV: 03/23/90

BIDDING SCHEDULE FOR
CONTRACT NUMBER
89156

PROJECT NUMBER	TERMINI	LOCATION	FUND CODE	ITEM
IR- 17-2(111)	CORDES JCT - FLAGSTAFF HIGHWAY	FLAGSTAFF TRAFFIC INTERCHANGE	0	0169
IR- 40-4(123)	FLAGSTAFF - HOLBROOK HIGHWAY	US 89A OP-WALNUT CANYON TI EB	0	0177
IR- 40-4(131)	FLAGSTAFF - HOLBROOK HIGHWAY	US 89A OP-WALNUT CANYON TI WB	0	0178

COUNTY	GROSS LENGTH	NET LENGTH	PREPARED BY
COCONINO	1.050 MILES	1.010 MILES	TLB
COCONINO	10.110 MILES	9.860 MILES	TLB
COCONINO	10.160 MILES	10.060 MILES	TLB

△1 = ADDENDUM NO. 1

△1 = ADDENDUM NO. 1

PROJECT NUMBER

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

REV: 03/23/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	4010016	PORTLAND CEMENT CONCRETE PAVEMENT (Unbonded Overlay)	SQ.YD.	2,111		
	4010210	CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	244,614		
	4010260	RUBBLIZE EXISTING PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	1,333		
	4020048	GRIND EXISTING PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	7,427		
△1	4020060	SEAL CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT	L.FT.	7,984		
	4020061	SEAL EDGE OF PORTLAND CEMENT CONCRETE PAVEMENT	L.FT.	33,874		
	4020072	REPAIR PORTLAND CEMENT CONCRETE PAVEMENT (SPALLED AREA)	SQ.FT.	1,600		
	4040026	ASPHALT CEMENT (AC-20) (FOR 3/4" MIX)	TON	4,710		
	4040111	BITUMINOUS TACK COAT	TON	414		
△1	4040116	Apply Bituminous Tack Coat	HOUR	828		
	4040125	FOG COAT	TON	58		
	4040161	ASPHALT RUBBER MATERIAL	TON	4,316		
	4040163	BLOTTER MATERIAL	TON	159		

△1 = ADDENDUM NO.1

PROJECT NUMBER

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90
REV: 03/23/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	4040310	JOINT SEALING (ASPHALTIC CONCRETE OVERLAY)	L.FT.	4,096		
△1	4060024	MINERAL ADMIXTURE (FOR 1/2" MIX)	TON	513	90.00	46,170.00
△1	4060026	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	923	90.00	83,070.00
	4060051	ASPHALT CONCRETE (RUBBERIZED)	TON	54,834		
	4060951	PAVEMENT REINFORCEMENT FABRIC	SQ.YD.	2,914		
	4070004	ASPHALTIC CONCRETE FRICTION COURSE (ASPHALT RUBBER)	TON	8,348		
	4160002	ASPHALTIC CONCRETE (3/4" MIX) (END PRODUCT)	TON	85,621		
	5010004	PIPE, CORRUGATED METAL, 12"	L.FT.	16		
	5010011	PIPE, CORRUGATED METAL, 24"	L.FT.	56		
	5010025	PIPE, CORRUGATED METAL, 36"	L.FT.	94		
	5010030	PIPE, CORRUGATED METAL, 42"	L.FT.	16		
	5010035	PIPE, CORRUGATED METAL, 48"	L.FT.	10		

△1 = ADDENDUM NO.1

PROJECT NUMBER

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90
REV: 03/23/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009Y	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	193		
	6010002Y	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	216		
	6050012Y	REINFORCING STEEL (EPOXY COATED)	LB.	23,750		
	6050101Y	PLACE DOWELS	EACH	2,094		
△1	9999907Y **	LUMP SUM STRUCTURE (TOTAL) * EASTBOUND STRUCTURES (4)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "Y" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

** Eastbound Structures (4) =

Structure No. 1261 - U.S. 89A Overpass E.B.
Structure No. 1263 - I-17 T.I. Overpass E.B.
Structure No. 1265 - Rio De Flag Bridge E.B.
Structure No. 1180 - Lonetree Road Overpas E.B.

△1 = ADDENDUM NO. 1

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90
REV: 03/23/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009Z	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	178		
	6010002Z	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	223		
	6050012Z	REINFORCING STEEL (EPOXY COATED)	LB.	25,225		
	6050101Z	PLACE DOWELS	EACH	1,944		
△1	99999082 **	LUMP SUM STRUCTURE (TOTAL) * WESTBOUND STRUCTURES (4)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amounts for the preceeding "Z" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

** Westbound Structures (4) =

Structure No. - 1262 U.S. 89A Overpass W.B.
Structure No. - 1264 I-17 T.I. Overpass W.B.
Structure No. - 1266 Rio De Flag Bridge W.B.
Structure No. - 1181 Lonetree Road Overpass W.B.

△1 = ADDENDUM NO. 1

Project No.
IR-17-2(111) H0212 04C
IR-40-4(123) H0270 04C
IR-40-4(131) H0275 04C

BIDDING SCHEDULE

Date: 03/05/90
REV: 03/23/90

SUMMARY SHEET

		ROADWAY SUBTOTAL	=	_____
9999903A	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+80.0 (Lt.)	=	_____
9999903B	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 198+78.6 (Lt.)	=	_____
9999903C	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 272+25.9 (Rt.)	=	_____
9999903D	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 272+25.9 (Lt.)	=	_____
9999903E	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Lt.)	=	_____
9999903F	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Rt.)	=	_____
9999903G	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Lt.)	=	_____
9999903H	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Rt.)	=	_____
9999903K	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+00.0 (Lt.)	=	_____
9999903L	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+00.0 (Rt.)	=	_____
9999903M	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 199+45.0 (Lt.)	=	_____
9999903N	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 199+45.0 (Rt.)	=	_____
9999903P	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 255+00.0 (Lt.)	=	_____
9999903Q	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 255+00.0 (Rt.)	=	_____
9999903R	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 274+50.0 (Rt.)	=	_____
9999903S	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Lt.)	=	_____
9999903T	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Rt.)	=	_____
9999903U	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Lt.)	=	_____
9999903V	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Rt.)	=	_____
△1 9999906X	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE 1238 & 1239	=	_____
△1 9999907Y	LUMP SUM STRUCTURE (TOTAL)	EASTBOUND STRUCTURES (4)	=	_____
△1 9999908Z	LUMP SUM STRUCTURE (TOTAL)	WESTBOUND STRUCTURES (4)	=	_____
		PROJECT TOTAL	=	_____

TLBJ/jkg

ARIZONA DEPARTMENT OF TRANSPORTATION

ADVERTISEMENT FOR BIDS

BID OPENING: FRIDAY, APRIL 6, 1990 AT 11:00 A.M.

PROJECT NO.: IR-17-2(111)
TRACS NO.: 017 CN 399 H0212 04C
TERMINI: CORDES JUNCTION - FLAGSTAFF HIGHWAY
LOCATION: (Flagstaff T.I.)

PROJECT NO.: IR-40-4(123)
TRACS NO.: 040 CN 195 H0200 04C
TERMINI: FLAGSTAFF - HOLBROOK HIGHWAY
LOCATION: (U.S. 89A Overpass - Walnut Canyon T.I. - Eastbound)

PROJECT NO.: IR-40-4(131)
TRACS NO.: 040 CN 195 H0275 04C
TERMINI: FLAGSTAFF - HOLBROOK HIGHWAY
LOCATION: (U.S. 89A Overpass - Walnut Canyon T.I. - Westbound)

ROUTE NO.	MILEPOST	DISTRICT	ITEM NO.
Interstate 17 (NB-SB)	339.40 to 340.45	IV	0169
Interstate 40 (EB)	195.08 to 205.20	IV	0177
Interstate 40 (WB)	195.08 to 205.21	IV	0178

The location and description of the proposed work and the representative items and approximate quantities are as follows:

The proposed work for Project IR-17-2(111) is located in Coconino County approximately 2 miles South of the City of Flagstaff and beginning on Interstate Highway I-17 at Milepost 339.40, approximately 0.60 miles south of the Junction of I-17 and I-40 and proceeding north to Milepost 340.45. The work consists of milling off the the existing asphalt pavement, patching and sealing the existing Portland Cement Concrete Pavement, shoulder build-up, overlaying, installing guardrail, constructing new bridge parapets and other incidental work.

The proposed work for Project IR-40-4(123) is located in Coconino County on Interstate Highway I-40 beginning at Milepost 195.08, approximately 0.36 miles west of the Junction of I-17 and I-40 and proceeding east in the Eastbound Lanes of I-40 for approximately 10.11 miles, to milepost 205.20. The work consists of cracking and seating, patching and sealing the existing Portland Cement Concrete Pavement, overlaying with bituminous material, extending existing concrete box culverts, installing guardrail, edge drain, shoulder build-up, and other incidental work. In addition to the normal work on this project, thirteen test sections shall be built in accordance with the Strategic Highway Research Program requiring special considerations.

The proposed work for Project IR-40-4(131) is located in Coconino County on Interstate Highway I-40 beginning at Milepost 195.08, approximately 0.36 miles west of the Junction of I-17 and I-40 and proceeding east in the Westbound Lanes of I-40 for approximately 10.16 miles, to milepost 205.21. The work consists of cracking and seating, patching and sealing the existing Portland Cement Concrete Pavement, overlaying with bituminous material, extending existing concrete box culverts, installing guardrail, shoulder build-up, and other incidental work.

Removal of Asphaltic Concrete (Patches)	L.Sum	1
Removal of Asphaltic Concrete Pavement(Milling)	Sq.Yd	87,900
Roadway Excavation	Cu.Yd	55,407
Borrow	Cu.Yd	39,710
Shoulder Build-Up	L.Ft.	206,478
Portland Cement Concrete Pavement (10")	Sq.Yd	2,111
Crack & Seat Portland Cement Concrete Pavement	Sq.Yd	244,614
Grind Exist. Portland Cement Concrete Pavement	Sq Yd	7,400
Asphalt Cement (AC-20) (for 3/4" Mix)	Ton	4,710
Bituminous Tack Coat	Ton	414
Asphalt Rubber Material	Ton	4316
Mineral Admixture (for 3/4" Mix)	Ton	923
Asphalt Concrete (Rubberized)	Ton	54,834
Asphaltic Concrete Friction Course (Asphalt Rubber)	Ton	8348
Asphaltic Concrete (3/4"Mix) (End Product)	Ton	85,621
Pipe, Corrugated Metal	L.Ft	222
Flared End Section	Each	9
Prefaricated Concrete End Section	Each	210
Pipe (4) (ATED Laterials)	L.Ft	4261
Bridge Repair (Deck Joints)	L.Sum	2
Temporary Concrete Barrier	L.Ft	11,630
Pavement Marking (Hot Sprayed Thermoplastic) (0.60)	L.Ft.	330,400
Pavement Marker, Snowplowable	Each	1610
Loop Detector Traffic Counter System	Each	16
Seeding (Class II)	Acre	82
Chain Link Fence, Type 1 (60")	L.Ft.	2000
Barbed Wire Fence, Type I	L.Ft.	847
Guard Rail, Breakaway Cable Terminal	Each	66
Guard Rail, Anchor Assembly	Each	37
Construct Guard Rail Room Salvage	L.Ft.	2801
Reconstruct Guard Rail	L.Ft.	28,318
Guard Rail Transition To Bride Dado	Each	37
Concrete Bridge Barrier Transition	Each	25
Aggregate Trench Edge Drain (ATED)	L.Ft.	98,336
Provide Trainees With On-The-Job Training	Hour	5000
Construction Surveying and Layout	L.Sum	1
Formed Rumble Strip	L.Ft.	188,820
Provide Trainees with On-The-Job Training	Hour	5,000
Construct H.S.W.I.M. (High Speed Weigh In Motion)	L.Sum	1
Concrete Box Culvert - Extensions	L.Sum	19
Bridge Structures - Barrier	L.Sum	3

The completion date for the combined contract of Projects IR-17-2(111), IR-40-4 (123) and IR-40-4 (131) is set at (October 1, 1990 for STAGE I, and December 15, 1990 for STAGE II). The contract includes an abbreviated period for execution of contract and start of work.

The Arizona Department of Transportation hereby notifies all bidders that pursuant to this advertisement for bids, Disadvantaged Business Enterprises will be afforded full opportunity to submit bids in response to this solicitation and will not be discriminated against on the grounds of race, color, sex, or national origin in consideration for an award.

The minimum goals for participation by Disadvantaged Business Enterprises in the work, as a percentage of the total amount bid, shall be 10.0 .

Project plans, specifications, and proposal pamphlets may be purchased from Contracts and Specifications Services, 1651 W. Jackson, Room 121F, Phoenix, AZ 85007, (602) 255-7221. Plans and bidding documents should be available for sale to bidders within one week following the advertisement for bids. The cost is $65.00, payable at time of order by cash, check or money order. Please indicate whether a bid proposal package or a subcontractor/supplier set is desired. Checks should be made payable to the Arizona Department of Transportation. No refund will be made for plans and specifications returned. We cannot guarantee mail delivery.

Cross sections and/or earthwork quantity sheets, if available, may be ordered from the Control Desk of Highway Plans Services at 255-8667. Orders must be placed at least five days prior to bid opening to insure availability. Documents may be picked up and paid for at Contracts & Specifications Services.

No contracting firm will be issued a proposal pamphlet until it has become prequalified. The Application for Contractor Prequalification shall be filed at least 15 calendar days prior to the bid opening date. The Application may be obtained from Contracts and Specifications Services.

No award will be made to any contractor who is not a duly licensed contractor in accordance with Arizona Revised Statutes 32-1101 through 32-1170.03.

All labor employed on this project shall be paid in accordance with the minimum wage rates shown in the General Wage Decision No. AZ90-2. These rates have been determined in accordance with the requirements of the law and issued by the Secretary of Labor for this project. The wage scale is on file in Contracts and Specifications Services and copies may be obtained at all reasonable times.

A proposal guaranty in the form of either a certified or a cashier's check made payable to the State Treasurer of Arizona for not less than five percent of the amount of the bid or in the form of a surety (bid) bond for five percent of the amount of the bid shall accompany the proposal.

Surety (bid) bonds will be accepted only on the form provided by the Department and only from corporate sureties authorized to do business in Arizona.

SPECIAL PROVISIONS

ARIZONA PROJECTS

IR-17-2(111)

017 CN 339 H0212 04C

CORDES JUNCTION - FLAGSTAFF HIGHWAY

(Flagstaff T.I.)

AND

IR-40-4(123)

040 CN 195 H0200 04C

FLAGSTAFF - HOLBROOK HIGHWAY

(U.S. 89A Overpass - Walnut Canyon T.I. - Eastbound)

AND

IR-40-4(131)

040 CN 195 H0275 04C

FLAGSTAFF - HOLBROOK HIGHWAY

(U.S. 89A Overpass - Walnut Canyon T.I.- Westbound)

Proposal pamphlets shall be submitted <u>only</u> in the envelope provided by the Department to:

Arizona Department of Transportation
Highways Division
Contracts and Specifications Services
1651 West Jackson Street, Room 121-F
Phoenix, Arizona 85007-3276

Sealed bids will be received until the hour indicated and then publicly opened and read. No bids will be received after the time specified.

Engineering Specialist:	Thomas L. Buhr Jr.	(602) 255-8262
Construction Supervisor:	Don Dorman	(602) 774-9554
Design Supervisor:	John W. Carr	(602) 255-8660

DAVID R. ALLOCCO, Engineer-Manager
Contracts & Specifications Services

IR-17-2(111) 017 CN 399 H0212 04C
IR-40-4(123) 040 CN 195 H0200 04C
IR-40-4(131) 040 CN 195 H0275 04C
02-21-90
11-90
TLBJ/emg/0028v

MILL, REPLACE & ARAC

CRACK & SEAT PCCP AND OVERLAY

PROPOSED WORK:

IR-17-2(111)

The proposed work for Project IR-17-2(111) is located in Coconino County approximately 2 miles South of the City of Flagstaff and beginning on Interstate Highway I-17 at Milepost 339.40, approximately 0.60 miles south of the Junction of I 17 and I 40 and proceeding north to Milepost 340.45. The work consists of milling off the the existing asphalt pavement, patching and sealing the existing Portland Cement Concrete Pavement, shoulder build-up, overlaying, installing guardrail, constructing new bridge parapets and other incidental work.

IR-40-4(123)

The proposed work for Project IR-40-4(123) is located in Coconino County on Interstate Highway I-40 beginning at Milepost 195.08, approximately 0.36 miles west of the Junction of I 17 and I 40 and proceeding east in the Eastbound Lane of I 40 for approximately 10.11 miles, to Milepost 205.20. The work consists of cracking and seating, patching and sealing the existing Portland Cement Concrete Pavement, overlaying with bituminous material, extending existing concrete box culverts, installing guardrail, edge drain, shoulder build-up, and other incidental work. In addition to the normal work on this project, thirteen test sections shall be built in accordance with the Strategic Highway Research Program requiring special considerations.

IR-40-4(131)

The proposed work for Project IR-40-4(131) is located in Coconino County on Interstate Highway I-40 beginning at Milepost 195.08, approximately 0.36 miles west of the Junction of I 17 and I 40 and proceeding east in the Westbound Lane of I 40 for approximately 10.16 miles, to Milepost 205.21. The work consists of cracking, seating, patching and sealing the existing Portland Cement Concrete Pavement, overlaying with bituminous material, extending existing concrete box culverts, installing guardrail, shoulder build-up, and other incidental work.

(SPC87FA, 450/a, 11/24/89)

SPECIFICATIONS:

The work embraced herein shall be performed in accordance with the requirements of the following separate documents:

Arizona Department of Transportation, Highways Division, Standard Specifications for Road and Bridge Construction, Edition of 1987,

Arizona Department of Transportation, Highways Division, Standard Drawings, listed in the project plans and defined hereinafter,

Arizona Department of Transportation, Traffic Control Manual for Highway Construction and Maintenance, January, 1989,

Manual on Uniform Traffic Control Devices for Streets and Highways, 1978, and Amendments, and

The Proposal Pamphlet and Non-bid Pamphlet which include the following documents:

These Special Provisions,

SUPPLEMENTAL SPECIFICATIONS, WIM System Applications Report Formats, Weight Violation Tablets, and Load Equivalencies Tables.

Required Contract Provisions All Federal-Aid Construction Contracts (Form PR 1273 Revised August, 1989),

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246), July 1, 1978, Revised November 3, 1980 and Revised April 15, 1981,

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246), July 1, 1978, Revised November 3, 1980 and Revised April 15, 1981,

Compliance Reports, Federal-Aid Projects, February 1, 1977, Revised July 1, 1978, Revised November 3, 1980, Revised April 15, 1981, and Revised September 7, 1983,

Additional Required Contract Provisions Federal-Aid Contracts, Training Special Provisions, August 15, 1975,

Federal-Aid Proposal (Notices to Prospective Federal-Aid Construction Contractors), September 29, 1975,

Wage Determination Decision,

Bidding Schedule,

Included in the Proposal Pamphlet only:

Proposal,

Surety (Bid) Bond, 12-1303,

Certification With Regard to the Performance of Previous Contracts or Subcontracts Subject to the Equal Opportunity Clause and the Filing of Required Reports, Federal Aid Projects, April, 1969, Rev. 03-31-89,

Affidavit-Disadvantaged Business Enterprises,

Certification With Respect to the Receipt of Addendums,

Affidavit by contractor certifying that there was no collusion in bidding for contract, and

Performance Bond (to be executed with the use of Pits under the jurisdiction of the State Land Department), April 8, 1976.

BID SUBMISSION

In submitting a bid, the holder of a Bid Proposal Pamphlet shall completely execute the following documents:

Proposal,

Bidding Schedule,

Surety (Bid) Bond, 12-1303,

Certification With Regard to the Performance of Previous Contracts or Subcontracts Subject to the Equal Opportunity Clause and the Filing of Required Reports, Federal Aid Projects, April, 1969, Rev. 03-31-89,

Affidavit-Disadvantaged Business Enterprises,

Certification With Respect to the Receipt of Addendums, and

Affidavit by contractor certifying that there was no collusion in bidding for contract.

PROPOSAL GUARANTY:

Each bidder is advised to satisfy himself as to the character and the amount of the proposal guaranty required in the Advertisement for Bids.

CONTRACT DOCUMENTS:

The bidder to whom an award is made will be required to execute a Performance Bond and a Payment Bond, each in 100 percent of the amount of his bid, an Insurance Certificate and the Contract Agreement.

A copy of these documents is not included in the Proposal Pamphlet which is furnished to prospective bidders; however, each bidder shall satisfy himself as to the requirements of each document.

The documents, approved by the Department of Transportation, Highways Division, are identified as follows:

Statutory Performance Bond, 12-1301, December, 1975
Statutory Payment Bond, 12-1302, December, 1975
Contract Agreement, 12-0912, January, 1986
Certificate of Insurance, 12-0100, June, 1985

A copy of each document may be obtained by making a request to Contracts and Specifications Services.

REQUIRED CONTRACT PROVISIONS:

The statement of materials and labor, Form PR-47, required on Federal-aid projects will not be required when the contract amount is under $1,000,000.00.

COPIES OF PROJECT DOCUMENTS:

Distribution of a limited number of plans and Special Provisions will be made to the successful low bidder, at no charge, following confirmation of bid prices and DBE submittal, if applicable. The distribution will be made on the following basis:

CONTRACT SIZE (DOLLARS)	FULL SIZE PLANS	1/2 SIZE PLANS	BOUND BID BOOKS	UNBOUND BID BOOKS
$0 - $10,000,000	2	25	5	25
over $10,000,000	5	50	5	50

These plans and Special Provisions will be set aside and designated for use by the low bidder along with an equal number held in reserve for the responsible District Office. In the event that excess documents remain following bid opening, the additional documents will be evenly split between the low bidder and the A.D.O.T. District Office.

Any additional plans or Special Provisions that the low bidder may require beyond the above distribution will be available at the invoice cost of printing by ordering thru the Engineer.

MATERIAL AND SITE INFORMATION:

Projects requiring materials, excavation, or site investigation may have additional information available concerning the material investigations of the project site and adjacent projects. This information, when available and applicable, may be examined in the Office of the Assistant State Engineer, Materials Section, 206 S. 17th Avenue, Phoenix, Arizona 85007. This information will not be attached to the contract documents. Copies of available information may be purchased by prospective bidders.

ADDENDUM TO FEDERAL FORM PR1273:

Additional to Section IV - PAYMENT OF PREDETERMINED MINIMUM WAGES:

> Donee's, buyers or other parties, except for truck owner-operators, engaged only in the removal of excavated material from federal aid projects are considered as subcontractors within the meaning of the Davis-Bacon Act and are therefore subject to the Wage Determination Decision contained herein.

(EPRISE, 450/e, 05/31/89)

DISADVANTAGED BUSINESS ENTERPRISES:

Purpose:

The following is the statement of policy by the United States Department of Transportation, Title 49 of the Code of Federal Regulations, Part 23.43 (a) (1) and (2):

> "(1) Policy. It is the policy of the Department of Transportation that minority business enterprises as defined in 49 CFR Part 23 shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal funds under this agreement. Consequently, the MBE requirements of 49 CFR Part 23 apply to this agreement."

"(2) DBE Obligation. (i) The recipient or its contractor agrees to ensure that disadvantaged business enterprises as defined in 49 CFR Part 23 have the maximum opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with Federal funds provided under this agreement. In this regard all recipients or contractors shall take all necessary and reasonable steps in accordance with 49 CFR Part 23 to ensure that minority business enterprises have the maximum opportunity to compete for and perform contracts. Recipients and their contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of DOT-assisted contracts."

The contractor is notified that the provisions of Title 49 of the Code of Federal Regulations, Part 23, apply to Socially and Economically Disadvantaged Business Enterprises (DBEs).

It is the policy of the Arizona Department of Transportation (Department) that Socially and Economically Disadvantaged Business Enterprises (DBEs) shall have maximum opportunity to participate as contractors, subcontractors, suppliers, or vendors in the performance of contracts financed in whole or in part with Federal funds. The provisions of this contract will be interpreted in accordance with this policy.

Definitions:

1. Disadvantaged Business Enterprise (DBE):

A small business concern, as defined pursuant to Section 3 of the Small Business Act and implementing regulations, (a) which is at least 51 percent owned by one or more socially and economically disadvantaged individuals or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more socially and economically disadvantaged individuals; and (b) whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

2. Socially and Economically Disadvantaged Individuals:

Those individuals who are citizens of the United States (or lawfully admitted permanent residents) and who are women, Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans, or other minorities or individuals found to be disadvantaged by the Small Business Administration pursuant to Section 8(a) of the Small Business Act. The Department makes a rebuttable presumption that individuals in the following groups are socially and economically disadvantaged. The Department may also determine, on a case by case basis, that individuals who are not members of one of the following groups are socially and economically disadvantaged:

(a) "Women,"

(b) "Black Americans," which includes persons having origins in any of the Black racial groups of Africa;

(c) "Hispanic Americans," which includes persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish or Portuguese cultures or origins, regardless of race;

(d) "Native Americans," which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians;

(e) "Asian-Pacific Americans," which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific and the Northern Marianas; and

(f) "Asian-Indian Americans," which includes persons whose origins are from India, Pakistan, and Bangladesh.

3. Joint Venture:

An association of two or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills, and knowledge.

A joint venture is eligible for certification if the DBE partner of the joint venture meets the standards for an eligible DBE set forth in above and in 49 CFR 23.53 and the DBE partner is responsible for a clearly defined portion of the work to be performed and shares in the ownership, control, management responsibilities, risks, and profits commensurate with its share of the joint venture.

Organizations Working with DBEs:

Listed below are the names of some agencies that are actively working with DBEs and assisting them in their efforts to participate in the highway construction program. All bidders should contact these agencies and work with them in all of their efforts to ensure maximum participation of DBEs in the construction program of the Department.

Applied Business Concepts, Inc.
5201 North 19th Avenue, Suite 122
Phoenix, AZ 85015
Phone (602) 249-0793

Arizona Department of Transportation
Affirmative Action Office
206 South 17th Avenue, Room 154A
Phoenix, AZ 85007
Phone (602) 255-7761

The contractor is also encouraged to contact other community organizations.

Applicability:

These provisions are applicable to all bidders including DBE bidders. A successful bid submitted by a certified DBE as a prime contractor shall be presumed to have met the prescribed DBE participation goal. As a prime contractor, a DBE shall perform a significant portion of the contract work with its own work force in accordance with normal industry practices and Subsection 108.01 - Subletting of Contract.

Certification:

Certification as a DBE or a DBE joint venture shall be predicated on:

1. The completion and execution of a "Disadvantaged Business Enterprise Application" and a "Disadvantaged Business Enterprise Disclosure Affidavit (Schedule A)", or a "Disadvantaged Business Enterprise Joint Venture Disclosure Affidavit (Schedule B)", as appropriate.

2. The submission of documents pertaining to the firm(s) as stated in the application(s).

3. The submission of any additional information which the Department may require to determine the firm's eligibility to participate in the DBE program.

Applications for certification may be filed with the Department at any time; however, completed applications shall be submitted by a DBE at least 10 working days prior to the bid opening for the project on which the DBE seeks to participate. A DBE must be certified by the Department at least five working days prior to the bid opening for a project to be eligible to participate as a DBE on that project. The Department will process applications in an expeditious manner, but is not committed to certify DBEs within any given period of time.

Application forms for certification are available at the Department's Affirmative Action Office, 206 South 17th Avenue, Room 154A, Phoenix, Arizona 85007. Phone (602) 255-7761.

Applicants for certification as DBEs shall agree to permit the Department to audit and examine the books, records, and files of the business which is applying for certification.

The Department recognizes only those businesses which have been certified by the Department, or certified by the Small Business Administration in accordance with Section 8(a) of the Small Business Act. DBE certifications by other Arizona agencies or by similar out-of-state transportation agencies will not be sufficient; the Department or the Small Business Administration (under Section 8 (a)) must first certify the DBE.

The names, addresses, dates of certification, and types of work performed by Department-certified DBEs will be listed in the Department's Directory of DBEs. Copies of the Directory will be available to the public at the Affirmative Action Office, 206 South 17th Avenue, Room 154A, Phoenix, Arizona 85007. Phone (602) 255-7761.

The Department maintains two lists of certified DBEs. The list that is made available to plan holders prior to bid openings has the names, addresses, phone numbers, and types of work performed for firms that have provided copies of their registrations or licenses, if required to perform on highway construction jobs. Information concerning contractor licensing and/or professional registration was obtained from the DBEs. ADOT does not guarantee the accuracy and/or completeness of the information nor does ADOT represent that any licenses or registrations are appropriate for the work to be done.

The second list contains certified DBEs who have not demonstrated to ADOT they are licensed and/or registered. This list is available upon request. However, the contractor bears all risks if it chooses to contract with a firm that does not have a license. If a DBE cannot complete its work due to failure to obtain or maintain its licensing, the contractor assumes liability to replace the DBE with another DBE.

The Department certifies firms according to their ownership and control. The Department does not certify firms according to their qualifications and/or abilities.

General:

Proposals submitted in variance with these provisions will be considered nonresponsive. Noncompliance with these provisions by the contractor will result in remedial action as herein set forth.

TIME IS OF THE ESSENCE IN RESPECT TO THE DBE PROVISIONS.

Agreements between the bidder and a DBE in which the DBE promises not to provide subcontracting quotations to other bidders are prohibited.

Each contractor shall establish a program which will effectively promote increased participation by DBEs in the performance of contracts and subcontracts. Each contractor shall also designate a fulltime employee who shall be responsible for the administration of the contractor's DBE program.

DBE Participation:

A DBE may participate as a prime contractor, subcontractor, joint venture partner with either a prime contractor or a subcontractor, or as a vendor of materials or supplies. A DBE joint venture partner shall be responsible for a clearly defined portion of the work to be performed, in addition to meeting the requirements for ownership and control.

A DBE second-tier subcontractor to a non-DBE will not be counted toward meeting the DBE goals.

The contractor shall, as a minimum, seek DBEs in the same geographic area in which it generally seeks subcontractors for a given project. If the contractor cannot meet the goals using DBEs from this geographic area, the contractor, as part of its effort to meet the goals, shall expand its search to a reasonably wider geographic area.

Goals:

The minimum goals for participation by DBEs on this project are as follows:

Ownership and Control	Percent of the Total Bid
DBEs	10.0

Counting DBE Participation Toward Meeting Goals:

Once a firm is determined to be an eligible DBE in accordance with these provisions, the total dollar value of the contract awarded to the firm is counted toward the goal subject to the conditions stated below.

The dollar amount of work to be accomplished by DBEs, including partial amount of a lump sum or other similar item, shall be on the basis of subcontract, purchase order, hourly rate, rate per ton, etc., as agreed to between parties, however, any dollar amount of work to be accomplished by DBE's in excess of the amount which would be paid based on contract unit bid prices will not count toward the established goal.

The contractor may count toward the goal, a portion of the total value of a contract with a joint venture, eligible under the standards of this subpart, equal to the percentage of the ownership and control of the DBE partner(s) in the joint venture.

The contractor may not count second-tier subcontracts to DBEs toward the goal.

A successful bid submitted by a certified DBE as a prime contractor shall be presumed to have met the prescribed DBE participation goal. As a prime contractor, a DBE shall perform a significant portion of the contract work with its own work force in accordance with normal industry practices and Subsection 108.01 - Subletting of Contract.

A DBE subcontractor may enter into second-tier subcontracts which are consistent with normal industry practices. However, items which are second-tier subcontracted by a certified DBE subcontractor will not be counted toward the participation goal unless:

1. That work is second-tier subcontracted to another certified DBE; or,

2. No more than 30 percent of the DBE subcontract is second-tiered to non-DBE.

A DBE subcontractor shall perform a commercially- useful function; that is, the firm shall be responsible for the execution of a distinct element of the work and shall carry out its responsibility by actually performing, managing, and supervising the work involved. To determine whether a DBE subcontractor is performing a commercially-useful function, the Department will evaluate the amount of work subcontracted and other relevant factors. If a DBE subcontractor further subcontracts a greater portion of the work than the above Department policy, the DBE subcontractor shall be presumed not to be performing a commercially-useful function.

Notwithstanding the foregoing criteria, if any item is subcontracted by a DBE subcontractor to a non-DBE beyond that percentage stated above, no credit will be given toward the participation goal for that specific item.

A contractor may count toward its DBE goal, 60 percent of its expenditures for materials and supplies required under a contract and obtained from a DBE regular dealer, and 100 percent of such expenditures to a DBE manufacturer.

A manufacturer is a firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the contractor.

A regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. To be a regular dealer, the firm must engage in, as its principal business, and in its own name, the purchase and sale of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns or operates distribution equipment. Brokers and packagers shall not be regarded as manufacturers or regular dealers within the meaning of this section.

A contractor may count toward its DBE goal, the following expenditures to DBE firms that are not manufacturers or regular dealers:

1. The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

2. The fees charged for delivery of materials and supplies required on a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by the recipient to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Credit for trucking by DBE will include only that amount of work actually performed by the DBE with its own personnel and with equipment owned by the DBE, except such equipment as described in the following paragraph.

A DBE owner/operator may augment its fleet by leasing or subcontracting from other owner-operators. However, the amount leased or subcontracted will not be counted toward the participation goal unless:

a) The trucks are leased from another certified DBE; or

b) No more than 30 percent of the DBE's fleet is leased or subcontracted from non-DBE.

If any item is leased or subcontracted by a DBE owner/operator from a non-DBE beyond the percentage stated above, no credit will be given toward the participation goal for that specific item.

A DBE owner/operator must perform a commercially- useful function and carry its responsibility by actually performing, managing and supervising the work. All employees under the subcontract must be on the DBE owner-operator payroll.

3. The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract, provided that the fee or commission is determined by the recipient to be reasonable and not excessive as compared with fees customarily allowed for similar services.

The Department's determination as to the amount of DBE credit to be received shall be final.

Submission with Bids:

All bidders shall certify in bid proposal on the "Disadvantaged Business Enterprise Assurances Affidavit" that the established goal(s) for DBE participation will be met or exceeded OR good faith efforts have been made.

BIDS SUBMITTED WITH UNSIGNED AND/OR NON-EXECUTED AFFIDAVITS WILL BE CONSIDERED NONRESPONSIVE.

Subsequent Detailed Submissions:

The apparent low bidder shall submit to the Affirmative Action Office no later than 4:00 P.M., on the fifth working day following the bid opening the "DBE Intended Participation Affidavit."

This affidavit must indicate that that bidder will meet or exceed the DBE goal if this was indicated on the submittal with the bid. However, if the bidder indicated a good faith effort with the bid, then the bidder must submit a documented good faith effort at this time.

FAILURE TO SUBMIT THE REQUIRED INFORMATION BY THE STATED TIME AND IN THE MANNER HEREIN SPECIFIED SHALL BE CAUSE FOR THE APPARENT LOW BIDDER TO BE INELIGIBLE TO RECEIVE AWARD OF CONTRACT AND THE PROPOSAL GUARANTEE SHALL BE FORFEITED.

The total dollar amount to be credited toward each goal will equal or exceed the goal established for this contract, or the apparent low bidder shall demonstrate that a good faith effort to meet the goal was made as described below.

The affidavit must be accurate and complete in every detail. The contractor must indicate the DBE's ADOT certification number, the firm's name, a general description of the work, and the proposed subcontract amount. ONLY THOSE DBE BUSINESSES CERTIFIED AT LEAST FIVE (5) WORKING DAYS PRIOR TO BID OPENING WILL BE CONSIDERED. It shall be the bidder's responsibility to ascertain the certification status of designated DBE's.

A Department-certified DBE prime contractor who is the apparent low bidder will not be required to indicate DBE participation.

The contractor shall provide the Affirmative Action Office at the pre-construction conference copies of completed and signed subcontracts, purchase orders, invoices, etc. with the appropriate DBEs.

Use of a DBE named on the "DBE Intended Participation Affidavit" is a condition of award. Substitution will not be allowed without written evidence from the prime contractor and/or DBE that the DBE is unable or unwilling to perform.

Documentation of Good Faith Effort:

If a bidder is not able to meet the DBE goals, documentation shall be submitted demonstrating actions taken in an effort to meet the goals by 4:00 P.M. on the fifth working day following the bid opening. Such documentation shall include not only the various types of efforts that the bidder has made to meet the DBE goals, but also the quantity and intensity of such efforts.

The contractor shall, as a minimum, seek DBEs in the same geographic area in which it generally seeks subcontractors for a given project. If the contractor cannot meet the goals using DBEs from this geographic area, the contractor, as part of its effort to meet the goals, shall expand its search to a reasonably wider geographic area.

Efforts that will be considered by the Department to determine if the contractor has made a good faith effort to meet the DBE goals shall include, but not be limited to, the following:

(1) Whether the contractor attended any pre-solicitation or pre-bid meetings that were scheduled by the Department to inform DBEs of contracting and subcontracting opportunities;

(2) Whether the contractor advertised in general circulation media, trade association publications, and minority-focus media concerning the subcontracting opportunities;

(3) Whether the contractor provided written notice to a reasonable number of specific DBEs, stating that their interest in the contract was being solicited, in sufficient time to allow the DBEs to participate effectively;

(4) Whether the contractor followed up initial solicitations of interest by contacting DBEs to determine with certainty whether the DBEs were interested;

(5) Whether the contractor selected portions of the work to be performed by DBEs so as to increase the likelihood of meeting the DBE goals (including, where appropriate, sub-dividing contracts into economically feasible units to facilitate DBE participation);

(6) Whether the contractor provided interested DBEs with adequate information about the plans, specifications and requirements of the contract;

(7) Whether the contractor negotiated in good faith with interested DBEs, not rejecting DBEs as unqualified without sound reasons based on a thorough investigation of their capabilities;

(8) Whether the contractor made efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance required by the Department or contractor;

(9) Whether the contractor effectively used the services of available community organizations; minority contractors' groups; and local, state, and federal minority business assistance offices.

When considering whether the bidder made a good faith effort to meet Department-established DBE goals, the Department will also consider the extent to which other bidders obtained DBE participation.

Award of Contract:

The contract, if awarded, will be made to the lowest responsible bidder whose bid is satisfactory. If it is determined that the apparent low bidder is not the lowest responsible and/or satisfactory bidder, whether under these provisions or for any other reasons, there will be a new apparent low bidder. The new apparent low bidder will be notified immediately by the Affirmative Action Office. The new apparent low bidder shall submit its subsequent detailed submission as set forth herein, within five (5) working days after notification.

The Director will award the contract as authorized by the State Transportation Board. The award of the contract will be administratively final.

Contract Performance:

Contract items of work designated by the contractor to be awarded to DBEs shall be performed by the designated DBE or a Department-approved DBE substitute. DBE contract work items shall not be performed by the contractor, in lieu of subcontracting, without approval of the Department. Contract items of work eliminated from the project with the approval of the Engineer will not reduce the contractor's credit for DBE participation.

The Department reserves the right to inspect all records of the contractor and all records of the DBEs concerning this contract.

Non-Performance by DBEs:

In the event a DBE is unable or unwilling to fulfill its agreement with the contractor, the contractor shall immediately notify the Engineer and provide all facts surrounding the matter. Such failure on the part of a DBE will not relieve the contractor of responsibility for meeting the DBE participation goal on the contract. The contractor shall immediately make reasonable good faith efforts to obtain another certified DBE to perform an equal or greater dollar value of work. The substitute DBE's name, description of work, and dollar value of work shall be submitted to the Department, and the Department's approval obtained prior to the substitute DBE beginning the work.

Unless the State Engineer finds the termination of the DBE's subcontract was the fault of the prime contractor, or was the result of the prime contractor's bad faith, the Department may bear reasonable actual administration costs associated with obtaining a substitute DBE, such as solicitation, staff time, and postage. It shall be the prime contractor's responsibility to provide the Department with documentation of these costs.

In the event a prime contractor is unable to obtain another certified DBE, the Department may lower the DBE goal on the project.

Compliance:

The contractor shall submit at the completion of the project the "Certification of Payments to DBE Firms Affidavit" for each firm used to meet the DBE goal. This affidavit shall be signed by the prime contractor and the relevant DBE.

Sanctions:

If the Department determines that the contractor has failed to make sufficient reasonable efforts to meet contract DBE goals, or to otherwise carry out DBE special provisions, such failure shall constitute a breach of contract and may result in termination of the contract, or any such other remedy as the Engineer deems appropriate.

(MENTOR, CS, 09/01/87)

MENTOR-PROTEGE PROGRAM

Description:

Purpose:

The Mentor-Protege program is an initiative to encourage and develop disadvantaged businesses in the highway construction industry. The program will permit contractors to provide certain types of assistance to certified Disadvantaged Business Enterprise (DBE) subcontractors on highway construction projects.

The program is intended to increase legitimate DBE activities and is not intended to diminish nor circumvent existing DBE rules or regulations. Abuse of this program may be used as the basis for actions against both categories of firms including suspension or debarment.

Policy:

It is the policy of ADOT that contractors and certified DBE subcontractors may engage in a Mentor-Protege agreement under certain conditions. Such an agreement must be mutually beneficial to both parties and ADOT in fulfilling requirements of 49 Code of Federal Regulations Part 23.

Definitions:

DBE: The definition, status, and requirements of DBE firms are defined by 49 CFR Part 23. Please also refer to the special provision entitled "Disadvantaged Business Enterprises".

Mentor: A designated contractor who oversees the development of a designated DBE subcontractor by training, counseling, assisting, and sponsoring the DBE firm in an ADOT approved Mentor-Protege Program.

Protege: An ADOT-certified DBE subcontractor who is guided by a mentor through training and specialized assistance to gain experience, develop expertise in highway construction, and attain general business growth in an approved mentor-protege program.

Mentor-Protege Development Plan: A detailed plan outlining a management agreement between a contractor (who agrees to serve as a mentor) and a DBE subcontractor (who agrees to serve as a protege).

Implementation:

Approval Process:

1. When a contractor and DBE agree to engage in a Mentor-Protege Development Plan Agreement, ADOT Affirmative Action Office will be notified by either party for the purpose of (a) reviewing requirements of STAA, 49 CFR part 23, and Mentor-Protege program; (b) establishing timeline for processing Agreement; (c) preliminary review of Agreement objective(s) and duration; and (d) reporting requirements. (A copy of the suggested form of agreement is included in these special provisions).

2. A completed Mentor-Protege Development Plan will be submitted to ADOT within 30 days following the initial review. Approval of the Agreement by ADOT will be in two stages:

a) General approval of Agreement by ADOT within 15 working days following submission of Agreement.

b) Approval of working plan for the designated project where a mentor-protege development plan will be implemented.

3. Duration of a Mentor-Protege Development Plan may exceed that of a single project, not to exceed three years. Duration of a working plan may exceed that of a single project. However, the continued use of an existing working plan must be approved by the ADOT Affirmative Action Office prior to beginning work on a new project.

4. The Mentor-Protege program is not intended to provide DBE firms with a means to avoid management and operational responsibilities. Mentors cannot be responsible for the management of DBE proteges. Under the program, all administrative functions must be performed by personnel responsible to or employed by protege. The protege must retain final decision making responsibilities.

5. Mentor and protege shall agree to an interview by ADOT Affirmative Action Office during the development of the Mentor-Protege Development Plan.

6. Mentor and protege shall agree to evaluations by ADOT. The frequency and method will depend on the project.

Content of Mentor-Protege Development Plan:

A mentor-Protege Development Plan Agreement shall address the following:

1. Areas of Assistance: Identify the specific areas in which the protege requires assistance.

2. Schedule of Assistance: Develop an Action Plan which defines the types and scope of assistance the mentor will provide to meet the protege's needs.

3. Responsibilities: Define the responsibilities of the mentor and the protege in each of the activities.

4. Benchmarks: Include measurable benchmarks to be reached by the protege at successive stages of the plan.

5. Evaluation: Provide formal evaluations of the protege's attainment of benchmarks. Evaluations must be made by both the mentor and the protege and reviewed by ADOT.

6. Duration: Specify the maximum timeframe the development plan agreement can remain in effect not to exceed three years.

7. Assurances - Provide assurances that all agreements, oral and written, pertaining to the Mentor-Protege program do not improperly obtain the benefits of the DBE program.

8. Key Personnel: Identify mentor's representative(s) responsible for training and/or coordinating the assistance provided to the protege.

9. Fees: Identify any fees paid as a condition of the agreement.

10. Copies of agreements - Attach copies of all bonding, security, lease agreements, notes, contracts, etc., made for the duration of the Mentor-Protege Plan.

Type of Assistance:

The type of assistance provided by contractors may include, but not be limited to:

1. Financial:

a) Working Capital Secured by Time Demand Notes or Stocks. Proteges acquiring working capital through the issuance of stocks must maintain no less than 51 percent ownership to maintain DBE certification. Time demand notes may be used to secure working capital. However, any abusive use of recall features will be cause for terminating program. Where working capital is secured by stocks or demand notes, a third party such as a bank could receive progress payments for work accomplished by the protege, made out jointly to the agent and the protege and make payments, on behalf of the protege, to material suppliers or for Federal and State payroll taxes, etc. In no case can the day-to-day control of the firm be relinquished by the disadvantaged owner as a requirement of the loan.

b) Bonding. Mentors may bond the entire job and charge a pro-rata share of the cost to the protege. Mentors may bond the entire job and carry the protege by absorbing the cost of the bond. Arrangements of the bonding must be included in the Schedule of Assistance.

2. Management Technical Assistance:

a) Assist in conducting a Protege Self-Assessment by areas to be strengthened for long-range planning of the protege firm.

b) Assist in developing business plan, loan packaging, and financial counseling.

c) Assist the protege in setting up a cost accounting system and train the protege's personnel to assume full control.

d) Provide training in plan interpretation, estimating, and materials supply function.

e) Provide guidance in general project management and related areas to make the protege aware of techniques to improve productivity and competitiveness and broaden knowledge of industry practices.

3. Operation:

a) Equipment/Facilities Use. Equipment and facilities may be furnished by mentor, provided that separate lease agreements are made and control over the equipment and facilities are under the supervision of protege.

b) Training of managers and specialists of the protege in state-of-the-art methods in the contracting industry.

c) Mentors may provide personnel with specialized expertise for a specific purpose and duration as outlined in the Action Plan. Such personnel must be on the protege's payroll and under direct supervision of the protege. Long term, continual, or repetitive use by a protege of personnel primarily employed by the mentor will be construed as an attempt to artificially inflate DBE participation and may be cause for termination of the mentor-protege agreement and decertification of the DBE.

General Practice:

1. Agreements may not include exclusive arrangements which limit competition.

2. DBE firms shall have the latitude to quote bids to other contractors.

3. The contractor and the DBE involved in a Mentor Protege agreement must remain separate and independent business entities.

4. Middlemen or passive conduits which serve no commercially useful function, or subcontractors acting essentially as brokers are unacceptable.

5. Formal or informal agreements which limit control and management by DBE firms are unacceptable.

6. Part ownership in a DBE firm by a non-disadvantaged entity, including a mentor, is permitted by the regulations (49 CFR 23) and may be necessary to ensure adequate capital and technical guidance of the DBE participant. However, any financial investment by the mentor must not create a situation wherein the mentor may assume control over the DBE firm.

Modifications:

Modifications to the Mentor-Protege Development Plan shall be subject to the approval of ADOT.

Termination:

The Mentor-Protege Development Plan may be terminated by mutual consent by both parties with notice to ADOT. ADOT may terminate approval of the Plan upon determination that:

1. The protege firm no longer meets the eligibility standards for certification as a DBE.

2. Either party has failed or is unable to meet its obligations under the Development Plan.

3. The DBE is not progressing or is not likely to progress in accordance with the Development Plan.

4. The DBE has reached a satisfactory level of self-sufficiency to compete without special treatment provided in the Development Plan.

In the event a Mentor Protege Development Plan is terminated, the contractor will remain responsible for the DBE goals established in the project Special Provisions.

ARIZONA DEPARTMENT OF TRANSPORTATION

Mentor-Protege Development Plan Agreement

PART ONE: General Agreement

This agreement entered into this _____ day of _____, 19__ in the city of _____, Arizona, by and between _____ (hereafter know as Mentor), and _____ (hereafter know as Protege), in accordance with rules and regulations of the Arizona Department of Transportation (ADOT) Mentor-Protege program, and in accordance with the requirements for increased Disadvantaged Business Enterprises (DBE) participation in the Surface Transportation Act of 1982 (STAA) and Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA).

This agreement is intended to cover the general relationship between the parties to insure compliance with STAA, STURAA, and ADOT guidelines, and to implement all provisions set forth in the Mentor-Protege Development Plan.

PART TWO: Assurances

2.1 Both mentor and protege will remain separate and independent business entities. Protege shall have the latitude to quote bids to other contractors.

2.2 Protege is an ADOT-certified DBE firm.

2.3 The Mentor-Protege program is not intended to provide DBEs with means to avoid management and operational responsibilities.

2.4 All agreements, oral and written, pertaining to this Mentor-Protege Plan Agreement do not cause the protege to improperly obtain the benefits of the DBE program.

PART THREE: Content of Plan

Both parties will agree to content of the plan which will include but not be limited to:

3.1 Exhibit A: Areas of Assistance--(Areas identified by both parties as the basis for providing assistance by mentor to protege.)

3.2 Exhibit B: Schedule of Assistance--An Action Plan developed by both parties defining the types and scope of assistance; responsibilities of mentor and protege in each activity; resources to be utilized; and measurable benchmarks to be reached by protege.

3.3 Exhibit C: Key Personnel--A list of mentor and protege representatives responsible for training and/or coordinating the Plan.

3.4 Exhibit D: Lease/Agreement(s)--Full copies of all lease agreements for equipment and facilities; financial agreements; and other agreements between the two parties and/or by third parties.

PART FOUR: Monitoring

4.1 Both parties hereby specifically consent to the monitoring of this contract by the appropriate federal and state officials or their agents, and to agree to cooperate with such agencies.

4.2 Both mentor and protege agree to evaluate the progress of the Plan at scheduled intervals with the results reviewed by ADOT.

PART FIVE: Duration

The duration of the Plan will coincide with the length of the project for which the plan was intended. Extended agreement plans shall not exceed a period of three years.

PART SIX: Modifications

None of these agreements may be modified except in writing signed by both parties and approved by ADOT.

PART SEVEN: Termination

The mentor or protege retains the right to terminate this agreement by showing cause in a written notice to all parties and ADOT. ADOT may terminate the approval of this agreement by showing cause in a written notice to mentor and protege. In the event of termination of agreement or termination of ADOT approval, the contractor will remain responsible for the DBE goals established in the project Special Provisions.

PART EIGHT: Privacy Act Provision

The information contained herein and on attachments is used for the ADOT Mentor-Protege Program only, and may not be disclosed without the express permission of all parties involved in this agreement.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed by their duly authorized officers on the day and year first above written.

Date	Mentor Firm (Authorized Official Name)	Signature

Date	Protege Firm (Authorized Official Name)	Signature

April 1987

ADDITIONS AND REVISIONS TO THE STANDARD SPECIFICATIONS:

(ERATA100, 454/1, 09/30/88)

STANDARD SPECIFICATIONS ERRATA:

The following changes shall be made to cover errors in the text of the Standard Specifications:

Page 27: The last sentence of the next-to-last paragraph shall read:

When such a condition is imposed, the contractor shall indicate the contractor's acceptance thereof in writing and such acceptance shall authorize the Department to deduct the contractor's share of the Department's costs from any monies due or that may become due to the contractor under the contract.

Page 41: The second sentence of Subsection 105.18(B) shall read:

Such demand for Arbitration shall be made by the claimant within 30 days measured from actual receipt of the State Engineer's decision, as provided for in Subsection 105.17 above.

The last sentence of Subsection 105.18(B) shall read:

The scope of the arbitration proceeding shall be restricted and limited to the matters presented to the State Engineer or authorized representative upon which the decision or determination was made and shall include no other matters.

The second sentence of Subsection 105.18(C) is hereby deleted.

In the last paragraph, the references to Subsections 108.07 and 108.08 are revised to read 108.08 and 108.09 .

Page 46: The first paragraph under Subsection 106.05(B), Certificate of Compliance: is revised to read:

The Engineer may permit the use of certain materials or manufactured assemblies prior to sampling and testing if those items are accompanied by Certificates of Compliance, stating that the materials involved comply in all respects with the requirements of the cited specifications. Such a certificate shall be furnished with each lot of material delivered to the project.

Item (7) of Subsection 106.05 (B) Certificate of Compliance: shall read:

The original signature of a person having legal authority to bind the manufacturer or supplier of the material. A reproduction is not acceptable. The signature shall be notarized.

Page 80: The ninth paragraph shall read:

Scales of acceptable size shall be furnished by the contractor and shall be sealed either by an inspector of the Department of Weights and Measures, State of Arizona, or by a registered service agency.

Page 111: The last paragraph of Subsection 203-5.04(A) shall read:

No measurement for payment will be made for structural excavation when structures are to be supported on piles or drilled shafts in new embankment sections.

Page 141: The last line of the first column of Table 305-2 shall read:

* less than 350

Page 145: The first sentence of the last paragraph of Subsection 401-3.03(C) shall read:

Forms shall remain in place until the day after placing the concrete and shall be removed in a manner that will prevent damage to the pavement.

Page 151: The second sentence of the third paragraph of Subsection 401-3.05(B) is hereby deleted.

Page 166: The first sentence of the first paragraph of Subsection 402-3.03 shall read:

Areas to be repaired will be designated by the Engineer and shall be repaired before any specified pavement grinding.

Page 260 The second sentence of the first paragraph of Subsection 409-5.02 shall read:

When such failure involves a deviation from the allowable asphalt property range, the payment to the contractor will be reduced by the amount determined through use of Table 404-1 of the Standard Specifications and the following formula:

Page 264: The first paragraph of Subsection 410-3.07 shall read:

At least three pneumatic rollers conforming to the requirements of Subsection 406-10.08 (A)(2) shall be provided to accomplish the required rolling, except that the minimum air pressure in each tire shall be 100 pounds per square inch.

Page 334: In the next-to-last paragraph under Subsection 601-3.03(A) the reference to Subsection 401-3.03(D) is changed to 401-3.04(D).

Page 337: In the last paragraph under Subsection 601-3.03(F) the reference to Subsection 401-3.03(D) is changed to 401-3.04(D).

Page 408: The last sentence of the last paragraph under Subsection 701-3.01 shall read:

All devices provided under this section which are lost, stolen, destroyed or are deemed unacceptable by the Engineer, while their use is required on the project, shall be replaced by the contractor and, except as hereinafter specified for temporary impact attenuators, at no additional cost to the Department.

Page 621: The second paragraph shall read:

Concrete shall be Class S portland cement concrete conforming to the requirements of Section 1006.

GENERAL NOTES AND REQUIREMENTS:

General Construction Requirements:

The contractor shall construct/place temporary transverse pavement ramps/tapers to allow traffic to flow smoothly over ending and beginning pavement elevation differences. These ramps/tapers shall be 50 feet long per every one (1) inch of elevation difference, with 50 foot minimum ramp/taper length. No measurement or direct payment will be made for these ramps/tapers, the cost being considered as included in the cost of contract items.

GENERAL REQUIREMENTS AND CONSTRUCTION SPECIFICATIONS FOR THE STRATEGIC HIGHWAY RESEARCH PROGRAM (SHRP):

These requirements apply only to the IR-40-4(123) Eastbound Project.

I. INTRODUCTION:

The contractor shall be aware that thirteen test sections are to be constructed between mileposts 202.1 and 204.2. These test sections are part of the Strategic Highway Research Program (SHRP). As such, they will require extraordinary compliance with the specifications to ensure the highest level of construction quality possible.

II. GENERAL COMMENTS:

All SHRP test sections will be completed within a single construction season between April 1 and October 1, 1990.

III. CONSTRUCTION SPECIFICATIONS:

1) Phasing:

PCCP surface preparation on test sections 5, 8, 10, 11, and 12 shall be completed first, followed by cracking and seating, and rubblization of the remaining sections as shown in the plans. Trench drain installation shall precede the crack and seat operations.

Cracking and seating of test sections 7 and 9 shall be delayed until such time that placement of the asphalt-rubber asphalt concrete overlay can be accomplished in conjunction with the asphalt concrete (3/4"Mix) (End Product) overlay.

Placement of the asphalt concrete (3/4"Mix) (End Product) overlay sections (i.e. test sections 1,2,3,4,5,6,8,10) will be accomplished next.

The first lift of asphalt concrete overlay placed prior to the unbonded concrete overlay will extend 3 inches beyond the existing outside shoulder (travel lane). This will provide a firm base upon which to form and construct the concrete pavement.

Construction of the unbonded concrete overlay within the test sections will not begin until all the asphalt concrete overlay has been completed except for test sections 7 and 9. The cracking and seating and overlay placement of test sections 7 and 9 may be accomplished separate from the remaining sections.

Construction of the unbonded concrete overlay will require milling out six inches of the eight inch newly placed asphalt concrete overlay in Test Section 2

Concrete placement for the unbonded concrete overlay will occur during daytime hours only.

Test section 1, which is designated for rubblization, will be utilized to verify the crack pattern for the crack and seat technique prior to rubblizing and prior to performing any crack and seat operations within the SHRP test sections.

The crack and seat spacing within the SHRP sections is different than the remainder of the project and therefore a verification process is necessary. The contractor will be required to demonstrate the suitability of his equipment and methodology to achieve the required crack spacing. Cores will be retrieved from this section to verify the adequacy of the cracking process as described elsewhere in these special provisions..

Asphalt concrete (3/4"Mix)(End Product) and asphalt-rubber asphalt concrete will only be placed within the SHRP test sections after a minimum of 5000 tons has been produced through the plant since the last calibration. This requirement is to ensure that the plant is calibrated and functioning properly prior to commencement of work within the test sections.

Additional Requirements: to ITEM 4010010 - PORTLAND CEMENT CONCRETE PAVEMENT:

The work under this item shall also consist of the removal and replacement of PCCP slabs or portions thereof as specified in section 402 of the Standard Specifications with the following additions:

The slab removal and replacement shall take place prior to any specified grinding and/or grooving.

The dowel bars shall be anchored to the existing slab with an approved epoxy. After the hole has been drilled, compressed air shall be used to clean and dry the hole prior to dowel placement. The epoxy shall be placed in the back of the dowel hole using a flexible tube or long nozzle that deposits the material to the rear of the dowel hole. The dowel shall be inserted into the hole with a slight twisting motion so that the material in the back of the hole is forced up and around the dowel bar. A retention disk shall be slipped tightly over the dowel to prevent the anchoring material from flowing out of the hole. The retention disk shall be as detailed on the Project Plans.

Approximately 104 full slabs will require full depth removal and replacement which totals approximately 2080 square yards. The existing PCCP is approximately 8-9 inches thick. The replacement slab shall be of equal thickness.

Approximately 25 partial slabs will require full depth removal and replacement which totals approximately 200 square yards.

Disposal of the existing PCCP removed shall be the responsibility of the Contractor. No measurement or payment will be made for removal or disposal, the cost being considered as included in the cost of the contract items.

Additional Requirements to ITEM 4010210 - CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT:

The work under this item shall also consist of furnishing all labor, equipment, tools, and materials necessary to crack and seat the SHRP Test Sections as shown in the plans and specified in these special provisions.

The crack and seat specifications described elsewhere in these special provisions will apply to the Test Sections with the following exceptions: The nominal crack spacing shall be 3 ft. by 3 ft. The requirement that no more than 20% of the pavement fragments shall be larger than 2 ft. is waived.

Test Section 1 shall be used to verify the acceptability of the contractor's procedures in accordance with the procedures described elsewhere in these special provisions. Upon successful demonstration of the methods, the Engineer will permit the contractor to begin crack and seat operations within the Test Sections.

Additional Requirements to ITEM 4020072 - REPAIR PORTLAND CEMENT CONCRETE PAVEMENT (Spalled Area):

The work under this item shall also consist of repairing spalled areas of the existing PCCP as specified in Section 402 of the Standard Specifications with the following exceptions:

Section 402-2.02(A) - The 2,000 p.s.i. required compressive strength does not apply to Accelerated Strength Portland Concrete patch material.

Section 402-2.02(B) - Delete this item. Accelerated strength portland cement concrete patch material will not be used.

Section 402-2.02 (C) - First paragraph deleted and replaced with: The Rapid Setting Patch Material shall be either Celtite 10-60 Celroc; Durapatch Highway Rapid setting patch material by L & M Construction Chemicals, Inc.; or Master Builder's Caltrans Formula Set 45.

Rapid setting patch material will be limited to the three brands specified above. Alternate brands will not be considered.

All rapid setting patch materials shall be extended by aggregate at the rate of 50% by weight of the dry components of the patch material. The aggregate shall be as designed for size No. 7 in accordance with AASHTO Standard Specification M 43.

Section 402-2.03(A) shall be revised as follows: Only 15 lb. chipping hammers will be allowed for the removal of concrete in spall repair areas.

Additional Requirements to ITEM 4020060 - SEAL CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT:

The work under this item shall also consist of renovating longitudinal and transverse joints in the existing Portland Cement Concrete Pavement and routing and sealing random cracks as specified in Section 402 of the Standard Specifications with the following exceptions:

Section 1011-8 Silicone Joint Sealant is deleted and the following is added:

Testing:

Silicone joint sealant shall be a low modulus silicone that is specifically formulated to seal Portland Cement Concrete Pavement joints. Silicone sealant shall be furnished in a one part formulation which is non-acid curing and shall meet the following physical requirements:

Test Method	Test	Material Requirement
ASTM D 412 (Method A, Die C)	Tensile Stress at 150% Elongation(1)	45 psi maximum/
ASTM D 412 (Method A, Die C)	Elongation (1)	700% minimum
ASTM D 2202	Flow	0.2 inch maximum
ASTM C 603	Extrusion Rate (ASTM C 920,Type S, Grade NS)	45 seconds maximum
ASTM D 792 (Method A)	Specific Gravity	1.150-1.515
ASTM C 679	Tack Free Time	35 to 75 minutes
ASTM D 2240 (Shore A)	Durometer Hardness	10 to 25
ASTM C 719 (Mortar Block)	Movement (2) (3)	+100% and -50% of the joint width. No Adhesive or cohesive failure after 10 cycles at standard conditions.

NOTE 1: Sample cured 7 days at 77 degrees F. +- 2 degrees F. and 50% +-5% relative humidity.

NOTE 2: Curing of specimens shall be in accordance with Article 7.2; any option or alternate condition will not be permitted.

NOTE 3: Section 8. Procedures shall be strictly adhered to through and including Article 8.5. The test procedure will then be considered concluded.

Packaging and Marking:

The sealant shall be delivered in the manufacturer's original sealed container. Each container shall have attached, intact, the original manufacturer's label. The label shall be tamper-proof, non-removable and shall be legibly marked with the manufacturer's name, the trade name of the sealer, the manufacturer's batch or production lot number, and the expiration date of the manufacturer's shelf life warranty. Sealant that has exceeded the shelf life may be retested (ASTM C 719) and recertified for 6 months from date of test completion. Retesting will be at the manufacturer's expense. Failure to meet specification requirements shall not be cause for claim or extension of the contract. The contractor shall be held liable for all costs incurred in procuring and testing of materials that are found to be outside specification requirements.

Field Performance:

Q17 The manufacture of the joint sealant shall demonstrate satisfactory field performance in Arizona of less than 1% total failure (either within the material or the adhesive bond to the joint face) after one year of service before the material shall be used.

Sampling:

All sealant to be used on the project shall be stockpiled at the site at least thirty (30) working days prior to use, or at least forty (40) working days prior to use if stockpiled at the vendor's place of business. This will allow twenty (20) days for laboratory testing to determine compliance. Subsequent deliveries shall be placed in separate stockpiles. The Engineer shall be notified when each stockpile has been established and is ready to be sampled. Not less than one random sample of each lot or batch number (minimum of 10 lbs. per sample) shall be taken. No material shall be placed until the Engineer has approved the material for placement.

Certification:

The contractor shall, at his expense, have the previously obtained sample tested by an independent laboratory. The testing laboratory shall be approved by the Engineer, shall be independent of the sealant manufacturer, and shall be under the supervision of a registered professional engineer. The contractor shall furnish to the Engineer certification by the approved testing laboratory that the production lot tested meets the specified requirements. A Certificate of Compliance and Certificate of Analysis conforming to the requirements of Subsection 106.05 shall be submitted.

The estimated quantity of the joints and random cracks requiring renovation and sealing are listed below:

Test Section No.	Description	Lin. Ft. of Renovation
5, 11	All Transverse and longitudinal joints except the outside edge joint	5634
5, 11	Random cracks requiring routing and sealing	1350*
8, 10	No joint or crack sealing	0
12	All Transverse and longitudinal joints except the outside edge joint	1350

*The random cracks to be renovated and sealed will be determined in the field by the Engineer. Any underrun or overrun will be paid for at the contract unit price. The contract unit price is non-negotiable.

Additional Requirements to Item 4020061 - SEAL EDGE OF PORTLAND CEMENT CONCRETE PAVEMENT:

The work under this item shall also consist of sawing or routing, and sealing the joint between the Portland Cement Concrete Pavement and the asphaltic concrete shoulder on the right and left side of the roadway as specified in Section 402 of the Standard Specifications.

Test Sections 5, 11 and 12 shall receive edge sealing.

The estimated quantity of edge joint to be sealed is 4290 linear feet.

Joint sealing shall utilize Craftco 231.

Additional Requirement to JOINT AND CRACK REPAIR (MINIMUM RESTORATION):

This work shall also consist of renovating longitudinal and transverse joints in the existing Portland Cement Concrete Pavement and routing and sealing random cracks as specified in Section 402 of the Standard Specifications with the following exceptions:

Joint Sealant shall conform to the requirements of Section 1011-3.

Section 1011-3-Joint Sealant (Hot-Poured) is revised as follows: The reference to ASTM D 3406 is deleted. The sealant shall be Craftco 231.

Test Sections 8 and 10 will not receive joint or crack sealing.

The estimated quantity of the joints and random cracks requiring renovation and sealing are listed below:

Test Section No.	Description	Lin. Ft. of Renovation
5,11	All Transverse and longitudinal joints except the outside edge joint	5634
5,11	Random cracks requiring routing and sealing	1350

*The random cracks to be renovated and sealed will be determined in the field by the Engineer. Any underrun or overrun will be paid for at the contract unit price. The contract unit price is non-negotiable.

Additional Requirement to PATCH REPAIR (MINIMUM RESTORATION):

This work shall also consist of restoring pavement ride qualities and structural section utilizing asphalt concrete in accordance with section 409 of the standard specifications and as directed by the Engineer except that 100% of the aggregate will pass the 1/2" sieve size.

Additional Requirement to JOINT SEALING (ASPHALT CONCRETE OVERLAY):

The work under this item consists of constructing sealed joints in the bituminous pavement overlay directly above the existing portland cement pavement joints. The joints shall be constructed by sawcutting and sealing with the specified sealant.

The contractor shall establish and permanently mark the locations of all transverse joints prior to placing the overlay. These marks shall be sufficient to precisely identify the transverse joint locations after overlay placement.

All joints in the new bituminous pavement shall be sawcut directly over the existing portland cement concrete pavement joints and sealed to a minimum depth of 5/8" and width of 1/2".

Sawed joints which deviate by one inch or more from the location of the underlying PCCP joint will be resawn at the contractor's expense.

Immediately prior to sealant application, the joints shall be thoroughly cleaned with high velocity compressed air or by other methods approved by the Engineer.

The equipment used in the application of sealant material shall be suitable for the intended purpose and will maintain a consistent, uniform, and homogeneous mixture throughout the joint sealant operation. The equipment shall be designed to provide a continuous supply so that operations may proceed without delays.

Sealant shall not be placed during wet weather or under other conditions which may adversely affect the operations. The sealant shall not be placed in joints which are wet. If weather condiditions are such as to adversely affect the operations, the Engineer will be the sole judge in determining whether or not the operations should cease.

Sealant shall be applied in accordance with the manufacturer's recommendations and the equipment used shall be as recommended by the manufacturer.

Joints will be sealed using Craftco 231.

SECTION 101 - DEFINITIONS AND TERMS:

101.01 Abbreviations: of the Standard Specifications is modified to add:

H.S.W.I.M.	- High Speed Weigh in Motion
ATED	- Aggregate Trench Edge Drain
SHRP	- Strategic Highway Research Program
AR-AC	- Asphalt Rubber - Aspahltic Concrete
PCCP	- Portland Cement Concrete Pavement
WIM	- Weigh-in-Motion
AR-ACFC	- Asphalt Rubber - Asphaltic Concrete Friction Course

(PLANS101, 450/m, 04/28/89)

101.34(A) Standard Drawings: of the Standard Specifications is revised to read:

Drawings approved for repetitive use, showing details to be used where appropriate.

All Standard Drawings approved by the Arizona Department of Transportation are listed in the project plans along with the latest revision dates, if any. The Standard Drawings are available in four separate bound sets: General Construction ("C") Standard Drawings; Structures Section Standard Drawings; Signing and Marking Standard Drawings; and Traffic Signal and Lighting Standard Drawings.

Standard Drawings are available from:

Records Administration Section
Engineering Records
Arizona Department of Transportation
1655 West Jackson, Room 112F
Phoenix, Arizona 85007
(602) 255-7498

The cost of each set of Standard Drawings is $5.00. Single copies of each drawing are also available at $0.15 each. The above costs include postage. The minimum mail order is $1.00.

SECTION 102 - BIDDING REQUIREMENTS AND CONDITIONS:

(NOBID102, 454/c, 04/14/89)

102.03 Suspension from Bidding: of the Standard Specifications is modified to add:

The signature of the bid proposal by a bidder constitutes the bidder's certification, under penalty of perjury under the laws of the United States, that the bidder, or any person associated therewith in the capacity of owner, partner, director, officer, principal investor, project director, manager, auditor, or any position involving the administration of federal funds, has not been, or is not currently, under suspension, debarment, voluntary exclusion or been determined ineligible by any federal agency within the past three years. Signature of the bid proposal also certifies, under penalty of perjury under the laws of the United States, that the bidder does not have a proposed debarment pending. In addition, signature of the bid proposal certifies that the bidder has not been indicted, convicted, or had a civil judgment rendered against (it) by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past three years.

Any exceptions to the above paragraph shall be noted and fully described on a separate sheet and attached to the bid proposal.

Included in the bid proposal pamphlet is an addendum to FHWA Form 1273, Required Contract Provisions, entitled "Appendix B - Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions", which has application to all lower tier transactions. Said addendum to Form 1273 shall be included by the contractor in all lower tier transactions. Submittal of a signed proposal by the lower tier subcontractor, supplier or vendor constitutes certification to all the stipulations therein.

(SURVY102, 454/n, 09/30/88)

102.06 Interpretation of Quantities in Bidding Schedule: the first sentence of the second paragraph of the Standard Specifications is revised to read:

When the contract provides for construction surveying and layout, the bidding schedule quantities for roadway excavation, drainage excavation and borrow, if applicable, will be considered to be the final quantities for payment for these items of work.

(EARTH102, CS, 09/01/87)

102.07 Examination of Plans, Specifications and Site of Work: of the Standard Specifications is modified to add:

A set of plans and earthwork quantity sheets will be available at Highway Plans Services, 205 South 17th Avenue, Room 108E, Phoenix, and at the project office responsible for the project, for contractors to review in the process of preparing bids for projects containing earthwork.

PRICE102, 450/C, 05/15/89

102.08 Preparation of Proposals: The first paragraph on page 17 of the Standard Specifications is revised to read:

The bidder shall specify a unit price, in figures, for each pay item for which a quantity is given in the Bidding Schedule and shall also show the amount extended, as the product of the quantity given and the unit price indicated for each bid item, in the column provided for that purpose. In the event that more than two decimal places are used in representing a unit price, all digits beyond the second decimal place will be truncated and the extended amount for the affected item(s) and the total bid will be recomputed accordingly. The total amount of the bid shall be obtained by adding the amounts of the several items. All of the figures shall be in ink or typed. In case of a discrepancy between a unit price and the amount extended, the unit price shall govern. All revisions or corrections to figures on the Bidding Schedule shall be initialed in ink by an authorized officer or agent of the bidder.

(IRRP102, 454/b, 08/24/89)

102.10 Irregular Proposals: the first paragraph of the Standard Specifications is revised to read:

Proposals may be considered irregular and may be rejected for any of the following reasons:

If any of the proposal documents show unauthorized alterations of words or figures.

If the proposal contains conditional or uncalled for alternate bids.

If the proposal documents contain unauthorized alterations of words or figures or erasures not initialed by the person or persons signing the proposal or if there is a submission of any kind which may tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.

If any of the unit prices quoted in the bidding schedule are unbalanced, either above or below the amount of a reasonable bid price, to the potential detriment of the Department.

SECTION 103 - AWARD AND EXECUTION OF CONTRACT:

(AWARD103, 450/o, 12/15/89)

103.02 Award of Contract: the first paragraph of the Standard Specifications is modified to add:

When a contract is funded, either wholly or in part, by federal funds, an award of contract may be made contingent upon the successful bidder obtaining an appropriate license from the State Registrar of Contractors, in accordance with Arizona Revised Statutes 32-1101 through 32-1170.03. The license must be obtained within 60 calendar days following opening of bid proposals. No adjustment in proposed bid prices or damages for delay will be allowed as a result of any delay caused by the lack of an appropriate license.

Failure to acquire the necessary licensing within the specified period of time shall result in either award to the next lowest responsible bidder, or re-advertisement of the contract, as may be in the best interests of the Department.

Licensing information is available from:

Registrar of Contractors
800 W. Washington, 6th Floor
Phoenix, Arizona 85007
Phone: (602) 542-1502

(QKST103, 0450/p 08/25/88)

103.06 Execution of Contract: of the Standard Specifications is revised to read:

The contract shall be signed by the successful bidder and returned, together with a satisfactory bond, within five calendar days after the date of the Notice of Award Letter.

The Department will execute the contract within ten calendar days after the date of the Notice of Award Letter. No contract shall be considered as effective until it has been fully executed by all the parties thereto.

103.07 Failure to Execute Contract: of the Standard Specifications is revised to read:

Failure to return a signed contract to the Department and file a satisfactory contract bond, as provided herein, within five calendar days after the date of the Notice of Award Letter, shall be just cause for the cancellation of the award and the forfeiture of the proposal guaranty which shall become the property of the Department, not as a penalty, but in liquidation of damages sustained. Award may then be made to the next responsible bidder or the work may be readvertised as the Department may decide.

SECTION 104 - SCOPE OF WORK:

(SCOPE104, 450/A, 04/28/89)

104.02 Alterations or Modifications To Contract: is revised to read:

(A) Significant Changes In The Character of Work:

(1) The Engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the project. Such changes in quantities and alterations shall not invalidate the contract nor release the surety, and the contractor agrees to perform the work as altered.

(2) If the alterations or changes in quantities significantly change the character of the work under the contract, whether or not changed by any such different quantities or alterations, an adjustment, excluding loss of anticipated profits, will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the contractor in such amount as the Engineer may determine to be fair and equitable.

(3) If the alterations or changes in quantities do not significantly change the character of the work to be performed under the contract, the altered work will be paid for as provided elsewhere in the contract.

(4) The term "significant change" shall be construed to apply only to the following circumstances:

(a) When the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction or

(b) When a major item of work, as defined elsewhere in the contract, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work performed.

(B) Suspensions of Work Ordered By The Engineer:

(1) If the performance of all or any portion of the work is suspended or delayed by the Engineer, in writing, for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the contractor shall submit to the Engineer, in writing, a request for adjustment within 7 calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.

(2) Upon receipt, the Engineer will evaluate the contractor's request. If the Engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment (excluding profit) and modify the contract in writing accordingly. The Engineer will notify the contractor of his/her determination whether or not an adjustment of the contract is warranted.

(3) No contract adjustment will be allowed unless the contractor has submitted the request for adjustment within the time prescribed.

(4) No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this contract.

(C) Differing Site Conditions:

(1) During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

(2) Upon written notification, the Engineer will investigate the conditions and if he/she determines that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding loss of anticipated profits, will be made and the contract modified in writing accordingly. The Engineer will notify the contractor of his/her determination whether or not an adjustment of the contract is warranted.

(3) No contract adjustment which results in a benefit to the contractor will be allowed unless the contractor has provided the required written notice.

(4) No contract adjustment will be allowed under this clause for any effects caused on unchanged work.

104.04 - Maintenance of Traffic: of the Standard Specifications is modified to add:

Traffic Control:

The contractor shall maintain a minimum of one lane of traffic per direction on I-40 at all times, unless otherwise permitted for roadway closures during blasting excavation. The contractor shall maintain one lane of traffic per direction on I-17 and I-40 at night, on weekends, on holidays, and/or as directed and approved by the Engineer.

In the event the contractor chooses to blast, traffic control shall conform to the traffic control plan and the following special provisions:

Traffic Control for Blasting:

The contractor shall furnish all necessary traffic control, personnel, signs, and equipment to ensure the safety of personnel at the job site, as well as the motoring public, in accordance with the 1989 ADOT Traffic Control Manual and the traffic control plan for a complete freeway closure.

The contractor shall use the traffic control plan for both the eastbound and westbound roadway closures.

Both the eastbound and westbound roadways shall be closed during the blasting operation. Closure of the east bound and westbound roadways, shall be limited to no more than 20 minutes. At or before the time this 20 minutes elapses, both lanes of one roadway and at least one lane and/or the adjacent shoulder of the other roadway shall be free of obstructions and opened to traffic.

If one lane closure is needed, the traffic control shall conform to Figure 6.11 on page 97 of the 1989 ADOT Traffic Control Manual. The contractor shall maintain full roadway widths at night, on weekends, on holidays, and as directed by the Engineer.

For each whole 5 minute increment of time more than 20 minutes of complete closure, of either the EB or WB roadway, the contractor shall be assessed a sum of $500.00 deducted from the overall cost.

Department of Public Safety - On Site:

D.P.S. officers shall be present at the job site at all times during traffic control and while the blasting work is in progress.

It is the responsibility of the contractor to make all necessary arrangements with the ADOT Engineer and the D.P.S. for the officers, according to the contractor's work schedule.

Contractor's use of DPS officers shall be in accordance to Section 701 of the Specifications.

SECTION 106 - CONTROL OF MATERIAL:

(QCONT106, 454/1, 05/31/89)

106.04 Tests and Acceptance of Material: of the Standard Specifications is revised to read:

(A) Department Quality Acceptance:

All materials will be inspected, tested and approved by the Engineer prior to incorporation in the work. Any work in which materials not previously approved are used shall be performed at the contractor's risk and may be considered as unauthorized and unacceptable and not subject to the payment provisions of the contract.

Materials will be sampled and tested by a qualified representative of the Department unless otherwise specified in the special provisions. Copies of all test results will be furnished to the contractor's representative at the contractor's request.

Whenever a reference is made in the specifications to an Arizona Test Method, it shall mean the test method in effect on the day the advertisement for bids for the work is dated.

Whenever a reference is made in the specifications to a Federal Specification, or to a specification or test designation of the American Association of State Highway and Transportation Officials, the American Society for Testing and Materials, or any other recognized national organization, it shall mean the year of adoption or latest revision of the specification or test designation in effect on the day the advertisement for bids for the work is dated.

(B) Contractor Quality Control:

(1) General:

Quality control measures sufficient to produce materials of acceptable quality are the responsibility of the contractor; however, the specifications for certain products require specific quality control requirements. When so specified, the contractor is required to provide and maintain a Quality Control Plan, along with all the personnel, equipment, supplies and facilities necessary to obtain samples, perform tests, and otherwise assure the quality of the product.

The contractor shall be prepared to discuss and present, at the preconstruction conference, his understanding of the quality control responsibilities for specific items as included in the contract. The contractor shall submit the Quality Control Plan, for the appropriate items, to the Engineer for approval, a minimum of ten working days prior to the start of related work. The contractor shall not start work on the subject items without an approved Quality Control Plan. No partial payment will be made for materials subject to specific quality control requirements without an approved Quality Control Plan. As a part of the process for approving the contractor's plan, the Engineer may require the contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

The contractor shall perform process control sampling, testing and inspection during all phases of the work and shall perform the process control sampling, testing and inspection at a rate sufficient to assure that the work conforms to the contract requirements. The contractor shall provide the Engineer a certification stating that all of the testing equipment to be used is properly calibrated and will meet the specifications applicable for the specified test procedures.

(2) Quality Control Laboratory:

The Plan must include a laboratory or laboratories meeting the requirements of the Departments "System for the Evaluation of Testing Laboratories". The requirements may be obtained from the Materials Section, 206 S. 17th Avenue, Phoenix, Arizona 85007.

Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect and review the contractor's laboratory facility. The Engineer will advise the contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting test results, the incorporation of the materials into the work will be halted immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

(3) Plan Administration and Technician Qualification:

The Plan shall be administered by an individual meeting one of the following requirements:

(a) Professional Engineer registered in Arizona with one year of highway experience acceptable to the Department.

(b) Engineer-In-Training certified by State of Arizona with two years of highway experience acceptable to the Department.

(c) An individual with three years of highway experience acceptable to the Department and with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

(d) Construction Materials Technician certified at Level III by NICET.

(e) Highway Materials Technician certified at Level III by NICET.

(f) Highway Construction Technician certified at Level III by NICET.

(g) A NICET certified Engineering Technician in Civil Engineering Technology with five years of highway experience acceptable to the Department.

The individual administering the plan must be a full time employee of the contractor or a consultant engaged by the contractor. In either case, the individual employed shall have full authority to institute any and all actions necessary for the successful operation of the plan. The contractor's employee or consultant may supervise the quality control plan on more than one project if that person can be at the job site within one hour after being notified of a problem.

The Process Control Technician (PCT) and Quality Control Technician QCT) performing the actual sampling, testing and/or inspection shall meet one of the following criteria:

(h) Construction Materials Technician certified at Level II or higher by NICET in appropriate subfield.

(i) Those listed under (a) through (g) above, meeting the criteria for Plan Administrator, if they have a demonstrated proficiency in performing the appropriate test(s) or inspection function.

(j) Construction Materials Technician trainee under direct observation of an individual listed in (h) or (i) above.

(4) Sampling:

The Plan shall contain a statistical based procedure of random sampling which provides that all material being produced have an equal chance of being selected for sampling and testing. The Engineer shall be provided the opportunity to witness all sampling.

When directed by the Engineer, the contractor shall sample and test any material which appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or corrected by the contractor. All sampling shall be in accordance with standard AASHTO, ASTM or Department procedures.

(5) Testing:

All testing shall be performed in accordance with the acceptance test procedures applicable to the specified contract items or other methods set forth in the Quality Control Plan and approved by the Engineer. Should acceptance test procedures not be applicable to quality control tests, the plan shall stipulate which tests procedures will be utilized. The contractor shall provide copies of all test results to the Engineer upon request. Test results shall be furnished to the Engineer on forms furnished by or otherwise meeting the approval of the Engineer.

(6) Records:

The contractor shall maintain complete testing and inspection records and make them available to the Department for review and copies as requested.

Linear control charts shall be maintained by the contractor. Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the upper and/or lower specification limit applicable to each test parameter, and the contractor's test results. The contractor shall use the control charts as part of a process control system for identifying production and equipment problems and for identifying potential pay factor reductions before they occur. If the contractor's projected data, during production, indicates a potential problem and the contractor is taking no satisfactory corrective action, the Engineer may halt production or acceptance of the material.

(DMAT106, 450/q, 02/24/88)

106.14 Domestic Materials:

Cement used on this project may be foreign or domestic.

The manufacturing processes to produce all steel products used on this project shall occur in the United States; however, raw materials used in manufacturing the steel products may be foreign or domestic. Steel not meeting these requirements may be used in products on this project provided that the invoiced cost to the contractor for such steel products incorporated into the work does not exceed either one-tenth of one percent of the total (final) contract cost or $2,500, whichever is greater.

The contractor shall furnish the Engineer with one or more affidavits, certificates, etc. which state that steel products utilized on the project meets the requirements specified hereinbefore. Such documents shall meet the requirements of Paragraph(s) 106.05(A) - Certificates of Compliance, and shall additionally identify whether the steel products are domestic or foreign.

SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC:

(SAFE107, 454/6, 03/17/89)

107.07 Sanitary, Health and Safety Provisions: of the Standard Specifications is modified to add:

Occupational Safety and Health Standards shall apply at all times. Should the contractor fail to follow OSHA regulations, the Engineer may suspend the work by written notice until compliance, and any such failure to comply with OSHA regulations shall constitute a waiver of any right to claim for such suspended work. If regulations are in conflict, the more strict regulation will apply.

107.08 Public Convenience and Safety: the third paragraph of the Standard Specifications is revised to read:

The contractor shall submit a Safety Plan to the Engineer at the preconstruction conference detailing the procedures the contractor will implement to satisfy OSHA and the State Occupational Safety Guidelines related to the worker as well as public safety in the construction of excavations, structures and confined air spaces as identified by the Engineer. The contractor's Safety Plan shall include the wearing of hard hats while within the project limits.

The Safety Plan submitted by the contractor shall include proposed methods to prevent unauthorized persons from gaining access to the work areas.

In conjunction with the Safety Plan, the contractor shall furnish and install 72-inch temporary chain link fencing, satisfactory to the Engineer, around all major structure construction areas (i.e., bridges, pumphouses, drop structures, retaining walls, etc.) and around any unattended excavation deeper than four feet, with slopes steeper than 2:1. Temporary fencing shall completely enclose the referenced construction activity and shall be secured after normal working hours to prevent unauthorized access.

Temporary fencing, when no longer needed to restrict access to the work site, may be used to construct permanent fence with the exception that materials which are unusable, in the opinion of the Engineer, due to either appearance or structural defects, shall be replaced with new materials. No direct measurement or payment will be made for furnishing or installing temporary fencing. Permanent fencing will be reimbursed under the appropriate bid items.

Unless otherwise approved in writing by the Engineer, open utility trenches shall be limited to 50 feet in length during non-working hours and shall be covered with steel plate in a manner satisfactory to the Engineer.

(FS107, CS, 09/01/87)

107.13 Forest Protection: of the Standard Specifications is modified to add:

Forest Service Regulations:

A portion of these projects are located on land under the jurisdiction of the Coconino National Forest.

Forest Service Officials:

Throughout the Fire Plan the term Forest Service Officer is used. This person shall be understood to be the District Ranger or any person authorized or duly appointed to act in all matters affecting the Coconino National Forest, Flagstaff Ranger District.

Forest Service Officers on this project are as follows:

	Name	Phone (Day)	(Night)
District Ranger:	Max C. Reid	(602)526-0866	
Fire Dispatcher:	Ames Coochyouma	(602)527-7420	(602)526-0600

(UTIL107, 450/s, 09/30/88)

107.19 Contractor's Responsibility for Utility Property and Services: of the Standard Specifications is modified to add:

The contractor's attention is directed to the requirements of A.R.S. 40-360.21 through .29 requiring all parties excavating in public streets, alleys or utility easements to first secure the location of all underground facilities in the vicinity of the excavation.

At least 48 hours prior to commencing excavation, the contractor shall call Blue Stake Center, between the hours of 7:00 A.M. and 4:30 P.M., Monday through Friday for information relative to the location of buried utilities in the following project locations:

Flagstaff Area 779-5139

The contractor may wish to review copies of existing ADOT permits, subject to availability, prior to start of construction, to assist the contractor in determining the location of any utilities, which the Department may have record of and which are not otherwise identified. Utility locations obtained from the Department are for information only and shall not relieve the contractor of responsibility for identifying, locating and protecting any existing utility lines. Copies of existing ADOT permits are on file with the Area Permit Supervisor as listed below:

DISTRICT IV

Flagstaff: 1801 S. Milton Road, Flagstaff, AZ 86001 (602) 774-1491

No conflicts are anticipated with public utilities; however, it shall be the contractor's responsibility to determine the exact location of all utilities prior to any construction operations, and shall notify the following at least five working days prior to commencing any work on the project.

US WEST COMMUNICATIONS	Bruce Bartlet	779-4931
CITY OF FLAGSTAFF	Vic Byerly	774-5281
SOUTHERN UNION GAS COMPANY	Bill West	774-4591
AT&T	A.E. Sturnacle	526-3220

The contractor shall inform the CITY OF FLAGSTAFF at least five (5) days prior to any crack and seat operation performed above CITY facilities and shall insure that CITY emergency personnel are on site during said operations. The contractor shall participate in the repair of any damaged CITY facility to the extent directed by the Engineer.

Bracing and Shoring:

It shall be the responsibility of the contractor to contact the utility companies in order for them to determine if there is a need for any bracing or shoring of power or telephone poles necessary, the contractor shall effect this work to the satisfaction of the utility company.

No measurement or direct payment will be made for bracing or shoring, the cost being considered as included in the price of contract items.

107.22 Enviromental Analyses: of the Standard Specifications is modified to add:

The following special category species in the project vicinity:

Arizona virgins bower (Clemantis hirsutissima arizonica), a USFWS Category 2 plant, usually found on rocky slopes in Ponderosa pine forests.

Occult little brown bat (Myotis lucifugus occultus), a USFWS Category 2 species.

SECTION 108 - PROSECUTION AND PROGRESS:

(SUBC108, 450/y, 04/14/89)

108.01 Subletting of Contract: the second paragraph of the Standard Specifications is revised to read:

"His own organization" shall be construed to include only workmen employed and paid directly by the prime contractor and equipment owned or rented by him, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

108.01 Subletting of Contract: of the Standard Specifications is modified to add:

The contractor shall provide to the Engineer a complete copy of each subcontract and lower tier subcontract. Each subcontract and lower tier subcontract shall include all of the required contract provisions including, but not limited to, the Equal Employment Opportunity Provisions, FHWA Form 1273, Required Contract Provisions, and the addendum thereto entitled "Appendix B - Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions" and the Wage Determination Decision, if these Provisions are made part of the prime contract. The Engineer will not consent to subletting of any portion of the contract if a copy of the subcontract or lower tier subcontract is not received. The Engineer's consent shall in no way be construed to be an endorsement of the subcontractor or its ability to complete the work in a satisfactory manner.

Contractors shall not sublet to subcontractors who are not duly licensed contractors in accordance with Arizona Revised Statutes 32-1101 through 32-1170.03.

Further information regarding licensing may be obtained by contacting:

Registrar of Contractors
800 W. Washington
6th Floor
Phoenix, AZ 85007
Phone: (602) 542-1502

The following items are hereby designated as Specialty Items:

4010210, 4020048, 4040111, 4040125, 6010501, 6010502, 7350010, 7350012, 8050003, 850023, 9250001 and 9999915.

(QKST108, 0450/w, 08/25/88)

108.02 Start of Work: of the Standard Specifications is revised to read:

Work shall not be started until the contract has been signed and executed by both the contractor and the Department.

The contractor shall begin work within ten calendar days after the date of the Notice of Award Letter.

When the contract time is on a calendar day basis or on a working day basis, contract time will be charged commencing on the date ten calendar days after the date of the Notice of Award Letter. Should this date fall on a Saturday, Sunday or holiday, the next working day shall be considered the starting date for the purpose of charging contract time.

(CPM108, 450/B, 07/24/89)

108.03 PRECONSTRUCTION CONFERENCE: of the Standard Specifications is modified to add:

The contractor shall be responsible for planning, scheduling and reporting the progress of the work to ensure timely completion of the contract.

The contractor shall submit a schedule in two parts, based upon the Sequence of Construction shown in the project plans or in these special provisions, in accordance with the following:

(A) Part I shall be a preliminary schedule and shall be submitted at the Preconstruction Conference for the Engineer's acceptance. It shall be a schematic (arrow) diagram or precedence diagram, showing the work stages and operations for all activities required by the contract. The diagram shall be in sufficient detail to allow day-to-day monitoring of the contractor's operations. Along with the preliminary schedule, the contractor shall include his calendar for the contract period which shall show work days, calendar days and dates. The diagram shall include four to ten milestone events as identified by the contractor and accepted by the Engineer.

(B) Part II shall be submitted for the Engineer's acceptance within fifteen (15) calendar days after Part I has been accepted by the Engineer. This second schedule shall include a complete critical path schedule to cover the contractor's anticipated time schedule. The schedule shall include a detailed network diagram acceptable to the Engineer with the following features:

(1) It shall be time-scaled in calendar days. All activities shall be plotted on their early start and finish dates. Unless approved by the Engineer, activities shall not exceed 15 working days in length. The plot shall have a size and scale acceptable to the Engineer.

(2) It shall show the order and interdependence of activities and the sequence of work as reflected in the Schedule Report specified in (B)(7) below. The critical activities shall be prominently distinguished on all reports by the use of color or other means acceptable to the Engineer.

(3) It shall include, in addition to all construction activities, such tasks as mobilization, demobilization, submittal and approval of samples of materials and shop drawings, procurement of significant materials and equipment, fabrication of special items, installation and testing and interfacing with other projects.

(4) The activities shall be sufficiently detailed so that a reviewer can follow the sequence. For example, the activities shall show forming, reinforcing, and placement of concrete on the calendar days they are scheduled to be performed.

(5) The diagram shall show for each activity the preceding and following event numbers or activity numbers, the activity description, the total float, and the duration of the activity in working days.

(6) The activities shall be organized and described so as to conform to the contract bid items. Activity descriptions shall be unique and specific with respect to the type of work and location.

(7) The diagram shall be accompanied by a Schedule Report of the network with a tabulation of the following data for each activity:

(a) Preceding and following event numbers or activity number
(b) Activity description
(c) Activity duration
(d) Earliest start date
(e) Earliest finish date
(f) Latest start date
(g) Latest finish date
(h) Total float times
(i) Responsibility for activity - e.g., contractor, subcontractor, supplier, etc.
(j) Resource loading for each activity listing personnel, equipment and anticipated revenue.

(C) The contractor shall make updated schedules and reports under the following circumstances or as requested:

(1) The contractor shall submit a monthly report of actual construction progress by the tenth working day of each calendar month by updating his schedule report to reflect all complete and in progress activities on the project. All negative float shall be explained in detail. If, in the opinion of the Engineer, the detailed network diagram requires revision, either wholly or in part, he shall so direct the contractor and the contractor shall submit such revision within ten (10) calendar days.

(2) The monthly report also shall show the activities or portion of activities completed during the one (1) month reporting period and the portion completed on the project to date, showing actual start and finish dates plus all future activities.

(3) The monthly report shall state the percentage of revenue actually earned as of the report date.

(4) The monthly report shall be accompanied by a narrative description of job progress, problem areas, current and anticipated delaying factors and their expected effect, and any corrective actions proposed or taken. The narrative description shall also clearly identify any departures from earlier schedules, including, but not limited to, changes in logical sequence or logical ties, constraints, changes in activity durations and changes, additions or deletions in event numbers, activity numbers and activity descriptions. The reasons for each departure shall be included in the narrative description. Any additions or deletions of milestone events must be approved by the Engineer.

(5) The monthly report shall include a summary of all activities sequenced by the total float from least to greatest float and ordered by early start.

(6) The required schedules and report shall be submitted to the Engineer as follows:

(a) Part I(Preliminary Schedule) - 7 originals
(b) Part II (Detail Network Diagram) - 7 originals
(c) Revisions to Part II - 7 originals
(d) Monthly Report - 3 originals plus 3 copies of the narrative.

(7) The monthly report shall include a detailed predecessor/successor analysis showing the predecessors, successors, logic ties, and constraints for each activity scheduled. These activities shall be ordered by event number or activity number from least to greatest.

(8) All Extra Work shall be shown on an updated Schedule.

The automated system software shall be Primavera or approved equal. If the contractor proposes and the Engineer approves an alternate software, the contractor shall furnish an unopened licensed disc package of the software to the Engineer for use during the duration of the project. The software shall be IBM PC compatible.

No measurement or direct payment will be made for contractor costs relating to preparation and submission of schedules and reports and revisions thereto, the cost being considered as included in the prices paid for contract items.

Float time is not for the exclusive use or benefit of either the Department or the contractor. Extension of time for performance may be granted to the extent that equitable time adjustment for the activity affected exceeds the total float or where otherwise justified, impact on the contract completion can be shown.

Acceptance of the contractor's schedules by the Engineer is not to be construed as relieving the contractor of his obligation to complete the work within the contract time; or as granting, rejecting, or in any other way acting on the contractor's requests for adjustments to the date for completing contract work, or claims for additional compensation. Such requests shall be processed in strict compliance with other relevant provisions of the contract.

The contractor shall participate in a review and evaluation of the proposed Part I, Preliminary Schedule and Part II Schedule and monthly updated schedule by the Engineer. Any revisions necessary as a result of their review shall be submitted for acceptance to the Engineer within ten (10) calendar days after the review. The accepted Part II Schedule shall then be used by the contractor for planning, organizing, executing, and directing the work and for reporting progress of work accomplished. The contractor shall furnish a copy of the Part II Schedule and monthly updated schedule on a 5 1/4 inch floppy disk to the Engineer for project use.

The Engineer shall complete review of Part I Preliminary and Part II Schedules within fifteen (15) calendar days of the receipt of each. No monthly progress payment will be made until Part I has been accepted. Within the next sixty (60) calendar days after acceptance of Part I, Part II will be submitted, reviewed, and accepted. If Part II has not been accepted within these sixty (60) calendar days, progress payment will be withheld until Part II has been accepted.

Failure of the contractor to comply with the monthly updated Schedule requirements specified herein, will be grounds for the Engineer to withhold an additional ten (10) percent of the monthly progress payments, in addition to the normal retention, until the contractor is in compliance. Additional money withheld will be paid upon compliance to the contractor in the next scheduled monthly estimate. If the monthly updated schedule is not received by the tenth working day of each month, but received prior to the 25th of the month, five (5) percent will be withheld until the following estimate.

108.08 Determination and Extension of Contract Time: of the Standard Specifications is modified to add:

Time is of the essence in the completion of this project.

The intent of this Section is to ensure swift completion of the work and minimize the impact of the construction on the community and the traveling public to the full extent possible consistent with good construction methods and sound engineering practice. Nothing within the Project Plans or these Special Provisions shall be interpreted contrary to the stated intent.

The contractor will not be allowed to pursue any portion of the work to the deteriment of any other portion of the work.

(A) Completion Date:

This combined contract of projects IR-17-2(111), IR-40-4(123), and IR-40-4(131) is divided into two (2) Stages with the following completion dates:

(1) STAGE I: Completion Date: October 1st, 1990.

The work under this Stage shall encompass all paving operations and underlying work exclusive of the final lift of 1/2" AR-ACFC.

The Incentive/Disincentive clauses as specified herein and in Subsection 108.09 apply only to Stage I operations.

(2) STAGE II: Completion Date: December 15, 1990.

The work under this stage shall include the completion of Stage I as well as all other construction operations.

The Schedule of Liquidated Damages as specified under Subsection 108.09, Failure to Complete the Work on Time, applies only to Stage II operations.

(B) Incentive to Complete the Work Early:

For each calendar day prior to October 1, 1990 that the contractor has been successful in achieving substantial completion of Stage I, an incentive payment of an additional $15,000 per calendar day will be added to the amount due the contractor on completion and acceptance of the entire contract. The maximum incentive that the contractor may earn is $450,000 based on a September 1, 1990 completion of Stage I.

108.09 Failure to complete the Work on Time: the first paragraph of the Standard Specifications is revised to read:

STAGE I: Disincentive:

For each calendar day that any work required to achieve substantial completion, as defined in Subsection 108.08 of these Special Provisions, remains uncompleted for Stage I, beyond October 1st, 1990, the sum of $15,000.00 shall be deducted from any monies due the contractor, and will continue to be assessed against the contractor at the said rate of $15,000.00 per calendar day until such time as substantial completion is achieved.

STAGE II: Liquidated Damages:

For each calendar day that any work included under Stage II of the contract shall remain incomplete, after December 15, 1990, the sum shown in the schedule of liquidated damages specified below will be deducted from any monies due the contractor, not as a penalty, but as liquidated damages.

In the event that neither Stage I or Stage II are complete by December 15, 1990, the disincentive payment and the liquidated damages shall run concurrently.

(ACMIX108, CS, 09/01/87)

108.04 Prosecution and Progress: of the Standard Specifications is modified to add:

The contractor shall submit his Asphaltic Concrete Mix Design, in accordance with the applicable subsections of Section 406, 407 and 416, within 30 calendar days from the date of notice of award of contract, unless otherwise noted and/or approved in writing by the Engineer.

(LIQDM108, 450/Z, 09/30/89)

108.09 Failure to Complete the Work on Time: the Schedule of Liquidated Damages of the Standard Specifications is revised to read:

Original Contract Amount		Daily Charge	
From More Than	To and Including	Calendar Day or Fixed Date	Working Day
$ 0	$ 25,000	$210	$300
25,000	50,000	250	350
50,000	100,000	280	400
100,000	500,000	490	700
500,000	1,000,000	770	1,100
1,000,000	2,000,000	910	1,300
2,000,000	5,000,000	1,190	1,700
5,000,000	10,000,000	1,750	2,500
10,000,000	----------	2,100	3,000

SECTION 109 - MEASUREMENT AND PAYMENT:

(FORCE109, 454/2, 10/26/89)

109.04 (B)(3) Equipment: of the Standard Specifications is modified to add:

Following is a rate adjustment factor table to be utilized with the Blue Book rates in adjusting rates for equipment used on force account work.

RATE ADJUSTMENT FACTOR TABLE

Year of Manufacture	Adjustment Factor
1989 and later	1.00
1988	.970
1987	.964
1986	.956
1985	.948
1984	.940
1983	.933
1982	.911
1981	.881
1980 or earlier	.856

109.08 Payment of Withheld Funds: the last paragraph of the Standard Specifications is revised to read:

The securities will be deposited in a joint escrow account to be held by a bank or savings and loan institution licensed by the state whose principal office is in Phoenix and in an amount at all times equal to or greater than the amount that would normally be withheld under the provisions of Subsection 109.06.

(LSUM109, CS, 09/01/87)

SECTION 109 - MEASUREMENT AND PAYMENT:

109.10 Lump Sum Payment for Structures: of the Standard Specifications is modified to add:

The Department will compensate the contractor for construction of each of the following structures or groups of structures on the basis of a lump sum amount:

(A)	9999903A	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+80.0 (Lt.)
(B)	9999903B	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 198+78.6 (Lt.)
(C)	9999903C	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 272+25.9 (Rt.)
(D)	9999903D	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 272+25.9 (Lt.)
(E)	9999903E	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Lt.)
(F)	9999903F	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Rt.)
(G)	9999903G	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Lt.)
(H)	9999903H	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Rt.)
(K)	9999903K	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+00.0 (Lt.)
(L)	9999903L	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+00.0 (Rt.)
(M)	9999903M	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 199+45.0 (Lt.)
(N)	9999903N	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 199+45.0 (Rt.)
(P)	9999903P	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 255+00.0 (Lt.)
(Q)	9999903Q	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 255+00.0 (Rt.)
(R)	9999903R	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 274+50.0 (Rt.)
(S)	9999903S	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Lt.)
(T)	9999903T	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Rt.)
(U)	9999903U	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Lt.)
(V)	9999903V	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Rt.)
(X)	9999903X	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE 1238 & 1239
(Y)	9999903Y	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE NO. 1261 (EB)
(Z)	9999903Z	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE NO. 1262 (WB)

Measurement and payment for the work will be made in accordance with the requirements of LUMP SUM PAYMENT FOR STRUCTURES under SECTION 109 - MEASUREMENT AND PAYMENT.

SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS:

202-3.06 Removal of Signs and Delineators: of the Standard Specifications is modified to:

Description:

Work under this section shall also consist of furnishing all equipment, tools and labor necessary to remove four exit gore signs including their posts and foundations and perform other miscellaneous work.

The gore sign panels not reused on the project shall remain the property of the state and shall be salvaged to the ADOT Flagstaff Maintenance Yard at 5701 E. Railhead Avenue, a distance of approximately six miles or a location directed by the Engineer. All other removed signing materials which are not salvaged or reinstalled shall become the property of the contractor for his disposal.

Washing of new and reused sign panels is considered as part of supplying and installing sign panels per Standard Specification 608-3.03.

(ACREM202, 451/A, 05/31/89)

202-3.03 Removal of Pavement:

202-3.03(B) Bituminous Pavement: of the Standard Specifications is revised to read:

Unless milling is specified in the Special Provisions, all bituminous pavement designated on the project plans to be removed, shall be completely removed down to the underlying base course or subgrade. The pavement material shall be removed and disposed of as specified in the Special Provisions.

Where new construction is to join existing bituminous pavement, the existing pavement shall be cut to a true line perpendicular to the centerline of the pavement with straight vertical edges free from irregularities. The removal of asphaltic concrete at the approaches to structures shall be accomplished in a manner approved by the Engineer.

202-3.03(C) Bituminous Pavement For Recycle: of the Standard Specifications is revised to read:

202-3.03(C) Bituminous Pavement Removal By Milling:

When milling is specified, the existing asphaltic concrete shall be removed in accordance with the details shown on the project plans with equipment specifically designed to remove such material by means of grinding or chipping to a controlled line and grade. The equipment used shall be capable of removing the existing asphaltic concrete within 0.01 foot of the specified removal depth. The removal shall be accomplished in a manner which does not destroy the integrity of any asphaltic concrete pavement that remains and which does not result in a contamination of the milled asphaltic concrete with the underlying base material.

Under no circumstance shall the removal of existing asphaltic concrete begin until the mix design for replacement asphaltic concrete has been approved by the Engineer.

The extent of removal of existing asphaltic concrete must be in keeping with the contractor's ability to produce, haul, place and compact replacement asphaltic concrete so that at all times the length of open "trench" is at a minimum. If the contractor's production of replacement asphaltic concrete is stopped for any reason, the removal of asphaltic concrete shall either cease or shall be reduced. The Engineer will be the sole judge as to whether the removal shall cease or be reduced and his decision will be based on the reason for the stoppage in asphaltic concrete production, the expected length of the stoppage, the type and depth of the material being removed, and the time of day.

Replacement asphaltic concrete shall be placed as soon as possible after the "trench" has been opened up. The surface on which the material is to be placed shall be uniform and free of loose material. Any exposed base material shall be compacted to the extent required by the Engineer.

The "trench" in which asphaltic concrete is being placed shall be filled before the end of each day's work and the lane shall be opened to traffic. The length of open "trench" at any one time shall not exceed two miles or 1/2 the length of the work, whichever is the lesser.

In the event of circumstances beyond the control of the contractor, such as equipment breakdown, or if the production of the replacement asphaltic concrete has been stopped by the Engineer and the contractor is unable to comply with the requirements in the preceding paragraph, the contractor shall provide and maintain such traffic control devices that the Engineer deems necessary under the circumstances in order to provide safe and efficient passage through the work zone.

If the Engineer deems it to be warranted, he will require that the contractor provide for the surface drainage of areas where the pavement surface has temporarily been removed.

Pavement, to be removed by milling, adjacent to manholes, valve boxes, small radius curbs and other fixed objects that produce confined areas shall be removed with milling equipment specifically designed to operate in restricted areas and capable of removing asphaltic concrete of the specified thickness without damage or displacement of the adjacent object.

On projects with existing curb and gutter, any asphaltic concrete buildup in the gutter designated to be removed, shall be removed prior to the pavement removal operation by equipment and methods approved by the Engineer. The equipment and methods used shall be capable of removing the asphaltic concrete buildup without causing damage to the curb and gutter.

ITEM 2020017 - REMOVAL OF ASPHALTIC CONCRETE (PATCHES):

Description:

The work under this item shall consist of furnishing all labor, equipment, and tools necessary to remove existing bituminous patching materials from portland cement concrete pavement surfaces as directed and/or by the engineer.

Method of Measurement:

The work for Item 2020017 - REMOVAL OF ASPHALTIC CONCRETE (PATCHES) will be measured as a single complete lump sum item.

Basis of Payment:

Payment will be made at the contract lump sum price for Item 2020017 - REMOVAL OF ASPHALTIC CONCRETE (PATCHES), which price shall be full compensation for the work as described and specified herein, including removal, hauling, and disposal.

ITEM 2020048 - REMOVAL OF STRUCTURE CONCRETE (WING WALLS):

Description:

The work under this item shall consist of furnishing all labor, equipment, and tools necessary to remove existing wing walls and their footings and/or foundations as are required in construction and extension of the existing concrete box culverts and adjacent slopes. This item is to cover the wing wall and foundations removed outside of the payment limits as shown on Standard No. B-01.10 of the ADOT Structures Section Standard Drawings 1988

Method of Measurement:

The work for Item 2020048 - REMOVAL OF STRUCTURE CONCRETE (WING WALLS) will be measured as a unit each.

Basis of Payment:

The accepted quantities of Item 2020048 - REMOVAL OF STRUCTURE CONCRETE (WING WALLS), measured as provided above, will be paid for at the contract unit price each, which price shall be full compensation for the work as described and specified herein and on the project plans.

Payment for this item shall be in conjunction with the requirements of Subsection 109.10 Lump Sum Payment for Structures.

ITEM 2020052 - REMOVE (Snow Cinder Build-Up and Other Debris):

Description:

The work under this item shall consist of furnishing all labor, equipment, and tools necessary to remove snow cinder build-up, gravel, rock, and other debris; from, within, around and/or beneath guard rail and components, shoulders, cut ditches, slopes as directed and/or approved by the Engineer.

Method of Measurement:

Item 2020052 - REMOVE (Snow Cinder Build-Up) will be measured by the linear foot. Measurement will be along the edge of pavement adjacent to the area of the removal.

Basis of Payment:

The accepted quantities of Item 2020052 - REMOVE (Snow Cinder Build-Up), measured as provided above, will be paid for at the contract unit price per linear foot, which price shall be full compensation for the work as described and specified herein, including removal, hauling, and disposal.

ITEM 2020065 - REMOVAL OF TREES:

Description:

The work under this item shall consist of furnishing all labor, equipment, and tools necessary to remove trees six (6) inches in diameter and larger to the satisfaction of the Engineer.

Trees for removal will be clearly marked by the Engineer with survey flagging prior to construction.

The contractor shall acquire and abide to applicable Forest Service requirements, regulations and those of Subsection 107.13 - Forest Protection of the Standard Specifications.

Method of Measurement:

Removal of trees will be measured as a unit each.

Basis of Payment:

The accepted quantities of removed trees, measured as provided above, will be paid for at the contract unit price each, which price shall be full compensation for the work as described and specified herein, including removal and disposal.

No measurement or direct payment will be made for removal of trees less than six (6) inches in diameter, the cost of their removal being considered as included contract unit price bid for Item 2010001 - Clearing and Grubbing.

SECTION 203 - EARTHWORK: of the Standard Specifications is modified to add:

(EWQC203, 451/S, 05/31/89)

203-2.01 Contractor Quality Control:

(A) General Requirements:

It shall be the responsibility of the contractor to administer a Quality Control Plan, hereinafter referred to as the "Plan", sufficient to assure that all earthwork operations are performed in accordance with the requirements of these specifications. The Plan shall meet the requirements of Subsection 106.04(B) and the requirements specified below. The Plan may be operated wholly or in part by a subcontractor or an independent organization; however, the Plan's administration, including compliance with the Plan and its modification, shall remain the responsibility of the contractor.

(B) Elements of The Plan:

The Plan shall address all elements which affect the quality of the earthwork including, but not limited to the following:

(1) Removal and Replacement of Unsuitable Subgrade Materials

(2) Construction of Embankments

(3) Placement of Backfill Materials, including pipe bedding and backfill as specified in Section 501

(4) Compaction

(C) Other Requirements:

The Plan shall include the use of Operations Technicians, including the following:

(1) Quality Control Technician (QCT).

This person will be expected to assure that the materials aspects of the Earthwork Items meet the requirements of the specifications. The Plan shall detail the frequency of each type of test, which shall include field density tests for compaction monitoring and gradation, moisture and PI tests to determine material suitability according to the Subgrade Acceptance chart or other materials requirements. The Plan shall detail the type of equipment to be utilized, test methods, and means of documentation.

If more than one individual is required to accomplish these requirements, the Plan shall so note. Included also shall be the criteria utilized by the QCT to correct or reject unsatisfactory materials.

The Department reserves the right to check the records of the QCT at any time. The Department may take field density tests or obtain samples for classification testing at any time to confirm the effectiveness of the activities of the QCT.

(ROCK203, 451/V, 04/30/89)

203-3.03 Construction Requirements:

203-3.03(A) General: the first paragraph of the Standard Specifications is revised to read:

All roadway excavation shall be finished to a reasonably smooth and uniform surface and shall not vary by more than 0.04 foot above or below the grade established and shall be in reasonably close conformance to the lines, dimensions and cross sections shown on the project plans or established by the Engineer. When roadway excavation is made in rock, the full cross section width of the roadway between the ditches shall be overexcavated a minimum depth of six inches below the subgrade elevation. The overexcavated area shall be filled with embankment material satisfactory to the Engineer and compacted and finished in accordance with the requirements of the Specifications. In situations where only part of the roadway section intersects areas of rock, that portion occurring in the rock zone shall be overexcavated and backfilled as noted above and brought up to match the adjoining subgrade.

No measurement or direct payment will be made for the work in overexcavating the rock areas, or placing the embankment material, the cost being considered as included in the cost of contract items.

203-10.03 Embankment Construction Requirements:

203-10.03(A) Placement: the fifth, sixth and seventh paragraphs of this subsection on page 115 of the Standard Specifications are revised to read:

When the embankment material, resulting from the required excavations, consists predominately of rock fragments of such size that the material cannot be placed in an eight inch layer without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment in layers not exceeding in thickness the approximate average size of the larger rocks being excavated, but not larger than 2 feet. It may be necessary to reduce the size of the excavated material by crushing or otherwise breaking down the material in order to comply with this requirement.

The placing of individual rocks and boulders greater than 24 inches in diameter will be permitted provided they do not exceed 36 inches in maximum dimension, are carefully distributed to prevent nesting and the interstices are filled with finer material and compacted to form a dense and compact mass. Each layer shall be leveled and smoothed by evenly distributing spalls and finer fragments of rock and earthen material with suitable leveling equipment.

Embankment material containing broken concrete, rock or other solid materials which are larger than six inches in greatest dimension shall be placed so that no surface of said material is less than two feet below the finished subgrade elevation or within five feet horizontally of any piling or structures. It may be necessary to reduce the size of the excavated material by crushing or otherwise breaking down the material in order to comply with this requirement.

203-10.03(B) Compaction: of the Standard Specifications is revised to read:

(1) Earth:

Embankment, constructed in layers of the depths specified herein, shall be compacted by rolling, tamping, or any other suitable means. Each layer of the embankment material shall be compacted to the specified density before the next layer is placed. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compacting. As the compaction of each layer progresses continuous leveling and manipulation of the material will be required to assure uniform density. Water shall be added or removed, if necessary, in order to obtain the required density. Construction equipment shall be routed uniformly over the entire surface of each layer, insofar as is practicable, and separate pieces of equipment shall not follow in the immediate tracks of preceding equipment.

Where embankments five feet or less in height are to be constructed, the top six inches of the ground on which the embankment material is to be placed shall be compacted to a density of not less than 95 percent of the maximum density.

Each layer of roadbed embankment shall be compacted to a density of not less than 95 percent of the maximum density, except that when asphaltic concrete is to be placed directly on subgrade, the top six inches of the embankment shall be compacted to a density of not less than 100 percent of the maximum density. Embankment material placed in dikes shall be compacted to a density of not less than 95 percent of the maximum density.

All determination of density will be made in accordance with the requirements of Arizona Test Methods 225, 226, 227, 230, or 231, and 232.

(2) Rock:

Density requirements will not apply to portions of embankments constructed of materials that cannot be tested by approved methods.

Rocky materials shall be placed, spread and leveled in 12 inch thick layers, when possible, over the full width of the embankment, with sufficient earth or other fine material so deposited to fill the interstices to produce a dense compact embankment. Each layer of material shall be compacted full width with: (a) Two passes of a 50 ton compression type roller or a vibratory roller having a minimum dynamic force of 40,000 pounds impact per vibration and a minimum frequency of 1,000 vibrations per minute; or (b) Eight passes of a 10 ton compression type roller or a vibratory roller having a minimum dynamic force of 30,000 pounds impact per vibration and minimum frequency of 1,000 vibrations per minute.

Layers of material thicker than 12 inches but not exceeding 24 inches shall be given a proportionate compactive effort. A 24 inch layer shall receive either 4 full width passes with the roller described in (a) above, or 16 full width passes with the roller specified in (b). Layers varying in thickness between 12 and 24 inches shall receive a compactive effort in proportion to their relative depth.

Rolling may be omitted on any layer, or portion thereof, when, in the judgement of the Engineer, it is physically impractical. In addition to the above rolling, each layer shall be further compacted by routing the hauling equipment uniformly over the entire width of the embankment. Additional compaction of rock embankments may be required at the discretion of the Engineer.

ITEM 2030901 - BORROW:

Borrow shall be as specified in Section 203 of the Standard Specifications and shall meet the following requirements:

Sieve	Percent Passing
1"	100
1/2"	70 - 90
#4	50 - 80
#200	5 - 25

The Plasticity Index shall be 3-20.

(SHOLD203, CS, 09/01/87)

ITEM 2031001 - COMPACTION OF SHOULDER MATERIAL:

The work under this item consists of the compaction of the material used to reshape the shoulders as shown on the project plans and/or as specified elsewhere herein. No density requirement is specified for this material; however, compaction will be required for all areas deemed practicable by the Engineer.

The equipment proposed for obtaining this compaction shall be of a type approved by the Engineer and the extent of compaction required will be determined by the Engineer.

Measurement for this work will be made, regardless of type of equipment used, by the hour for the compacting unit, but only for the time that the unit is actually used for compacting the shoulder material, except that in any half-shift during which the unit is operated for necessary compaction, measurement will be made for the full half-shift, provided that the unit is not inoperative due to breakdown or other causes determined by the Engineer to be the responsibility of the contractor.

Payment for this work will be made at the contract price per hour, which price shall be full compensation for the item complete, as herein described and specified.

Item 2031010 - SHOULDER BUILD-UP:

Description:

The work under this item shall consist of furnishing and placing milled asphaltic concrete for slope repair in accordance with the details on the Project Plans and the requirements of the Special Provisions or as directed by the Engineer.

Construction Requirements:

Shoulder build-up material shall be placed in accordance with the requirements of paragraph one and two of Subsection 203-10.03(A) of the Standard Specifications.

Method of Measurements:

Shoulder build-up will be measured by the linear foot. Measurement will be along the edge of pavement against which the materials is placed.

No measurement nor payment will be made for furnishing materials and or borrow for shoulder build-up, the cost being considered as included in the linear foot price.

Basis of Payment:

The accepted quantities of shoulder build-up, measured as provided above, will be paid for at the contract price per linear foot, which price shall be full compensation for the work, complete in place, as specified herein and as shown on the project plans. Payment for the compaction of shoulder build-up material will be made as herein specified under Item 2031001.

SECTION 206 - FURNISH WATER SUPPLY:

(WATR206, 451/W, 08/24/89)

206-5 Basis of Payment: of the Standard Specifications is modified to add:

When the bidding schedule does not contain a contract pay item for furnish water supply, full compensation for either developing or obtaining an adequate water supply and furnishing all water required for the work shall be considered as included in the prices paid for the various contract items of work requiring the use of water.

SECTION 303 - AGGREGATE SUBBASES AND AGGREGATE BASES:

Aggregate base shall be AB-3.

SIZE	% PASSING
1"	100
3/4"	80 - 100
3/8"	55 - 75
No. 8	30 - 45
No. 200	0 - 8

The P.I. shall not exceed 3 Plasticity Index.

ITEM 4010016 - PORTLAND CEMENT CONCRETE PAVEMENT (Unbonded Overlay):

Description:

The work under this item consists of furnishing all materials, labor, equipment, and constructing an unbonded concrete overlay test section in accordance with the requirements of section 401 of the Standard Specifications. The test section will be constructed in a manner which facilitates the installation of the weigh-in-motion equipment.

Materials:

Concrete for the unbonded concrete overlay will be class S with a maximum aggregate size of 1 inch. The concrete will attain a minimum 3 day compressive strength of 3500 p.s.i. and a minimum 28 day compressive strength of 4000 p.s.i..

Construction Requirements:

Upon completion of the other experimental test sections described elsewhere, construction of the unbonded concrete overlay may proceed for the passing lane and inside shoulder. This will require milling the asphalt concrete throughout the Test Section resulting in a vertical face at each end and an a.c. overlay thickness of two inches throughout the section. The two inch thickness of asphalt concrete will serve as a bond break between the existing PCCP and the new concrete overlay. Just prior to milling, the asphalt concrete will be sawed transversely to a depth of six inches at the Test Section limits.

All forming, dowel basket placement, concrete placement, joint sawing and sealing, and concrete curing will be accomplished within 96 hours; 72 hours of this time will be for concrete curing. The concrete will attain a strength of 3000 p.s.i. before construction traffic is permitted on the surface. Equipment used in sawing and sealing contraction joints will be allowed on the surface as needed.

04 Sealant shall be Dow Corning self-leveling silicone sealant and shall conform to section 1011-8 as described elsewhere in these special provisions.

Asphalt concrete tapers will be constructed within 24 hours after completion of the concrete construction and curing. The tapers shall utilize transverse butt joints when transitioning into existing asphalt concrete as shown in the plans. Curing of the concrete pavement will continue for this additional 24 hour period. Upon completion of the tapers and related striping traffic will immediately be switched to the passing lane and shoulder. Neither lane shall be closed for more than five consecutive days.

During construction of the travel lane and outside shoulder traffic will be maintained in the passing lane in accordance with the approved traffic control plan submitted under Section 401-3.01 and as shown in the plans. Silicone shall be used for sealing transverse joints as shown in the plans. The sealant shall be Dow Corning self-leveling.

05 Contraction joints shall be constructed transverse to the roadway. Load transfer dowels shall be as detailed in Std. C-7.02, except that assemblies will be constructed without a skew angle and shall be placed perpendicular to the transverse joints.

Inner pavements don't need skew

(LTDA401, CS, 09/01/87)

Materials:

Dowel bars shall be plain round bars, 1 1/4 inches in diameter and 18 inches in length and shall conform to the requirements of AASHTO M 254 with Type B coating, except that the core material shall conform to the requirements of ASTM A 615, Grade 40.

The following powdered epoxy resins may be used to coat dowel bars:

Scotchkote 202, 213
3M Company
St. Paul, Minnesota 55101

Micron 650-Blu Epoxy
Republic Steel Corp.
Cleveland, Ohio

LSU 431-Formula 907-2-5
Ciba-Geigy Corp.
Ardsley, New York

Flintflex 531-6020, 531-5068, 531-6080, 531-6085
Dupont Company
Wilmington, Delaware

Epoxy Powder 720-a-009
Cook Paint and Varnish
Kansas City, Missouri

Corflex CF-4650 Green
Carboline/Ferro Company
St. Louis, Missouri 63144

Oxyplast El-704-P-9
Fuller O'Brien
South San Francisco, CA.

Corvel ECA-1400-Green
ECA-1440-3
ECA-1558-Red-27000
Polymer Corporation
Reading, Pennsylvania 19603

Epoxiplate R-346, R-347, R-348
R-349, R-352, R-361, R-371
Armstrong Products
Warsaw, Indiana 46580

Mobilox 1004 R-2
Mobile Chemical Company
Cleveland, Ohio

Nap-Guard 7-2000
Napco Corporation
Houston, Texas

Interpon HD-33
International Paint Company
Houston, Texas

DK 23-0548, DK 23-0602
DK 23-0679
Hysol Division
The Dexter Corporation
Olean, New York 14760

The powdered epoxy resin selected by the contractor and furnished by the manufacturer shall be of the same material and quality as the resins listed above.

The approved powders are based on specified dowel bar preparation and powder application and curing methods and these identical methods shall be followed during fabrication.

General Requirements:

Certification:

The coating manufacturer shall supply the purchaser with certification which properly identifies the batch and/or lot number, material, quantity of batch, date of manufacturer, and name and address of manufacturer. A statement shall also be submitted certifying that production bars and prequalification bars have been identically prepared and applied with epoxy powders.

Material for Repair:

Patching or repair material, compatible with the coating and inert in concrete, shall be made available by the epoxy manufacturer. This material shall be suitable for repairs of areas of the coating damaged during fabrication and/or handling in the field.

Application Requirements:

Coating Applicator:

The coating applicator's facilities shall be subject to approval by the Department. Applications for approval of facilities shall be made to the Department by the coating applicator.

Surface Preparation:

The surface of bars to be coated shall be blast cleaned in accordance with the Steel Structures Painting Council-Surface Preparation Specification No 10 (SSPC-SP10), Near White Blast Cleaning. After blasting, the cleaned surface of the bar shall be as defined by SSPC-Vis 1, Pictorial Standards Asa 2 1/2, or CSa 2 1/2 as applicable.

The powdered epoxy resin coating shall be applied to the cleaned surface as soon as possible after cleaning and before visible oxidation occurs. In no case shall more than eight hours elapse between cleaning and coating.

Coating Application:

The powdered epoxy resin coating shall be applied in accordance with the requirements of the coating manufacturer. The epoxy coating may be applied before or after fabrication of the dowel bars.

Coating Thickness:

The epoxy coating shall be applied as a smooth uniform coat. After curing, the coating thickness shall be a minimum of 7 mils. Coating thickness shall be controlled by taking measurements on a representative number of bars from each production lot.

Continuity of Coating:

The coating shall be checked visually after cure for continuity. It shall be free of holes, voids, contamination, cracks and damaged areas.

The coating shall not have more than two holidays (pinholes not visible to the naked eye) in any linear foot of the coated bar. A holiday detector shall be used, in accordance with the manufacturer's instructions, to check the coating for holidays.

Coating Cure:

The coating applicator shall check each production lot to determine that the entire production lot of coated bars is in a fully-cured condition.

Quality Control:

The coating applicator shall be responsible for performing quality control and tests. This will include inspection for compliance with the requirements of Coating Thickness, Continuity of Coating and Coating cure.

Plant Inspection:

The Department reserves the right to have its authorized representative observe the preparation, coating and test of the dowel bars. The representative shall have free access to the plant, and any work done when access has been denied shall be automatically rejected.

If the representative elects, lengths of coated bars may be taken from the production run on a random basis, for test, evaluation and check purposes by the Department.

Certification of Compliance:

The contractor shall furnish a Certificate of Compliance from the coating applicator with each shipment of coated bars. The Certificate of Compliance shall (1) verify that the coated bars and coating material have been tested in accordance with the requirements of these specifications, (2) state the actual test results for each requirement, and (3) state that the actual test results comply with the requirements.

Shop Repair of Coated Bars:

Epoxy coated dowel bars which do not meet the requirements for Coating Thickness, Continuity of Coating, or Coating Cure shall not be repaired.

Reinforcement bars with these defects shall be replaced or alternately, stripped of epoxy coating, recleaned and recoated in accordance with the requirements of these specifications.

Coating breaks due to fabrication and handling shall be repaired with patching material if the defective area is greater than the cross-sectional area of the reinforcement bar. Defects which are smaller than the cross-sectional area need not be repaired.

The repair of coating breaks shall be limited to bars of which the total of the defective coating areas does not exceed five percent of the surface area of the dowel bar. Bars with greater than five percent damage shall be replaced or alternately, stripped of epoxy coating, recleaned and recoated in accordance with the requirements of this specification.

Field Repair:

The contractor shall be required to field repair damaged areas of the bar coating, and to replace bars exhibiting severely damaged coatings. The material used for field repair shall be that supplied by the coating applicator.

Field repair shall be performed wherever the area of coating damaged exceeds the cross-sectional area of the dowel bar.

Field repair shall not be allowed on bars which have severely damaged coatings. A severely damaged coating is defined as coating which has a total damaged area greater than five percent of the surface area of the dowel bar as determined by the Engineer. Dowel bars having severely damaged coating as determined by the Engineer, shall not be incorporated in the work and shall be removed from the work site. All such bars shall be replaced in kind by the contractor at no additional coat to the Department.

Anchor straps shall conform to the requirements on the project plans.

All legs, spacer bars and tie bars shall conform to the requirements of Section 1003.

Construction Requirements:

Load transfer dowel assemblies shall be placed at each transverse weakened plane joint on the mainline paving. The assemblies shall be placed only on the mainline 12 foot traffic lanes and 18 foot High Occupancy Vehicle lanes as shown on the project plans.

Dowel assemblies shall be constructed such that the dowels are placed at mid-depth of the slab and centered about the weakened plane joint. Dowels shall be spaced 12 inches center to center, but shall not be placed within 15 inches of the pavement edge or within four inches of longitudinal joint.

Dowel bars shall be placed to a vertical and a horizontal tolerance of ± 1/2 of an inch of the specified depth, centering, and spacing.

Dowel bars shall be placed parallel to the pavement center line and pavement surface within a tolerance of ± 3/8 inch for the full dowel length.

Dowel assemblies shall be secured in position on the prepared base in a manner that will hold the assembly in position without disruption throughout construction. Wires or bars used to maintain the assemblies' shape for shipment shall be removed prior to placing concrete if, in the opinion of the Engineer, the wires or bars will offer restraint to early shrinkage of concrete or if the wires or bars extend across transverse joints.

The location of each dowel assembly shall be marked outside the limits of the pavement construction operations in such a manner as to insure the centering of the saw cut about the dowel location.

Payment for load transfer dowel assemblies will be adjusted as specified below when sawed joints are inaccurately placed over load transfer dowel assemblies.

The contractor shall supply equipment and methods of operation such that there is no interference with or movement of dowel assemblies. Final dowel positions shall not exceed the placement tolerances specified above.

Immediately prior to concrete placement, the dowel bars shall be uniformly coated with a thin film of heavy waterproof grease for the full length of the dowel.

Prior to sawing joints in the concrete pavement the contractor will submit a sawing plan as required in section 401-3.01 which identifies the method of sawing and the timing of the sawing operation for approval to the Engineer. The contractor should be aware that the cure time for this concrete section is less than for conventional concrete pavements. Sawing will have to be accomplished sooner than typically performed.

Pavement smoothness will be determined in accordance with Section 401-4.02 of the Standard Specifications except that the required profile index will be 3 inches per mile and the profilograph testing will be modified as follows: The tested profile shall be conducted during the traffic control closures required for construction of the pavement and shall only be conducted on the concrete pavement section. The measurements shall be obtained for the full length of the section. Remedial measures required to obtain the specified smoothness shall be conducted in a manner which will not interfere with the installation or permanent operation of the weigh-in-motion equipment.

Weigh-in-Motion equipment, described elsewhere in these special provisions, will not be installed in the concrete pavement until a minimum of one week of traffic has occurred in each lane. No sawing for the detector loops, axle sensors, or weigh scales shall be allowed until this requirement has been met.

Method of Measurement:

Unbonded concrete pavement overlay will be measured by the square yard, calculated from the dimensions shown on the plans and adjusted by the amount of any changes ordered by the Engineer. Quantities will be calculated to the nearest square yard. No allowance will be made for pavement placed in excess of the specified dimensions.

Basis of Payment:

The accepted quantities of unbonded concrete pavement overlay, measured as provided above, will be paid for at the contract unit price which shall include full compensation for sawing and milling the existing asphalt concrete overlay, furnishing all labor, materials, equipment, tools, and incidentals, and for performing all the work involved in constructing the pavement complete in place as shown on the plans and specified herein.

ITEM 4010210 - CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT:

Description:

This work shall consist of cracking and seating existing concrete pavement following removal of existing bituminous overlays, if present, and prior to placement of a bituminous overlay.

The aggregate edge drain shall be placed ahead of the crack and seat operation.

Equipment:

Equipment to be used for cracking concrete pavement shall be capable of impacting the pavement with a variable force which can be controlled in magnitude and point of impact. The cracking equipment shall be capable of fracturing the full depth and full width (each lane) of the PCCP with each impact without excessive spalling and shattering of the existing surface. The breaker shall be equipped with a plate type shoe designed to prevent penetration spalling or shattering of the existing surface. Unguided free falling weights such as "headache balls or drop balls" shall not be used. The equipment for seating the cracked concrete shall be a 50 ton pneumatic tired roller with 100 psi inflation pressure.

Construction Methods:

Cracking shall be accomplished one lane at a time with an impact hammer. Following removal of any existing bituminous overlays, if present, the existing concrete pavement shall be cracked by such equipment and by such a method so as to produce full depth and full width, generally transverse hairline cracks visible to the eye at a nominal longitudinal spacing of 2'±6"; special care should be taken to prevent the formation of a continuous longitudinal crack. No more than 20% of pavement material shall be larger than 2'-0". Acceptance of the extent of breakage shall be at the discretion of the Engineer.

Before cracking operations begin, the Engineer will designate test sections. The contractor shall crack the test sections using varying energy and striking patterns until a satisfactory cracking pattern is established. The contractor will be required to core the cracked PCCP in each test section to verify full depth cracking. This energy and striking pattern will then be required for the remainder of the project unless the Engineer determines conditions have changed such that a satisfactory cracking pattern is no longer being produced. Adjustments shall then be made to the energy and/or striking pattern as required to re-establish a satisfactory cracking pattern. When cracking the test sections, the contractor shall furnish and apply water to dampen the pavement following cracking to enhance visual determination of the cracking pattern. The contractor will be required to core, furnish and apply water to the cracked PCCP a minimum of four times per day, at locations determined by the Engineer to confirm that the specified crack pattern and full depth cracking are being maintained. The field engineer may require more cores to verify full depth PCCP cracking operation. The pavement cracking tool shall not impact the pavement within 1 foot of another break line, random crack, pavement joint, or edge of pavement. A screen satisfactory to the Engineer shall be provided to protect vehicles in the adjacent lane from flying chips during the cracking process when necessary.

The cracking and seating operation shall be performed between the hours of 8:00 p.m. and 10:00 a.m. or as directed by the Engineer.

The contractor shall exercise care during breaking to protect, and prevent damage to underground utilities and drainage facilities, bridge approach slabs, decks; public convenience, safety and traffic. Only construction or hauling traffic is permitted over the newly cracked pavement. The contractor shall be required to repair all damages to above, caused by cracking and seating operation. There will be no additional payment for repair of the damages.

Following cracking, the concrete shall be rolled with at least 2 to 5 (in the same direction) passes until the concrete pieces are assured of being seated. Any section that does not seat well under the roller shall be cracked into smaller sections and rolled again as directed by the Engineer.

After all segments have been seated to the satisfaction of the Engineer, loose debris shall be cleaned from all joints and cracks by the use of power broom, compressed-air equipment. All spalls shall be patched with bituminous material to the satisfaction of the Engineer prior to overlay.

Placing of the asphaltic concrete overlay shall follow the breaking and seating operation as closely as is practicable and, in no case, shall the broken pavement remain exposed more than 24 hours. If this 24-hour requirement is not met, breaking operations shall be suspended until all broken pavement has been covered by at least the first asphaltic concrete leveling course.

Measurement and Payment:

The completed work as measured for CONCRETE PAVEMENT CRACKING AND SEATING will be paid for at the contract unit price for the following contract item (pay item).

Pay Item	Pay Unit
Concrete Pavement Cracking	Square Yard

The contract price paid per square yard for cracking the existing concrete pavement shall include full compensation for furnishing all labors, materials, tools, equipments, and incidentals, and for doing all work in cracking the existing pavement, furnishing and applying water, seating cracked pavement, maintaining the cracked pavement in suitable condition for use by traffic if required, cleaning the pavement, filling joints, cracks and spalls, and coring the existing pavement as shown on the plans and these Special Provisions, and as directed by the Engineer.

ITEM 4010260 - RUBBLIZE EXISTING PORTLAND CEMENT CONCRETE PAVEMENT:

Description:

Under this item, the contractor shall rubblize, grade and compact the existing portland cement concrete pavement as shown on the plans or as directed by the Engineer.

Materials:

Filler aggregate shall be ~~class 5~~ Class 1 as designated in section 303-2 of the Standard Specifications.

Construction Methods:

The existing pavement shall be rubblized with a self-contained, self-propelled, resonant frequency pavement breaking unit capable of producing low amplitude, 2000 pound force blows at a rate of not less than 44 per second. The unit shall also be equipped with a water system to suppress dust generated by the operation.

The operating speed of the unit shall be such that the existing pavement is reduced into pieces ranging from sand sized pieces to pieces not exceeding 6 inches in largest dimension, the majority being a nominal 1 to 2 inches in size. Continuous coverage with the breaking equipment shoe shall be required. Rubblization shall start at the outside edge of the lane and proceed towards the longitudinal joint.

Prior to placing the initial lift of asphalt concrete, the rubblized pavement shall be compacted with two passes of a vibratory steel wheel roller having a nominal gross weight of not less than 10 tons operated in the vibration mode. The roller shall be operated at a speed not to exceed 6 feet per second. Any depressions, one inch or greater in depth from that of the immediate surrounding area, resulting from the rubblizing or compaction effort shall be filled with filler aggregate and struck off level with the surrounding area. Filled depressions shall then be compacted with the same roller compactive effort previously described.

Regrading of the rubblized section may be necessary to restore the pavement section prior to overlay placement.

(MC-250

A prime coat shall be applied to the rubblized section just prior to overlaying. The prime coat shall be applied in accordance with Section 404. For estimating purposes the application rate is 0.25 gallons per square yard. The engineer shall determine the exact application rate.

Placing of the asphalt concrete overlay shall follow the rubblization process as closely as is practical and in no case shall the rubblized section remain exposed for more than 24 hours. However, in the event of rain, this time limitation may be waived to allow sufficient time for the rubblized pavement to dry to the satisfaction of the Engineer.

Traffic will not be allowed on the rubblized section until the initial lift of asphalt concrete has been placed.

Rubblization shall begin in the passing lane. Traffic will be maintained in the travel lane during this operation until such time that the first lift of asphalt concrete has been satisfactorily placed. Immediately after placement of the initial lift of asphalt concrete, rubblization of the travel lane will commence. Traffic shall not be allowed on the initial lift for more than 24 hours. All asphalt concrete lifts shall be completed within 72 hours after commencement of rubblization.

The contractor will ensure that the rubblization process does not disrupt the D-cracked concrete in the travel lane during the rubblizing process. If spalling of the concrete occurs in the travel lane during rubblization of the passing lane, the contractor will immediately halt his operation. The spalled areas will be repaired and the contractor's operation modified to prevent re-occurrence of this problem.

Method of Measurement:

The quantity measured under this item shall be the number of square yards of existing portland cement concrete pavement rubblized.

Basis of Payment:

The unit price per square yard shall include the cost of furnishing all labor, materials and equipment necessary to rubblize, suppress dust, place and compact filler material, compact and maintain the compacted condition of the existing pavement until placement of the initial asphalt concrete course.

SECTION 402 - PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS: of the Standard Specification is modified to add:

ITEM 4020060 - SEAL CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT: AND

ITEM 4020061 - SEAL EDGE OF PORTLAND CEMENT CONCRETE PAVEMENT:

Description:

The work under Items 4020060 and 4020061 shall consist of furnishing all materials and renovating longitudinal and transverse joints in the existing Portland Cement Concrete Pavement and sealing random cracks as specified herein, detailed on the project plans and as directed by the Engineer.

Material Requirements:

Q13 Joint sealant shall conform to the requirements of Section 402-7.

Construction Requirements:

Prior to applying sealant, all joints, and random cracks 1/4 to 1 1/2 inch in width shall be thoroughly cleaned of all loose and weathered joint material to a minimum depth of 3/4 inch by equipment approved by the Engineer. Immediately after cleaning of the joints and random cracks, the internal surfaces shall be cleaned of oil, grease, and old sealant by compressed air sandblasting, just prior to applying sealant compressed air shall be used to further clean and dry the joints and cracks. Cracks and joints greater than 1 1/2 inch in width shall be repaired under the item for "Spall Repairs (PCCP)". The Engineer shall be the sole judge to determine which crack/joint or spall shall be considered to be sealed with ar or repaired under item for "Spall Repairs (PCCP)". The cracks adjacent to transverse and longitudinal joints shall be sealed by over filling the joints and spreading asphalt rubber material with a squeegee such that a minimum coverage thickness of 1/16" is obtained. This shall be included as part of joint sealing operation. For estimating purposes 1.0 foot total width shall be considered at all joints.

The estimated quantity of the joints and random cracks requiring renovation and sealing are listed below:

Milepost	Direction	Description	Lineal Feet of Renovation
339.4 to 340.45	NB & SB	Joints	33,874
339.4 to 340.45	NB & SB	Cracks	1,000

The random cracks to be renovated and sealed will be determined in the field by the Engineer, the estimated quantity is based on visual observation made in January, 1989 and the exact quantities may vary from this estimate.

Method of Measurement:

The work for Items 4020060 and 4020061 will be measured by the linear foot.

Basis of Payment:

The accept quantities of renovations for the work of Items 4020060 and 4020061, measured as provide above shall be paid for at the applicable contract unit price, per linear foot, which price shall be full compensation for the work, complete in place, as described and specified herein on the project plans.

ITEM 4020072 - REPAIR PORTLAND CEMENT CONCRETE PAVEMENT (SPALLED AREAS):

Description:

The work under this item shall consist of repairing spalled areas of the existing PCCP as specified in Section 402 of the Standard Specifications except that the patch material to be used will be premix patching material. The premix patching material shall be as specified in Section 409 except gradation is modified to 100% passing the 1/2" sieve.

The estimated quantity for spalled areas to be repaired is 300 square feet. The estimated quantity is based on visual observations. The exact quantities may very from this estimate.

Method of Measurement:

The work for Item 4020072 - REPAIR PORTLAND CEMENT CONCRETE PAVEMENT (Spalled Areas) will be measured by the square foot.

Basis of Payment:

The accepted quantities of the work for Item 4020072, measured as provided above shall be paid for at the contract unit price, per square foot, which shall be full compensation for the work, complete in place, as described and specified herein on the project plans.

SECTION 404 - BITUMINOUS TREATMENTS:

(BITR404, 451/O, 08/25/89)

404-3.13 Fog Coat: of the Standard Specifications is revised to read:

The type of bituminous material shall be ERA-25, diluted with 1 part water to 1 part ERA-25 and shall be applied at the approximate rate of 0.08 gallon per square yard.

Blotter material shall be applied to the treated surface in one or more application for a total application of approximately 2 pounds per square yard at a time specified by the Engineer and before opening the roadway to traffic.

404-3.14 Provisional Seal: This subsection and its entire content in the Standard Specifications is hereby deleted.

404-4 Method of Measurement: the fifth, sixth, seventh and eighth paragraphs of the Standard Specifications relating to time to apply tack and provisional seal coats are hereby deleted.

404-5 Basis of Payment: the eighth and ninth paragraphs of the Standard Specifications are revised to read:

The unit price for bituminous tack coat is deemed to be the cost to furnish, transport, store and apply asphalt cement or emulsified asphalt at the project location. Payment for bituminous tack coat will be made at the unit price multiplied by the respective payment factor, listed under Subsection 404-3.12, and adjusted to the nearest dollar.

The accepted quantity of bituminous tack coat, measured as provided above, will be paid at the contract unit price per ton adjusted as provided above which price shall be full compensation for furnishing, transporting, storing and applying the exact type, grade or designation of bituminous tack coat specified by the Engineer.

404-5 Basis of Payment: the tenth, eleventh, twelfth, thirteenth and fourteenth paragraphs of the Standard Specifications are hereby deleted.

(BIMAT404, 451/P, 11/08/89)

404-5 Basis of Payment: of the Standard Specifications is modified to add:

The term "bituminous material" as used herein shall include asphalt cement, liquid asphalt and emulsified asphalt.

The contract unit price for each item of bituminous material will be considered to include all costs for furnishing, hauling, handling, spreading, and mixing of the material as required, including the "initial cost" of asphalt cement, but excluding any difference in the cost of asphalt cement that occurs between the date of bid opening and the date that the material is delivered or used.

The "initial cost" of asphalt cement, liquid asphalt and emulsified asphalt is hereby defined as the arithmetic average, to the nearest dollar, of the price of AC-40 asphalt cement posted by the following refineries:

(1) WITCO CHEMICAL, Golden Bear Division
Corner, Norris and Manor Roads
Oildale, CA 93308

(2) CHEVRON, USA, INC.
6501 Trowbridge
El Paso, TX 79905

(3) CHEVRON, USA, INC.
841 Standard Avenue
Richmond, CA 94804

(4) EDGINGTON OIL COMPANY, INC.
2400 East Artesia Boulevard
Long Beach, CA 90805

(5) SUN BELT REFINING CO.
P.O. Box 2179
Coolidge, Az. 85228

This price will be determined monthly by the Department from information furnished by the refineries and will be made known by means of a memorandum issued on the first working day after the 25th of each month and mailed to those currently receiving copies of the Advertisements for Bids.

This price will be deemed to be the "initial cost" for bituminous material of all types, grades, etc. on projects on which bids are opened during the following month. This price may also be obtained from Contracts and Specifications Services, (602) 255-7221.

For each item of bituminous material for which there is a specific pay item, an adjustment in compensation will be made for either an increase or decrease in the price of AC-40 asphalt cement as shown in the latest memorandum, current as of the date of use, as compared to the "initial cost".

The tons of emulsified products to which the adjustment will be applicable will be the tons of the emulsified bituminous asphalt prior to dilution.

Adjustments in compensation for emulsified asphalts will be made at 60 percent of either the increase or decrease.

The tons of bituminous materials which are paid for on an invoice basis to which the adjustment will be applicable are the tons which have been delivered to the project and subsequently incorporated into the work. The adjustment will be applicable on the date of use.

The tons of bituminous materials which are paid for on the basis of extraction tests to which the adjustment will be applicable are the tons which have been incorporated into the mixture.

No additional compensation will be made for any additional or increased charges, costs, expenses, taxes, etc., which the contractor may have incurred since the time of bidding and which may be the result of any increase in the "initial cost" of bituminous material.

Any adjustment in compensation in the cost of an item of bituminous material will be made once and only after the work in which the material has been utilized has been completed.

After the expiration of the specified completion time set forth in the contract or as may be extended in accordance with the provisions of Subsection 108.08 of the Specifications any adjustment in compensation made for bituminous material incorporated into the work will be on the basis of the price of paving asphalt shown in the latest memorandum on the date of the expiration of the specified completion time, as hereinbefore specified.

ITEM 4060051 - ASPHALT CONCRETE (RUBBERIZED):

Asphalt Rubber - Asphaltic Concrete (hereinafter asphaltic concrete) shall consist of furnishing all materials, mixing at a plant, hauling, and placing a mixture of an aggregate material and bituminous material to form a pavement course or to be used for other specified purposes, in accordance with the details shown on the project plans and the requirements of these specifications, and as directed by the Engineer.

The contractor shall be responsible for all adjustments to his equipment necessary to properly accommodate the use of asphalt rubber as a bituminous material.

Materials:

Mineral Aggregate:

There is no Department furnished source of mineral aggregate. The contractor shall provide a source in accordance with the requirements of Section 1001 of the Specifications.

Mineral aggregate shall conform to the following requirements when tested in accordance with the applicable test methods.

Mineral Aggregate Characteristics	Test Method	Requirement
Combined Bulk Specific Gravity	AASHTO T 85 Arizona Test Method 211	2.35 - 2.85
Combined Water Absorption	AASHTO T 85 Arizona Test Method 211	0 - 2.5%
Sand Equivalent	AASHTO T 176	Minimum 55
Crushed Faces	Arizona Test Method 212	Minimum 70%
Abrasion	AASHTO T 96	100 Rev., Max. 9% 500 Rev., Max. 40%

The mix design grading limits for mineral aggregate shall be as follows:

Sieve Size	Percent Passing w/ Mineral Admixture
1/2 inch	100
3/8 inch	80 - 90
1/4 inch	40 - 60
No. 8	26 - 34
No. 40	5 - 15
No. 200	0 - 3.5

During the production of asphaltic concrete, mineral aggregate gradation shall be tested for acceptance in accordance with the requirements of Subsection 406-9.03(A).

Bituminous Material:

Bituminous material shall be asphalt-rubber (vulcanized) and shall conform to the requirements of Section 1009 of the Standard Specifications, except for the following:

The rubber shall conform to the following gradation:

Sieve Size	Percent Passing
No. 10	100
No. 16	75 - 100
No. 30	25 - 100
No. 50	0 - 50
No. 100	0 - 10
No. 200	0 - 5

The asphalt rubber binder shall conform to the following requirements:

Parameter	Requirement
Viscosity, Haake, 350F	1500 - 4000 cp.
Cone Penetration, 77T (ASTM D1191)	20 min.
Softening Point, F (ASTM D36)	125F min.
Resilience, 77F (ASTM D3407)	15% min.

During the production of asphaltic concrete, the contractor shall maintain on the site a nuclear asphalt content gauge calibrated on the material being tested in accordance with the gauge manufacturer's recommendations. Asphaltic concrete asphalt rubber content shall be measured by the contractor by means of the nuclear asphalt content gauge a minimum of four times per full shift. Production of asphaltic concrete shall cease immediately and the plant recalibrated if the Engineer determines the percent of bituminous material has varied by an amount greater than 0.5± percent from the amount directed by the Engineer. During the production of asphalt rubber, the contractor shall maintain on site equipment necessary to measure the viscosity of the mixture. The mixture shall be maintained between 1500 and 4000 centipoise at 350F. Mixture viscosity shall be checked at the direction of the Engineer.

Mineral Admixture:

Where the average elevation of the project is over 3,500 feet, an approved mineral admixture will be required. The approximate amount shall be one percent, by weight, of the mineral aggregate. The mineral admixture shall be lime conforming to the requirement of ASTM C 977.

The mineral admixture shall be mechanically mixed with the mineral aggregate prior to combining the mineral aggregate and asphalt cement. The Engineer may direct a spray of water to be applied either to control the loss of the mineral admixture or to comply with the requirement for maintaining a 3-5% moisture content in the mineral aggregate during mixing with the mineral admixture.

A drum mix plant shall be used. The mineral admixture shall be added and thoroughly mixed by means of a mechanical mixing device prior to the mixture entering the drum drier. The mineral admixture shall be weighed across a weigh belt, or an approved alternative weighing system, with a weigh belt, or an approved alternative weighing system, with a weigh totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer consisting of a least tow motorized shafts with mixing paddles. The mixing device shall be designed such that the aggregate upon entering the device is moved in a near horizontal direction by the mixing paddles without the aid of conveyor belts for a distance of at least 3 feet. Mixing devices which permit the aggregate to fall through mixing blades onto a belt or chute are not acceptable. The mixing devices rated capacity in tons per hour shall not be exceeded by the rate of aggregate feed to the mixer. The mixer shall be constructed to prevent the leakage of the contents. The mixer shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected on a belt prior to entry into the drum. The mixing device shall be capable of effective mixing in the full range of asphaltic concrete production rates.

The contractor shall furnish daily documentation to the Engineer that the required amount of mineral admixture has been incorporated into the asphaltic concrete.

A positive signal system and a limit switch device shall be installed in the plant at the point of introduction of the admixture. The positive signal system shall be placed between the metering device and the drum dryer, and utilized during production whereby the mixing shall automatically be stopped if the admixture is not being introduced into the mixture.

The average elevation of the roadway for this project is 6,900 feet.

Mix Design Proposal:

A fifty pound sample from each stockpile of mineral aggregate shall be furnished to the Engineer, along with a letter from the contractor explaining in detail his proposed methods of producing mineral aggregate, including the expected wasting, washing, blending, proportioning, etc., to produce asphaltic concrete that meets the requirements and gradation as specified herein and any special or limiting conditions that he may propose.

Along with these aggregate samples the contractor shall furnish a minimum 10 pound sample of the granulated rubber proposed for use, one gallon of AC - 10 asphalt cement form the intended supplier, and two gallons of the proposed mixture of asphalt and rubber.

The Department will, within 10 working days of receipt of all samples in the Central Laboratory, provide the contractor with the percentage of bituminous material to be used in the mix, the percent of aggregate material passing each required sieve, the requirements for any admixture, and any special or limiting conditions for the use of the mix.

Construction Requirements:

The asphaltic concrete shall be constructed in accordance with the requirements of Subsection 406-10 and the following modifications and additions:

General:

The surface upon which the asphaltic concrete is to be paced shall be cleaned of all objectionable material and tacked with a light coat of bituminous material. The cleaning of the surface, the tacking of the surface, and amount of bituminous material used shall be as directed by and acceptable to the Engineer.

Just prior to being placed, the asphaltic concrete shall be in a thoroughly mixed condition, free of lumps and crusts, and be in a free flowing, workable condition.

Proportioning:

The asphalt cement shall be modified by the addition of a minimum of 20 percent of granulated rubber, by weight of the asphalt unless otherwise approved by the Department's Central Laboratory.

The asphalt cement and rubber shall be combined prior to incorporation into the asphaltic concrete for a period of at least one hour: however, the mixture of asphalt cement and rubber should not be held at temperatures over 350 degrees F. for a period over 10 hours. The temperature of the asphalt cement shall be between 350 and 400 degrees F. at the addition of the granulated rubber. Temperature of the asphalt rubber mixture shall be maintained between 325 and 375 degrees F. during the one hour reaction period.

Compaction:

The temperature of asphaltic concrete just prior to compaction shall be at least 275 degrees F.

Compaction shall be accomplished by the following sequence and coverage of rollers.

A minimum of two (2) Static Steel Wheel rollers and two (2) Vibratory Steel Wheel rollers shall be provided. The drums shall be of sufficient width that when staggered, tow (2) rollers can cover the entire width of the ribbon with one (1) pass. The two vibratory rollers shall be used for initial breakdown and be maintained no more than 150 feet behind the paving machine. The remaining two rollers shall follow as closely behind the initial breakdown as possible. As may passes as is possible shall be made with the second set of rollers before the temperature of the asphaltic concrete falls below 220 degrees F.

Steel Wheel compactors shall weigh not less than eight tons. The rollers shall be self-propelled and shall be operated with the drive wheel in the forward position. Vibratory rollers shall be used in the mode required by the Engineer. All rollers shall be equipped with pads and a watering system to prevent sticking of the asphaltic concrete mix to the steel wheels.

In order to achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. At no time shall the paving machine be stopped for more than three minutes. In the event a three minute or longer delay occurs the paving machine shall be pulled away from the mat in order for the rollers to compact this area in accordance with the above temperature limitations.

The rollers steel wheels shall be wetted with water or, if necessary, soapy water to prevent mix pick-up during rolling. The Engineer may change the number of coverages or sequence if, in his judgement, the change is necessary to prevent picking up of the asphaltic concrete.

Asphaltic concrete will be accepted complete in place, in the judgement of the Engineer, the asphaltic concrete reasonably conforms to the requirements specified herein. Asphaltic concrete that is not acceptable and is rejected shall be replaced to the satisfaction of the Engineer and at no expense to the Department.

Method of Measurement:

Asphaltic concrete will be measured by the ton for the mixture actually used, which will include the weight of mineral aggregate, bituminous material, any necessary blending material, and any necessary mineral admixture. Measurement will include any weight used in construction of intersections, turnouts, or other miscellaneous items or surfaces.

Asphalt-rubber material will be measured by the ton in accordance with the requirements of Section 1009 of the Standard Specifications.

Mineral Admixture will be measured by the ton.

Basis of Payment:

The accepted quantities of asphaltic concrete, measured as provided above, will be paid for at the contract unit price per ton for the bituminous mixture, which price shall be full compensation for the work, complete in-place, as specified herein.

Payment for the asphalt-rubber will be made by the ton of the mixture, including asphalt cement and granulated rubber.

Payment for mineral admixture will be made by the ton.

For estimating purposes the unit weight of the bituminous mix is 146 pounds per cubic foot, the asphalt rubber is 6.5%, and the haul distance is 11 miles.

ITEM 4060951 - PAVEMENT REINFORCEMENT FABRIC:

The work under this item consists of furnishing all equipment, materials, labor, and placing by use of mechanical equipment a pavement reinforcing fabric and binder coat between pavement layers in accordance with the detail shown on the plans and these specifications.

Pavement reinforcing fabric shall be non woven polyester, polypropylene or combination of polypropylene and 1/4 nylon materials conforming to the following when tested in conformance with the listed ASTM designations:

Weight oz./Sq. Yd. ASTM Designation: D 1910	5 to 8
Grab Tensile Strength (1-inch grip), pounds ASTM Designation: D 1117	100 minimum
Elongation at Break, Percent ASTM Designation: D 1117	40 minimum
Fabric Thickness ASTM Designation: 461	30 to 105 mils
Melting point, degrees F ASTM Designation: D276	300 or greater

Pavement reinforcing fabric shall be accompanied with a certificate of compliance conforming to provisions in Section 106.05 of the Standard Specifications.

The fabric shall be protected from exposure to ultraviolet rays and shall be kept dry until placed.

A binder coat of AC-20 shall be applied to the surface at approximately 0.25-0.3 gallons per square yard prior to applying the fabric. The exact rate of application will be determined by the Engineer. The fabric shall be placed immediately after spraying the binder coat. The fabric should be clean, dry, and sufficiently bonded to the binder coat prior to paving. Wrinkles or folds in excess of one inch shall be slit and laid flat. All transverse joints and slit folds or wrinkles shall be shingle-lapped in the direction of the paving operation.

Transverse joints shall be overlapped a minimum of 12 inches, and the longitudinal joints shall be overlapped a minimum of three inches, and the lap joints shall be sealed with an application of binder coat. The rate of application shall be as specified above. Brooming and/or pneumatic rolling will be required to maximize geotextile contact with the pavement surface.

The reinforcing fabric (interlayer) shall be unrolled and spread uniformly directly by mechanical means on the coated surface.

Fabric placement and subsequent application of the overlay shall be accomplished by the end of each shift.

Fabric Laydown Equipment:

Mechanical layout equipment shall be capable of handling full rolls of fabric, and shall be capable of laying the fabric smoothly, without excessive wrinkles or folds that lap. The test for lapping shall be made by gathering together the fabric in a wrinkle. If the height of the doubled portion of extra fabric is 1/2 inch or more, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving. When manual laydown is required, a length of standard one-inch pipe, together with suitable roll tension devices, shall be used. The fabric shall be unrolled, stretched, aligned and placed in increments of approximately 30 feet.

Traffic:

Only necessary construction equipment shall be allowed on the fabric until the application of the asphaltic concrete overlay and subsequently opening to normal traffic. Construction equipment turning movements as well as sudden stops or starts on the fabric should be minimized.

Method of Measurement:

Reinforcing fabric shall be measured by the square yard in-place. Measurement will be to the nearest square yard. No allowance will be made for material in laps.

Basis of Payment:

Payment for Item 4060951 - Pavement Reinforced Fabric will be made at the contract unit price for Reinforcing Fabric, which price and payment shall constitute full compensation for furnishing all labor, material, and equipment and performing all operations in connection with placing the reinforcing fabric as shown in the contract plans.

No measurement or direct payment will be made for brooming the asphaltic concrete surface or furnishing and applying the binder coat. The cost for this work being considered as included in the cost of the reinforcing fabric.

ITEM 4070004 - ASPHALTIC CONCRETE FRICTION COURSE (ASPHALT RUBBER)

Asphaltic Concrete Friction Course - Asphalt Rubber (hereinafter asphaltic concrete) shall consist of furnishing all materials, mixing at a plant, hauling, and placing a mixture of an aggregate material and bituminous material to form a pavement course or to be used for other specified purposes, in accordance with the details shown on the project plans and the requirements of these specifications, and as directed by the Engineer.

The contractor shall be responsible for all adjustments to his equipment necessary to properly accommodate the use of asphalt rubber as a bituminous material.

Materials:

Mineral Aggregate:

There is no Department furnished source of mineral aggregate. The contractor shall provide a source in accordance with the requirements of Section 1001 of the Specifications.

Mineral aggregate shall conform to the following requirements when tested in accordance with the applicable test methods:

Mineral Aggregate Characteristics	Test Method	Requirement
Combined Bulk Specific Gravity	AASHTO T 85 Arizona Test Method 211	2.35 - 2.85
Combined Water Absorption	AASHTO T 85 Arizona Test Method 211	0 - 2.5
Sand Equivalent	AASHTO T 176	Minimum 55
Crushed Faces	Arizona Test Method 212	Minimum 70%
Abrasion	AASHTO T 96	100 Rev., Max. 9% 500 Rev., Max. 40%
Flakiness Index	Arizona Test Method 233	Maximum 25
Percent Carbonate in Aggregate	Arizona Test Method 238	Maximum 30%

All fine mineral aggregate material used for asphaltic concrete shall be crushed aggregate. All mineral aggregate material passing the #4 sieve shall be removed prior to the crushing, screening, and washing operations necessary to produce the specified gradation. The contractor shall notify the Engineer a minimum of 48 hours in advance of crushing the material to be used as mineral aggregate, so all crushing operations are inspected. Existing stockpile material which has not been inspected during crushing will not be permitted for use. Any material inspected by the Department as crushed material shall be separated from the contractors other stockpiles and reserved for use by the Department.

The mix design grading limits for mineral aggregate shall be as follows:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	30 - 60
No. 8	6 - 10
No. 200	0 - 3.5

During the production of asphaltic concrete, mineral aggregate gradation shall be tested for acceptance in accordance with the requirements of Subsection 407-9.03(A).

Bituminous Material:

Bituminous material shall be asphalt-rubber (vulcanized) and shall conform to the requirements of Section 1009 of the Standard Specifications, except for the following:

The rubber shall conform to the following gradation:

Sieve Size	Percent Passing
No. 10	100
No. 16	75 - 100
No. 30	25 - 100
No. 50	0 - 45
No. 100	0 - 10
NO 200	0 - 5

The asphalt rubber binder shall conform to the following requirements:

Parameter	Requirement
Viscosity, Haake, 350F	1500 - 4000 cp.
Cone Penetration, 77F (ASTM D1191)	20 min.
Softening Point, F (ASTM D36)	120F min.
Resilience, 77F (ASTM D3407)	15% min.

During the production of asphaltic concrete, the contractor shall maintain on the site a nuclear asphalt content gauge calibrated on the material being tested in accordance with the gauge manufacturer's recommendations. Asphaltic concrete asphalt rubber content shall be measured by the contractor by means of the nuclear asphalt content gauge a minimum of four times per full shift. Production of asphaltic concrete shall cease immediately and the plant recalibrated if the Engineer determines the percent of bituminous material has varied by an amount greater than 0.5± percent from the amount directed by the Engineer. During the production of asphalt rubber, the contractor shall maintain on site equipment necessary to measure the viscosity of the mixture. The mixture shall be maintained between 1500 and 4000 centipoise at 350F. Mixture viscosity shall be checked at the direction of the Engineer.

Mineral Admixture:

The contractor shall use mineral admixture. Mineral admixture, in the amount of 1.0 percent by weight of the mineral aggregate, shall be lime conforming to the requirements of ASTM C 977.

The mineral admixture shall be mechanically mixed with the mineral aggregate prior to combining the mineral aggregate and asphalt cement. The Engineer may direct a spray of water be applied either to control the loss of the mineral admixture or to comply with the requirement for maintaining a 3-5% moisture content in the mineral aggregate during mixing with the mineral admixture.

A drum mix plant shall be used. The mineral admixture shall be added and thoroughly mixed by means of a mechanical mixing device prior to the mixture entering the drum drier. The mineral admixture shall be weighed across a weigh belt, or an approved alternative weighing system, with a weigh totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer consisting of at least two motorized shafts with mixing paddles. The mixing device shall be designed such that the aggregate upon entering the device is moved in a near horizontal direction by the mixing paddles without the aid of conveyor belts for a distance of at least 3 feet. Mixing devices which permit the aggregate to fall through mixing blades onto a belt or chute are not acceptable. The mixing devices rated capacity in tons per hour shall not be exceeded by the rate of aggregate feed to the mixer. The mixer shall be constructed to prevent the leakage of the contents. The mixer shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected on a belt prior to entry into the drum. The mixing device shall be capable of effective mixing in the full range of asphaltic concrete production rates.

The contractor shall furnish daily documentation to the engineer that the required amount of mineral admixture has been incorporated into the asphaltic concrete.

Mix Design Proposal:

A fifty pound sample from each stockpile of mineral aggregate shall be furnished to the Engineer, along with a letter from the contractor explaining in detail his proposed methods of producing mineral aggregate, including the expected wasting, washing, blending, proportioning, etc., to produce asphaltic concrete that meets the requirements and gradation as specified herein and any special or limiting conditions that he may propose.

Along with these aggregate samples the contractor shall furnish a minimum 10 pound sample of the granulated rubber proposed for use, one gallon of AC-10 asphalt cement from the intended supplier, and two gallons of the proposed mixture of asphalt and rubber.

The Department will, within 10 working days of receipt of all samples in the Central Laboratory, provide the contractor with the percentage of bituminous material to be used in the mix, the percent of aggregate material passing each required sieve, the requirements for any mineral admixture and any special or limiting conditions for the use of the mix.

Construction Requirements:

The asphaltic concrete shall be constructed in accordance with the requirements of Subsection 407-10 and the following modifications and additions:

General:

The surface upon which the asphaltic concrete is to be placed shall be cleaned of all objectionable material and tacked with a light coat of bituminous material. The cleaning of the surface, the tacking of the surface, and amount of bituminous material used shall be as directed by and acceptable to the Engineer.

Just prior to being placed, the asphaltic concrete shall be in a thoroughly mixed condition, free of lumps and crust, and be in a free flowing, workable condition.

The first sentence of the last paragraph of Subsection 407-10.05 is modified to read:

The temperature of asphaltic concrete upon discharge from the mixer shall not exceed 325 degrees F.

The fourth paragraph of Subsection 407-10.06 is modified to read:

The temperature of asphaltic concrete just prior to compaction shall be at least 275 degrees F.

In addition to the requirements of Subsection 407-10:

Proportioning:

The asphalt cement shall be modified by the addition of a minimum of 20 percent of granulated rubber, by weight of the asphalt unless otherwise approved by the Department's Central Laboratory.

The asphalt cement and rubber shall be combined prior to incorporation into the asphaltic concrete for a period of at least one hour; however, the mixture of asphalt cement and rubber should not be held at temperatures over 350 degrees F. for a period over 10 hours. The temperature of the asphalt cement shall be between 350 and 400 degrees F. at the addition of the granulated rubber. Temperature of the asphalt rubber mixture shall be maintained between 325 and 375 degrees F. during the one hour reaction period.

Subsection 407-10.08 is modified to read:

Compaction:

Compaction shall be accomplished by the following sequence and coverage of rollers.

A minimum of three (3) Static Steel Wheel rollers shall be provided. The drums shall be of sufficient width that when staggered, two (2) rollers can cover the entire width of the ribbon with one (1) pass. Two of these rollers shall be used for initial breakdown and be maintained no more than 150 feet behind the paving machine. As many passes as is possible shall be made with the first set of rollers before the temperature of the asphaltic concrete falls below 200 degrees F. The remaining roller shall follow and accomplish finish rolling.

Static Steel Wheel compactors shall weigh not less than eight tons. The rollers shall be self-propelled and shall be operated with the drive wheel in the forward position. Vibratory rollers may be used in the mode directed by the Engineer. All rollers shall be equipped with pads and a watering system to prevent sticking of the asphaltic concrete mix to the steel wheels.

In order to achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. At no time shall the paving machine be stopped for more than three minutes. In the event a three minute or longer delay occurs the paving machine shall be pulled away from the mat in order for the rollers to compact this area in accordance with the above temperature limitations.

The rollers steel wheels shall be wetted with water or, if necessary, soapy water to prevent mix pick-up during rolling. The Engineer may change the number of coverages or sequence if, in his judgement, the change is necessary to prevent picking up of the asphaltic concrete.

Asphaltic concrete will be accepted complete in place, if, in the judgement of the Engineer, the asphaltic concrete reasonably conforms to the requirements specified herein. Asphaltic concrete that is not acceptable and is rejected shall be replaced to the satisfaction of the Engineer and at no expense to the Department.

Method of Measurement:

Asphaltic concrete will be measured by the ton for the mixture actually used, which will include the weight of mineral aggregate, bituminous material, any necessary blending material, and any necessary mineral admixture. Measurement will include any weight used in construction of intersections, turnouts, or other miscellaneous items or surfaces.

Asphalt-rubber material will be measured by the ton in accordance with the requirements of Section 1009 of the Standard Specifications.

Basis of Payment:

The accepted quantities of asphaltic concrete, measured as provided above, will be paid for at the contract unit price per ton for the bituminous mixture, which price shall be full compensation for the work, complete in place, as specified herein.

Payment for the asphalt-rubber will be made by the ton of the mixture, including asphalt cement and granulated rubber.

For estimating purposes the unit weight of the bituminous mix is 130 pounds per cubic foot, the asphalt rubber is 9.0%, and the haul distance is 11 miles.

It has been determined that the average elevation of the roadway for this project is 6,900 feet.

SECTION 416 - ASPHALTIC CONCRETE - END PRODUCT:

(ACEX416, 453/0, 05/31/89)

416-2 Asphaltic Concrete Mix Design Criteria: mix design criteria for effective voids in the Standard Specifications is revised to read:

Criteria	Requirements 3/4" Mix	Arizona Test Method
1. Void in Mineral Aggregate, Percent	14.5 - 17.0	815
2. Effective Voids Percent, Range	5.5 ± 0.2	815
4. Index of Ratained Strength, Percent, Minimum	70	802
7. Stability, Pounds, Minimum	3000	815

8. Mineral Aggregate Grading Limits	Percent Passing Incl. Admix.	Arizona Test Method
1"	100	
3/4"	85 - 95	
1/2"	- - -	
3/8"	60 - 75	201
No. 8	36 - 46	
No. 40	11 - 19	
No. 200	2.0 - 5.5	

416-3.01 Mineral Aggregate: of the Standard Specifications is modified to add:

Mineral aggregate shall conform to the following requirements when tested in accordance with the applicable test methods.

Mineral Aggregate Characteristics	Test Method	Requirement
Combined Bulk Specific Gravity	AASHTO T 85, Arizona Test Method 211	2.35 - 2.85
Combined Water Absorption	AASHTO T 85, Arizona Test Method 211	0 - 2.50%
Sand Equivalent	AASHTO T 176	Minimum 55
Crushed Faces	Arizona Test Method 212	Minimum 70%
Abrasion	AASHTO T 96	100 Rev., Max 9% 500 Rev., Max 40%

Tests on aggregates outlined above, except for abrasion, shall be performed on materials furnished for mix design purposes and composited to the mix design gradation. Abrasion shall be performed separately on materials from each source of mineral aggregate. All sources shall meet the requirements for abrasion.

For comparative purposes, quantities shown in the bidding schedule have been calculated based on the following data:

	3/4" Mix
Unit Weight, Pounds per Cubic Foot	144
Percent, Asphalt Cement	5.5
Percent, Mineral Admixture	2.0

416-3.03 Bituminous Materials: of the Standard Specifications is modified to add:

The grade to be used shall be AC-20.

416-4 Mix Design: The last five paragraphs on page 273 of the Standard Specifications are revised to read:

The mix design shall be submitted on a laboratory bituminous mixture design form in ADOT format and signed by a person authorized by the contractor to act in such matters on behalf of the contractor.

Representative samples of the mineral aggregate used for the mix design shall be submitted to the Engineer for determination of a coating index and sand equivalent. The coating index will be determined in accordance with the requirements of Arizona Test Method 239 and the sand equivalent will be determined in accordance with the requirements of AASHTO T-176.

The Engineer will determine the Coating Index and Sand Equivalent and review the mix design to assure that it contains all required information. If the mix design is unsatisfactory or incomplete, the Engineer will, within two working days after receipt of all samples and the mix design proposal, advise the contractor of the need to resubmit the mix design proposal.

If the contractor elects to change his source of material, once a mix design has been approved, or if a mix design should prove unsatisfactory to the contractor during production, the contractor shall furnish the Engineer with a new mix design for approval which meets the requirements specified herein. For acceptance purposes, the revised mix design will not be retroactive.

416-5 Contractor Quality Control: Of the Standard Specifications is revised to read:

416-5.01 General Requirements:

It shall be the responsibility of the contractor to administer a Quality Control Plan, hereinafter referred to as the "Plan", sufficient to assure a product meeting the requirements of these specifications. The Plan shall meet the requirements of Subsection 106.04(B) and the requirements specified below. The Plan may be operated wholly or in part by a subcontractor or an independent organization, however, the Plan's administration, including compliance with the Plan and its modification, shall remain the responsibility of the contractor.

416-5.02 Elements of The Plan:

The Plan shall address all elements which affect the quality of the asphaltic concrete including, but not limited to the following:

(A) Mix Design
(B) Aggregate Production
(C) Quality of Components
(D) Stockpile Management
(E) Proportioning
(F) Mixing, including addition of Mineral Admixture, if required
(G) Placing and Finishing
(H) Joints
(I) Compaction

416-5.03: Other Requirements:

The Plan shall include the use of Operation's Technicians, including the following:

(A) Process Control Technician (PCT). This person will be expected to utilize laboratory test results and other quality control practices to assure the quality of aggregates and other mix components and adjust and control mix proportioning to meet the mix design(s). The Plan shall detail the frequency of each type of test, when and how corrective actions are to be taken, and the means of documentation. The PCT shall be responsible for periodically inspecting all equipment utilized in proportioning and mixing to assure its proper operating condition and to assure that proportioning and mixing is in conformance with the mix design and other requirements. The Plan shall set forth how these duties and responsibilities will be accomplished and documented.

If more than one individual is required to accomplish these requirements, the Plan shall so note. Included also shall be the criteria utilized by the PCT to correct or reject unsatisfactory materials.

(B) Quality Control Technician (QCT). This person will be expected to assure that the delivered materials meet the requirements of the specifications. In addition, this person shall be responsible for periodically inspecting all equipment utilized in placing, finishing and compacting to assure its proper operating condition and to assure placing, finishing, joint construction and compaction in conformance with the specifications. The Plan shall set forth how these duties and responsibilities will be accomplished and documented. If more than one individual is required to accomplish these requirements, the Plan shall so note. Included also shall be the criteria utilized by the QCT to correct or reject unsatisfactory materials.

(C) The Plan shall set forth the coordination of the activities of the PCT and QCT.

(D) The Department reserves the right to check the records of the PCT and QCT at any time. The Department may take and test samples at any time to confirm the effectiveness of the activities of the PCT and QCT.

416-6 Construction Requirements: of the Standard Specifications is modified to add:

Construction Requirements: The fourth through the seventh paragraph of this subsection of the Standard Specification shall be superceded by the following requirements:

The mineral admixture shall be mechanically mixed with the mineral aggregate prior to combining the mineral aggregate and asphalt cement. The Engineer may direct a spray of water be applied either to control the loss of the mineral admixture or to comply with the requirement for maintaining a 3-5% moisture content in the mineral aggregate during mixing with the mineral admixture.

A drum mix plant shall be used. The mineral admixture shall be added and thoroughly mixed by means of a mechanical mixing device prior to the mixture entering the drum drier. The mineral admixture shall be weighed across a weigh belt, or an approved alternative weighing system, with a weigh totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer consisting of at least two motorized shafts with mixing paddles. The mixing device shall be designed such that the aggregate upon entering the advice is moved in a near horizontal direction by the mixing paddles without the aid of conveyor belts for a distance of at least 3 feet. Mixing devices which permit the aggregate to fall through mixing blades onto a belt or chute are not acceptable. The mixing devices rated capacity in tons per hour shall not be exceeded by the rate of aggregate feed to the mixer. The mixer shall be constructed to prevent the leakage of the contents. The mixer shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected on a belt prior to entry into the drum. The mixing device shall be capable of effective mixing in the full range of asphaltic concrete production rates.

The contractor shall furnish daily documentation to the Engineer that the required amount of mineral admixture has been incorporated into the asphaltic concrete.

416-9 Basis of Payment:

(F) Mineral Admixture: of the Standard Specifications is revised to read:

If mineral admixture is used in the mix design it will be paid for at the predetermined price established in the Bidding Schedule. If mineral Admixture is eliminated, it will be eliminated in accordance with the requirements of Subsection 109.05, however, no reimbursement will be made for any costs which the contractor may have incurred in anticipation of its use.

SECTION 501 - PIPE:

ITEM 5014801 - PREFABRICATED CONCRETE END SECTION:

Description:

Precast Concrete Headwall:

Precast concrete headwalls for subsurface drains shall be constructed in accordance to the following details and specifications:

1. Concrete for precast headwall shall have a minimum compressive strength of 5,000 psi prior to shipping and an air content of approximately 6%. The fabricator shall provide a quality control program approved by the Engineer.

2. The rodent shield may be fabricated from one of the following:

   a. Carbon steel flattened expanded metal, style 1/2" No. 13F.

   b. Tack-welded or frame-welded wire cloth, min. gage no. 8 wire.

   c. Welded-wire stock, min. gage No. 8 wire.

Type b. and c. shall have nominal openings of 1/2" square. All wire or expanded metal shall be hot dipped galvanized after fabrication. Actual screen dimensions shall be such as will snugly fit the provided slot (tapered if necessary), with the screen lip fitting flush with the casting top and bottom tight to the flowline.

3. Alternate to above designs (both rodent screen and concrete headwall) may be approved by the Materials Section Engineer.

4. Approximate weight of headwall = 210 lbs.

5. When a rubber or plastic gasket is cast into the headwall, for connecting the discharge pipe, the gasket shall be placed as far towards the outside face of the headwall as possible consistent with providing enough embedment to securely anchor the gasket.

Method of Measurement: and

Basis of Payment:

The contract price paid per each of the sizes shown in the project plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drain outlets, complete in place, including outlet connecting outlets to drainage facilities, and excavation and backfill, and for outlets to be installed in embankments and existing shoulders, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

ITEM 5019321 - PIPE (4")(ATED Laterals):

Description:

Pipe and Pipe Fittings: (ATED Laterials)

Pipe and pipe fittings for edge drains and edge drain outlets shall be of the size or sizes shown on the plans.

Pipe installed in trenches to be backfilled with aggregate shall be polyvinyl chloride (PVC) 90 degrees centigrade electric plastic conduit, EPC-40 or EPC-80, conforming to the requirements of NEMA Specification TC-2.

All other pipe for edge drains and edge drain outlets shall, at the Contractor's option, be either:

1. PVC 90 degrees centigrade electric plastic conduit, EPC-40 or EPC-80, conforming to the requirements of NEMA Specification TC-2, or

2. PVC plastic pipe, Schedule 40 or Schedule 80, conforming to the requirements of ASTM Designation D 1785. The type, grade, and design stress designation of the pipe shall, at the Contractor's option, be either 1120, 1220, 2120, 2116, 2112, or 2110 as specified in said ASTM Designation.

Pipe shall be straight end or bell end. Bell end sockets shall conform to the requirements of ASTM Designation: D 2672 except for marking.

In addition, pipe designated as slotted on the plans shall have 3 rows of slots in the pipe. The rows shall be in the longitudinal direction of the pipe and the slots shall be cut in the circumferential direction of the pipe. The 3 rows shall be spaced equally around the circumference of the pipe. Each row shall have 22($\pm$1) uniformly spaced slots per linear foot of pipe. The slots shall be 0.045-inch to 0.065-inch wide and of such length as to provide a minimum of 2.00 square inches of slot opening per linear foot of pipe. Other suitable configurations of slots which provide drainage equal to or better than the above slot requirements may be used if approved in writing by the Engineer.

Except as otherwise provided for "Y" fittings, fittings for PVC 90 degrees centigrade electric plastic conduit shall conform to the requirements of NEMA Specification TC-3, and fittings for PVC plastic pipe shall be socket-type fittings conforming to the requirements of ASTM Designation: D2467 for Schedule 80 pipe and ASTM Designation: D2466 for Schedule 40 pipe. "Y" fittings shall be shop fabricated from pipe conforming to the requirements for the kind of edge drain pipe installed. The fittings shall provide an unobstructed passageway through both legs of the "Y".

Aggregate:

The gradation of virgin aggregate will be determined in accordance with the requirements of Arizona Test Method 201.

Sieve Size	Percent Passing
1 1/2 inch	100
1 inch	50 - 75
1/2 inch	20 - 50
No. 4	0 - 15
No. 200	0 - 2.5

The combined bulk specific gravity range for the aggregate shall be 2.35 to 2.85.

The combined water absorption range for the aggregate shall be 0 to 2.5.

Resistance to abrasion for aggregate will be determined in accordance with the requirements of AASHTO T 96 and shall meet the following requirements:

Maximum loss of 40 percent at 500 revolutions.

Installation:

Pipe (4") ATED laterial shall be installed in accordance with the details shown on the plans and as specified in this Section.

Prior to excavating trenches for the installation of laterials and in existing paved areas, the outline of the paved areas to be removed shall be cut to a neat line to a minimum depth of 2 inches with a power-driven saw or a wheel type rock cutting excavator. Cuts along the joint between existing asphalt concrete and existing portland cement concrete pavement will not be required. Records indicated that the existing structural section of the shoulders consists of 2.5" to 3" AC, 5" AB, 4" to 7" CTB and 9" Subgrade Seal.

Construction Requirements:

Weather Limitations:

Filter fabric shall not be placed when weather conditions, in the opinion of the Engineer, are not suitable to allow placement or installation.

Pipe and fittings shall be jointed by solvent cementing with commercial quality solvent cement and primer specifically manufactured for use with rigid PVC plastic pipe and fittings. The solvent cement and primer used shall be made by the same manufacturer. The color of the primer shall contrast with the color of the pipe and fittings. The solvent cement and primer shall be used in accordance with the manufacturer's printed instructions.

Aggregate materials shall be placed with great care and spread in two layers in a manner which does not damage the fabric. Pins or piles of aggregate can be used to hold the filter fabric in place while aggregate is being placed. Aggregate material shall be compacted as specified in Subsection 303-3.02.

Method of Measurement:

The edge drains and edge drain outlets, will be measured by the linear foot along the line of the pipe. The length to be paid for will be the slope length of the pipe designated by the Engineer. Pipe placed in excess of the length designated by the Engineer will not be paid for. Outlet pipe will be measured and paid for as plastic pipe (edge drain outlet).

No deduction in the length of plastic pipe (edge drain) will be made for gaps in edge drain pipe at locations of dual outlet, connections to the edge drain.

The "Y" fitting at intermediate outlet connections will be measured and paid for as plastic pipe (edge drain outlet) between the couplings at each end of the curved section of the "Y" fitting, and as plastic pipe (edge drain) between the couplings at each end of the straight section of the "Y" fitting.

Basis of Payment:

The contract price paid per linear foot for plastic pipe (edge drain) of the size or sizes shown in the project plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drains complete in place, including excavation (and removal of any concrete deposits that may occur along the lower edge of the concrete pavement), filter fabric, and permeable material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract price paid per linear foot for plastic pipe (edge drain) of the size or sizes shown in the project plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drains complete in place, including excavation (and removal of any concrete deposits that may occur along the lower edge of the concrete pavement), filter fabric, and permeable material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract price paid per linear foot for plastic pipe (edge drain outlet) of the size or sizes shown in the project plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drain outlets, complete in place, including outlet connecting outlets to drainage facilities, and excavation and backfill, and for outlets to be installed in embankments and existing shoulders, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The edge drain outlet shall be clean at the time of installation and shall be free of obstructions after installation. Pipes that are found to be plugged shall be replaced by the Contractor at his expense, including replacement of permeable material, surfacing and backfill materials.

SECTION 601 - CONCRETE STRUCTURES:

(PRCST601, 453/3, 06/20/88)

601-1 Description: of the Standard Specifications is modified to add:

The following have been approved as alternates to cast-in-place minor structures:

Utility Vault Company Drawing HD-102, revised 5-12-78, has been approved as an alternate to Standard Drawing C-15.90.

Utility Vault Company Drawing HD-103, revised 5-12-78, has been approved as an alternate to Standard Drawing C-15.80.

O'Malley Pipe Company Drawing dated 8/15/79 has been approved as an alternate to Standard Drawing C-15.80.

Utility Vault Company Drawing HD-121, revised 5-12-78, has been approved as an alternate to Standard Drawing C-15.10 or C-15.30.

Pre-Cast Mfg. Co. Drawing SMH-4, revised 07-02-82, has been approved as an alternate to Standard Drawing C-18.10.

Pre-Cast Mfg. Co. Drawing CB-103, dated September 19, 1980, Revised 5/27/86, has been approved as an alternate to Standard Drawing C-15.90.

Pre-Cast Mfg. Co. Drawings CB15301 through CB15304, dated 4-19-87, have been approved as an alternate to Standard Drawing C-15.30.

Pre-Cast Mfg. Co. Drawings CB15801 through CB15802, dated 4-19-87, have been approved as an alternate to Standard Drawing C-15.80.

Pre-Cast Mfg. Co. Drawings CB15101 through CB15104, dated April 7, 1988, has been approved as an alternate to Standard Drawing C-15.10.

The "H" dimension for catch basins shall be determined in the field prior to casting.The contractor is advised to acquaint himself with conditions peculiar to the project which might limit the use of precast items.

To obtain approval of drawings for precast minor structures, the drawings must be submitted to the Engineer at least six weeks in advance of their need. Eight sets of clear, legible drawings, not exceeding 36 inches by 22 inches in size, must be submitted by the manufacturer. If corrections are required, one set of drawings will be returned with the required revisions noted thereon. After corrections have been made, two sets of corrected drawings must be re-submitted. Upon approval, the manufacturer will be notified in writing and the precast item will be listed as an approved alternate.

Drawings of proposed precast minor structures should be submitted to:

Arizona Department of Transportation
Assistant State Engineer, Construction
206 South 17th Avenue, Room 172A
Phoenix, Arizona 85007

(FORMS601, 454/u, 04/14/89)

601-3.02 Falsework and Forms:

601-3.02(C) Forms Construction:

(1) General Requirements: of the Standard Specifications is modified as follows:

The last sentence of the fifth paragraph, regarding re-use of plywood forms, is hereby deleted.

(3) Metal, Fiberglass and Other Forms: of the Standard Specifications is modified as follows:

The fourth paragraph, regarding the use of metal forms, is hereby deleted.

601-3.02(D) Removal of Falsework and Forms: of the Standard Specifications is modified as follows:

The second paragraph on page 333, regarding backfilling around structures, is hereby deleted. Backfilling shall be in conformance with the requirements of Subsection 203-5.03(B).

(DIMT601, 454/g, 06/20/88)

601-4.02 Dimensional Tolerances: of the Standard Specifications is modified to add:

(C) Slip Form or Extruded Barrier:

Barrier lengths not in compliance with the straightedge and alignment tolerances in Subsection 601-4.02(C)(2) shall be removed and replaced at the contractor's expense.

(1) The top of the exposed faces of the barrier shall comply with the following tolerances to be accepted at 100 percent of the unit price bid per linear foot.

(a) When a ten foot long straightedge is placed on the top surface of the barrier it shall not vary by more than 1/4 inch from the straightedge.

(b) When a ten foot long straightedge is placed along the face of the barrier it shall not vary by more than 1/2 inch from the straightedge.

(c) The horizontal alignment shall not deviate by more than that allowed in Section 401 when placed adjacent to Portland Cement Concrete Pavement.

All other barrier dimensions shall not deviate by more than 1/2 inch from plan's alignment.

(2) The top and exposed faces of the barrier shall comply with the following tolerances to be accepted at 75 percent of the unit price bid per linear foot.

(a) When a ten foot long straightedge is placed on the top surface of the barrier it shall not vary by more than 1/2 inch from the straightedge.

(b) When a ten foot long straightedge is placed along the face of the barrier it shall not vary by more than 3/4 inch from the straightedge.

(c) The horizontal alignment shall not deviate by more than that allowed in Section 401 when placed adjacent to Portland Cement Concrete Pavement.

All other barrier dimensions shall not deviate by more than 3/4 inch from plan's alignment.

ITEM 6010501 - BRIDGE REPAIR (Deck Joints) (Westbound):

Description:

The work under this item shall consist of furnishing all materials, equipment and labor necessary to reconstruct the two existing expansion joint assemblies on westbound I-40 at Butler T.I. in conformity with the details on the project plans, the requirements of these special provisions, the Standard Specifications and as directed by the Engineer. Reconstruction of these two joints is the subject of an experimental project designed to provide a side by side performance comparison between a joint system installed in accordance with ADOT standards and a proprietary joint system installed on the adjacent eastbound structure.

Materials:

.01 - General:

The joint armor shall be furnished and installed as two components which will be butted together at the centerline of the roadway without splicing. Butted ends shall meet smoothly on the roadway or be ground smooth. The joint armor shall conform to the requirements of ASTM A 36.

The joint seal shall be composed of an extruded vulcanized elastomeric virgin polychloroprene material and shall conform to the provisions of ASTM D 3542 Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Bridges. The seal to be used on the westbound structure shall have nominal dimensions of 4"x4" when uncompressed per ADOT standard B-24.20 and shall not be the same make or type of seal used on the eastbound structure. [REF: Special Provisions IR-40-4(123)] The Contractor shall indicate on the shop drawings the manufacturer and part numbers of the joint seal, cleaning solution, and adhesive.

The lubricant adhesive and sealant used to install a seal element into a deck joint assembly shall be a one part, moisture curing, polyurethane and aromatic hydrocarbon solvent mixture as recommended by the seal manufacturer and as approved by the Engineer. The lubricant adhesive and sealant shall have a viscosity such that it will perform suitably with installation equipment, remaining fluid from five degrees Fahrenheit to 120 degrees Fahrenheit. Each lot of lubricant adhesive and sealant shall be delivered in sealed containers plainly marked with the manufacturer's name or trademark and the date of manufacture. The shipping containers shall also indicate any special precautions or instructions required because of product toxicity, flammability, other such information pertinent to the proper storage and use of the product.

Concrete for expansion joint reconstruction shall be Class "S" with a maximum aggregate size of 3/4 inch and shall meet all requirements of Section 1006 of ADOT Standard Specifications. The concrete shall attain a minimum compressive strength of 2000 psi prior to routing any traffic over newly constructed portions of the joint, and shall attain a minimum compressive strength of 3000 psi in 48 hours.

.02 - Certification:

One piece of the seal material supplied shall be at least 18 inches longer than required by the project plans. The additional length will be removed by the Engineer and used for testing by the Materials Section. The Contractor shall furnish a Certificate of Compliance as defined in Arizona specification 106.05 prior to installation of the joint seal.

Construction Requirements:

.01 - General:

Removal of the existing concrete near the joint shall be in accordance with ADOT Standard Specification, Subsection 202-3.05 entitled "Removal of Bridges" or as directed by the Engineer. The contractor shall verify all dimensions in the field prior to fabrication of material.

Joint assemblies shall consist of elastomeric seal elements and metal joint armor. Joint armor shall be cast in the new concrete. The completed assembly shall be in planned position, shall satisfactorily resist the intrusion of foreign material and water and shall provide bump free passage of traffic.

Prior to any fabrication, the contractor shall submit eight sets of shop drawings to the Engineer for his approval in accordance with the requirements of Subsection 105.02 of ADOT Standard Specifications. The shop drawings shall include complete details of the method of installation to be followed.

In determining the quality or suitability of a deck joint assembly submitted for approval for each application, the factors to be considered will include, but will not be limited to, the ability of the assembly to resist the intrusion of foreign material and water throughout the full range of movement, the capability of installing or removing elastomeric portions of the assembly at any amount of closure, and the ability to function without distress to any component.

Compression seals shall be continuous cellular extruded shapes made of material conforming to the requirements hereinbefore specified. At the time of manufacture, the seals shall be clearly marked on the top surface at one foot intervals and shall show the manufacturer's name or trademark, the lot number, and the size designation at intervals of five feet or less.

The seal shall be so formed that it can be compressed to 40 percent of its original width without damage while simultaneously maintaining the top center of the exposed surface below the top surface of the installed joint.

.02 - Preparation for Installation:

All metal surfaces which will be exposed and are not to be in contact with the joint seal or concrete shall be painted in accordance with the requirements of Section 610 of ADOT Standard Specifications.

.03 - Installation:

Joints to be sealed shall be covered or otherwise protected at all times prior to installing the elastomeric portion of the assembly. The elastomer shall be installed at such time and in such a manner that it will not be damaged by construction operations.

The joint seal material shall be cut to the full length of the joint as measured in the field. This single joint seal shall then be installed into the joint gap in two separate operations in order to be consistent with traffic control limitations. Only portions of the joint which are completely closed to traffic shall be sealed during any one operation. Portions of the seal material not yet installed shall be kept away from the adjacent traffic.

Immediately prior to the installation of the seal element, the metal contact surfaces of the joint armor shall be clean, dry and free of oil, rust, paint or foreign material. The contact surfaces of the seal element shall be cleaned with normal butyl-acetate, using clean rags or mops, immediately prior to application of the lubricant-adhesive and sealant. The lubricant-adhesive and sealant shall be applied to the seal element and joint armor contact surfaces at the rate recommended by the manufacturer.

The joint seal element shall be installed in strict accordance with the manufacturer's recommendations, subject to these special provisions and the approval of the Engineer, using equipment manufactured specifically for the installation of said element. The equipment shall not cause structural damage to either the seal element or the joint armor and shall not permanently twist, distort, or cause other malformations in the installed seal element. Any perforation or tearing of the seal element due to installation procedures or construction activities will be cause for rejection of the installed seal element.

.04 - Curing:

Traffic shall not be allowed on the reconstructed portion of the joint until the Engineer is satisfied that the new concrete has attained the compressive strength hereinbefore specified.

Method of Measurement:

ITEM 6010501 - BRIDGE REPAIR (Deck Joints)(Westbound) will be measured on a lump sum basis.

Basis of Payment:

Payment will be made at the contract lump sum price for ITEM 6010501 - BRIDGE REPAIR (Deck Joints)(Westbound), which price shall be full compensation for the work, complete in place, as described and specified herein and on the project plans.

ITEM 6010502 - BRIDGE REPAIR (Deck Joints)(Eastbound):

Description:

The work under this item shall consist of furnishing all labor required for reconstructing the two expansion joints on eastbound I-40 at the Butler T.I. in accordance with the details shown on the project plans and as directed by the Engineer. The majority of the material will be supplied by ADOT as described hereinafter. Reconstruction of these two joints is the subject of an experimental project designed to evaluate the performance of a proprietary joint system which shows potential for requiring less maintenance than the system currently in place.

Materials:

.01 - General:

The joint armor shall be furnished and installed as two components which will be butted together at the centerline of the roadway without splicing. Butted ends shall meet smoothly on the roadway or be ground smooth. The joint armor shall conform to the requirements of ASTM A 36.

The joint seal shall be composed of an extruded vulcanized elastomeric virgin polychloroprene material and shall conform to the provisions of ASTM D 3542 Standard Specification for preformed Polychloroprene Elastomeric Joint Seals for Bridges. The seal to be used is the JEENE 6080W in conjunction with JEENE D-17 cleaning solution and JEENE ADE-52 adhesive. A quantity of each of these three products sufficient for sealing 48 linear feet of approximately 2.5 inch wide joint will be supplied by ADOT. The Contractor shall indicate on the shop drawings the manufacturer and part numbers of the joint seal, cleaning solution, and adhesive.

.02 - Certification:

The Contractor shall furnish a Certificate of Compliance as defined in Arizona specification 106.05 prior to installation of the joint seal.

.03 - Length and Width of Seal:

Each seal shall be furnished and installed in one continuous piece which will extend across the full width of the existing concrete pavement and contain no splices. The seal shall not extend into the asphalt concrete pavement shoulders. The seal profile width shall be the same as the newly formed joint gap.

.04 - Concrete:

Concrete for expansion joint reconstruction shall be Class "S" with a maximum aggregate size of 3/4 inch and shall meet all requirements of Section 1006 of ADOT Standard Specifications. The concrete shall attain a minimum compressive strength of 2000 psi prior to routing any traffic over newly constructed portions of the joint, and shall attain a minimum compressive strength of 3000 psi in 48 hours.

Construction Requirements:

.01 - General:

Removal of the existing concrete near the joint shall be in accordance with ADOT Standard Specification, Subsection 202-3.05 entitled "Removal of Bridges" or as directed by the Engineer. The contractor shall verify all dimensions in the field prior to fabrication of material.

Joint assemblies shall consist of elastomeric seal elements and metal joint armor. Joint armor shall be cast in the new concrete. The completed assembly shall be in planned position, shall satisfactorily resist the intrusion of foreign material and water and shall provide bump free passage of traffic.

Installation shall be performed by the Contractor or by a suitable subcontractor under the guidance of a technical representative of the JEENE Technology Corporation. This representative shall be contacted directly by the Contractor to obtain the names of suitable subcontractors who have previous JEENE seal installation experience. Contact information for JEENE Technologies can be obtained from ADOT'S Arizona Transportation Research Center (ATRC). No work defined under this item shall be performed without supervision by both the JEENE representative and the ATRC representative.

Prior to any fabrication, the contractor shall submit eight sets of shop drawings to the Engineer for his approval in accordance with the requirements of Subsection 105.02 of ADOT Standard Specifications. The shop drawings shall include complete details of the method of installation to be followed.

.02 - Preparation for installation:

All metal surfaces which will be exposed and are not to be in contact with the joint seal or concrete shall be painted in accordance with the requirements of Section 610 of ADOT Standard Specifications.

All existing seal material and other debris shall be removed from the joint opening. Steel vertical surface bonding areas shall be ground to bare metal to remove galvanization or other coatings. The joint gap shall be vacuumed or air blasted to remove all dust and debris. All bonding surfaces shall be cleaned with the aforementioned cleaning solution. Preparation of bonding surfaces shall be accomplished not more than 24 hours prior to joint installation and shall be kept clean and dry until the joint profile is installed.

.03 - Installation:

The joint seal element shall be installed in strict accordance with the manufacturer's recommendations, subject to these special provisions and the approval of the Engineer, using equipment manufactured specifically for the installation of said element. The equipment shall not cause structural damage to either the seal element or the joint armor and shall not permanently twist, distort, or cause other malformations in the installed seal element. Any perforation or tearing of the seal element due to installation procedures or construction activities will be cause for rejection of the installed seal element.

The joint seal material shall be cut to the full length of the joint as measured in the field, both ends plugged, and single air valve installed. This single joint seal shall then be installed into the joint gap in two separate operations in order to be consistent with traffic control limitations. Only portions of the joint which are completely closed to traffic shall be sealed during any one operation. Portions of the seal material not yet installed shall be kept away from the adjacent traffic.

Adhesive shall be applied liberally to the previously prepared inner walls of the joint gap and to the outer walls of the joint seal to achieve a complete and uniform coating. Adhesive shall not be applied to any portion of the joint seal material or joint wall not to be sealed in the given operation. The joint seal shall be immediately inserted into the joint gap and pressurized lightly so that the seal profile width expands to bring the installed portion of the seal bonding surface and the corresponding joint wall bonding surfaces into contact. The pressure shall be sufficient for securely holding the seal at the recessed elevation specified on the project plans. Excess adhesive shall be removed from the exposed joint and seal surfaces.

.04 - Curing:

Traffic shall not be allowed on the reconstructed portion of the joint until the Engineer is satisfied that the new concrete has attained the compressive strength hereinbefore specified. Pressurization of the seal shall be maintained for a period of 24 hours after which time the air valve shall be removed to bleed off the air and the resulting hole repaired as recommended by the manufacturer.

Method of Measurement:

ITEM 6010502 - BRIDGE REPAIR (Deck Joints)(Eastbound) will be measured on a lump sum basis.

Basis of Payment:

Payment will be made at the contract lump sum price for ITEM 6010502 -BRIDGE REPAIR (Deck Joints)(Eastbound), which price shall be full compensation for the work, complete in place, as described and specified herein and on the project plans.

SECTION 608 - SIGN PANELS: of the Standard Specifications is modified to add:

ITEM 6080101 MISCELLANEOUS WORK (SIGNS):

Description:

This work consists of storing sign materials during construction, plumbing posts, torquing bolts and washing of the reinstalled sign panel not covered under Standard Specification 608-3.03.

Method of Measurement:

ITEM 6080101 MISCELLANEOUS WORK (Signs) will be measured on a lump sum basis.

Basis of Payment:

Payment will be made at the contract Lump Sum price for ITEM 6080101 Miscellaneous Work (Signs), which price shall be full compensation for the work, complete in place, as described and specified herein and on the project plans.

SECTION 701 - MAINTENANCE AND PROTECTION OF TRAFFIC:

(PDMPT701, 453/4, 10/13/89)

701-2 Materials(Equipment, Workmen, Devices and Facilities):

701-2.02 Flashing Arrow Panels: the first paragraph of the Standard Specifications is revised to read:

Flashing arrow panels shall conform to the requirements of Section 4.17 of the Traffic Control Manual with the following additions:

701-2.05 Temporary Pavement Markings: is revised to read:

(A) Raised Pavement Markers:

Raised Pavement Markers may be Temporary Reflective Markers, Permanent Reflective Markers(used as Temporary) or Non-reflective Markers, as required on the Project Plans or by the Engineer.

Raised Pavement Markers shall be in conformance with Standard Drawing 4-M-2.02 and Subsections 706-2 and 706-3 of The Specifications or shall be included on a list of pre-approved products maintained by Traffic Design Services.

(B) Pavement Marking Paint:

Paint for temporary striping shall be white or yellow and shall conform to the requirements for permanent striping paint as set forth in Section 708 of the Specifications.

(C) Preformed Pavement Markings:

Preformed Pavement Markings shall be either Type II (Temporary-Removable) or Type III (Temporary-Nonremovable), as indicated on the project plans or as directed by the Engineer. Preformed Pavement Markings shall be in conformance with the requirements of Section 705 of the Specifications or shall be included on a list of pre-approved products maintained by Traffic Design Services.

701-2.08 Chip Seal Pavement Markers: is revised to read:

Chip Seal Pavement Markers shall conform to Standard Drawing 4-M-2.05.

The Chip Seal Marker body and cover shall be manufactured from a polyurethane material conforming to the following requirements:

	Requirement	ASTM Test Method
Specific Gravity (Min.)	1.19	D- 792
Hardness (Min.)	80A	D-2240
Tensile Strength (Min. PSI)	4600	D- 412
Ultimate Elongation (Min.%)	330	D- 412
Modulus @ 300% PSI	1000	D- 412
Stiffness @		
-20 deg. F. (Min. PSI)	17000	D-1053
70 deg. F. (Min. PSI)	900	D-1053
Compression Set		
22 Hrs. @ 70 deg. C.	65	D- 395
Taber Abrasion (CS17 Wheel)		
Wt. loss mg/1000 cycles	3	-------

Reflective tape shall be metalized polycarbonate microprism retroreflective material with acrylic backing or equal. The tape shall have a minimum reflectance equal to, or greater than, 1800 candlepower per foot-candle per square foot at 1/10 degree observation and 0 degree entrance angles.

701-3.02 Maintenance and Protection of Traffic: the first paragraph of the Standard Specifications is modified to add:

The Engineer shall be sole judge as to which signs may require portable stands or embedded posts.

701-3.05 Temporary Pavement Markings (Application and Removal):

701-3.05(A) General: the second paragraph of the Standard Specifications is revised to read:

On overlay projects, pavement marking for temporary striping shall consist of four inch wide by four foot long strips of reflective material, either pavement marking tape or traffic paint, placed at 40 foot intervals. In situations involving severe degree of curvature, the Engineer may direct that the length and spacing be adjusted to two foot and 20 foot respectively. These requirements apply to white lane lines separating traffic moving in the same direction and to yellow centerlines for two-lane, two-way roadways in areas where it is safe to pass. Temporary markings shall not be used for edge striping. Temporary pavement marking shall be placed on each subsequent pavement course.

701-3.05(C) Preformed Pavement Markings: The second paragraph of the Standard Specifications is revised to read:

Only Type II Preformed Pavement Markings shall be used on surface or finish pavement courses where eventual removal will be required by the Traffic Control Plan, or as specified in Subsection 705-3.

701-4.01 General: the first and second paragraphs of the Standard Specifications are revised to read:

The Department will reimburse the contractor for the work of maintaining and protecting traffic on the basis of the predetermined reimbursement rates hereinafter specified under Subsection 701-4.02 for the various elements of work except for Temporary Concrete Barrier, Temporary Impact Attenuation Devices, and Furnish and Install Temporary Traffic Control Devices.

No additional reimbursement will be made to the contractor for any elements of work other than those listed in the special provisions under Subsection 701-4.02, unless approved in writing by the Engineer prior to use. The cost for elements of work required for traffic control and not listed under Subsection 701-4.02, or included in Item 7010006, will be negotiated with the Engineer prior to approval.

701-4.02 (B) Elements of Work (Complete-in-Place): of the Standard Specifications is revised to read:

The elements of work listed under this subsection will be measured for payment upon the satisfactory completion of the initial installation or obliteration. Except as hereinafter specified under Basis of Payment, no subsequent measurements will be made.

Element of Work	Unit	Rate($)
Specialty Sign (High Intensity Reflective Sheeting)	Sq. Ft.	10.00
Specialty Sign (Std. Intensity Reflective Sheeting)	Sq. Ft.	7.25
Preformed Pavement Marking (Taped Line) (Type II)	L.Ft.	1.60
Preformed Pavement Marking (Taped Line) (Type III)	L.Ft.	0.80
Temporary Pavement Marking (Painted Line)	L.Ft.	0.13
Obliterate Pavement Marking	L.Ft.	0.50
Obliterate Pavement Legends	Each	10.00
Obliterate Pavement Arrows	Each	20.00
Delineator (Std. Dwg. 4-M-4.01)	Each	27.00
Reflective Raised Pavement Marker (Temporary)	Each	4.00
Reflective Raised Pavement Marker (Permanent) (Used As Temporary)	Each	4.50

Non-Reflective Raised Pavement Marker (Temporary)	Each	2.50
Remove Raised Pavement Marker	Each	0.10
Chip Seal Pavement Marker (Single Capped)	Each	2.00
Chip Seal Pavement Marker (Double Capped)	Each	3.00

701-4.02 (C) Elements of Work (In Use): of the Standard Specifications is revised to read:

The elements of work listed under this subsection will be measured from the point at which the element is put into active use on the project and accepted by the Engineer until such times that the Engineer determines that the element is no longer required:

Element of Work	Unit		Rate($)
Temporary Concrete Barrier(In Use)	L.Ft./Day		0.05
Impact Attenuation Device (Sand Barrel) (In Use)	Ea./Day		0.05
Impact Attenuation Device (Energy Absorbing Terminal)(In Use)	Ea./Day		1.00
Impact Atten Dev. (Truck Mounted)	Hour		27.00
Flashing Arrow Panel	Hour		5.00
Pilot Truck	Hour		6.36
Relocation Service, Truck	Hour		9.00
Flagger	Hour	*Area 1	24.18
		*Area 2	20.20
Flagger (Uniformed Police Officer)	Hour		26.32
Official Police Vehicle	Mile		0.21
Truck Driver: Pilot, Reloc Svcs, Truck Mount Atten. Devices	Hour		15.24
Relocation Service, Barricade Setter	Hour		10.93
Maintain Changeable Message Board	Hour		1.45
Vertical Panels	Ea./Day		0.50
Tubular Marker	Ea./Day		0.35
Barricade (Type II)	Ea./Day		0.50
Barricade (Type III)	Ea./Day		0.75
Flashing Warning Light (Type A)	Ea./Day		0.25
Flashing Warning Light (Type B)	Ea./Day		2.50
Steady-Burn Warning Light (Type C)	Ea./Day		0.80
High Intensity Reflective Sheeting, Small Sign (Less than 10 Sq.Ft.)	Ea./Day		1.10
High Intensity Reflective Sheeting, Medium Sign (10-16 Sq.Ft.)	Ea./Day		1.30
High Intensity Reflective Sheeting, Large Sign (More than 16 Sq.Ft.)	Ea./Day		1.50
Std. Intensity Reflective Sheeting, Small Sign (Less than 10 Sq.Ft.)	Ea./Day		0.50
Std. Intensity Reflective Sheeting, Medium Sign (10-16 Sq.Ft.	Ea./Day		0.65

Std. Intensity Reflective Sheeting, Large Sign (More than 16 Sq.Ft.)	Ea./Day	1.00
Embedded Sign Posts	Ea./Day	0.10
Portable Sign Stand (Spring Type)	Ea./Day	2.10
Port. Sign Stand (9 Sq.Ft. or More)	Ea./Day	1.00
Port. Sign Stand (Under 9 Sq.Ft.)	Ea./Day	0.70
High Level Flag Tree	Ea./Day	0.80
Traffic Cones, 28 inch	Ea./Day	0.40
Drum (18" x 36")	Ea./Day	1.20

*Based on U.S. Dept. of Labor, General Wage Decision.

701-4.03 Relocation Services: of the Standard Specifications is revised to read:

Following the initial installation of the elements of work described in Subsection 701-4.02, the Engineer may direct the contractor to move any element of work from one location and re-erect it at another location. Except as hereinafter specified for Temporary Concrete Barrier (New Installation) or the exceptions specified in the remainder of this Subsection or Subsection 701-4.04, measurement for reimbursement of the work associated with such relocations will be made as specified for the Relocation Service elements of work.

When work of a progressive nature is involved, such as resurfacing a road under traffic, or closing a lane or lanes for work to be accomplished during a shift, no measurement for reimbursement will be made for setting up or relocating the necessary traffic control equipment, workmen, devices, facilities, signs (except semi-permanent signs on embedded posts), etc., that are moved concurrently with the advancing operation, or removal at the end of the shift. The cost of such work to be considered as included in Item 7010006.

701-5 Method of Measurement: the sixth and the last elements of work of paragraph one of the Standard Specifications are revised to read:

Flagging Services will be measured by the hour for each hour that a civilian flagger is provided and for each hour that a uniformed, off-duty law enforcement officer is employed directly by the contractor as a flagger, when authorized in advance by the Engineer. The time for a uniformed off-duty law enforcement officer used as a flagger will be measured in accordance with the following table:

Consecutive Hours Worked	Reimbursement Time Factor
First eight hours.....	straight time
Hours nine through twelve.....	time and one half
Over 12 hours.....	double time

Overtime hours will be converted into straight time hours for measurement. An off-duty law enforcement officer shall not work more than 12 consecutive hours unless an emergency situation exists which, in the opinion of the Engineer, requires that the officer remain in the capacity of flagger. In the event an off-duty officer reports to the project site and the work shift is cancelled within the first two hours, the contractor will be reimbursed for two hours at the appropriate rate. Flaggers used for the contractor's convenience, such as ingress and egress of construction equipment along the project traveled way, will not be measured for payment.

Vertical Panels, Barricades, Warning Lights, Signs, Sign Stands/Posts, Traffic Cones, Tubular Markers, Flag Trees, and Drums will be measured as a unit for each device furnished and subsequently utilized at the project site.

701-5 Method of Measurement: of the Standard Specification is modified to add:

Item 7010006 will be measured by the unit "lump sum" and shall include the furnishing and installation of all necessary temporary traffic control devices measured individually as provided above.

Overtime hours for flagging services flaggers and for relocation service barricade setters shall be converted into straight time hours for measurement on the basis of one and one half times the number of man hours for all approved flagging and relocation service barricade setter hours worked in excess of 40 hours per week.

Specialty Signs are signs which are required on the job, as determined by the Engineer, but which are not indicated on the project plans and are not included in item 7010006 or among reusable traffic control signs. The size, type and legend on Specialty Signs will be determined by the Engineer and will be measured for payment by the square foot.

Obliterate Pavement Legends or Arrows will be measured by each separate symbol, arrow or single letter.

701-5 Method of Measurement: the first paragraph at the top of page 418 of the Standard Specifications is revised to read:

Truck Driver (Pilot Truck, Relocation Service Truck and Truck Mounted Attenuation Device) will be measured by the hour for each hour that the Driver operates the vehicle. Overtime hours will be converted to straight time hours for measurement.

701-6 Basis of Payment: of the Standard Specifications is revised to read:

The contractor will be compensated for accepted quantities of Maintenance and Protection of Traffic in accordance with the procedures described herein and in Subsection 701-4 of the Standard Specifications.

701-6.01 Elements of Work (Bid Items): of the Standard Specifications is modified to add:

(C) Furnish and Install Temporary Traffic Control Devices:

Item 7010006 - Furnish & Install Temporary Traffic Control Devices is included in the Bidding Schedule to establish a bid item which shall be full compensation for furnishing to the jobsite, stockpiling, and installation of flashing arrow panels, changeable message boards, vertical panels, barricades, warning lights, signs, sign stands/posts, traffic cones, tubular markers, flag trees, and drums, complete-in-place. Item 7010006 also includes the cost of relocation of all necessary traffic control devices or the moving of devices for the Contractor's advancing operation as specified herein and as shown on the plans, except for items directed by the Engineer. The cost of additional information traffic control signs, shown on the project plans, furnished by the contractor and not included as reusable traffic control signs as listed in Subsection 701-4.02(C), will be included in Item 7010006, which costs shall include all materials, labor and other additional costs for the installation, any relocation and removal of the signs.

Item 7010006 also includes removal of all temporary traffic control devices used for maintenance and protection of traffic on the project and included in the Elements of Work (In Use) and Elements of Work (Complete-in-Place), unless such cost is included in the predetermined reimbursement rates as specified in this Subsection.

Signs mounted on posts set in the ground shall be removed at the completion of the project, the post holes filled and compacted, and the immediate area restored to match the surrounding area. The cost of such removal and restoration shall be considered as included in the cost of Item 7010006.

Furnish and install temporary traffic control devices will be paid for at the contract lump sum price, which shall be full compensation for furnishing, installing, and removing all devices and the labor, tools, equipment, and incidentals necessary to complete the work.

Twenty five percent of the unit price bid will be paid upon satisfactory initial installation of temporary traffic control devices. The remaining seventy five percent will be paid in monthly increments based on the current month's percentage of project completion.

701-6.02 Elements of Work (Complete-in-Place):

701-6.02(E) Specialty Signs:

The accepted quantities of Specialty Signs will be paid for at the predetermined rate per square foot listed in Subsection 701-4.02(B). The rate established shall be full compensation for manufacturing, delivery to the job site, erection complete in place, and eventual removal.

701-6.02(F) Remove Raised Pavement Markers:

The accepted quantities for removal of Raised Pavement Markers will be paid for at the predetermined rate each listed in Subsection 701-4.02(B).

701-6.02(G) Obliterate Pavement Legends or Arrows:

The accepted quantities of Arrows, Symbols or individual Letters obliterated shall be paid for at the predetermined rate each listed in Subsection 701-4.02(B).

701-6.03 Elements of Work (In Use):

701-6.03(H) Operators: is revised to read:

(H) Truck Drivers(Pilot Truck, Relocation Service Truck and Truck Mounted Attenuation Device):

The accepted quantities of Truck Drivers, measured as provided under Subsection 701-5 of the Specifications, will be paid for at the predetermined reimbursement rate per hour, which rate shall be full compensation for the work, complete, including, but not limited to, all overhead costs and fringe benefits. No additional payment will be made to the contractor if the rate he is required to pay exceeds the predetermined reimbursement rate.

701-6.03(K) Vertical Panels, Barricades, Warning Lights, Signs, Sign Stands/Posts, Traffic Cones, Tubular Markers, Flag Trees, and Drums: of the Standard Specifications is revised to read:

The accepted unit quantities of vertical panels, barricades, warning lights, signs, sign stands/posts, traffic cones, tubular markers, flag trees and drums, measured as provided above on a daily basis, will be paid for at the predetermined reimbursement rate, which rate shall be full compensation for the use and maintenance of each device (in use).

Payment for relocation of vertical panels, barricades, warning lights, signs, sign stands, traffic cones, tubular markers, flag trees, drums, and work of a progressive nature will be made in accordance with the procedures of Subsection 701-4.03.

The work of removing and reinstalling signs on embedded posts will be reimbursed at the relocation service rates, regardless of the type of work or operation, when directed by the Engineer.

The predetermined reimbursement rate for signs, vertical panels, and flag trees includes the cost of flags and ballasting.

The predetermined reimbursement rate for barricades includes the cost of ballasting.

SECTION 703 - DELINEATORS AND MARKERS:

(DELIN703, 454/j, 06/20/88)

703-2.02 Metal Posts: the first paragraph of the Standard Specifications is revised to read:

Posts for delineators and for all markers, except milepost markers installed on freeways, shall be fabricated from structural steel conforming to the requirements of ASTM A 570, Grade 30, 36, or 40 and shall be galvanized in accordance with the requirements of ASTM A 123. Delineator posts shall weigh 1.12 pounds ± five percent per foot of post and marker posts shall weigh 1.90 pounds ± five percent per foot of post.

(PLSTC704, 454/7, 04/14/89)

SECTION 704 - THERMOPLASTIC STRIPES AND MARKINGS: of the Standard Specifications is modified as follows:

704-3.02 - Application: The first paragraph is replaced by:

The contractor shall remove all dirt, dust, grease, oil or other detrimental material from the road surface prior to application of the thermoplastic material. The method of cleaning the surface is subject to approval by the Engineer and shall include sweeping and the use of high-pressure air spray. The cost for cleaning the surface, including sweeping and high-pressure air spray, shall be considered part of the cost for applying thermoplastic striping and no separate measurement or payment will be made for this work.

When thermoplastic striping, symbols or legends are to be applied to new portland cement concrete pavement, any curing compound present shall be removed by means of a high-pressure water jet or sandblasting, followed up by sweeping and high-pressure air spray. On both old and new portland cement concrete pavement a primer-sealer, as recommended by the thermoplastic manufacturer, shall be applied prior to placing the thermoplastic material to assure a satisfactory bond.

The air and road surface temperature at the time of application shall not be less than 50 degrees F. and the pavement surface shall be absolutely dry.

The first two sentences of the second paragraph are replaced by:

The thermoplastic striping and markings shall be a minimum of 0.060 inches thick in all applications.

704-4 Method of Measurement: is revised to add:

Removal of curing compound from new portland cement concrete pavement and the application of primer-sealer, which is to be applied to both old and new portland cement concrete pavement, prior to application of thermoplastic striping or marking, shall be measured by the linear foot or unit each, respectively, depending on the nature of the work to be done, and in accordance with the items of work established in the Bid Schedule.

704-5 Basis of Payment: is revised to add:

The accepted quantities for removal of curing compound from new portland cement concrete pavement and the application of primer-sealer, measured as provided above, will be paid for at the contract unit price for each, respectively, under the items of work established in the Bid Schedule.

(PVMRK706, 454/8, 10/20/88)

SECTION 706 - RAISED PAVEMENT MARKERS: of the Standard Specifications is modified as follows:

706-2.02 Reflective Pavement Markers:

The table listing the types of reflective markers used is modified to delete Type B, Clear, Two-way.

The fourth paragraph is revised to read:

Reflective pavement markers will be tested for compressive strength.

The first sentence of the sixth paragraph is revised to read:

The specific intensity of each clear reflecting surface shall be not less than the following:

706-2.05 Epoxy Adhesive: is hereby deleted.

706-2.06 Bituminous Adhesive: is hereby added :

The bituminous adhesive for pavement markers shall be a hot-melt adhesive manufactured by one of the following approved manufacturers:

Signal Products Divsion
Amerace Corporation
7542 N. Natchez Avenue
Niles, Illinois 60648

or

CRAFCO, Incorporated
P.O. Box 20133
Phoenix, Arizona 85036

706-3 Construction Requirements: of the Standard Specifications is modified to read:

The portion of the highway to which the markers are to be attached shall be free of dirt, existing painted lines, curing compound, grease, oil, moisture, loose or unsound layers and any other material which could adversely affect the bond of the adhesive. The method of cleaning the pavement surface and removal of detrimental material is subject to approval by the Engineer and shall include sweeping and the use of high-pressure air spray. On portland cement concrete pavement and old asphaltic concrete pavements, cleaning shall be accomplished by sandblasting, followed by sweeping and/or air blowing. Newly placed asphaltic concrete pavement need not be sandblasted unless, in the opinion of the Engineer, the surface is contaminated with materials that would adversely affect the bond of the adhesive.

The adhesive shall be placed uniformly on the cleaned pavement surface in an amount sufficient to result in complete coverage of the area of contact of the markers, with no voids present and with a slight excess after the markers have been placed. The markers shall be placed in position and pressure applied until firm contact is made with the pavement. The markers shall be protected against impact until the adhesive has set to the degree acceptable to the Engineer.

Excess adhesive on the pavement and on the exposed surfaces of the markers shall be immediately removed. Thinners or solvents which may be detrimental to either the markers or the bond provided by the adhesive shall not be used in removing excess adhesive.

Markers shall not be installed when the temperature of the pavement surface or the atmosphere is less than 40 degrees Fahrenheit, when the relative humidity is 80 percent or higher or when the pavement surface is not dry.

All markers shall be installed to the line approved by the Engineer and in such manner that the reflective face of the markers is perpendicular to a line parallel to the roadway centerline. No pavement markers shall be installed over longitudinal or transverse joints of the pavement surface.

(PPM708, 453/8, 10/13/88)

SECTION 708 - PERMANENT PAVEMENT MARKINGS:

708-1 Description:

The work under this section shall consist of cleaning and preparing the pavement surface, furnishing all materials and applying white or yellow chlorinated rubber traffic paint and reflective glass beads at the locations and in accordance with the details shown on the plans, MUTCD, the requirements of these specifications, or as directed by the Engineer.

708-2 Materials:

708-2.01 Pavement Marking Paint:

(A) General:

All material used in the formulation of the pavement marking paint shall meet the requirements herein specified. Any materials not specifically covered shall meet the approval of the Engineer.

(B) Composition Requirements:

The permanent pavement marking paint shall consist of the following components with all percentages specified being by weight:

(1) Pigment Composition: percent by weight of total pigment	White	Yellow
Titanium Dioxide, Rutile (ASTM D 476, Type II 92% min.)	24.0-26.0	7.0-9.0
Medium Chrome Yellow (ASTM D 211, Type III 87% min.)		15.0-17.0
Zinc Oxide (ASTM D 79 American Process Type)	7.5-9.5	7.0-9.0
Magnesium Silicate (ASTM D 605)	36.0-38.0	35.0-37.0
Calcium Carbonate (ASTM D 1199, Type GC, Grade I or II)	28.0-30.0	31.0-33.0
Antisettling Agency (Bentone 34 or Claytone 40) See Note 1		

(2) Vehicle Composition:
percent by weight

	White and Yellow
Alkyd Resin Solution - See Note 2	21.3 min.
Chlorinated Rubber (Parlon S20 or Alloprene X20)	16.4 min.
Chlorinated Paraffin (Fed. Spec. Mil-C 429C, Type I)	11.3 - 13.3
Lead Drier 24% (ASTM D 600 Class B)	0.2 - 0.4
Cobalt Drier 6% (ASTM D 600 Class B)	0.05 - 0.25
Antiskinning Agent (Exkin or Equivalent) See Note 3	0.45 - 0.55
Stabilizer (Propylene Oxide) See Note 4	
Toluene (ASTM D 362)	26.1 max.
Heptane (Technical Grade)	6.5 - 8.5
Methyl Ethyl Ketone (ASTM D 740)	14.7 min.
Methanol (ASTM D 1152)	0.2 - 0.4

Note 1. Sufficient dispersing and suspending agent shall be added to prevent excessive settling.

Note 2. Alkyd Resin Solution: The medium oil soya-modified alkyd resin shall be supplied as 59 to 61 percent non-volatile solids in VM & P Naphtha (TT-N-95b, Type I). The resin solids shall contain an oil acid content of 48 to 55 percent, a phthalic anhydride content of 33 to 37 percent and an acid number of 8 maximum. The alkyd resin solution shall have a maximum of 9 (Gardner). The alkyd resin solution, reduced to 45 percent solids with VM & P Naphtha, shall have a viscosity of D to G (Gardner-Holdt). No rosin will be permitted. The oil fatty acids shall be of vegetable origin, either alkali refined soya bean oil or the fatty acids of soya bean oil having a minimum iodine number of 115. No recovered oil marine or soya food fatty acid derivatives shall be used. The alkyd resin solution must tolerate a 500 percent by weight dilution with VM & P Naphtha. A solution containing alkyd resin solution, chlorinated rubber, methyl ethyl ketone, toluene and heptane in the proportions given in the vehicle composition shall be clear, transparent and show no separation after storage of 24 hours in a three-quarter full test tube at 26.7 degrees ± 2.8 degrees C (80 degrees ± 5 degrees F).

Note 3. Sufficient antiskinning agent shall be used to prevent skinning. Material shall be added at the proper time during the manufacturing of the paint so as to minimize losses due to volatilization and maximize retention in the packaged product.

Note 4. Other approved Stabilizers: Styrene Oxide - 3 pounds per 100 gallons of paint; Thermolite 813 - 0.5 pounds per 100 gallons of paint.

(C) Manufacturing Formulations:

The typical formula which may serve as a guide for the paint manufacture is as follows: (Yield is approximately 100 gallons).

	POUNDS	
	White	Yellow
Titanium Dioxide	150	50
Medium Chrome Yellow		100
Zinc Oxide	50	50
Magnesium Silicate	224	224
Calcium Carbonate	175	200
Antisettling Agent (Claytone)	5	5
Methanol	2	2
Alkyd Resin Solution (60% non-volatile)	130	130
Chlorinated Rubber (93% non-volatile)	100	100

Chlorinated Paraffin	75	75
24% Lead Drier	2	2
6% Cobalt Drier	1	1
Antiskinning Agent (Exkin)	3	3
Stabilizer (Propylene Oxide)	3	3
Toluene	160	160
Heptane	45	45
Methyl Ethyl ketone	90	90
	1215	1240

(D) Quantitative Requirements of Mixed Paint:

	White	Yellow
Pigment: percent by weight-See Note 5	48.9-50.6	49.9-51.6
Total Solids: percent by weight	69.4 min.	70.0 min.
Non-volatile Vehicle: percent by weight vehicle	38.9 min.	38.9 min.
Viscosity: K.U. at 77 F	76 ± 8	76 ± 8
Weight per Gallon: pounds	12.1 ± 0.2	12.4 ± 0.2
Fineness of Grind: Hegman gauge, North Standard Scale	3 min.	3 min.
Drying Time: minutes	1 - 4	1 - 4
Directional Reflectance:	80 min.	50 min.
Uncombined Water: percent by weight of paint	1.0 max.	1.0 max.
Coarse Particles and Skins: retained on a No. 325 mesh sieve, percent by weight of pigment.	1.0 max.	1.0 max.

Note 5. The extracted pigment upon analysis shall conform to the quantitative compositional requirements.

(E) Qualitative Requirements:

(1) Color of Yellow paint:

The color of the yellow paint shall visually match color chip No. 33538 of Fed. Std. 595 (Note 6). In case of dispute, the color shall be within the green and red tolerance limits when compared with the standard color chips of "Highway Yellow Color Tolerance Chart" U.S. Department of Commerce, Bureau of Public Roads PR Color No. 1, June 1965.

(2) Condition in Container:

The paint shall not show excessive settling in freshly-opened full can and shall be easily redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, livering, caking, gelling or thixotropic properties, lumps, skins or color separation.

(3) Skinning:

The paint shall not skin within 48 hours in a three-quarter filled, tightly closed container.

(4) Storage Stability:

The paint shall show a viscosity increase of not more than five (5) Krebs units above the original viscosity and the degree of settling shall have a rating of six (6) or better (Note 7). When stored for twelve (12) months the paint must be usable, the drying time shall be as specified and the consistency range shall be -68 to 84 Krebs units.

(5) Flexibility and Adhesion:

The paint shall show no cracking, flaking or loss of adhesion when tested as specified. Apply a wet film thickness of 0.005 inches with a film applicator to a 3 by 5 inch tin panel weighing 0.39 to 0.51 lbs. per sq.ft., previously cleaned with a Hydrocarbon Solvent and lightly buffed with steel wool. Dry the paint film at 70 degrees to 80 degrees F in a horizontal position for 18 hours, then bake in an oven at 122 degrees $\pm$ 4 degrees F (47.8 degrees C to 52.2 degrees C) for two hours, cool to room temperature for at least 1/2 hour and bend over a 1/2 inch diameter rod and examine, without magnification.

(6) Water Resistance:

The paint shall show no softening, blistering, loss of adhesion or other evidence of deterioration other than a slight loss in gloss when tested as specified. Apply a wet film thickness of 0.015 inches with a film applicator to a clean glass plate. Let dry in a horizontal position at room temperature (70 degrees to 80 degrees F) for 72 hours. Immerse one-half the painted plate in distilled water at room temperature for 18 hours as specified in method 6011 of Fed. Test Method Std. No. 141, allow to dry for two hours and examine.

(7) Dilution Stability:

The thinned paint shall be uniform and show no separation, curdling or precipitation after reduction in the properties of eight parts by volume of the package material with not more than one part by volume of the appropriate thinner for each type of paint.

(8) Spraying Properties:

The paint as received or diluted no more than specified above shall have satisfactory spraying properties when applied (and held in a horizontal position) to tinplate or aluminum surfaces at a wet film thickness of approximately 0.015 inch. The sprayed film shall dry to a smooth uniform finish, free from roughness, grit, unevenness and other surface imperfections. The paint shall show no streaking or separation when placed on clean glass.

(9) Bleeding:

The bleeding characteristics shall be determined in accordance with ASTM D 969. The test panels shall be evaluated according to ASTM D 868, and the degree of resistance to bleeding shall have a numerical rating of six (6).

Note 6. Apply a wet film of 0.015 inches to a tin panel; let dry for 24 hours and compare color.

Note 7. Storage stability shall be determined in accordance with ASTM D 1309 Settling Properties of Traffic Paints During Storage; ASTM D 869 Evaluating Degree of Settling; and Consistency, Krebs-Standard Method 4281 of Federal Test Method Std. No. 141.

(F) Manufacturing Requirements:

(1) Inspection:

The manufacture shall advise the Engineer when paint is to be manufactured and shall furnish the Engineer free access to all parts of the plant and shall furnish every reasonable facility for sampling both the paint and the raw materials during the process of manufacturing.

All materials used in formulation shall meet the requirements herein specified. Any materials not specifically covered shall meet the approval of the Engineer.

(2) Testing:

All tests will be conducted in accordance with the latest test methods of the American Society for Testing and Materials, Federal Test Method Standard No. 141, and methods in use by Materials Services, Highways Division, and the Arizona Department of Transportation. Where both an ASTM and Federal Test Method is available for new materials or the finished product, the ASTM test method will prevail.

Evidence of adulteration or improper formulation shall be cause for rejection.

(3) Packaging:

The finished paint shall be homogeneous, free of dirt, water and other foreign matter. The paints shall be strained immediately prior to canning.

All shipping containers must comply with Federal Interstate shipping standards of the Department of Transportation, and be stamped 17-H in accordance with the standards. The containers must be lined so as to prevent attack by the paint. The lining must not come off the container as skins.

All containers of paint shall be labeled with weatherproof markings, showing the color, manufacturer's name, date of manufacture, tare weight, net weight, gross weight and manufacturer's batch number on the side of drum and also on the lid.

708-2.02 Reflective Glass Beads:

(A) General:

The beads shall be manufactured from glass of a composition designated to be highly resistant to traffic wear and to the effects of weathering.

The glass beads shall be moisture-proof, contain less than 1/4 of one percent moisture by weight, and be free of trash, dirt, or other deleterious materials.

Beads shall be essentially free of sharp angular particles showing milkiness or surface scoring or scratching. Beads shall be water white in color.

(B) Physical Requirements:

(1) Gradation:

When tested by the method provided in AASHTO M-247 (by use of US Standard Sieves) the grade sizes of the beads shall be as follows:

Size of Sieve	Percent Passing
No. 20	100
No. 30	75 - 95
No. 50	15 - 35
No. 100	0 - 5

(2) Roundness:

When tested by the method provided in ASTM D-1155-53 (Procedure B except paragraphs (F) and (G) are deleted) beads retained on any screen specified in the gradation requirements shall contain a minimum of 70% true spheres.

(3) Index of Refraction:

When tested by a liquid immersion method at a temperature of 25 degrees C, the beads shall have an index of refraction of 1.50 to 1.57.

(4) Specific Gravity:

The specific gravity of the beads shall be in the range 2.40-2.60 when tested in accordance with the following procedures:

Place 100 grams in an oven at 110 C for 1 hour.

Remove beads and place in a desiccator until the sample is cool.

Remove approximately 60 grams of beads from the desiccator and weigh the sample accurately.

Pour the beads slowly in a clean 100 ml graduated cylinder containing 50 ml of isopropyl alcohol. Make certain that air is not entrapped among the beads.

The total volume, minus 50, will give the volume of the beads.

Calculate the specific gravity as follows:

$$\text{Specific Gravity} = \frac{\text{Weight of sample}}{\text{Volume of the sample}}$$

(5) Chemical Stability:

Beads which show any tendency toward decomposition, including surface etching, when exposed to atmospheric conditions, moisture, dilute acids, or alkalies or paint film constituents, may be required to demonstrate satisfactory reflectance behavior, prior to acceptance, under such tests as may be prescribed.

(C) Moisture Proofing:

All glass beads shall have a moisture-proof overlay consisting of water repellent material applied during the process of bead manufacture. The beads so treated shall not absorb moisture in storage and shall remain free of clusters and lumps and shall flow freely from dispensing and testing equipment.

The beads shall pass the test for water repellency and free flow using the following equipment:

(1) Test bag:

The bag used is approximately 10 1/2 inches x 17 1/2 inches after sewing. The material used in the construction of the bag is unbleached cotton sheeting with a thread count of 48 x 48. The material before sewing is approximately 18 inches x 22 inches. The cloth is folded in half lengthwise and stitched in the shape of an "L" with the short side left open at the top. The material can be obtained from selected manufacturers of cloth and paper packaging. The finished bag may also be obtained from the manufacturer of the glass beads.

Newly fabricated bags must be thoroughly washed with hot water and detergent and rinsed before use to remove the sizing which may be present in the cloth. Subsequent to the initial washing, the bags need only be rinsed clean of beads from previous tests and dried thoroughly before use.

(2) Funnel:

The funnel used is a standard laboratory funnel with a top opening diameter of 125 mm. and 150 mm. stem length. The inside diameter of the stem is between 9 and 10 mm. This funnel is available from most laboratory glassware supply houses. Corning No. 6100 or equal.

(3) Ring Stand and Clamp.

(4) Balance accurate to 0.1 grams.

(5) Distilled water.

MOISTURE TESTING PROCEDURE:

Glass beads shall be tested for compliance to specification requirements. Testing shall be conducted at standard conditions of temperature (25 ± 1 degrees C) and humidity (50 ± 5 percent R.H.) and shall consist of the following procedure or an approved alternate:

Weigh 900.0 grams of glass beads into a clean, dry, flat-bottomed pan.

Dry beads at 150 degrees C for two hours.

Cool beads to room temperature (25 ± 1 degrees) in a desiccator.

Using the clean, pre-washed bag described under apparatus section, turn the bag inside-out so that the sewn seam and seam-allowance are on the outside.

Quantitatively transfer the beads into the inverted cotton bag.

Grasp the gathered top of the bag with one hand and lower the bag into a container of distilled water until the beads are approximately one inch below the water level. The container shall be of such dimensions that the bag does not contact the bottom or sides during immersion. Each bag shall be immersed individually. Do not allow one bag to contact another if multiple tests are run.

Remove the bag after 30 seconds of immersion time.

Cradle the bottom of the bag uniformly in the palm of one hand and twist the top neck of the bag until the twisted bag is compressed firmly against the beads. Twist until excess water no longer drips from the bag.

After the excess water has been squeezed from the bag, allow the bag to unwind.

Gather the top of the bag and clamp. Suspending the bag on a ring stand or other support such that the bottom or sides of bag do not contact the support.

After a standing time of 2 hours at room temperature 25 degrees ± 1 degrees C, remove bag from support. Mix sample thoroughly by holding the bottom seam allowance in one hand and gathered neck of the bag in the other, invert bag and shake up and down 5 times.

Transfer the sample into a clean, dry funnel of the type described under apparatus. if consecutive tests are run, be sure the funnel is clean, dry and free of beads from prior tests.

The entire sample shall flow through the funnel without stoppage.

At the start of the test only, it is permissible to lightly tap the stem of the funnel to initiate flow.

Small quantities of beads which have adhered to the side of the funnel or stem shall not be cause for failure.

708-3 Construction Requirements:

708-3.01 Equipment:

The traffic paint and beads shall be placed on the pavement by a spray-type, self-propelled pavement marking machine except that temporary striping during construction may be placed with other equipment designed for application of paint and beads.

The application equipment to be used on roadway installation shall have, as a minimum, the following characteristic and/or apparatus:

The machine shall be capable of applying a clear-cut 4-inch line or lines.

The machines shall be equipped with a mechanical device capable of placing a broken reflectorized line with a 10-foot painted segment and a 30-foot gap.

The machine shall be equipped with an air-operated glass bead drop-in dispenser controlled by the spray gun mechanism.

A glass bead dispenser which is capable of placing the glass beads into the paint line as the paint is applied to the pavement shall be utilized. This dispenser shall provide satisfactory marking and delineation.

708-3.02 Application:

Pavement markings shall be applied when the pavement surface is dry and the weather is not foggy, rainy, or otherwise adverse to the application of markings. The surface shall be free from excess asphalt or other deleterious substances before traffic paint, beads or primer are applied. The contractor shall remove dirt, debris, grease, oil, rocks or chips from the pavement surface before applying markings. The method of cleaning the pavement surface and removal of detrimental material is subject to approval by the Engineer and shall include sweeping and the use of high-pressure air spray. The placing of traffic markings shall be done only by personnel who are experienced in this work.

The volume of paint in place shall be determined by measuring the paint tank with a calibrated rod. At the option of the Engineer, if the striping machine is equipped with air-atomized spray units (not airless) and paint gauges, the volume of paint may be determined by utilizing said gauges.

The quantity of glass reflectorizing beads in place shall be determined by measuring the glass reflectorizing bead tank with a calibrated rod.

The contractor shall provide the necessary personnel and equipment to divert traffic from the installation area where the work is in progress and during drying time when, in the opinion of the Engineer, such diversion of traffic is necessary.

Tolerances for Placing Paint, Beads, and Primer:

The length of painted segment and gap shall not vary more than 6 inches in a 40-foot cycle.

The finished line shall be smooth, aesthetically acceptable and free from undue waviness.

Painted lines shall be 4, 8, or 12 inches wide as shown on the plans with a tolerance of plus or minus 1/8 inch and shall be placed at a minimum rate of 16 gallons per mile for a solid 4-inch line and 4 gallons per mile for a broken 4-inch line, based on a 10-foot stripe and a 30-foot gap (40-foot cycle aggregate).

Glass reflectorizing beads shall be applied on the wet paint at a minimum rate of 6 pounds to each gallon of paint.

Wet mil thickness shall not be less than 15 mils.

708-4 Method of Measurement:

Pavement marking paint will be measured by the linear foot along the centerline of the pavement stripe. Skips in dashed lines will not be included in the measurement. Length of pavement markings will be based on four inch wide stripe. Measurement for striping with a plan width greater or less than the basic four inches as shown on the plans or directed by the Engineer will be made by the following method:

$$\frac{\text{Plan Width of Striping (inches)} \times \text{Linear Feet}}{4 \text{ (inches)}}$$

Symbols and legends will be measured by each unit applied. Each legend, regardless of the number of letters, will be considered as a single unit.

708-5 Basis of Payment:

Pavement striping of the type specified, measured as provided above, will be paid for at the contract price per linear foot for the total length of painted line applied to the nearest foot, which price shall be full compensation for the work complete, as described and specified herein and on the project plans.

Pavement symbols and legends measured as provided above, will be paid for at the contract price for each painted symbol or legend, which price shall be full compensation for the work complete, as described and specified herein and on the project plans.

(LOOP735, 453/!, 09/30/88)

SECTION 735 - DETECTORS: of the Standard Specifications is modified to add:

735-1 Description:

The work shall consist of furnishing all materials and installing a complete Detector Loop Traffic Counter System at the approximate location shown on the project plans and in conformance with the requirements of Section 735 of the Standard Specifications and Standard Drawings T.S. 7-1 and T.S. 7-3. The exact location will be specified by the Engineer. Installation shall be in accordance with ADOT's "Detector Loop Traffic Counter System Installation Procedures" Manual, dated September, 1986.

A complete traffic counter system for an undivided roadway shall consist of the number and size of loops and pullboxes necessary at one location in one roadway to cover all travel lanes. Each through lane shall contain a detector loop.

A complete traffic counter system for a multi-lane divided roadway shall consist of the number and size of loops and pullboxes required to cover all travel lanes in adjacent roadways for one location. Each through lane shall contain a detector loop.

735-2 Materials:

735-2.05 Detector Loop Traffic Counter System:

(A) General:

The contractor shall submit to the Engineer three copies of a complete list of the materials the contractor proposes to incorporate into the project, and three copies of shop drawings for each system indicating the project number and location (milepost and/or station number). The list of materials shall include the brand or trade names, identification numbers, type and quantity of materials to be used. The shop drawings shall include the size of loops, length of loop lead-ins, and location of pullbox(es), all in relationship to the roadway.

No material shall be ordered or installed without the approval of the Engineer.

(B) Loop Conductors:

The conductors for each inductive detector loop shall be No. 14 AWG stranded copper wires, Type THWN, 600 Volt, continuous and unspliced and inserted in polyvinyl chloride tubing.

(C) Conduit and Tubing - PVC:

The polyvinyl chloride tubing shall be UL FR-1 rated at 105 degrees, 31 mil minimum wall thickness, inner diameter .182 to .198 inch, dielectric strength 900 V/CM, moisture absorption less than one percent, and highly resistant to chemicals and oil.

Conduit shall be rigid nonmetallic (PVC) conforming to the requirements of the Specifications and shall be sized large enough to contain the number of loop lead-ins required and be a minimum of two inches in diameter.

(D) Pullboxes:

Pullboxes shall be No. 5 conforming to the requirements of the Specifications and to Standard Drawing T.S. 1-2.

(E) Saw Cut Sealant:

The sealant shall be an approved crack filler emulsion and sand, or epoxy loop sealant conforming to the requirements of Subsection 735-2.04.

735-3 Construction Requirements:

735-3.01 General:

When loops are to be placed in existing pavements, saw cuts shall be made and the loops placed in accordance with the details shown on Standard Drawings T.S. 7-1 and T.S. 7-3.

The saw cuts shall be cleaned with clean water and blown dry by means of an air stream free of oil or water. They shall be inspected for jagged edges or protrusions prior to the placement of the wire. The wire shall be placed as far down in the saw cut as possible and in such a manner that the insulation is not damaged. The bend in the wire at any one point shall not exceed 45 degrees. The wire shall be held in place during installation by strips of polyethylene foam sealant backers two inches in length, placed approximately two feet apart. Wires crossing pavement joints shall be protected with plastic sleeving extending a minimum of four inches each side of the joint.

735-3.02 Testing:

(A) General Requirements:

Any loop that fails to meet the requirements listed below, or will not tune when a detector is connected, shall be replaced at the contractor's expense.

(B) Preliminary:

The contractor shall perform the following tests on each loop in the presence of the Engineer both before and after the sealant has been poured and hardened:

1) Insulation Resistance to Ground - The insulation resistance to ground for each loop shall be measured with a megohmmeter connected to either loop lead-in and to the nearest reliable electrical ground, such as a metal light pole or fire hydrant, or to a metal rod driven three feet into the ground between the roadway and the pull box. The insulation to ground shall not measure less than 50 megohms at 500 volts DC.

2) Series Resistance - The series resistance of each six foot by six foot loop, measured by an ohmmeter, shall be between 0.1 and 0.5 ohms and the maximum resistance of any size loop including lead-ins shall not exceed 10 ohms.

The contractor shall submit two copies of the complete preliminary testing results to the Engineer.

(C) Final:

Final testing will be conducted by the Travel and Facilities Section of the Arizona Department of Transportation after the work is complete in place.

In addition to repeating the preliminary tests and recording the results, the following tests will be made:

1) Inductance - The inductance of each loop will be measured with an inductance tester. The inductance for a six foot by six foot loop with an 11 foot lead-in shall be in the range between 50 and 80 microhenries. The inductance may be greater with larger loops and longer lead-ins but in no case shall the total inductance exceed 700 microhenries.

2) Operation Test - A known working loop detector will be connected to each loop and the response observed under working conditions.

735-4 Method of Measurement:

The Detector Loop Traffic Counter System will be measured as a unit for each system installed and accepted.

735-5 Basis of Payment:

The work, measured as provided above, will be paid for at the contract unit price for each system, which price shall be full compensation for the work described and specified herein and on the plans.

SECTION 805 - SEEDING:

ITEM 8050003 - SEEDING (Class II) TYPE A:

Description:

Seeding consists of furnishing and applying chemical fertilizer; furnishing and planting grass and shrub seed and furnishing, applying and affixing mulch. The areas to be seeded are disturbed or unvegetated areas as designated by the Engineer.

Materials:

Seed:

Seed shall consist of Blue flax (Linum lewisii), Blue grama (Bouteloua gracilis 'Lovington'), Canada bluegrass (Poa compress a), Prairie coneflower (Ratibida columnaris), Penstemon (Penstemon strictus), and Streambank wheatgrass (Agropyron riparium).

Application rates of seed as specified are for Pure Live Seed (PLS). PLS is determined by multiplying the sum of the germination and hard or dormant seed by the purity.

Weed content of seed shall not exceed 0.5% and shall conform to the requirements of Subsection 805-2.02 of the Standard Specifications dated 1987.

Emulsified Asphalt:

Emulsified asphalt shall be type SS-1 or CSS-1 and shall conform to the requirements of Subsection 1005-3.04 of the Standard Specifications.

Binder:

Binder shall be free flowing, noncorrosive powder produced from natural plant gum marketed under M-Binder, M145 Binder, AZ-TAC or approved equal.

Wood Fiber Mulch:

Wood fiber mulch shall consist of a specially prepared wood fiber processed to contain no growth germination inhibiting factors. The mulch shall be from virgin wood and be manufactured and processed so the fibers will remain in uniform suspension in water under agitation to form a homogenous slurry.

Fertilizer:

Chemical fertilizer shall conform to the requirements of Subsection 805-2.06 of the Standard Specifications and shall be the kind as hereafter specified.

Straw Mulch:

Straw mulch shall conform to the requirements of Subsection 805-2.03 of the Standard Specifications and shall be from the current season's crop. A letter of certification from the supplier shall be required to the effect that the straw was baled less than 12 months from the delivery date.

Construction Requirements:

General:

Seeding shall be accomplished as soon as possible after the slopes and those portions of the right-of-way that have been disturbed have been finished in accordance with the requirements of the applicable portions of Section 203 of the Standard Specifications.

Tillage:

All areas to be seeded shall have the following chemical fertilizers uniformly applied to the surface at the rate specified and tilled into a minimum of the top three inches of the surface:

Type of Fertilizer	Pounds per Acre
Ammonium Phosphate	200

Tillage shall be accomplished with a disc harrow, chiseling tool or with other equipment which will provide an even mixture of fertilizer into the soil.

Tillage shall be performed across the slope when practical. No work shall be done when the moisture content of the soil is unfavorable or the ground is otherwise in a condition inimical to tillage.

In areas which, in the opinion of the Engineer, are too rocky to till without drastically disturbing the completed sections, the Engineer will approve a reduction of tillage accordingly. Tillage depth shall be at least 1/2 inch deep to break up the compacted surface and provide material for seed coverage.

All competitive vegetation shall be uprooted during the tillage operation and the soil shall be left in a smooth, firm surface free of clods, large stones over four inches in any dimension and other foreign material that would interfere with the seeding operation.

Planting:

After the tillage is completed and accepted by the Engineer, seed shall be planted by drill, except that on slopes too steep or rocky, seed may be broadcast provided that it is covered by dragging, hand raking or other approved methods. Hydroseeding is an acceptable method for seed distribution in areas where drilling is not practical, provided 50 pounds per acre of binder and 200 pounds per acre of wood fiber are included in the slurry with the seed. Seed shall not be in the slurry more than 30 minutes. Seed planted by this method will not require covering. The type of seed and the pure live seed rate is as follows:

Type of Seed	Pounds per Acre
Blue flax	3
Blue grama	1
Canada bluegrass	2
Prairie coneflower	1
Pestemon	2
Streambank wheatgrass	4

Seed shall be planted approximately 1/4 inch deep, with a maximum depth of 1/2 inch. The distance between the drilled furrows shall not be more than 8 inches. If the furrow openers on the drill exceed 8 inches, the area shall be drilled twice. Seeding shall be done with grass seeding equipment with double disc openers, depth bands, packer wheels or drag chains, rate control attachments, seed boxes with agitators and separate boxes for small seed. Seed of different sizes shall be sowed from at least two separate boxes adjusted or set to provide the planting rate as specified.

Applying mulch:

Mulch shall be immediately affixed by either crimping or tacking. The Engineer shall determine which areas are not conducive to anchoring by crimping and will direct the contractor to anchor such mulch by tacking.

Within 24 hours after each area is planted, straw mulch shall be uniformly applied at the rate of approximately 2 1/2 tons per acre for crimped areas and 1 3/4 tons per acre for tacked areas.

Anchorage by crimping:

Mulch shall be anchored into the soil with a heavy disc with flat, serrated discs at least 1/4 inch thick having dull edges and spaced no more than nine inches apart. Mulch shall be anchored to a depth of at least two inches and shall not be covered with an excessive amount of soil. Anchoring operations shall be across the slopes where practical with no more than two passes of the anchoring equipment.

Anchorage by tacking:

Mulch shall be anchored by tacking using either emulsified asphalt uniformly applied at the rate of approximately 400 gallons per acre or a slurry consisting of 150 pounds of binder, 400 pounds of wood fiber mulch and 700 gallons of water per acre.

Method of Measurement:

Seeding Class II will be measured by the acre, to the nearest hundredth acre, measured along the ground surface for the areas which have been planted and mulched, as determined by the Engineer.

Basis of Payment:

The accepted quantities of seeding, measured as provided above, will be paid for at the contract unit price per acre, which price shall be full compensation for the work complete including all equipment, labor and materials required for planting as described and specified herein.

ITEM 8050023 - SEEDING (Class II) TYPE B:

Description:

Seeding consists of furnishing and applying chemical fertilizer; furnishing and planting grass and shrub seed and furnishing, applying and affixing mulch. The areas to be seeded are disturbed or unvegetated areas as designated by the Engineer.

Materials:

Seed:

Seed shall consist of Blue flax (Linum lewisii), Blue grama (Bouteloua gracilis 'Lovington'), Canada bluegrass (Poa compress a), Prairie coneflower (Ratibida columnaris), Penstemon (Penstemon strictus), Streambank wheatgrass (Agropyron riparium), Ponderosa Pine (Pinus ponderosa, Apache Plume (Fallugia paradoxa), Squaw Bush (Rhus trilobata), Winterfat (Ceratoides lanata) and Rocky Mountain Juniper (Juniperus scopulorum).
Application rates of seed as specified are for Pure Live Seed (PLS). PLS is determined by multiplying the sum of the germination and hard or dormant seed by the purity.

Weed content of seed shall not exceed 0.5% and shall conform to the requirements of Subsection 805-2.02 of the Standard Specifications dated 1987.

Emulsified Asphalt:

Emulsified asphalt shall be type SS-1 or CSS-1 and shall conform to the requirements of Subsection 1005-3.04 of the Standard Specifications.

Binder:

Binder shall be free flowing, noncorrosive powder produced from natural plant gum marketed under M-Binder, M145 Binder, AZ-TAC or approved equal.

Wood Fiber Mulch:

Wood fiber mulch shall consist of a specially prepared wood fiber processed to contain no growth germination inhibiting factors. The mulch shall be from virgin wood and be manufactured and processed so the fibers will remain in uniform suspension in water under agitation to form a homogenous slurry.

Fertilizer:

Chemical fertilizer shall conform to the requirements of Subsection 805-2.06 of the Standard Specifications and shall be the kind as hereafter specified.

Straw Mulch:

Straw mulch shall conform to the requirements of Subsection 805-2.03 of the Standard Specifications and shall be from the current season's crop. A letter of certification from the supplier shall be required to the effect that the straw was baled less than 12 months from the delivery date.

Construction Requirements:

General:

Seeding shall be accomplished as soon as possible after the slopes and those portions of the right-of-way that have been disturbed have been finished in accordance with the requirements of the applicable portions of Section 203 of the Standard Specifications.

Tillage:

All areas to be seeded shall have the following chemical fertilizers uniformly applied to the surface at the rate specified and tilled into a minimum of the top three inches of the surface:

Type of Fertilizer	Pounds per Acre
Ammonium Phosphate	200

Tillage shall be accomplished with a disc harrow, chiseling tool or with other equipment which will provide an even mixture of fertilizer into the soil.

Tillage shall be performed across the slope when practical. No work shall be done when the moisture content of the soil is unfavorable or the ground is otherwise in a condition inimical to tillage.

In areas which, in the opinion of the Engineer, are too rocky to till without drastically disturbing the completed sections, the Engineer will approve a reduction of tillage accordingly. Tillage depth shall be at least 1/2 inch deep to break up the compacted surface and provide material for seed coverage.

All competitive vegetation shall be uprooted during the tillage operation and the soil shall be left in a smooth, firm surface free of clods, large stones over four inches in any dimension and other foreign material that would interfere with the seeding operation.

Planting:

After the tillage is completed and accepted by the Engineer, seed shall be planted by drill, except that on slopes too steep or rocky, seed may be broadcast provided that it is covered by dragging, hand raking or other approved methods. Hydroseeding is an acceptable method for seed distribution in areas where drilling is not practical, provided 50 pounds per acre of binder and 200 pounds per acre of wood fiber are included in the slurry with the seed. Seed shall not be in the slurry more than 30 minutes. Seed planted by this method will not require covering. The type of seed and the pure live seed rate is as follows:

Blue flax	3
Blue grama	1
Canada bluegrass	2
Prairie coneflower	1
Pestemon	2
Streambank wheatgrass	4
Ponderosa pine	15
Apache Plume	1
Squaw Bush	5
Winterfat	2
Rocky Mountain Juniper	1

Seed shall be planted approximately 1/4 inch deep, with a maximum depth of 1/2 inch. The distance between the drilled furrows shall not be more than 8 inches. If the furrow openers on the drill exceed 8 inches, the area shall be drilled twice. Seeding shall be done with grass seeding equipment with double disc openers, depth bands, packer wheels or drag chains, rate control attachments, seed boxes with agitators and separate boxes for small seed. Seed of different sizes shall be sowed from at least two separate boxes adjusted or set to provide the planting rate as specified.

Applying mulch:

Mulch shall be immediately affixed by either crimping or tacking. The Engineer shall determine which areas are not conducive to anchoring by crimping and will direct the contractor to anchor such mulch by tacking.

Within 24 hours after each area is planted, straw mulch shall be uniformly applied at the rate of approximately 2 1/2 tons per acre for crimped areas and 1 3/4 tons per acre for tacked areas.

Anchorage by crimping:

Mulch shall be anchored into the soil with a heavy disc with flat, serrated discs at least 1/4 inch thick having dull edges and spaced no more than nine inches apart. Mulch shall be anchored to a depth of at least two inches and shall not be covered with an excessive amount of soil. Anchoring operations shall be across the slopes where practical with no more than two passes of the anchoring equipment.

Anchorage by tacking:

Mulch shall be anchored by tacking using either emulsified asphalt uniformly applied at the rate of approximately 400 gallons per acre or a slurry consisting of 150 pounds of binder, 400 pounds of wood fiber mulch and 700 gallons of water per acre.

Method of Measurement:

Seeding Class II will be measured by the acre, to the nearest hundredth acre, measured along the ground surface for the areas which have been planted and mulched, as determined by the Engineer.

Basis of Payment:

The accepted quantities of seeding, measured as provided above, will be paid for at the contract unit price per acre, which price shall be full compensation for the work complete including all equipment, labor and materials required for planting as described and specified herein.

SECTION 901 - MOBILIZATION:

(MOBL901, 453/@, 08/24/89)

901-5 Basis of Payment: the third, fourth and fifth paragraphs of the Standard Specifications are revised to read:

The first payment of the lump sum price for mobilization will be paid after the Preconstruction Conference provided that all submissions required under Subsection 108.03 are submitted by the contractor at the Preconstruction Conference to the satisfaction of the Engineer. The amount paid for the first partial payment will be in accordance with Table 1.

The second payment of the lump sum price for mobilization will be made when the Engineer has determined that a significant amount of equipment has been mobilized to the project site which will be used to perform portions of the contract work. The amount paid for the second partial payment will be in accordance with Table 1.

The third payment of the lump sum price for mobilization will be made on the first estimate following completion of 5 percent of the contract. The amount paid for the third payment will be in accordance with Table 1.

The fourth payment of the lump sum price for mobilization will be made on the first estimate following completion of 10 percent of the contract. The amount paid for the fourth payment will be in accordance with Table 1.

TABLE 1

AMOUNT ALLOWED FOR MOBILIZATION
DURING THE LIFE OF THE CONTRACT

CONTRACT AMOUNT	(% OF CONTRACT)	BASIS OF PAYMENT
0 - 5,000,000	12%*	25% of the lump sum price for mobilization or 3% of the original contract amount, whichever is less.
5,000,000+	10%*	25% of the lump sum price for mobilization or 2.5% of the original contract amount, whichever is less.

*If the price bid for mobilization exceeds this percentage, any excess will be paid to the contractor upon completion of the contract.

SECTION 910 - CONCRETE BARRIERS:

(CONCB910, 454/i, 06/20/88)

910-3.01 General: the second paragraph of the Standard Specifications is revised to read:

Concrete barriers shall present a smooth, uniform appearance in their final position, conforming to the horizontal and vertical lines shown on the project plans or ordered by the Engineer.

910-3.02 Cast-in-Place by Slip Form or Extrusion: the second paragraph of the Standard Specifications is revised to read:

Slip form or extruded barrier will be considered not to require additional finishing if the surface meets the requirements of a Class II finish as described in Subsection 601-3.05 and the alignment is satisfactory. If the extruded barrier does not meet these requirements, operations shall be stopped until adjustments are made to the equipment or the concrete mix that will result in an acceptable product. Barrier that cannot be refinished to meet the specifications for a Class II finish shall be removed and replaced at the contractor's expense. Barrier that has unsatisfactory alignment, as determined by the straightedge test in Subsection 601-4.02(C), shall be penalized or replaced in accordance with that Subsection.

910-3.03 Cast-in-Place by Fixed Forms: of the Standard Specifications is modified to add:

When a ten foot long straightedge is placed on the top and along the faces of the barrier, the surface shall not vary more than 1/4 inch from the straightedge.

910-3.04 Precast: of the Standard Specifications is modified to add:

When a ten foot long straightedge is placed on the top and along the faces of the barrier, the surface shall not vary more than 1/4 inch from the straightedge.

ITEM 9130850 - AGGREGATE TRENCH EDGE DRAIN (ATED):

Description:

The work under this item consist of furnishing all labor, equipment and materials and constructing the Aggregate Trench Edge Drain "ATED", as specified herein after; at the locations and as detailed on the project plans.

Material Requirements:

Filter Fabric:

The filter fabric materials shall be supplied in accordance with and conform to the following material requirements and those listed.

General Requirements:

Certificates of Analysis, conforming to the requirements of Subsection 106.05(c), may be submitted, along with a representative sample of appropriate size for testing, by the supplier or manufacturer of any geosynthetic material to the ADOT Materials Section for evaluation and pre-approval. Testing methods and results shown in the Certificate of Analysis shall conform to the listed specifications for the proposed geosynthetic use. Supporting documentation including, but not limited to, product information sheets, installation procedures and recommendations, recommended use, and project references shall also be submitted by the supplier or manufacturer as part of product evaluation and pre-approval.

Certificates of Compliance, conforming to the requirements of Subsection 106.05(b), shall be submitted to the Engineer by the contractor upon delivery of geosynthetic materials for use on a specific project. If the delivered materials have not been evaluated and pre-approved as noted above, it will be necessary for a Certificate of Analysis to be submitted to the Engineer along with the supporting documentation as above before the material may be considered for use on the project. Each geosynthetic material lot or shipment must be approved by the Engineer before the materials may be incorporated in the work.

Filter fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. The fabric shall be nonwoven, shall not act as a wicking agent, shall be permeable, and shall conform to the following:

Property	Requirement	Test Method
Grab Tensile Strength (lbs.)	140	ASTM D4632-86
Grab Elongation at Break (%)	45 min., 115 max.	ASTM D4632-86
Puncture Strength (lbs.)	50	ASTM D3787
Burst Strength (psi)	220	ASTM D3786
Trapezoidal Tear (lbs.)	40	ASTM D4533-85
Permittivity (sec -1)	0.5	ASTM D4491-85
Apparent Opening Size (U.S. Standard Sieve Size)	50 - 100	ASTM D4751-87
Ultraviolet Stability (%)	70	ASTM D4355-84

Minimum average roll values represent the average test results for a lot in the weaker direction when sampled according to ASTM D4354 and Tested according to the test method specified above.

Fabric Packaging, Handling, and Storage:

The identification, packaging, handling, and storage of the filter fabric shall be in accordance with ASTM D4873. Fabric rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labelled or tagged to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number, date of manufacture, shipping date, and the project number and name to which it is assigned. Rolls will be stored on the site or at another identified storage location in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof, light colored, opaque cover. At no time, shall the fabric be exposed to sunlight for a period exceeding 14 days.

The filter fabric shall be provided in rolls wrapped with protective covering to protect the fabric from mud, dirt, dust, and debris. The fabric shall be free of defects or flaws which significantly affect its physical properties. Each roll of fabric in the shipment shall be labeled with a number or symbol to identify that production run.

The average roll minimum value (weakest principle direction) for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the average roll minimum value (weakest principle direction) stipulated in the AASHTO Specification.

Equipment:

Mechanical or manual laydown equipment shall be capable of handling full rolls of fabric, and laying the fabric smoothly, without wrinkles or folds. The equipment shall be in accordance with the fabric manufacturer's recommendations or as approved by the Engineer.

Pipe and Pipe Fittings:

Pipe and pipe fittings for edge drains shall be of the size or sizes shown on the plans.

Pipe installed in trenches to be backfilled with aggregate shall be polyvinyl chloride (PVC) 90 degrees centigrade electric plastic conduit, EPC-40 or EPC-80, conforming to the requirements of NEMA Specification TC-2.

All other pipe for edge drains shall, at the Contractor's option, be either:

1. PVC 90 degrees centigrade electric plastic conduit, EPC-40 or EPC-80, conforming to the requirements of NEMA Specification TC-2 or

2. PVC plastic pipe, Schedule 40 or Schedule 80, conforming to the requirements of ASTM Designation D 1785. The type, grade, and design stress designation of the pipe shall, at the Contractor's option, be either 1120, 1220, 2120, 2116, 2112, or 2110 as specified in said ASTM Designation.

Pipe shall be straight end or bell end. Bell end sockets shall conform to the requirements of ASTM Designation: D 2672 except for marking.

In addition, pipe designated as slotted on the plans shall have 3 rows of slots in the pipe. The rows shall be in the longitudinal direction of the pipe and the slots shall be cut in the circumferential direction of the pipe. The 3 rows shall be spaced equally around the circumference of the pipe. Each row shall have22($\pm$1) uniformly spaced slots per linear foot of pipe. The slots shall be 0.045-inch to 0.065-inch wide and of such length as to provide a minimum of 2.00 square inches of slot opening per linear foot of pipe. Other suitable configurations of slots which provide drainage equal to or better than the above slot requirements may be used if approved in writing by the Engineer.

Except as otherwise provided for "Y" fittings, fittings for PVC 90 degrees centigrade electric plastic conduit shall conform to the requirements of NEMA Specification TC-3, and fittings for PVC plastic pipe shall be socket-type fittings conforming to the requirements of ASTM Designation: D2467 for Schedule 80 pipe and ASTM Designation: D2466 for Schedule 40 pipe. "Y" fittings shall be shop fabricated from pipe conforming to the requirements for the kind of edge drain pipe installed. The fittings shall provide an unobstructed passageway through both legs of the "Y".

Aggregate:

The gradation of virgin aggregate will be determined in accordance with the requirements of Arizona Test Method 201.

Sieve Size	Percent Passing
1 1/2 inch	100
1 inch	50 - 75
1/2 inch	20 - 50
No. 4	0 - 15
No. 200	0 - 2.5

The combined bulk specific gravity range for the aggregate shall be 2.35 to 2.85.

The combined water absorption range for the aggregate shall be 0 to 2.5.

Resistance to abrasion for aggregate will be determined in accordance with the requirements of AASHTO T 96 and shall meet the following requirements:

Maximum loss of 40 percent at 500 revolutions.

Installation:

Edge drains, edge drain outlets, aggregate, and filter fabric shall be installed in accordance with the details shown on the plans and as specified in this Section.

Prior to excavating trenches for the installation of edge drains and edge drain outlets, in existing paved areas, the outline of the paved areas to be removed shall be cut to a neat line to a minimum depth of 2 inches with a power-driven saw or a wheel type rock cutting excavator. Cuts along the joint between existing asphalt concrete and existing portland cement concrete pavement will not be required. Records indicated that the existing structural section of the shoulders consists of 2.5" to 3" AC, 5" AB, 4" to 7" CTB and 9" Subgrade Seal.

Surfaces to receive filter fabric, immediately prior to placing, shall be free of loose or extraneous material and sharp objects that may damage the filter fabric during installation.

The fabric shall be aligned and placed in a wrinkle-free manner.

Adjacent rolls of the fabric shall be overlapped from 24 inches. The preceding roll shall overlap the following roll in the direction the material is being spread.

Should the fabric be damaged during placing, the torn or punctured section shall be either completely replaced or shall be repaired by placing a piece of fabric that is large enough to cover the damaged area and to meet the overlap requirement.

Damage to the fabric resulting from the Contractor's vehicles, equipment or operations shall be replaced or repaired by the Contractor at his expense.

Construction Requirements:

Weather Limitations:

Filter fabric shall not be placed when weather conditions, in the opinion of the Engineering, are not suitable to allow placement or installation.

Pipe and fittings shall be jointed by solvent cementing with commercial quality solvent cement and primer specifically manufactured for use with rigid PVC plastic pipe and fittings. The solvent cement and primer used shall be made by the same manufacturer. The color of the primer shall contrast with the color of the pipe and fittings. The solvent cement and primer shall be used in accordance with the manufacturer's printed instructions.

Aggregate materials shall be placed with great care and spread in two layers in a manner which does not damage the fabric. Pins or piles of aggregate can be used to hold the filter fabric in place while aggregate is being placed. Aggregate material shall be compacted as specified in Subsection 303-3.02.

Method of Measurements:

The edge drains will be measured by the linear foot along the line of the pipe. The length to be paid for will be the slope length of the pipe designated by the Engineer. Pipe placed in excess of the length designated by the Engineer will not be paid for. Outlet pipe will be measured and paid for as plastic pipe (edge drain outlet).

No deduction in the length of plastic pipe (edge drain) will be made for gaps in edge drain pipe at locations of dual outlet, connections to the edge drain.

The "Y" fitting at intermediate outlet connections will be measured and paid for as plastic pipe (edge drain outlet) between the couplings at each end of the curved section of the "Y" fitting, and as plastic pipe (edge drain) between the couplings at each end of the straight section of the "Y" fitting.

Basis of Payment:

The contract price paid per linear foot for plastic pipe (edge drain) of the size or sizes shown in the project plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drains complete in place, including excavation (and removal of any concrete deposits that may occur along the lower edge of the concrete pavement), filter fabric, and permeable material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

(TRN923, CS, 09/01/87)

ITEM 9230001 - PROVIDE TRAINEES WITH ON-THE-JOB TRAINING:

The number of trainees to be trained under this project shall be at least 9; however, the contractor shall make every possible effort to provide additional trainees with training and shall see that all trainees are afforded every opportunity to participate in as much training as is practically possible to provide.

As approved by the Engineer, reimbursement will be made for training of persons in excess of the minimum number specified herein.

At the preconstruction conference, the contractor shall submit a schedule which will indicate the approximate number of hours each trainee will be trained in each phase of the work, the crafts to which the trainees belong and the estimated period of time that they will be employed as trainees. A supplemental schedule shall be submitted to the Engineer when a revision in the original schedule is necessary.

(SURVY925, 454/r, 12/15/89)

SECTION 925 - CONSTRUCTION SURVEYING AND LAYOUT: the SECTION Heading of the Standard Specifications is revised as shown:

925-2 Materials, Personnel and Equipment: the second paragraph of the Standard Specifications is revised to read:

The contractor shall furnish all traffic control, including flagging for survey and staking operations, the cost being considered to be included in contract bid item 9250001 - CONSTRUCTION SURVEYING AND LAYOUT. Traffic control devices and procedures for construction surveying shall be in accordance with the requirements of the Traffic Control Manual.

925-3 Construction Requirements: the first paragraph of the Standard Specifications is revised to read:

Prior to beginning any survey operations, the contractor shall furnish to the Engineer, for his approval, a written outline detailing the method of staking, marking of stakes, grade control for various courses of materials, referencing, structure control, and any other procedures and controls necessary for survey completion. A part of this outline shall also be a schedule which will show the sequencing of the survey and layout work, throughout the course of the contract, listing a percentage of completion for each month. Section 1100-B, Chapter XI of the ADOT Construction Manual shall be used by the contractor as a guide in the preparation of this outline. The contractor may obtain a copy of Chapter XI, for a fee, from Engineering Records, 1655 West Jackson, Room 112F, Phoenix, AZ 85007, Phone (602) 255-7498.

925-3 Construction Requirements: the eleventh and twelfth paragraphs of the Standard Specifications are revised to read:

On projects where traffic is being carried through the work zone, pavements shall be marked for traffic centerline delineation before the end of each work shift. Temporary pavement markings shall conform with the requirements set forth under Subsection 701-3.05 of the Standard Specifications and any subsequent modifications thereto.

Any discrepancies in grade, alignment, earthwork quantities, locations or dimensions detected by the contractor shall immediately be brought to the attention of the Engineer. No changes in the project plans will be allowed without the approval of the Engineer. Requests for verification of earthwork quantities shall be in accordance with Subsection 102.06.

925-5 Basis of Payment: the third paragraph of the Standard Specifications is revised to read:

If additional staking and layout are required as a result of additional work ordered by the Engineer, such work will be paid under ITEM 9250102 - TWO-PERSON SURVEY PARTY, ITEM 9250103 - THREE-PERSON SURVEY PARTY and/or ITEM 9250104 - FOUR-PERSON SURVEY PARTY. Payment will be made at the respective predetermined unit prices of $65.00 per hour, $75.00 per hour and or $85.00 per hour. Should such additional work require the contractor to pay travel and subsistence costs for the survey party or survey parties utilized, payment for travel and subsistence will be made under the provisions of Subsection 109.04, except that no mark-up will be allowed for profit and overhead. The Engineer will be the sole judge as to whether the additional work shall be performed by the contractor or by department forces.

SECTION 928 - FORMED RUMBLE STRIP:

(RUMBL928, 454/t, 10/05/88)

928-3 - Construction Requirements: of the Standard Specifications is revised to read:

Rumble Strips shall be formed in the asphaltic concrete by making indentations approximately 7/8 inch deep by two feet in length and spaced at centers of approximately eight inches, in accordance with the details shown on the project plans.

A self-propelled vibratory roller, weighing at least six tons, may be used to form the Rumble Strips. If the rear tires are pneumatic, they shall have a smooth or slick tread design. The roller shall be equipped with an approved water system which will moisten the drums and tires so that the bituminous material will not be picked up. The roller shall also be equipped with an approved guide that extends in front of the roller and is clearly visible to the operator so that proper alignment of the strips will be obtained.

Other equipment may be used to construct the Rumble Strip, subject to approval by the Engineer.

The equipment used shall be positioned by using planking, or by other approved means, so that the asphaltic concrete is indented only at those locations specified on the plans and to the dimensions specified herein.

The forming of the Rumble Strips shall be accomplished in one pass of the equipment and while the asphaltic concrete is hot. The surface surrounding the indentations shall be smooth and not deformed. These requirements apply if the Rumble Strip is formed by the roller which is in the vibratory mode or by other equipment.

The asphaltic concrete shall be compacted to the degree specified in the appropriate section of the specifications.

ITEM 9999915 - CONSTRUCT H.S.W.I.M.:

Description:

The work under this item consist of furnishing all labor, equipment materials and technical support to construct and install the High Speed Weigh-In-Motion (H.S.W.I.M.) and located as specified hereinafter as (Electrical Support System for WIM System and High Speed Weigh-in-Motion System) and as shown on the projects, and in accordance with the applicable Standard Specification, and/or as directed by the Engineer.

Construction, Materials, and Installation Requirements:

ELECTRICAL SUPPORT SYSTEM FOR WIM SYSTEM:

General:

The weigh-in-motion(WIM) electrical support system includes equipment and hardware necessary to provide electrical connection of the axle sensors and induction loops to the central unit, provides solar power, main voltage, and battery power for system operation and telecommunication hookup, and provides environmental enclosure for the central unit.

Foundations:

Portland cement concrete for cabinet foundations shall be class S concrete with a minimum 28 day compressive strength of 3000 p.s.i..

Conduit:

The conduit run between a foundation and the nearest pull box shall be the rigid metal or IMC type.

When a standard coupling cannot be used for coupling metal type conduit, a UL listed threaded union coupling, or a concrete tight split coupling or concrete tight set screw coupling shall be used.

When rigid non-metallic conduit is placed in a trench (not under pavement), after the bedding material is placed and conduit installed, the trench shall be backfilled with commercial quality concrete, containing not less than 376 pounds of cement per cubic yard, to not less than 4 inches above the conduit before additional backfill material is placed.

After conductors have been installed, the ends of conduits terminating in pull boxes, and in service and controller cabinets shall be sealed with an approved type of sealing compound.

Trenching Installation of Conduit:

Conduit shall be placed under existing pavement in a trench approximately 2 inches wider than the outside diameter of the conduit to be installed. The trench shall not exceed 6 inches in width. Conduit depth shall not exceed 12 inches or conduit trade-diameter plus 10 inches, whichever is greater, except that at pull boxes the trench may be hand dug to required depth. The top of the installed conduit shall be a minimum of 9 inches below finish grade.

In areas where additional pavement is to be placed, trenching installation shall be completed prior to placing final pavement layer.

The outline of all areas of pavement to be removed shall be cut to a minimum depth of 3 inches with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter outside the removal area.

The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with commercial quality concrete, containing not less than 564 pounds of cement per cubic yard. Concrete backfill shall be placed to the pavement surface except, when the trench is in asphalt concrete pavement, the top 0.10-foot of the trench shall be backfilled with asphalt concrete produced from commercial quality paving asphalt and aggregates.

All excavated areas in the pavement shall be backfilled, except for the top 0.10-foot, by the end of each work period.

Conduit from the scales installed between the edge of traveled way and the edge of shoulder shall be installed as provided for above.

Pull Boxes:

Grout shall not be placed in the bottom of pull boxes.

Conductors and Wiring:

Splices of conductors shall be insulated with heat-shrink tubing of the appropriate size.

Heat-Shrink Tubing:

Heat shrink tubing shall be a dual wall, irradiated polyolefin, tubing containing an adhesive inner wall. When heated, the inner wall shall melt and fill all crevices and interstices of the object being covered while the outer wall shrinks. Each end of the heat-shrink tube or the open end of the end cap of heat-shrink material shall, after contraction, overlap the conductor insulation at least 1 1/2 inches.

All heat-shrink tubing shall also meet the following requirements:

Shrinkage Ratio:	33 percent, maximum, of supplied diameter when heated to 125 degrees C. and allowed to cool to 25 degrees C.
Dielectric Strength:	350 kilovolts per inch, minimum.
Resistivity:	10^{14} ohms per centimeter, minimum.
Tensile Strength:	2500 lbs. per square inch, minimum.
Operating Temperature:	55 degrees C. to 135 degrees C.
Water absorption:	0.5 percent maximum.

When three or more conductors are to be enclosed within a single splice using heat-shrink material, mastic shall be placed around each conductor, prior to being placed inside the heat-shrink material. The mastic shall be the type recommended by the manufacturer of the heat-shrink material.

Telephone Cable:

Telephone cable shall consist of 4 No. 18 conductors with braided copper shield and an outside jacket. Each conductor shall have a minimum of 16 tinned copper strands. Individual conductor insulation shall be rubber or thermoplastic, rated for 600 volts and color coded black, white, red and green. Jacket shall be neoprene, polyethylene or polyvinyl chloride with a nominal thickness of 0.035 inch. Outside diameter of jacket shall not exceed 0.35 inch.

Service:

Type I and Type III service equipment enclosures shall be fabricated from aluminum and shall conform to the requirements of Section 734-2.03 with the following exceptions: Delete Subsections (C)(2), (E)(2) paragraphs 2,3,4,and 5, (E)(3), (F)(3), (F)(4), (F)(5) and (F)(6).

Telephone service installation and materials shall conform to the requirements of the serving utility.

Controller Cabinet:

Controller cabinet shall be Type M traffic control cabinet. The controller cabinet will be located approximately 60 ft. right of Station 278+60. The exact location will be established by the Engineer. The maximum allowable distance between the wheel scales and the controller unit will be 96 ft..

Detectors:

Loop wire shall be as specified by the WIM manufacturer. In locations where the loop is interrupted by contraction joints a loop wire with an additional plastic hose shall be utilized in accordance with the manufacturers recommendations to allow movement of the slabs with the wires.

Residue resulting from slot cutting operations shall not be permitted to flow across shoulders or lanes occupied by public traffic and shall be removed from the pavement surface.

Slots shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

The loop detector sensor units shall be mounted in the controller cabinet as recommended by the WIM system manufacturer.

Technical Support:

The WIM manufacture shall maintain a technical representative on-site during installation of the electrical support equipment and shall certify in writing that the contractor has installed the equipment in accordance with the manufacture's recommendations.

HIGH SPEED WEIGH-IN-MOTION SYSTEM:

GENERAL:

The high speed weigh-in-motion system (hereafter "WIM System") includes equipment and software for collecting, processing, storing, transmitting (to a host computer) and manipulating information related to the counting, classifying, and speed monitoring of all vehicles and the weighing of trucks and buses. The system will be the Permanent Traffic Data Analyzer DAW 200 manufactured by PAT Equipment Corporation.

Drain:

The WIM drainage pit will outlet into the concrete pavement edge drain through a minimum 6 inch diameter hole drilled through the concrete pavement. Chipping or jack hammering will not be allowed in constructing this drainage conduit.

On-Site Equipment:

The WIM system shall provide for single threshold weighing, and operate over a specified range of 5 MPH to 80 MPH. Single threshold weighing shall consist of two scales in each lane of travel. The entire lane width of 12 feet shall be covered by the weigh sensor(s) in each lane. The WIM installation shall consist of, at minimum, the following components:

1. Wheel scales, frames and mounting hardware for both lanes to be instrumented. The scales shall report weigh data for each wheel track (right axle weight and left axle weight). Installation of scales will be in accordance with the manufacturer's recommendations.
2. Two inductive loop detectors per lane for measuring speed and vehicle length. Loops and lead-in cable are provided for in Section 14, elsewhere in these special provisions.
3. Embedded axle sensors consisting of piezoelectric cable embedded in loaded epoxy in an aluminum frame, and a screened transmission cable.

   The embedded axle sensor shall be electrically screened so as to not generate electrical noise. Sensors shall be self-powered, shall provide a steady output signal over the complete active zone, and shall be capable of operation throughout a temperature range of -20o C. to 70o C.

Piezoelctric cable shall have single wire core and sheath made of copper with polarized piezoelectric insulation, and shall have a nominal linear capacitance of 7,500pF/meter, a minimum insulation resistance of 1010 ohms, sensitivity dispersion not exceeding 7 percent and a nominal piezoelectric factor of one volt per bar.

Screened transmission cable shall have multiwire core and a braid made of tinned copper with polyethylene insulation material, and shall be a 50 ohm coaxial cable, Type RG58CU, of 5 millimeter diameter with an 85o C. rated polyvinyl chloride sheath and a capacitance of 110 pF/meter +/- 10pF/meter.

4. A central unit, shall be installed in the controller cabinet which is to be provided in Section 15 elsewhere in these special provisions. The central unit shall include all the equipment and software necessary to calculate, store and transmit to a host computer all data specified in these special provisions. Power and telephone service to the WIM Systems will be provided by others,. A 12 volt DC battery backup system shall be provided uninterrupted power to the central unit during AC power outages of up to 24 hours. The modem to be installed in the controller cabinet shall be compatible with the Host computer modem described under "WIM System Application Software" elsewhere in these special provisions. The user shall have the capability to enter a site designation code (up to eight characters).

5. A battery powered portable personal computer (PC) adequate to connect to the central unit for system testing will be provided by the Department. The Contractor will provide the necessary cables, connections, software, and modifications to the PC to allow this equipment to be able to perform adjustments, programming and on-site direct data downloading with the central unit. This device will be used to conduct all system testing. The portable PC shall have at least one built-in 3.5 inch floppy disk drive, with a minimum capacity of 1.4 megabytes and one internal hard disk drive, with a minimum of 20 megabytes. The display shall be visible in all lighting conditions.

6. All necessary interconnecting cables and miscellaneous materials required to make the system operational.

Functional Requirements:

The WIM System shall be able to accommodate vehicles and vehicle combinations with up to 9 axles and shall automatically determine from each vehicle, by lane of travel:

1. Weight of each axle:

Accuracy:	MEAN	STD. DEV.
Single axle	+/- 5%	8%
Tandem axle	+/- 5%	6%
gross weight	+/- 5%	5%

2. Axle Spacing:

Accuracy:	MEAN	STD. DEV.
	+/- 6"	12"

3. Vehicle Length

Accuracy	MEAN	STD. DEV.
	+/- 12"	18"

4. Speed:

Accuracy	MEAN	STD. DEV.
	+/- 1 mph	2 mph

5. Vehicle Classification:

The WIM System shall provide for a minimum of fifteen vehicle classifications. Class 1 through Class 13 shall be used according to Federal Highway Administration's (FHWA) Scheme "F" (as shown in Section 4, Chapter 3 of the FHWA Traffic Monitoring Guide). Class 14 will identify special vehicles as determined by the user. Class 15 will identify any vehicle which does not conform to the classification criteria for Classes 1 through 14. Classification criteria for Classes 1 through 14 shall be programmable by the user.

The WIM System shall provide sufficient flexibility in programming parameters including number of axles, axle spacing, and weights (axle and/or gross) for each of these classes so that accurate classifying is achievable.

6. Invalid Measurements:

Any vehicle in Vehicle Classifications 4 through 15 having a difference of 40 percent or more between the left and right wheel weights of any axle shall be coded as an "Invalid Measurement." Any vehicle so coded shall not be considered a "weighed vehicle" but shall be classified and counted and all vehicle data shall be stored in the vehicle record.

7. Determination of Weight Violations:

For each vehicle in Vehicle Classification 4 through 15 crossing the scale, the WIM System shall determine which, if any, axle(s) or axle grouping(s) exceed the weight limits set forth in the Weight Violation Table contained in these special provisions. Any vehicle with one or more weight violations will be coded as to such a violation or combination of violations. The weight limitations set forth in the Weight Violation Table shall be the default settings. Such weights shall be programmable by the user.

All accuracy performance testing will be based on 40 truck measurements per lane.

The central unit of the WIM System shall calculate and temporarily store all specified data on a storage medium.

The on site data storage device shall have the capacity to store a minimum of three days of vehicle count data in addition to a minimum of 30,000 truck records. The storage device shall be a type that is not susceptible to loss of accumulated data should electrical power be interrupted.

The central unit shall store the following data:

A. Hourly vehicle counts by class and by speed range for each 24 hour period.

B. Individual vehicle records for all vehicles equal to Class 4 or higher with front axle weight greater than 4 kips (hereafter referred to as "truck records"). The front axle weight threshold for truck records shall be programmable by the operator (4 kips shall be the default setting). Each truck record shall include, as a minimum, the following data:

a. Time and Date
b. Lane Number
c. Vehicle Number
d. Speed
e. Vehicle Classification
f. Weight in kips of each wheel or dual set of wheels by left and right side by axle number.
g. Spacings in feet between each sequentially numbered axle.
h. Overall length of each vehicle or combination of vehicles in feet.
i. Code for weight violation(s).
j. Code for invalid Measurement.

Data shall be calculated and formatted such that all data can be accessed and all required reports can be generated by use of the WIM System Application Software.

All equipment shall operate properly, without the use of supplemental heating or cooling equipment, within an ambient temperature range of -20 degrees F. and +122 degrees F..

Wim System Application Software:

An application program, hereafter referred to as "The System Program," which can execute on the "Host Computer" (described following) shall be furnished as part of the WIM System. The System Program shall download the files from the central unit by telecommunication, generate the specified reports and generate a specified ASCII file.

1. The host computer will be furnished by others and will consist of:

(a) One IBM Personal System /2 Model 80 with VGA monitor.

(b) Laser printer (parallel).

(c) Hayes Smartmodem 2400, or compatible modem.

2. The system program shall be "user friendly," hierarchical menu driven and shall perform the following application:

(a) Real Time View:

The Real Time View program shall provide for on-line monitoring of traffic. The display on the host computer shall depict the axle configuration of each vehicle passing through the site. The contents and format for the real time display shall be similar to the sample display included at the end of these special provisions. The user shall have the option of displaying either all traffic or only vehicle classifications 4 through 15 as well as the option of displaying a selected individual lane or all lanes.

Printing of the real time data on the host computer printer shall be facilitated by means of an on/off toggle key from the keyboard.

(b) System Data Programming:

The System Data Programming program shall provide for on-line modification to the central unit's software parameters, such as speed and weight calibration factors, vehicle classification parameters, weight violation table parameters, and front axle weight threshold.

c) Manual Downloading:

The Manual Downloading program shall provide for the downloading of selected daily data files from the storage medium of the central unit to the storage medium of the host computer. The program shall provide for a listing of the daily data files stored in the central unit and shall provide for user selection of the file or files to be downloaded from such a listing. The program shall provide for the dowloading of the current day's data stored as of the time of downloading. Transmission shall be at 2400 baud using an error checking protocol which ensures accurate transmission and receipt of all data. If a particular transmission block cannot be successfully transmitted after a minimum of three attempts under such protocol, data downloading shall be resumed and an error message shall be recorded.

d) Automatic Downloading:

The Automatic Downloading program shall provide for unattended downloading of daily files stored in the central unit's storage medium to the storage medium of the host computer. Transmission shall be at 2400 baud using an error checking protocol. The program shall provide the following:

1. User's input for the date and time that unattended downloading is to begin.
2. Downloading of all daily files not previously downloaded by the Automatic Downloading program.
3. At least three attempts to make telephone connection with the central unit.
4. At least three attempts to download files from the central unit before aborting download.
5. The recording of an error message if problems are encountered during the downloading process.
6. Discontinuation of telephone connection after downloading of files from the central unit (or after an abort) and returning the host computer to a standby mode.

(e) Report Preparation:

The Report Preparation program shall generate specified reports using the downloaded data. Such reports shall be sent to the host computer printer. The program shall prepare the following daily reports:

1. Distribution of vehicle classification by hour of day.
2. Distribution of vehicles by speed and by hour of day.

3. Distribution of weight violations and invalid measurements for vehicle classification 4 through 15.

4. Distribution of weight violations by hour of day for vehicle classification 4 through 14.

5. Distribution of overweight vehicles by hour of day for vehicle classifications 4 through 14.

6. Distribution of gross weights for vehicle classifications 4 through 14.

7. Distribution of 18 kip equivalent single axle loadings (ESALS) by hour of day for vehicle classifications 4 through 14. (Program provides for user input of either flexible pavement and structural number or rigid pavement and slab thickness).

The program shall provide for user selection of the date and the specific report.

The program shall also provide for user selection of the lane or lanes to be covered by the specific report (the default shall be "all lanes." The printed report shall note which lanes are represented.

The contents and format of each report shall be similar to the sample reports contained in these special provisions. The reports shall be printed in condensed print when necessary to fit on 8 1/2" X 11" sheets.

The determination of weight violations for axle weight, tandem axle weight, gross vehicle weight, and bridge weight shall be in accordance with the Weight Violation Tables contained in these special provisions. Determination of 18 kip equivalent single axle loads shall be in accordance with the Axle Load Equivalency Factor tables contained in these special provisions.

(f) Truck Record Batch Print:

The Truck Record Batch Print program shall provide for the display of, and on/off printer toggle of, individual truck records.

The program shall provide for a listing of the daily truck record files available on the storage medium of the host computer and the user's selection of one of those files.
The program shall also provide for the user's selection of the vehicle class or classes for which individual trucks will be displayed or printed as well as the starting hour of day.

The user shall have the following options in viewing and printing the individual truck records:

1. Scroll and print continuously all records for the selected class(es); user has capability to stop/resume scrolling or terminate program.

2. Scroll each record one at a time; user has capability to:

(a) Print displayed record and display next record.

(b) Display next record.

(c) Terminate program.

Example of the truck record batch print is included in these special provisions.

(g) ASCII Export Utility:

The ASCII Export Utility program shall allow the user to generate an ASCII file of the daily truck records from the downloaded data. Such file will have a name which identifies the file as to site designation and date and as to its being an ASCII file. The file format shall contain all truck record files. Such fields shall be comma delimited and padded with blanks to complete the fixed logical record length.

Data Files:

Notwithstanding the method of data manipulation and formatting used by the central unit, data files shall conform to the following:

1. Individual daily data files shall be created and stored in the storage medium of the central unit. Each daily data file shall include data for each 00:00 hour through 24:00 hour period and shall have a file name which uniquely identifies the files as to site designation, date, and file contents (i.e. class/count summary data, individual truck record data, or both).
2. The daily data files shall be created at the start of each day, data for each vehicle shall be filed within one hour of the vehicle's passing through the site, and the current day's files shall be accommodative to downloading at any time during the day. Data file structure shall be accommodative to efficient use of storage medium space and rapid downloading via modem to the host computers.
3. Daily files containing class / count summary data and individual truck records data may be created in the storage medium of the central unit as 2 separate daily files or as one daily file. However if one daily file is created and downloaded as such, the System Program shall create 2 separate daily files, each with a file name which uniquely identifies it as to site, date, and whether it is a vehicle class/count summary file or and individual truck file.

Acceptance Test:

The Contractor shall demonstrate that the WIM system is available for use by the Department of Transportation by successfully completing the acceptance test for each lane of data collection.

The acceptance test shall consist of the following:

1. Continuous operation of the WIM on-site equipment for 72 consecutive hours. Failure of the system to record and store data meeting the requirements set forth in these special provisions for an accumulated time exceeding 3 hours during the 72 hour period hall be cause for the acceptance test to be repeated.
2. Testing of the WIM System Application Software during the above noted 72 hour period and the full working day following the 72 hour period. Failure of the software to perform any application meeting the requirements set forth in these special provisions shall be cause for the acceptance test to be repeated.

Method of Measurement:

The work for ITEM 9999915 - CONSTRUCT H.S.W.I.M. will be measured as a single complete lump sum item.

Basis of Payment:

Payment will be made at the contract lump sum price for ITEM - 9999915 - CONSTRUCT H.S.W.I.M., which price shall be full compensation for the furnishing all labor, equipment, materials, technical support and incidentals for the work, complete in place, as described and specified hereinbefore as (Electrical Support System for WIM System and High Speed Weigh-In-Motion System).

SECTION - 1001 MATERIAL SOURCES

No state designated Aggregate Source is set up for this project. Materials sources shall be as specified in Section 1001 of the Standard Specifications. The following pit (Serial Number 8656, Area 1) is a an available/approved source for borrow material:

Location and Description:

Located approximately 2540 feet left of Station 316+83 on Highway 66 near an existing commercial pit, approximately 6 to 8 miles from the project. The material consists of red and black cinders with clay and occasional scoria cobbles. Date of report: June 27, 1983.

Investigation:

The investigation of this source consisted of the review and sampling of ten test holes in January of 1983. No water was encountered or noted at the time of the investigation.

Information Available to Bidders:

The following information is available at the office of the Materials Section located at 206 South 17th Avenue, Phoenix Arizona 85007:

1. Drillers logs and laboratory test results from the field investigation conducted in January 1983.

2. Aerial photographs and geologic maps of the general pit area.

Haul Road and Haul Distance:

Light blade work will be required to reshape the existing haul road from the pit to Highway 66, a distance of approximately 3,100 feet. The average haul distance from the pit area to the project is estimated at 3 miles. Legal loads will be necessary on all paved roads.

Factors:

The usable material will have compacted unit weight of approximately 100 pounds per cubic foot and shrink factor of 15%.

Royalty Rates:

Royalty Rates for materials removed from this source will be assess at the following rate: 47.5¢ per cubic yard, or 35¢ per ton.

SECTION 1003 - REINFORCING STEEL:

(EPOX1003, 453/*, 09/01/87)

1003-5.02 Epoxy for Coating: of the Standard Specifications is modified to add:

The following powdered epoxy resins have passed prequalification tests and may be used if the material is applied and cured in the same manner as that used to coat the test bars in the original powder prequalification test:

Scotchkote 202, 213
3M Company
St. Paul, Minnesota 55101

Corvel ECA-1400-Green-3169
ECA-1440-3
ECA-1558-Red-27000
Polymer Corporation
Reading, Pennsylvania 19603

Micron 650-Blu Epoxy
Republic Steel Corp.
Cleveland, Ohio

LSU 431-Formula 907-2-5
Ciba-Geigy Corp.
Ardsley, New York

Flintflex 531-6020, 531-6068,
531-6080, 531-6085
Dupont Company
Wilmington, Delaware

Epoxy Powder 720-A-009
Cook Paint and Varnish
Kansas City, Missouri

Corflex CF4650 Green
Carboline/Ferro Company
St. Louis, Missouri

Oxyplast EL-704-P-9
Fuller O'Brien
South San Francisco, California

Epoxiplate R-346, R-347, R-348
R-349, R-352, R-361, R-371
Armstrong Products
Warsaw, Indiana 46580

Interpon HD-33
International Paint Company
Houston, Texas

Mobilox 1004-R-2
Mobil Chemical Company
Cleveland, Ohio

Nap-Guard 7-2000
Napco Corporation
Houston, Texas

DK 23-0548, DK 23-0602
DK 23-0679
Hysol Division
The Dexter Corporation
Olean, New York 14760

SECTION 1006 - PORTLAND CEMENT CONCRETE:

(CONC1006, 454/h, 02/28/89)

1006-4.01 General Requirements: of the Standard Specifications is revised to read:

The contractor may obtain concrete for each Class of concrete and for each strength of Class S concrete from an approved commercial source in lieu of establishing a batch plant at the project site.

For each class of concrete and each strength of Class S concrete, except for Class P concrete produced in a batch plant at the site and used exclusively for Class P work, the contractor shall furnish an invoice for each batch of concrete. The minimum information to be shown on each invoice shall be the date, time batched, truck identification number, name or identification of batch plant, name of contractor, name and location of project, the volume of concrete, the batch weights or mix design code number, the estimated percent of free moisture in the coarse and fine aggregates, the amount of any water withheld during batching, and the number of revolutions that the concrete has been mixed at mixing speed in a truck mixer. An authorized representative of the contractor shall be responsible for each invoice and shall sign each invoice accepting the contractor's responsibility for the concrete as the concrete is being placed. He shall immediately furnish the invoice to the Engineer.

1006-4.02 Proportioning:

1006-4.02(B) Water: the first paragraph of the Standard Specifications is revised to read:

Water shall be measured by volume or by weight. Measurement by volume will be by metering.

1006-4.02(C) Aggregates: the second paragraph of the Standard Specifications is revised to read:

Suitable dial scales shall be provided by the contractor to weigh each size of aggregate, The scales shall be positioned so as to be easily visible to the Engineer and accurate to +0.2 percent of scale capacity. The weighing equipment shall have a batching accuracy of + two percent of the required weight. The weighing equipment shall be arranged so as to permit the convenient removal of excess material from the weighing hopper and the equipment shall be arranged to enable the operator to have convenient access to all controls, The scales shall be so equipped and the dials so graduated that the weights of materials being weighed can be accurately determined. Every expedient shall be used to obtain and preserve uniform moisture content in the coarse and fine aggregates. The moisture content shall not vary more than three percent during any day's production. The estimated percent of free moisture in each of the coarse and fine aggregates shall be determined by the contractor using acceptable test methods.

1006-4.03 Mixing:

1006-4.03(C) Mixing in Truck Mixers: of the Standard Specifications is revised to read:

Truck-mixed concrete shall be mixed entirely in the truck mixer and shall be mixed at the batch plant or at the site.

Truck mixers shall be operated within a capacity not to exceed 63 percent of the gross volume of the drum and at speeds shown on the manufacturer's plate as mixing and agitating speeds.

Any water added after the initial batching shall be measured. Measurement will be by metering or sight-glass. If sight-glass is used, the sight-glass shall be calibrated and clean, and the truck shall be level.

Each batch of concrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum at mixing speed after all materials have been loaded into the drum, except that when approved by the Engineer, the maximum of 100 revolutions may be increased. Any revolving of the drum beyond the maximum number of revolutions shall be at the agitating speed. Mixing shall begin within ten minutes after the cement has been combined with either the aggregate or water.

The truck mixer shall be equipped with an electrically or mechanically activated revolution counter by which the number of drum revolutions may be verified. The counter shall be of the "continuous registering" type, which accurately registers the number of revolutions. It shall be mounted on the truck mixer or just inside the truck cab, so that it may be safely and conveniently read from beside the truck. The revolution counter shall be reset to zero after all materials have been loaded into the drum.

Discharge from the truck mixer shall be completed within 90 minutes from the time batched.

If additional mixing water is required to maintain the specified slump, the concrete shall be mixed by a minimum of 20 revolutions of the drum at mixing speed after the water has been added, prior to discharge of any concrete for placement. Any additional mixing water and required mixing revolutions shall be recorded on the invoice specified in Section 1006-4.01. This additional mixing may be in excess of the maximum revolutions previously specified.

1006-5 Weather Limitation:

1006-5.01 General Requirements: the third paragraph of the Standard Specifications is hereby deleted.

1006-7 Compressive Strength and Acceptance:

1006-7.05 Acceptance For Compressive Strength:

1006-7.05(B) Class S and Class B Concrete: the second paragraph of the Standard Specifications is revised to read:

If such evidence consists of concrete cores, the contractor shall obtain three cores from the concrete represented by the failing strength test and deliver them to the Engineer in time to allow complete testing of such cores within 42 days after the placement of the concrete. All cores shall be obtained and tested in accordance with the requirements of AASHTO T 24. All cores will be tested in the wet condition. The concrete represented by the cores will be considered acceptable if the numerical average of the three tests is 95 percent of the required 28 day compressive strength. If the average compressive strength does not meet this requirement, all concrete so represented shall be removed at the contractor's expense unless permitted to remain in place by the Engineer. If the concrete is permitted to remain in place, when the average compressive strength of the three cores fails to meet 95 percent of the required 28 day compressive strength, it will be paid for at 55 percent of the contract price.

(PCQC1006, 453/a, 05/31/89)

SECTION 1006 - PORTLAND CEMENT CONCRETE:

1006-4.01 General Requirements: is modified to add:

1006-4.01(A) Contractor Quality Control:

(1) General Requirements:

It shall be the responsibility of the contractor to administer a Quality Control Plan, hereinafter referred to as the "Plan", sufficient to assure a product meeting the requirements of these specifications. The Plan shall be administered whenever Class S or Class P concrete is being used for project construction, with the exception of pre-cast, pre-stressed units constructed at a central plant in Arizona. The Plan shall meet the requirements of Subsection 106.04(B) and the requirements specified below. The Plan may be operated wholly or in part by a subcontractor or an independent organization; however, the Plan's administration, including compliance with the Plan and its modification shall remain the responsibility of the contractor.

(2) Elements of The Plan:

The Plan shall address all elements which affect product qualities including, but not limited to the following:

(a) Mix Design(s)

(b) Aggregate Production

(c) Quality of Components

(d) Stockpile Management

(e) Proportioning, including added water

(f) Mixing and Transportation, including time from batching to completion of delivery

(g) Initial Mix Properties, including Temperature, Air Content, and Consistency

(h) Placement and Consolidation

(i) Compressive Strength

(j) Finishing and Curing

Requirements:

The Plan shall include the use of Operations Technicians, including the following:

(a) Process Control Technician (PCT). This person will be expected to utilize laboratory test results and other quality control practices to assure the quality of aggregates and other mix components and control and adjust mix proportioning to meet the mix design(s). The Plan shall detail the frequency of each type of test, when and how corrective actions are to be taken, and the means of documentation. The PCT shall be responsible for periodically inspecting all equipment utilized in proportioning and mixing to assure its proper operating condition and to assure that proportioning and mixing is in conformance with the mix design and other requirements. The Plan shall set forth how these duties and responsibilities will be accomplished and documented.

If more than one individual is required to accomplish these requirements, the Plan shall so note. Included also shall be the criteria utilized by the PCT to correct or reject unsatisfactory materials.

(b) Quality Control Technician (QCT). This person will be expected to perform and utilize quality control tests at the job site in assuring that delivered materials meet the requirements of the specifications and the mix design, including temperature, slump and air content. In addition, this person shall be responsible for periodically inspecting all equipment utilized in placing, consolidating, joint construction and finishing to assure its proper operating condition and to assure placing, consolidation, joint construction and finishing in conformance with the specifications. The Plan shall detail the frequency of each type of test, when and how corrective actions are to be taken, and the means of documentation. If more than one individual is required to accomplish these requirements, the Plan shall so note. Included also shall be the criteria utilized by the QCT to reject unsatisfactory materials.

(c) The Plan shall set forth the coordination of the activities of the PCT and the QCT.

(d) The Department reserves the right to check the records of the PCT and QCT at any time. The Department may take and test samples at any time to confirm the effectiveness of the activities of the PCT and QCT.

SECTION 1009 - ASPHALT RUBBER MATERIAL:

(RUBR1009, 453/b, 05/01/89)

1009-2 Materials: The paragraph headed, 1009-2, Materials, on page 724 of the Standard Specifications is hereby deleted.

Table D.14. Axle load equivalency factors for rigid pavements, tandem axles and p of 2.5.

Axle Load (kips)	Slab Thickness, D (inches) 6	7	8	9	10	11	12	13	14
2	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
4	.0006	.0006	.0005	.0005	.0005	.0005	.0005	.0005	.0005
6	.002	.002	.002	.002	.002	.002	.002	.002	.002
8	.007	.006	.006	.005	.005	.005	.005	.005	.005
10	.015	.014	.013	.013	.012	.012	.012	.012	.012
12	.031	.028	.026	.026	.025	.025	.025	.025	.025
14	.057	.052	.049	.048	.047	.047	.047	.047	.047
16	.097	.089	.084	.082	.081	.081	.080	.080	.080
18	.155	.143	.136	.133	.132	.131	.131	.131	.131
20	.234	.220	.211	.206	.204	.203	.203	.203	.203
22	.340	.325	.313	.308	.305	.304	.303	.303	.303
24	.475	.462	.450	.444	.441	.440	.439	.439	.439
26	.644	.637	.627	.622	.620	.619	.618	.618	.618
28	.855	.854	.852	.850	.850	.850	.849	.849	.849
30	1.11	1.12	1.13	1.14	1.14	1.14	1.14	1.14	1.14
32	1.43	1.44	1.47	1.49	1.50	1.51	1.51	1.51	1.51
34	1.82	1.82	1.87	1.92	1.95	1.96	1.97	1.97	1.97
36	2.29	2.27	2.35	2.43	2.48	2.51	2.52	2.52	2.53
38	2.85	2.80	2.91	3.03	3.12	3.16	3.18	3.20	3.20
40	3.52	3.42	3.55	3.74	3.87	3.94	3.98	4.00	4.01
42	4.32	4.16	4.30	4.55	4.74	4.86	4.91	4.95	4.96
44	5.26	5.01	5.16	5.48	5.75	5.92	6.01	6.06	6.09
46	6.36	6.01	6.14	6.53	6.90	7.14	7.28	7.36	7.40
48	7.64	7.16	7.27	7.73	8.21	8.55	8.75	8.86	8.92
50	9.11	8.50	8.55	9.07	9.68	10.14	10.42	10.58	10.66
52	10.8	10.0	10.0	10.6	11.3	11.9	12.3	12.5	12.7
54	12.8	11.8	11.7	12.3	13.2	13.9	14.5	14.8	14.9
56	15.0	13.8	13.6	14.2	15.2	16.2	16.8	17.3	17.5
58	17.5	16.0	15.7	16.3	17.5	18.6	19.5	20.1	20.4
60	20.3	18.5	18.1	18.7	20.0	21.4	22.5	23.2	23.6
62	23.5	21.4	20.8	21.4	22.8	24.4	25.7	26.7	27.3
64	27.0	24.6	23.8	24.4	25.8	27.7	29.3	30.5	31.3
66	31.0	28.1	27.1	27.6	29.2	31.3	33.2	34.7	35.7
68	35.4	32.1	30.9	31.3	32.9	35.2	37.5	39.3	40.5
70	40.3	36.5	35.0	35.3	37.0	39.5	42.1	44.3	45.9
72	45.7	41.4	39.6	39.8	41.5	44.2	47.2	49.8	51.7
74	51.7	46.7	44.6	44.7	46.4	49.3	52.7	55.7	58.0
76	58.3	52.6	50.2	50.1	51.8	54.9	58.6	62.1	64.8
78	65.5	59.1	56.3	56.1	57.7	60.9	65.0	69.0	72.3
80	73.4	66.2	62.9	62.5	64.2	67.5	71.9	76.4	80.2
82	82.0	73.9	70.2	69.6	71.2	74.7	79.4	84.4	88.8
84	91.4	82.4	78.1	77.3	78.9	82.4	87.4	93.0	98.1
86	102.	92.	87.	86.	87.	91.	96.	102.	108.
88	113.	102.	96.	95.	96.	100.	105.	112.	119.
90	125.	112.	106.	105.	106.	110.	115.	123.	130.

Table D.6. Axle load equivalency factors for flexible pavements, triple axles and p 2.5

Axle Load (kips)	Pavement Structural Number (SN) 1	2	3	4	5	6
2	.0000	.0000	.0000	.0000	.0000	.0000
4	.0002	.0002	.0002	.0001	.0001	.0001
6	.0006	.0007	.0005	.0004	.0003	.0003
8	.001	.002	.001	.001	.001	.001
10	.003	.004	.003	.002	.002	.002
12	.005	.007	.006	.004	.003	.003
14	.008	.012	.010	.008	.006	.006
16	.012	.019	.018	.013	.011	.010
18	.018	.029	.028	.021	.017	.016
20	.027	.042	.042	.032	.027	.024
22	.038	.058	.060	.048	.040	.036
24	.053	.078	.084	.068	.057	.051
26	.072	.103	.114	.095	.080	.072
28	.098	.133	.151	.128	.109	.099
30	.129	.169	.195	.170	.145	.133
32	.169	.213	.247	.220	.191	.175
34	.219	.266	.308	.281	.246	.228
36	.279	.329	.379	.352	.313	.292
38	.352	.403	.461	.436	.393	.368
40	.439	.491	.554	.533	.487	.459
42	.543	.594	.661	.644	.597	.567
44	.666	.714	.781	.769	.723	.692
46	.811	.854	.918	.911	.868	.838
48	.979	1.015	1.072	1.069	1.033	1.005
50	1.17	1.20	1.24	1.25	1.22	1.20
52	1.40	1.41	1.44	1.44	1.43	1.41
54	1.66	1.66	1.66	1.66	1.66	1.66
56	1.95	1.93	1.90	1.90	1.91	1.93
58	2.29	2.25	2.17	2.16	2.20	2.24
60	2.67	2.60	2.48	2.44	2.51	2.58
62	3.09	3.00	2.82	2.76	2.85	2.95
64	3.57	3.44	3.19	3.10	3.22	3.36
66	4.11	3.94	3.61	3.47	3.62	3.81
68	4.71	4.49	4.06	3.88	4.05	4.30
70	5.38	5.11	4.57	4.32	4.52	4.84
72	6.12	5.79	5.13	4.80	5.03	5.41
74	6.93	6.54	5.74	5.32	5.57	6.04
76	7.84	7.37	6.41	5.88	6.15	6.71
78	8.83	8.28	7.14	6.49	6.78	7.43
80	9.92	9.28	7.95	7.15	7.45	8.21
82	11.1	10.4	8.8	7.9	8.2	9.0
84	12.4	11.6	9.8	8.6	8.9	9.9
86	13.8	12.9	10.8	9.5	9.8	10.9
88	15.4	14.3	11.9	10.4	10.6	11.9
90	17.1	15.8	13.2	11.3	11.6	12.9

Table D.15. Axle load equivalency factors for rigid pavements, triple axles and p of 2.5

Axle Load (kips)	Slab Thickness D (inches) 6	7	8	9	10	11	12	13	14
2	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003
6	.001	.001	.001	.001	.001	.001	.001	.001	.001
8	.003	.002	.002	.002	.002	.002	.002	.002	.002
10	.006	.005	.005	.005	.005	.005	.005	.005	.005
12	.011	.010	.010	.009	.009	.009	.009	.009	.009
14	.020	.018	.017	.017	.016	.016	.016	.016	.016
16	.033	.030	.029	.028	.027	.027	.027	.027	.027
18	.053	.048	.045	.044	.044	.043	.043	.043	.043
20	.080	.073	.069	.067	.066	.066	.066	.066	.066
22	.116	.107	.101	.099	.098	.097	.097	.097	.097
24	.163	.151	.144	.141	.139	.139	.138	.138	.138
26	.222	.209	.200	.195	.194	.193	.192	.192	.192
28	.295	.281	.271	.265	.263	.262	.262	.262	.262
30	.384	.371	.359	.354	.351	.350	.349	.349	.349
32	.490	.480	.468	.463	.460	.459	.458	.458	.458
34	.616	.609	.601	.596	.594	.593	.592	.592	.592
36	.765	.762	.759	.757	.756	.755	.755	.755	.755
38	.939	.941	.946	.948	.950	.951	.951	.951	.951
40	1.14	1.15	1.16	1.17	1.18	1.18	1.18	1.18	1.18
42	1.38	1.38	1.41	1.44	1.45	1.46	1.46	1.46	1.46
44	1.65	1.65	1.70	1.74	1.77	1.78	1.78	1.78	1.79
46	1.97	1.96	2.03	2.09	2.13	2.15	2.16	2.16	2.16
48	2.34	2.31	2.40	2.49	2.55	2.58	2.59	2.60	2.60
50	2.76	2.71	2.81	2.94	3.02	3.07	3.09	3.10	3.11
52	3.24	3.15	3.27	3.44	3.56	3.62	3.66	3.68	3.68
54	3.79	3.66	3.79	4.00	4.16	4.26	4.30	4.33	4.34
56	4.41	4.23	4.37	4.63	4.84	4.97	5.03	5.07	5.09
58	5.12	4.87	5.00	5.32	5.59	5.76	5.85	5.90	5.93
60	5.91	5.59	5.71	6.08	6.42	6.64	6.77	6.84	6.87
62	6.80	6.39	6.50	6.91	7.33	7.62	7.79	7.88	7.93
64	7.79	7.29	7.37	7.82	8.33	8.70	8.92	9.04	9.11
66	8.90	8.28	8.33	8.83	9.42	9.88	10.17	10.33	10.42
68	10.1	9.4	9.4	9.9	10.6	11.2	11.5	11.7	11.9
70	11.5	10.6	10.6	11.1	11.9	12.6	13.0	13.3	13.5
72	13.0	12.0	11.8	12.4	13.3	14.1	14.7	15.0	15.2
74	14.6	13.5	13.2	13.8	14.8	15.8	16.5	16.9	17.1
76	16.5	15.1	14.8	15.4	16.5	17.6	18.4	18.9	19.2
78	18.5	16.9	16.5	17.1	18.2	19.5	20.5	21.1	21.5
80	20.6	18.8	18.3	18.9	20.2	21.6	22.7	23.5	24.0
82	23.0	21.0	20.3	20.9	22.2	23.8	25.2	26.1	26.7
84	25.6	23.3	22.5	23.1	24.5	26.2	27.8	28.9	29.6
86	28.4	25.8	24.9	25.4	26.9	28.8	30.5	31.9	32.8
88	31.5	28.6	27.5	27.9	29.4	31.5	33.5	35.1	36.1
90	34.8	31.5	30.3	30.7	32.2	34.4	36.7	38.5	39.8

DISTRIBUTION OF VEHICLE CLASSIFICATIONS BY HOUR OF DAY

SITE DESIGNATION: LANE NO's (display user's entry as to selected lane(s))

DATE:

HOURLY SUMMARY — VEHICLE COUNTS

HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	HOURLY TOTALS
00-01																
01-02																
02-03																
03-04																
04-05																
05-06																
GTR TOTALS																
06-07																
07-08																
08-09																
09-10																
10-11																
11-12																
GTR TOTALS																
12-13																
13-14																
14-15																
15-16																
16-17																
17-18																
GTR TOTALS																
18-19																
19-20																
20-21																
21-22																
22-23																
23-24																
GTR TOTALS																

DAILY SUMMARY — VEHICLE COUNTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL VEHICLES

rv as to selected lane(s)

D RANGE, MPH

-55	56-60	61-65	66-70	71-75	76-80	> 80

Percentage Vehicles > 55 MPH	
Percentage Vehicles > 60 MPH	
Percentage Vehicles > 65 MPH	
Percentage Vehicles > 70 MPH	

LASSIFICATIONS 4 THROUGH 14

v as to selected lane(s)

NUMBER OVERWEIGHT VEHICLES

7	8	9	10	11	12	13	14

NUMBER OVERWEIGHT VEHICLES

7	8	9	10	11	12	13	14

ASSIFICATIONS 4 THROUGH 14

y as to selected lane(s)>

NUMBER OF WEIGHT VIOLATIONS

AXLE	TANDEM	GROSS	BRIDGE
---	---	---	---
---	---	---	---
---	---	---	---
---	---	---	---
---	---	---	---

NUMBER OF WEIGHT VIOLATIONS

AXLE	TANDEM	GROSS	BRIDGE
---	---	---	---

Sheet 15 of 18

E CLASSIFICATIONS 4 THROUGH 14

to selected lane(s)>

NUMBER OF WEIGHT VIOLATIONS

PERCENT VEHICLES OVERWEIGHT	AXLE	TANDEM	GROSS	BRIDGE
---	---	---	---	---
---	---	---	---	---

---

ent / Total Vehicles Counted
With Invalid Measurements Total Vehicles Counted
Vehicles Weighed"

s on data for "Weighed Vehicles"

Sheet 14 of 18

DISTRIBUTION OF GROSS WEIGHTS FOR VEHICLE CLASSIFICATIONS 4 THROUGH 14

SITE DESIGNATION: LANE NO's (display user's entry as to selected lane(s))

DATE:

VEHICLE COUNTS

GROSS WT KIPS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	TOTALS
0- 5															
5- 10															
10- 15															
15- 20															
20- 25															
25- 30															
30- 35															
35- 40															
40- 45															
45- 50															
50- 55															
55- 60															
60- 65															
65- 70															
70- 75															
75- 80															
80- 85															
85- 90															
90- 95															
95-100															
100-105															
105-110															
110-115															
115-120															
> 120															
TOTALS															

DISTRIBUTION OF 18 KIP ESALS BY HOUR OF DAY FOR VEHICLE CLASSIFICATIONS 4 THROUGH 14

FOR _____ (display user's entries as to pavement type and str. no. or slab thickness)

SITE DESIGNATION: LANE NO's (display user's entry as to selected lane(s))

DATE:

HOURLY SUMMARY

HOUR	TOTAL VEH'S WEIGHED	TOTAL ESALS	ESALS BY HOUR BY CLASS 4	5	6	7	8	9	10	11	12	13	14
00-01													
01-02													
02-03													
03-04													
04-05													
05-06													
STR TOTALS													
06-07													
07-08													
08-09													
09-10													
10-11													
11-12													
STR TOTALS													
12-13													
13-14													
14-15													
15-16													
16-17													
17-18													
STR TOTALS													
18-19													
19-20													
20-21													
21-22													
22-23													
23-24													
STR TOTALS													

DAILY SUMMARY

	TOTALS	4	5	6	7	8	9	10	11	12	13	14
VEH'S WEIGHED :												
18 KIP ESALS :												
AVERAGE ESAL :												

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

(Exclusive of Appalachian Contracts)

		Page
I.	General	1
II.	Nondiscrimination	1
III.	Nonsegregated Facilities	2
IV.	Payment of Predetermined Minimum Wage	3
V.	Statements and Payrolls	5
VI.	Record of Materials, Supplies, and Labor	6
VII.	Subletting or Assigning the Contract	6
VIII.	Safety: Accident Prevention	6
IX.	False Statements Concerning Highway Projects	6
X.	Implementation of Clean Air Act and Federal Water Pollution Control Act	7
XI.	Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion-Lower Tier Covered Transactions	7

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;
Section IV, paragraphs 1, 2, 3, 4, and 7;
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. **Certification of Eligibility:** By entering into this contract, the contractor certifies as follows:

a. Neither the contractor nor any person or firm who has an interest in the contractor's firm is ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act, 29 CFR 5.12(a)(1), or 49 CFR 29.

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act, 29 CFR 5.12(a)(1), or 49 CFR 29.

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

II. NONDISCRIMINATION

(Applicable to Federal-aid construction contracts and related subcontracts and purchase orders exceeding $10,000.)

1. **Selection of Labor:** During the performance of this contract, the contractor shall not:

a. discriminate against labor from any other State, possession, or territory of the United States, or

b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

2. **Employment Practices:**

a. The Equal Employment Opportunity Affirmative Action Notice set forth in 41 CFR 60-4.2 and the Equal Employment Opportunity Construction Contract Specifications set forth in 41 CFR 60-4.3 are incorporated by reference in this contract.

b. Regulation 41 CFR 60-4.2 requires goals and timetables for minority and female participation expressed in percentage terms for the contractor's aggregate work force in each trade on all construction work in the covered area. The goals for this contract are stated elsewhere in the bidding documents and in the construction contract.

c. Regulation 41 CFR 60-4.3 provides specific affirmative action standards the contractor shall implement to ensure equal employment opportunity in achieving the minority and female participation goals set forth in paragraph 2b of this Section.

3. **Equal Opportunity Clause:** During the performance of this contract, the contractor agrees as follows:

a. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; and, selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the State highway agency (SHA) setting forth the provisions of this nondiscrimination clause.

b. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

c. The contractor will send to each labor union or representative of workers with which the contractor has a collective bargaining agreement or other contract or understanding a notice to be provided by the SHA advising the said labor union or workers' representative of the contractor's commitments under this Section II, paragraph 3.

d. The contractor will comply with all provisions of Executive Order 11246, Equal Employment Opportunity, dated September 24, 1965, and of the rules, regulations (41 CFR Part 60), and relevant orders of the Secretary of Labor.

e. The contractor will furnish all information and reports required by Executive Order 11246 and by rules, regulations, and orders of the Secretary of Labor, pursuant thereto, and will permit access to its books, records, and accounts by the Federal Highway Administration (FHWA) and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

f. In the event of the contractor's noncompliance with the nondiscrimination clauses of this Section II, paragraph 3, or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part. The contractor may be declared ineligible for further Government contracts or federally-assisted construction contracts in accordance with procedures authorized in Executive Order 11246 and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

g. The contractor will include the provisions of this Section II, paragraph 3, in every subcontract or purchase order so that such provisions will be binding upon each subcontractor or vendor, unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246. The contractor will take such action with respect to any subcontract or purchase order as the SHA or the FHWA may direct as a means of enforcing such provisions, including sanctions for noncompliance. In the event a contractor becomes a party to litigation by a subcontractor or vendor as a result of such direction, the contractor may request the SHA to enter into such litigation to protect the interest of the State. In addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

4. Selection of Subcontractors, Procurement of Materials, and Leasing of Equipment:

a. The contractor shall not discriminate on the grounds of race, color, sex, or national origin in the selection and retention of subcontractors, including procurement of materials and leases of equipment. In all solicitations made by the contractor each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract relative to nondiscrimination on the grounds of race, color, sex, or national origin.

b. In the event of the contractor's noncompliance with the nondiscrimination provisions of this Section II, paragraph 4, this contract may be subject to sanctions including but not limited to the withholding of payments to the contractor under the contract until the contractor complies and/or cancellation, termination, or suspension of the contract in whole or in part.

c. The contractor shall include the provisions of this paragraph 4 in every subcontract, including procurement of materials and leases of equipment. The contractor shall take such action with respect to any subcontractor or procurement as the SHA or the FHWA may direct as a means of enforcing such provisions, including sanctions for noncompliance. In the event a contractor becomes involved in, or is threatened with, litigation by a subcontractor or supplier as a result of such direction, the contractor may request the SHA to enter into such litigation to protect the interests of the State. In addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

5. General Participation Requirements:

a. Policy: It is the policy of the DOT that disadvantaged business enterprises (DBE's), as defined in 49 CFR Part 23, shall have equal opportunity to participate in the performance of contracts financed in whole or in part with Federal funds. Consequently, the requirements of 49 CFR Part 23 apply to this contract.

b. Obligation: The contractor agrees to take all necessary steps to ensure that eligible businesses, as defined in 49 CFR Part 23, have equal opportunity to compete for and perform subcontracts financed in whole or in part with Federal funds provided under this contract.

c. The contractor's failure to carry out the requirements of paragraphs 5a and 5b of this Section II shall constitute a breach of contract and may result in termination of the contract or other appropriate action.

d. The contractor shall provide all information and reports required by 49 CFR Part 23 or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information and its facilities as may be determined by the SHA or the FHWA to be pertinent to ascertain compliance with the regulations or directives.

III. NONSEGREGATED FACILITIES

(Applicable to Federal-aid construction contracts and related subcontracts exceeding $10,000.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise.

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements exceeding $10,000 and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to Federal-aid construction contracts exceeding $2,000 and related subcontracts.)

1. General:

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits therefor only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry; and

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the U.S. Department of Labor, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of the U.S. Department of Labor):

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, widthdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal Employment Opportunity:

The utilization of apprentices, trainees, and journeymen-level employees shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, 23 CFR 230A, and 29 CFR Part 30.

5. Apprentices and Trainees (Programs of the U.S. Department of Transportation):

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting equal employment opportunity in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. Withholding:

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices and trainees described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7

above, the contractor and any subcontractor responsible therefor shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. **Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to Federal-aid construction contracts exceeding $2,000 and related subcontracts.)

1. **Compliance with Copeland Regulations (29 CFR Part 3):** The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. **Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish each week in which any contract work is performed to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices and trainees described in Section IV, paragraphs 4 and 5 and watchmen and guards engaged on work during the preceding weekly payroll period). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3;

(3) that each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid primary, urban, and Interstate System contracts, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than $1,000,000 (23 CFR Part 635) the contractor shall:

a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items so performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR Part 635).

a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirement set forth in paragraph 1 of this Section VII is computed includes the cost of materials and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract entered into pursuant to this contract, that the contractor and any subcontractor shall not require any laborer or mechanic employed in performance of the contract to work in surroundings or under conditions which are unsanitary, hazardous, or dangerous to his/her health or safety, as determined under construction safety and health standards [Title 29, Code of Federal Regulations, Part 1926 (formerly Part 1518) as may be revised] promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (83 Stat. 96).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

* * * * *

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

Title 18, United States Code, Section 1020, reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the costs thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or.

"Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

"Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-Aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

"Shall be fined not more than $10,000 or imprisoned not more than 5 years, or both."

* * * * *

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable Federal-aid construction contracts and related subcontracts exceeding $100,000.)

By submission of this bid, or the execution of this contract or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, et seq., as amended by Pub. L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR Part 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraphs 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

* * * * *

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION—LOWER TIER COVERED TRANSACTIONS

(Applicable to all subcontractors, material suppliers, vendors and other lower tier participants.)

1. Instructions for Certification:

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to

exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Covered Transactions:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS EXECUTIVE ORDER 11246, July 1, 1978 (Revised November 3,1980

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

d. "Minority" includes:

(i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area.

Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activites to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilites shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION
TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY
(EXECUTIVE ORDER 11246)

JULY 1, 1978 (Revised November 3, 1980)

(Revised April 15, 1981)

1. The bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

	Minority	Female
Tucson and balance of Pima County	24.1	6.9
Cochise, Graham, Greenlee and Santa Cruz Counties	27.0	6.9
Phoenix and balance of Maricopa County	15.8	6.9
Apache, Coconino, Gila, Mohave, Navajo, Pinal, Yavapai and Yuma Counties	19.6	6.9

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in all areas where he has Federal or federally assisted work.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3 (a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

EQUAL EMPLOYMENT OPPORTUNITY

COMPLIANCE REPORTS

(Project, Total Work Force, Training and Annual)

Federal-Aid Projects

February 1, 1977; Revised July 1, 1978; Revised November 3, 1980; Revised April 15, 1981; Revised September 7, 1983

MONTHLY REPORTS:

Monthly Highway Project Report (ADOT 10-9405, Revised 1-77):

On each contract in the amount of $10,000 or more and on each subcontract in the amount of $10,000 or more, the contractor shall submit and each subcontractor shall submit the report on 10-9405.

The information required covers the second pay period in one month to the second pay period of the next month.

If the percentages shown in item 4 are less than the required minimum percentages for each of the four covered areas an explanation shall be given on the report.

Negative reports shall be furnished when the contractor or subcontractor has started but has not completed contract work and has not worked on the project during the reporting period.

These reports shall be sent to the project office and shall be received at the project office no later than the first day of the month following the reporting period.

Total Work Force Form OFCCP 257:

On each contract in the amount of $10,000 or more and on each subcontract in the amount of $10,000 or more, the contractor shall submit and each subcontractor shall submit the report on Form OFCCP 257.

The information required covers the second pay period in the month to the second pay period of the next month.

The information shall reflect the contractor's and each subcontractor's data for all work, both highway and nonhighway and Federal-aid as well as non Federal-aid for each of the four covered areas in which they have Federal-aid work.

These total work force reports shall be sent as follows:

AFFIRMATIVE ACTION OFFICE
Arizona Department of Transportation, Room 154-A
206 South 17th Avenue
Phoenix, Arizona 85007 (602) 255-7761

The reports shall be received at this office no later than the first day of the month following the reporting period.

ANNUAL REPORTS:

On each contract in the amount of $10,000 or more and on each subcontract, not including material suppliers, in the amount of $10,000 or more, the contractor and each subcontractor shall submit the report on Form PR-1391.

The information required covers the second pay period in the month of July.

These reports shall be sent to the project office and shall be received at the project office no later than August 1.

Additional Required Contract Provisions, Federal-Aid Contracts (Training Special Provisions), August 15, 1975

The contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

In the event that a contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Highways Division for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The contractor shall satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the contractor's records shall document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Highways Division and the Federal Highway Administration. The Highways Division and the Federal Highway Administration will approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training will also be considered acceptable provided they are being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the Highways Division prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the engineer, reimbursement will be made for training persons in excess of the number specified herein. This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project: contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment will be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees be on board for the entire length of the contract. A contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program will apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The contractor shall furnish the trainee a copy of the program he will follow in providing the training. The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The contractor shall provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

FEDERAL-AID PROPOSAL NOTICES

NOTICES TO PROSPECTIVE FEDERAL-AID CONSTRUCTION CONTRACTORS

1. CERTIFICATION OF NONSEGREGATED FACILITIES

a. *A certification of Nonsegregated Facilities, as required by the May 9, 1967, Order of the Secretary of Labor (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities (is included in the proposal and must be submitted prior to the award of a Federal-aid highway construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause).*

b. *Bidders are cautioned as follows: By signing this bid, the bidder will be deemed to have signed and agreed to the provisions of the "Certification of Nonsegregated Facilities" in this proposal. This certification provides that the bidder does not maintain or provide for his employees facilities which are segregated on a basis of race, creed, color, or national origin, whether such facilities are segregated by directive or on a de facto basis. The certification also provides that the bidder will not maintain such segregated facilities.*

c. *Bidders receiving Federal-aid highway construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, will be required to provide for the forwarding of the following notice to prospective subcontractors for construction contracts and material suppliers where the subcontracts or material supply agreements exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.*

2. NOTICE TO PROSPECTIVE SUBCONTRACTORS AND MATERIAL SUPPLIERS OF REQUIREMENT FOR CERTIFICATION OF NONSEGREGATED FACILITIES

a. *A Certification of Nonsegregated Facilities as required by the May 9, 1967, Order of the Secretary of Labor (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, which is included in the proposal, or attached hereto, must be submitted by each subcontractor and material supplier prior to the award of the subcontract or consummation of a material supply agreement if such subcontract or agreement exceeds $10,000 and is not exempt from the provisions of the Equal Opportunity clause.*

b. *Subcontractors and material suppliers are cautioned as follows: By signing the subcontract or entering into a material supply agreement, the subcontractor or material supplier will be deemed to have signed and agreed to the provisions of the "Certification of Nonsegregated Facilities" in the subcontract or material supply agreement. This certification provides that the subcontractor or material supplier does not maintain or provide for his employees facilities which are segregated on the basis of race, creed, color, or national origin, whether such facilities are segregated by directive or on a de facto basis. The certification also provides that the subcontractor or material supplier will not maintain such segregated facilities.*

c. *Subcontractors or material suppliers receiving subcontract awards or material supply agreements exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for construction contracts and materials supplies where the subcontracts or material supply agreements exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.*

3. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

By signing this bid, the bidder will be deemed to have stipulated as follows:

a. *That any facility to be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub. L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR, Part 15), is not listed on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.*

b. *That the State highway department shall be promptly notified prior to contract award of the receipt by the bidder of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility to be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.*

GENERAL WAGE DECISION NO. AZ90-2

Supersedes General Wage Decision No. AZ89-2

State: ARIZONA

County(ies): Statewide

Construction Type: Heavy & Highway

Construction Description: Heavy & Highway Construction Projects

Modification Record:

No.	Publication Date	Page No.(s)

AZ90-2

	Basic Hourly Rates	Fringe Benefits
BRICKLAYERS; Stonemasons:		
Northern Area:		
Zone A	14.95	2.39
Zone B	16.95	2.39
Zone C	17.95	2.39
Zone D	18.45	2.39
Zone E	20.45	2.39
Southern Area:		
Zone A:		
Bricklayers; Stonemasons	13.13	2.62
Manhole Builders	13.43	2.62
Zone B:		
Bricklayers; Stonemasons	13.50	2.62
Manhole Builders	13.80	2.62
Zone C:		
Bricklayers; Stonemasons	13.88	2.62
Manhole Builders	14.18	2.62
Zone D:		
Bricklayers; Stonemasons	14.63	2.62
Manhole Builders	14.93	2.62
CARPENTERS:		
Carpenters	14.28	3.00
Piledrivermen	14.79	3.00
MILLWRIGHTS:		
Northern Area	19.29	3.00
Central amd Southern Area	16.29	3.00
CEMENT MASONS:		
Zone 1:		
Northern Area:		
Cement Masons	18.505	3.05
Concrete Troweling Machine; Sawing and Scoring Machine; Curb and Gutter Machine	18.74	3.05
Central & Southern Areas:		
Cement Masons	16.005	3.05
Concrete Troweling Machine; Sawing and Scoring Machine; Curb and Gutter Machine	16.24	3.05
Zone 2:		
Cement Masons	16.445	2.62
Concrete Troweling Machine; Sawing and Scoring Machine; Curb and Gutter Machine; Clary and similar type of power Screed Operator	16.68	2.62
ELECTRICIANS:		
Area 1:		
Electricians	16.81	1.30+ 3.75%
Cable Splicers	18.16	1.30+ 3.75%
Area 2:		
Electricians' Technicians; Cable Splicers:		
Zone A	17.10	2.33+ 3.5%
Zone B	20.22	2.33+ 3.5%

Area 3:	18.74	12%+ 1.40
Area 4:		
Electricians on projects having an electrical contract value of less than $20 million	16.00	2.14+ 3%
Electricians on projects having an electrical contract value of $20 million or more	17.95	2.14+ 3%
Area 5:		
Electricians	17.00	1.00+ 11.5%
Cable Splicers	17.25	1.00+ 11.5%
IRONWORKERS:		
Northern Area	19.00	5.40
Southern Area	16.00	5.40
Central Area	16.00	5.40
LABORERS:		
Area 1:		
Group 1	13.08	2.77
Group 2	15.61	2.77
Group 3	16.19	2.77
Group 4	16.46	2.77
Group 5	18.01	2.77
Barricade Setter:		
Placement, removal, transport, and maintenance of the traffic control devices	5.90	1.27
Area 2:		
Group 1	10.58	2.77
Group 2	13.11	2.77
Group 3	13.69	2.77
Group 4	13.96	2.77
Group 5	15.51	2.77
Barricade Setter:		
Placement, removal, transport, and maintenance of the traffic control devices	5.90	1.27
(Tunnel and Shaft Work):		
Area 1:		
Group 1	15.985	2.77
Group 2	16.24	2.77
Group 3	16.44	2.77
Group 4	16.98	2.77
Group 5	17.295	2.77
Group 5A	17.655	2.77
Area: 2		
Group 1	13.485	2.77
Group 2	13.74	2.77
Group 3	13.94	2.77
Group 4	14.48	2.77
Group 5	14.795	2.77
Group 5A	15.155	2.77
LINE CONSTRUCTION:		
Zone 1:		
Groundmen	13.41	4.75+ 3.5%
Equipment Operator; Powdermen & Mechanics	15.83	4.75+ 3.5%
Linemen, Crane Operator, Sagger, and		

Pilot	18.15	4.75+ 3.5%
Cable splicers	18.66	4.75+ 3.5%
Zone 1-A:		
Groundmen	14.41	4.75+ 3.5%
Equipment Operator; Powdermen & Mechanics	16.74	4.75+ 3.5%
Linemen, Crane Operator, Sagger, and Pilot	18.15	4.75+ 3-1/2%
Cable splicers	19.73	4.75+ 3-1/2%
Zone 2:		
Groundmen	15.40	4.75+ 3-1/2%
Equipment Operator; Powdermen & Mechanics	17.74	4.75+ 3-1/2%
Linemen, Crane Operator, Sagger, and Pilot	20.12	4.75+ 3-1/2%
Cable splicers	20.67	4.74+ 3-1/2%
PAINTERS:		
Area 1:		
Zone A:		
Brush	11.60	1.90
Brush, Steel & Bridge	12.10	1.90
Spray	12.05	1.90
Spray, Steel & Bridge	12.60	1.90
Zone B: ($0.75 per hour above Zone A BHR)		
Zone C: ($1.75 per hour above Zone A BHR)		
Zone D: ($2.00 per hour above Zone A BHR)		
Area 2:		
Zone A:		
Brush and Roller; Sandblaster (Nozzleman); Sheetrock Taper; Floor Coverer; Sandblaster (pot tender)	13.54	1.30
Spray; Paperhanger	13.79	1.30
Creosote Applier	13.87	1.30
Swing Stage:		
Brush; Sandblaster	13.94	1.30
Spray	14.19	1.30
Steeplejack	14.40	1.30
Steel and Bridge, Brush; Nozzleman and Pot Tender; Steel (steam cleaner); Electric and Air Tool Operator; Steel Sandblaster	14.67	1.30
Steel Sandblaster	14.67	1.30
Zone B: ($1.00 per hour above Zone A (BHR)		
Zone C: ($2.50 per hour above Zone A BHR)		
Area 3:		
Zone A:		
Brush	12.47	1.77
Spray; Sandblaster	13.07	1.77
Paperhanger	12.60	1.77
Swing Stage, under 40 feet:		
Brush	12.77	1.77
Spray	13.37	1.77

Swing Stage, over 40 feet:		
Brush	13.47	1.77
Spray	14.07	1.77
Structural Steel & Tanks:		
Brush	13.47	1.77
Spray & Sandblasters	14.07	1.77
Creosote Base and Bituminous material	12.87	1.77
Zone B: ($0.75 per hour above Zone A BHR)		
Zone C: ($1.50 per hour above Zone A BHR)		
Zone D: ($2.75 per hour above Zone A BHR)		
PLUMBERS AND PIPEFITTERS:		
Zone 1	16.50	4.43
Zone 2	19.50	4.43
Zone 3:		
Commercial	16.00	3.78
Industrial	19.34	3.78
POWER EQUIPMENT OPERATORS:		
Group 1	11.99	3.28
Group 2	14.66	3.28
Group 3	15.57	3.28
Group 4	16.42	3.28
TRUCK DRIVERS:		
Group 1	7.40	2.87
Group 2	10.50	2.87
Group 3	14.82	2.87
Premium Pay: Combination Man - $.30 per hr. over highest rated work. Multiple-Unit Equipment		

WELDERS -- Receive the rate prescribed for craft performing operation to which welding is incidental.

AREA DESCRIPTIONS

BRICKLAYERS; STONEMASONS:
Northern Area: Apache, Coconino and Gila Counties; Graham County (west and north of the San Francisco River to the Gila River); Greenlee County (west and north of the San Francisco River to the Gila River); Maricopa, Mohave, and Navajo Counties; Pinal County (north of a boundary line drawn west along the Gila River to the western City limits of Florence, a straight line from the extreme southwestern City limits of Florence to the extreme southern City limits of Coolidge, then a straight line to the extreme southern City limits of Casa Grande, with the line extending to the Maricopa/Pinal County Line); Yavapai, Yuma and La Paz Counties:

Zone A: 0-50 road miles from the City Hall in Phoenix
Zone B: 50-75 road miles from the City Hall in Phoenix
Zone C: 75-100 road miles from the City Hall in Phoenix
Zone D: 100-200 road miles from the City Hall in Phoenix
Zone E: 200 road miles and over from the City Hall in Phoenix

Southern Area: Cochise County; Graham County (east and south of the San Francisco River to the Gila River); Greenlee County (east and south of the San Francisco River to the Gila River); Pima County; Pinal County (south of a boundary line drawn west along the Gila River to the western City limits of Florence, a straight line from the extreme southwestern City limits of Florence to the extreme southern City limits of Coolidge, then a straight line to the extreme southern City limits of Casa Grande, with the line extending to the Maricopa/Pinal County Line); Santa Cruz Counties:

Zone A: 0-15 road miles from Tucson City limits
Zone B: 15-30 road miles from Tucson City limits
Zone C: 30-40 road miles from Tucson City limits
Zone D: Over 40 road miles from Tucson City limits

CARPENTERS:

Northern Area: Area north of a straight line drawn between a point 35 miles due north of the City Hall in Flagstaff and a point 35 miles due north of the City Hall in Kingman, extending to the Arizona/Nevada State Line on the west; and connecting to a point 35 miles due north of the City Hall in Holbrook, thence due east to the intersection of the Arizona/New Mexico State Line

Central and Southern Areas: All areas not included in the Northern Area

CEMENT MASONS:

Zone 1: Apache, Coconino, and Gila Counties; Graham County (north of Sentinel-Casa Grande-Safford Line); Greenlee County (north of Sentinel-Casa Grande-Safford Line); Maricopa County (north of Sentinel-Casa Grande-Safford Line); Mohave, and Navajo Counties; Pinal County (north of Sentinel-Casa Grande-Safford Line); Yavapai, Yuma and La Paz Counties:

NORTHERN AREA: Area North of a straight line drawn between a point 35 miles due north of the City Hall in Flagstaff and a point 35 miles due north of the City Hall in Kingman, extending to the Arizona/Nevada State Line on the west and connecting to a point 35 miles due north of the City Hall in Holbrook, thence due east to the intersection of the Arizona/New Mexico State Line.

CENTRAL and SOUTHERN AREAS: All Areas not included in the NORTHERN AREA

Zone 2: Southern parts of Cochise, Graham, Greenlee, Maricopa, and Pinal Counties; Pima and Santa Cruz Counties

ELECTRICIANS:

Area 1: Apache County (north of Highway #66)

Area 2: Coconino County; Navajo County (north and west of a boundary line beginning at a point where Clear Creek crosses the Coconino/Navajo County Line and then extending in a northeasterly direction along Clear Creek and northeasterly to Cottonwood Wash, along Cottonwood Wash extending northeasterly to where it intersects the Navajo Indian Reservation, then easterly along the Navajo Indian Reservation boundary line to a point where it intersects the Navajo/Apache County Line):

Zone A: 5 miles north-south, east and west of the Post Offices of Williams, Sedona, and Winslow
Zone B: Remainder of Area 2 not covered by Zone A

Area 3: Apache County (south of Highway #66); Gila County; Navajo County (south and east of a boundary beginning at a point where Clear Creek crosses the Coconino/Navajo County Line, then extending in a northeasterly direction along Clear Creek and northeasterly to Cottonwood Wash, along Cottonwood Wash extending northeasterly to where it intersects the Navajo Indian Reservation, then easterly along the Navajo Indian Reservation boundary line to a point where it intersects the Navajo/Apache County Line); Pinal County (north of the line, "First Standard Parallel South" and east of the line "Second Guide Meridian East")

Area 4: Maricopa and Mohave Counties; Pinal County (north and west of the boundary line beginning at a point where the Papago Indian Reservation Road #15 crosses the Pima/Pinal County Line, then extending in a northeasterly direction on the Papago Indian Reservation Road #15 to the intersection with the Florence Canal, north and east on the Florence Canal to the intersection with the line, "Second Guide Meridian East", then north to the Pinal/Maricopa County Line); Yavapai County

Area 5: Cochise, Graham, Greenlee, and Pima Counties; Pinal County (south and east of the boundary line beginning at a point where the Papago Indian Reservation Road #15 crosses the Pima/Pinal County Line, then extending in a northeasterly direction on the Florence Canal, north and east on the Florence Canal to the intersection with the line, "Second Guide Meridian East", then north to the line, "First Standard Parallel South", and along that line to the Graham/Pinal County Line); Santa Cruz, Yuma, and La Paz Counties

IRONWORKERS:

Northern Area: The boundaries of the area shall be the Navajo & Hopi Indian reservations, the City of Page & the Glen Cayon Dam

Southern Area: Cochise, Graham, Pima, Santa Cruz, Yuma & Greenlee Cos. & those portions of Pinal & Gila Cos. located south of the 33rd parallel

Central Area: All parts of Arizona not in the Northern or Southern Areas

LINE CONSTRUCTION:

Zone 1: Phoenix and Tucson 30 miles radius from the center of Town; Area within 10 mile radius from the City Hall in Yuma

Zone 1-A: Flagstaff, Globe, and Kingman; and 10 mile radius from the center of Town

Zone 2: Other areas not covered by Zone 1 and Zone 1-A

PAINTERS:

Area 1: Apache, Coconino, Navajo, and Yavapai Counties (north of Woodruff/Camp Wood Line); Mohave County (north of a line following the Geodetic Hualapai Boundary Line to the Colorado River, a distance of 23 miles east of Pierce Ferry and then intersecting the Arizona/Nevada State Line):

- Zone A: 0-20 road miles from Courthouse in Flagstaff
- Zone B: 20-35 road miles from Courthouse in Flagstaff
- Zone C: 35-80 road miles from Courthouse in Flagstaff
- Zone D: 80 road miles and over from Courthouse in Flagstaff

Area 2: Apache, Coconino, Navajo, and Yavapai Counties (south of the Woodruff/Camp Wood Line); Gila, Graham, Greenlee, Maricopa, and Pinal Counties (north of 33rd Parallel); Mohave County (south of a

line following the Geodetic Hualapai Boundary Line to the Colorado River, a distance of 23 miles east of Pierce Ferry and then intersecting the Arizona/Nevada State Line):

Zone A: 0-40 paved road miles from Courthouse in Phoenix; also, Luke and Williams Air Force Bases
Zone B: 41-60 paved road miles from Courthouse in Phoenix
Zone C: 61 paved road miles and over from Courthouse in Phoenix

Area 3: Cochise County; Graham, Greenlee, Maricopa and Pinal Counties (south of 33rd Parallel); Pima, Santa Cruz, Yuma, and La Paz Counties:

Zone A: 0-30 paved road miles from Stone and Congress in Tucson or from the County Courthouse in Yuma
Zone B: 31-40 paved road miles from Stone and Congress in Tucson or from the County Courthouse in Yuma
Zone C: 41-50 paved road miles from Stone and Congress in Tucson or from the County Courthouse in Yuma
Zone D: 51 paved road miles and over from Stone and Congress in Tucson or from the County Courthouse in Yuma

PLUMBERS & PIPEFITTERS

ZONE 1

Base points shall be: Phoenix--the intersection of Central Avenue and Jefferson Street; Flagstaff, Yuma, Kingman, Prescott, Havasu City and Winslow -- the main Post Office building in each city. The "Free Zone" (Zone No. 1) from Phoenix shall be 40 miles from the stated base point. The Free Zone from Flagstaff, Yuma, Kingman, Prescott, Havasu City and Winslow shall be 20 road miles from the stated base point. In addition, all areas within the city limits of Phoenix, Chandler, Scottsdale, Tempe, Glendale, Mesa and Gilbert, as well as that area bordered or encompassed by Apache Trail on the north, Higley Road on the east, Elliott Road on the south and Arizona Avenue on the west, and Sun City West will be included as Free Zones. Any work contracted for outside of these Free Zones will be determined from the Phoenix base point.

ZONE 2

Pay Zone shall refer to all jobs outside of the Free Zones listed above.

ZONE 3

Seven Southern Counties of Arizona: Pima, Gila, Pinal, Graham, Greenlee, Santa Cruz, and Cochise

LABORERS:

Area 1: Area north of a straight line drawn between a point 35 miles due north of the City Hall in Flagstaff and a point 35 miles due north of the City Hall in Kingman, extending to the Arizona/Nevada State Line on the west; and connecting to a point 35 miles due north of the City Hall in Holbrook, thence due east to the intersection of Arizona/New Mexico State Line

Area 2: All Areas not included in Area 1

GROUP DESCRIPTIONS

LABORERS

Group 1: Laborer, General or Construction; Tool Dispatcher or Checker; Manually Controlled Signal Operator; Fence Builder; Guard Rail Builder - highway; Chat Box Man; Dumpman and/or Spotter; Rip Rap Stone Man; Rock Slinger; Head Rock Slinger ($.25); Form Stripper; Packing Rod Steel and Form Stripper; Packing Rod Steel and Pans; Cesspool Diggers and Installers; Astro Turf Layer; Clean Up - Bull Gang Trackman; Railroad Chipper (clearing and grubbing); Kettleman - Tarman; Spikers; Wrenchers - Creosote Tieman; Floor Sanders - Concrete; Sandblaster (Pot Tender); Powderman Tender; Fine Grader; All Tenders not herein separately classified; Window Cleaner Flaggers

Group 2: Concrete Laborer (belt, pipe and/or Hoseman); Cement Mason Tender; Cutting Torch Operator; Power-type Concrete Buggy; Bander

Group 3: Chuck Tender (except tunnel); Guinnea/Chaser; Operator and Tender of Pneumatic and Electric Tools; Concrete Vibrating Machines, Chain Saw Machines (on clearing and grubbing); Hydraulic Jacks and similar mechanical tools not separately herein classified; Pipe Caulker and/or Backup Man - Pipeline; Rigger and Signal Man - Pipeline; Pipe Wrapper; Cribber; Shorer (except tunnel); Pneumatic Gopher; Pre-cast, Manhole Erector

Group 4: Asphalt Raker and Ironer; Air and Water Washout Nozzleman (low and high pressure); Scaler (using Bos n's Chair or Safety Belt); Tamper (mechanical - all types); Sandblaster (Nozzleman); Concrete Saw (hand-guided); Concrete Cutting Torch; Gunite (Gunman, Mixerman, Rodman); bio-filter; Pressman; Installer; Operator; Hand-guided Trencher and similarly operated equipment; Driller (Jackhammer and/or Pavement Breaker); Grade Setter (pipeline); Pipe Layer (including but not limited to non-metallic transite and plastic pipe, water pipe, sewer pipe, drain pipe, underground tile and conduit)

Group 5: Drill Doctor and/or Air Tool Repairman; Scaler (Driller); Form Setter and/or Builder; Welder and/or Pipe Layer installing process piping; Driller - Core Diamond, Wagon, Air Track, Joy, Mustang, PR-143, 220 Gardner, Denver, Hydrasonic; Powder Man; Water Blaster Operator

(TUNNEL and SHAFT WORK)

Group 1: Bull Gang, Muckers, Trackman; Dumpmen; Concrete Crew (includes Rodders and Spreaders); Grout Crew; Swamper (Brakeman and Switchmen on tunnel work)

Group 2: Nipper; Chucktender, Cabletender; Vibratorman, Jackhammer, Pneumatic Tools (except Driller)

Group 3: Grout Gunman

Group 4: Timberman, Retimberman - wood or steel blaster, Driller, Powderman; Cherry Pickerman; Powderman - Primer House; Steel Form

Raiser and Setter; Kemper and other Pneumatic Concrete Placer Operator; Miner - Finisher; Miners - Tunnel (hand or machine)

Group 5: Diamond Drill

Group 5A: Shaft and Raise Miner Welder

POWER EQUIPMENT OPERATORS

Group 1: A Frame Boom Truck, Winch Truck, Air Compressor Operator, Beltorete Operator, Boring Bridge and Texture, Concrete Mixer Operator (skip type), Conductor, Brakeman, Handler, Conveyor Operator, Cross Timing and Pipe Float, Curing Machine Operator, Dinky Operator (under 20 tons), Elevator Hoist Operator (husky and similar), Firemen (all), Foorklift and Ross carrier Operator, Generator operator (all), Highline Cableway Signalman, Hydrographic Mulcher, Hydrographic seeder, Joint Inserter, Jumbo Finishing Machine, Kolman Belt Loader Operator, Machine Conveyor Operator, Multiple Power Concrete Saw Operator, Oiler, Pavement Breaker, Power Grizzly Operator, Power Sweeper, Pressure Grout Machine Operator (as used in heavy engineering construction), Pump Operator, Roller Operator (except as otherwise classified), Self-Propelled Chip Spreading Machine, Skiploader (3-1/2 c.y. and less), Slurry Seal Machine Operator (moto paver driver), Small Self-Propelled Compactor (with blade) - backfill, ditch operation, Straw Blower, Tractor Operator (D-5 and under), Tripper Operator, Tugger Operator, Welding Machine Operator, Wheel-Type Tractor Operator (Ford, Ferguson type with attachments, BeeGee etc.)

Group 2: Aggregate Plant Operator (including crushing, screening and sand plants, etc.), Asphalt Plant Mixer Operator, Asphalt Laydown Machine Operator, Backhoe Operator (rubber tire or track less than 1 c.y. MRC), Boring machine Operator, Concrete Batch Plant Operator (all types and sizes), Concrete Mechanical Tamping, Spreading or Finishing Machine Operator (including Clary, Johnson or similar types), Concrete Mixer Operator (paving type and mobile mixers), Concrete Pump Operator, Crane Operator (crawler and pneumatic less than 15 ton capacity MRC), Drilling Machine Operator (including water wells), Elevating Grader Operator (all types and sizes, except as otherwise classified), Field Equipment Serviceman, Grade Checker (excluding Civil Engineer), Locomotive Engineer (including Dinky 20 tons weight and over), Moto-Paver (and simmmilar type equipment) Operator, Motor Grader Operator (any type power blade-rough), Oiler Driver, Operating Engineer Rigger, Pneumatio Tired Scraper Operator (all sizes and types), Power Jumbo Form Setter Operator, Road Oil Mixing Machine Operator, Roller Operator (on all types asphalt pavement), Screed Operator, Self-Propelled Compactor (with blade) (815, 825 or equivalent - grade operation), Skip Loader Operator (all types with a rated capacity over 3 1/2 but less than 6 c.y.), Slip Form Operator (power driven lifting device for concrete forms), Soil Cement Road Mixing Machine Operator (single Pass type), Stationary Pipe-Wrapping and Cleaning Machine Operator, Surface Heater and Planer Operator Tractor Operator (dozer, pusher - all), Traveling Pipe-Wrapping Machine Operator, Trenching Machine Operator, Tugger (two or more)

Group 3: Asphalt or Concrete Planing, Rotomill and Milling Machine Operator, Auto Grade Machine Operator (CMI and similar Equipment), Boring Machine Operator (including Mole, Badger and similar type), Concrete Pump Operator (truck mounted, with boom attached), Crane Operator (crawler and pneumatic over 15 tons and less than 100 ton capacity MRC), Crawler-Type Tractor Operator (with boom attachment and slope bar), Derrick Operator, Gradall Operator, Heavy Duty Mechanic/Welder, Helicopter Hoist Operator or Pilot, Highline Cableway Operator, Mass Excavator Operator (150 Bucyrus, Erie and similar type), Mechanical Hoist Operator (two or more drums), Motor Grader Operator (any type power blade-finish), Mucking Machine Operator, Operating Engineers Electrician (including lineman, tower erector, cable splicer, etc.), Overhead Crane Operator, Piledriver Engineer (portable stationary or skid rig), Power Driver Ditch Lining or Ditch Trimming Machine Operator, Remote Control Earth Moving Machine Operator Skip Loader Operator (all types with rated capacity 6 c.y. but less than 10 c.y.), Slip Form Paving Machine Operator (including Gunnert, Zimmerman and similar types), Tower Crane (or similar type), Universal Equipment Operator (shovel, backhoe, dragline, clamshell, etc., up to 10 c.y.),

Group 4: Crane Operator (pneumatic or crawler - 100 ton hoisting capacity and over MRC rating), Skip Loader Operator (all types with rated capicity of 10 c.y. or more), Universal Equipment Operator (shovel, backhoe, dragline, clamshell, etc., 10 c.y. and over)

TRUCK DRIVERS

Group 1: Pickup Driver, Station Wagon Driver, Man Haul Driver, 4 axle or less Dump or Flattrack Driver, Self-propelled street sweeper, tireman, Water Truck Driver, 3800 Gals. and under, Vacuum Pump Truck Driver, Forklift or Fork Truck, Transit Mix Driver, 8 cy or less Mixer capacity, Ambulance Driver with current Red Cross or Bureau/Mines First Aid Certificate

Group 2: Transit Mix Driver, over 87 cy, Rock Truck Driver-under 35 tons, Oil Tanker or Spreader Truck Driver and/or Bootman, Retortman or Leverman, 5 axle Dump or Flattrack Driver, Water Truck Driver 3900 gal and over, Off-Highway Equipment Driver including but not limited to: 2 or 4 Wheel Power Unit, i.e., Cat DW Series, Euclid, Int'l and Similar Type Equipment, Transporting Material when top loaded or by External Means, Including Pulling Water Tanks, Fuel Tanks or other applications under Teamster Classification

Group 3: Field Equipment Serviceman or Fuel Truck Driver, Heavy Duty Mechanic/Welder, Transport Driver (Heavy Equipment), Off Highway Rock Truck-35 Tons and over

Combination men shall be paid thirty cents ($.30) over the highest rated work.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR, 5.5 (a) (1) (ii))

AZ90-2

ARIZONA DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

DATE: 03/05/90

CONTRACTS AND SPECIFICATIONS SERVICES

BIDDING SCHEDULE FOR
CONTRACT NUMBER
89156

PROJECT NUMBER	TERMINI	LOCATION	FUND CODE	ITEM
IR- 17-2(111)	CORDES JCT - FLAGSTAFF HIGHWAY	FLAGSTAFF TRAFFIC INTERCHANGE	0	0169
IR- 40-4(123)	FLAGSTAFF - HOLBROOK HIGHWAY	US 89A OP-WALNUT CANYON TI EB	0	0177
IR- 40-4(131)	FLAGSTAFF - HOLBROOK HIGHWAY	US 89A OP-WALNUT CANYON TI WB	0	0178

COUNTY	GROSS LENGTH	NET LENGTH	PREPARED BY
COCONINO	1.050 MILES	1.010 MILES	TLB
COCONINO	10.110 MILES	9.860 MILES	TLB
COCONINO	10.160 MILES	10.060 MILES	TLB

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2010001	CLEARING AND GRUBBING	L.SUM	1		
	2020001	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.SUM	1		
	2020017	REMOVAL OF ASPHALTIC CONCRETE (Patches)	L.SUM	1		
	2020019	REMOVAL OF EMBANKMENT CURB	L.FT.	19,053		
	2020020	REMOVAL OF CONCRETE CURB	L.FT.	381		
	2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	40		
	2020030	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT (Milling)	SQ.YD.	87,900		
	2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	85		
	2020052	REMOVE (Snow Cinder Build-Up and Other Dedris)	L.FT.	158,400		
	2020053	REMOVE (Downdrain)	EACH	15		
	2020054	REMOVE (Spillway)	EACH	51		
	2020065	REMOVAL OF TREES	EACH	185		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020071	REMOVE GUARD RAIL	L.FT.	850		
	2020072	REMOVE AND SALVAGE GUARD RAIL	L.FT.	11,620		
	2020076	REMOVE AND SALVAGE BREAKAWAY CABLE TERMINAL	EACH	1		
	2020101	REMOVE FENCE	L.FT.	1,257		
	2030301	ROADWAY EXCAVATION	CU.YD.	55,407		
	2030401	DRAINAGE EXCAVATION	CU.YD.	45		
	2030901	BORROW	CU.YD.	39,710		
	2031001	COMPACTION OF SHOULDER MATERIAL	HOUR	410		
	2031010	SHOULDER BUILD-UP	L.FT.	206,478		
	2070001	DUST PALLIATIVE	M.GAL.	1,250	8.00	10,000.00
	3030003	AGGREGATE BASE, CLASS 3	TON	431		
	4010010	PORTLAND CEMENT CONCRETE PAVEMENT (10")	SQ.YD.	2,111		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	4010016	PORTLAND CEMENT CONCRETE PAVEMENT (Unbonded Overlay)	SQ.YD.	2,111		
	4010210	CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	244,614		
	4010260	RUBBLIZE EXISTING PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	1,333		
	4020048	GRIND EXISTING PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	7,427		
	4020060	SEAL CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT	L.FT.	1,000		
	4020061	SEAL EDGE OF PORTLAND CEMENT CONCRETE PAVEMENT	L.FT.	33,874		
	4020072	REPAIR PORTLAND CEMENT CONCRETE PAVEMENT (SPALLED AREA)	SQ.FT.	1,600		
	4040026	ASPHALT CEMENT (AC-20) (FOR 3/4" MIX)	TON	4,710		
	4040111	BITUMINOUS TACK COAT	TON	414		
	4040125	FOG COAT	TON	58		
	4040161	ASPHALT RUBBER MATERIAL	TON	4,316		
	4040163	BLOTTER MATERIAL	TON	159		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/06/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	4040310	JOINT SEALING (ASPHALTIC CONCRETE OVERLAY)	L.FT.	4,096		
	4060024	MINERAL ADMIXTURE (FOR 1/2" MIX)	TON	513		
	4060026	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	923		
	4060051	ASPHALT CONCRETE (RUBBERIZED)	TON	54,834		
	4060951	PAVEMENT REINFORCEMENT FABRIC	SQ.YD.	2,914		
	4070004	ASPHALTIC CONCRETE FRICTION COURSE (ASPHALT RUBBER)	TON	8,348		
	4160002	ASPHALTIC CONCRETE (3/4" MIX) (END PRODUCT)	TON	85,621		
	5010004	PIPE, CORRUGATED METAL, 12"	L.FT.	16		
	5010011	PIPE, CORRUGATED METAL, 24"	L.FT.	56		
	5010025	PIPE, CORRUGATED METAL, 36"	L.FT.	94		
	5010030	PIPE, CORRUGATED METAL, 42"	L.FT.	16		
	5010035	PIPE, CORRUGATED METAL, 48"	L.FT.	10		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/06/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	5010040	PIPE, CORRUGATED METAL, 54"	L.FT.	30		
	5014024	FLARED END SECTION, 24" (C-13.25)	EACH	3		
	5014036	FLARED END SECTION, 36" (C-13.25)	EACH	6		
	5014801	PREFABRICATED CONCRETE END SECTION	EACH	210		
	5019321	PIPE (4") (ATED Laterials)	L.FT.	4,261		
	5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	1		
	5030152	CONCRETE CATCH BASIN (MEDIAN DIKES)	EACH	1		
	5030500	JUNCTION BOX	EACH	1		
	6010501	BRIDGE REPAIR (Deck Joints) (Westbound)	L.SUM	1		
	6010502	BRIDGE REPAIR (DECK JOINTS) (Eastbound)	L.SUM	1		
	6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	18		
	6080005	SIGN PANEL (E SERIES) (HIGH REFLECTIVITY SHEETING)	SQ.FT.	320		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/06/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	6080101	MISCELLANEOUS WORK (SIGNS)	L.SUM	1		
	7010001	MAINTENANCE AND PROTECTION OF TRAFFIC	L.SUM	1	460,000.00	460,000.00
	7010006	FURNISH AND INSTALL TEMPORARY TRAFFIC CONTROL DEVICES	L.SUM	1		
	7010010	TEMPORARY CONCRETE BARRIER (NEW INSTALLATION)	L.FT.	11,630		
	7030003	DELINEATOR (4-M-4.01) (SINGLE WHITE OR SINGLE YELLOW)	EACH	32		
	7030014	OBJECT MARKER (4-M-3.01) (TRIPLE VERTICAL)	EACH	8		
	7040003	PAVEMENT MARKING (WHITE HOT SPRAYED THERMOPLASTIC)(0.060")	L.FT.	212,400		
	7040004	PAVEMENT MARKING (YELLOW HOT SPRAYED THERMOPLASTIC)(0.060")	L.FT.	118,000		
	7060131	PAVEMENT MARKER, SNOWPLOWABLE	EACH	1,610		
	7320090	ELECTRICAL CONDUIT (4") (PVC)	L.FT.	990		
	7320420	PULL BOX (NO. 7)	EACH	6		
	7320580	CONDUCTOR (BARE BOND)	L.FT.	990		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/06/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	7350010	LOOP DETECTOR TRAFFIC COUNTER SYSTEM	EACH	8		
	7350012	LOOP DETECTOR TRAFFIC COUNTER SYSTEM (Replace)	EACH	8		
	7370300	REMOVE AND SALVAGE OR REINSTALL ELECTRICAL EQUIPMENT	L.SUM	1		
	8050003	SEEDING (CLASS II) (Type A)	ACRE	57		
	8050023	SEEDING (CLASS II) (Type B)	ACRE	25		
	9010001	MOBILIZATION	L.SUM	1		
	9020003	CHAIN LINK FENCE, TYPE 1 (60")	L.FT.	2,000		
	9030011	BARBED WIRE FENCE, TYPE 1	L.FT.	847		
	9040001	CHAIN LINK CABLE BARRIER	L.FT.	50		
	9050002	GUARD RAIL, W-BEAM, SINGLE FACE, SHOP CURVED	L.FT.	26		
	9050031	GUARD RAIL, BREAKAWAY CABLE TERMINAL	EACH	66		
	9050036	GUARD RAIL, ANCHOR ASSEMBLY	EACH	37		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/06/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	9050046	RECONSTRUCT GUARD RAIL ANCHOR ASSEMBLY	EACH	2		
	9050100	CONSTRUCT GUARD RAIL FROM SALVAGE	L.FT.	2,801		
	9050106	RECONSTRUCT GUARD RAIL BREAKAWAY CABLE TERMINAL	EACH	8		
	9050110	RECONSTRUCT GUARD RAIL	L.FT.	28,318		
	9050206	GUARD RAIL ANCHORAGE, BOLTED	EACH	18		
	9050301	GUARD RAIL RUB RAIL	EACH	30		
	9050404	GUARD RAIL TRANSITION,W-BEAM TO CONCRETE HALF BARRIER	EACH	8		
	9050417	GUARD RAIL TRANSITION TO BRIDGE DADO	EACH	37		
	9050418	GUARD RAIL TRANSITION TO BRIDGE DADO (Shop Curve)	EACH	4		
	9050451	GUARD RAIL POSTS	EACH	7		
	9050471	GUARD RAIL POST, BLOCKS AND FASTENERS (FORCE ACCOUNT)	L.SUM	13		
	9100006	CONCRETE BARRIER (SPECIAL HALF)	L.FT.	120		

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/06/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	9100007	CONCRETE HALF BARRIER TRANSITION (20-FT)	EACH	6		
	9100053	CONCRETE BRIDGE BARRIER TRANSITION	EACH	25		
	9130850	AGGREGATE TRENCH EDGE DRAIN (ATED)	L.FT.	98,336		
	9170033	INLET (C-4.20) (SINGLE) (Detail L)	EACH	5		
	9230001	PROVIDE TRAINEES WITH ON-THE-JOB TRAINING	HOUR	5,000	0.80	4,000.00
	9250001	CONSTRUCTION SURVEYING AND LAYOUT	L.SUM	1		
	9280001	FORMED RUMBLE STRIP	L.FT.	188,820		
	9999915	CONSTRUCT H.S.W.I.M.	L.SUM	1		

ROADWAY SUBTOTAL =

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009A	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	3		
	2020048A	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401A	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501A	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506A	STRUCTURE BACKFILL	CU.YD.	195		
	6010002A	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	47		
	6050001A	REINFORCING STEEL	L.SUM	4,855		
	9999903A	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 177 + 80.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "A" Items.
(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009B	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	2		
	2020048B	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401B	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501B	STRUCTURAL EXCAVATION	CU.YD.	30		
	2030506B	STRUCTURE BACKFILL	CU.YD.	105		
	6010002B	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	32		
	6050001B	REINFORCING STEEL	L.SUM	3,770		
	9999903B	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 198 + 78.6 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "B" Items.
(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009C	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048C	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401C	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501C	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506C	STRUCTURE BACKFILL	CU.YD.	230		
	6010002C	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	70		
	6050001C	REINFORCING STEEL	L.SUM	7,135		
	9999903C	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 272 + 25.9 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "C" Items.
(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009D	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	3		
	2020048D	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401D	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501D	STRUCTURAL EXCAVATION	CU.YD.	40		
	2030506D	STRUCTURE BACKFILL	CU.YD.	270		
	6010002D	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	66		
	6050001D	REINFORCING STEEL	L.SUM	7,720		
	9999903D	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 272 + 25.9 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "D" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009E	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020040E	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401E	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501E	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506E	STRUCTURE BACKFILL	CU.YD.	275		
	6010002E	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	75		
	6050001E	REINFORCING STEEL	L.SUM	7,405		
	9999903E	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 356 + 50.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "E" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009F	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048F	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401F	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501F	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506F	STRUCTURE BACKFILL	CU.YD.	275		
	6010002F	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	59		
	6050001F	REINFORCING STEEL	L.SUM	6,210		
	9999903F	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 356 + 50.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "F" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009G	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048G	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401G	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501G	STRUCTURAL EXCAVATION	CU.YD.	40		
	2030506G	STRUCTURE BACKFILL	CU.YD.	345		
	6010002G	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	86		
	6050001G	REINFORCING STEEL	L.SUM	9,480		
	9999903G	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 384 + 50.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "G" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020009H	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
2020048H	REMOVAL OF STRUCTURE) (Wing Walls)	EACH	2		
2030401H	DRAINAGE EXCAVATION	CU.YD.	10		
2030501H	STRUCTURAL EXCAVATION	CU.YD.	35		
2030506H	STRUCTURE BACKFILL	CU.YD.	305		
6010002H	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	64		
6050001H	REINFORCING STEEL	L.SUM	7,040		
9999903H	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 384 + 50.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "H" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009K	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	3		
	2020048K	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401K	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501K	STRUCTURAL EXCAVATION	CU.YD.	25		
	2030506K	STRUCTURE BACKFILL	CU.YD.	90		
	6010002K	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	48		
	6050001K	REINFORCING STEEL	L.SUM	4,430		
	9999903K	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 177 + 00.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "K" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009L	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	3		
	2020048L	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401L	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501L	STRUCTURAL EXCAVATION	CU.YD.	30		
	2030506L	STRUCTURE BACKFILL	CU.YD.	95		
	6010002L	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	58		
	6050001L	REINFORCING STEEL	L.SUM	5,350		
	9999903L	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 177 + 00.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "L" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020009M	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	2		
2020048M	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
2030401M	DRAINAGE EXCAVATION	CU.YD.	10		
2030501M	STRUCTURAL EXCAVATION	CU.YD.	30		
2030506M	STRUCTURE BACKFILL	CU.YD.	45		
6010002M	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	41		
6050001M	REINFORCING STEEL	L.SUM	4,865		
9999903M	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 199 + 45.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "M" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009N	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	2		
	2020048N	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401N	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501N	STRUCTURAL EXCAVATION	CU.YD.	30		
	2030506N	STRUCTURE BACKFILL	CU.YD.	40		
	6010002N	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	45		
	6050001N	REINFORCING STEEL	L.SUM	4,865		
	9999903N	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 199 + 45.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "N" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020009P	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
2020048P	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
2030401P	DRAINAGE EXCAVATION	CU.YD.	10		
2030501P	STRUCTURAL EXCAVATION	CU.YD.	30		
2030506P	STRUCTURE BACKFILL	CU.YD.	145		
6010002P	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	52		
6050001P	REINFORCING STEEL	L.SUM	4,540		
9999903P	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 255 + 00.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "P" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009Q	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048Q	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401Q	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501Q	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506Q	STRUCTURE BACKFILL	CU.YD.	195		
	6010002Q	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	78		
	6050001Q	REINFORCING STEEL	L.SUM	7,115		
	9999903Q	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 255 + 00.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "Q" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009R	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048R	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401R	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501R	STRUCTURAL EXCAVATION	CU.YD.	45		
	2030506R	STRUCTURE BACKFILL	CU.YD.	335		
	6010002R	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	74		
	6050001R	REINFORCING STEEL	L.SUM	9,785		
	9999903R	LUMP SUM STRUCTURE (TOTAL) CBC Sta. 274 + 50.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "R" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009S	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048S	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401S	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501S	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506S	STRUCTURE BACKFILL	CU.YD.	275		
	6010002S	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	75		
	6050001S	REINFORCING STEEL	L.SUM	7,405		
	9999903S	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 356 + 50.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "S" Items.

(Notes: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009T	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048T	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401T	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501T	STRUCTURAL EXCAVATION	CU.YD.	35		
	2030506T	STRUCTURE BACKFILL	CU.YD.	330		
	6010002T	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	68		
	6050001T	REINFORCING STEEL	L.SUM	7,865		
	9999903T	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 356 + 50.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for "T" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009U	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048U	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401U	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501U	STRUCTURAL EXCAVATION	CU.YD.	45		
	2030506U	STRUCTURE BACKFILL	CU.YD.	410		
	6010002U	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	80		
	6050001U	REINFORCING STEEL	L.SUM	10,740		
	9999903U	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 384 + 50.0 (Lt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "U" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009V	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	4		
	2020048V	REMOVAL OF STRUCTURE (Wing Walls)	EACH	2		
	2030401V	DRAINAGE EXCAVATION	CU.YD.	10		
	2030501V	STRUCTURAL EXCAVATION	CU.YD.	45		
	2030506V	STRUCTURE BACKFILL	CU.YD.	410		
	6010002V	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	70		
	6050001V	REINFORCING STEEL	L.SUM	9,570		
	9999903V	LUMP SUM STRUCTURE (TOTAL) * CBC Sta. 384 + 50.0 (Rt.)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "V" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009X	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	45		
	6010002X	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	54		
	6050012X	REINFORCING STEEL (EPOXY COATED)	LB.	11,800		
	6050101X	PLACE DOWELS	EACH	544		
	9999906X	LUMP SUM STRUCTURE (TOTAL) * Structure No. 1238 & 1239	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "X" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	2020009Y	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	193		
	6010002Y	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	216		
	6050012Y	REINFORCING STEEL (EPOXY COATED)	LB.	23,750		
	6050101Y	PLACE DOWELS	EACH	2,094		
	9999907Y	LUMP SUM STRUCTURE (TOTAL) * Structure No. 1261 (EB)	L.SUM	1		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "Y" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

IR- 17-2(111)
IR- 40-4(123)
IR- 40-4(131)

BIDDING SCHEDULE

DATE: 03/05/90

	ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	20200092	REMOVAL OF STRUCTURAL CONCRETE	CU.YD.	178		
	60100022	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	223		
	60500122	REINFORCING STEEL (EPOXY COATED)	LB.	25,225		
	60501012	PLACE DOWELS	EACH	1,944		
	99999082	LUMP SUM STRUCTURE (TOTAL) Structure No. 1262 (WB)	L.SUM	1		
				TOTAL:		

*The Lump Sum Amount of the Item shall equal the sum of the amount for the preceeding "Z" Items.

(Note: See Subsection 109.10 - Lump Sum Payment for Structures, for instructions.)

Project No.
IR-17-2(111) H0212 04C
IR-40-4(123) H0212 04C
IR-40-4(131) H0212 04C

BIDDING SCHEDULE

Date: 03/05/90

SUMMARY SHEET

		ROADWAY SUBTOTAL	=	_____
9999903A	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+80.0 (Lt.)	=	_____
9999903B	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 198+78.6 (Lt.)	=	_____
9999903C	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 272+25.9 (Rt.)	=	_____
9999903D	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 272+25.9 (Lt.)	=	_____
9999903E	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Lt.)	=	_____
9999903F	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Rt.)	=	_____
9999903G	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Lt.)	=	_____
9999903H	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Rt.)	=	_____
9999903K	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+00.0 (Lt.)	=	_____
9999903L	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 177+00.0 (Rt.)	=	_____
9999903M	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 199+45.0 (Lt.)	=	_____
9999903N	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 199+45.0 (Rt.)	=	_____
9999903P	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 255+00.0 (Lt.)	=	_____
9999903Q	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 255+00.0 (Rt.)	=	_____
9999903R	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 274+50.0 (Rt.)	=	_____
9999903S	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Lt.)	=	_____
9999903T	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 356+50.0 (Rt.)	=	_____
9999903U	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Lt.)	=	_____
9999903V	LUMP SUM STRUCTURE (TOTAL)	CBC STA. 384+50.0 (Rt.)	=	_____
9999903X	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE 1238 & 1239	=	_____
9999903Y	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE NO. 1261 (EB)	=	_____
9999903Z	LUMP SUM STRUCTURE (TOTAL)	STRUCTURE NO. 1262 (WB)	=	_____
		PROJECT TOTAL	=	_____

TLBJ/jkg

PERFORMANCE BOND

MATERIAL SOURCES UNDER THE JURISDICTION OF THE

STATE LAND DEPARTMENT

APRIL 8, 1976

KNOW ALL MEN BY THESE PRESENTS:

That we, the Principal and Surety hereto, are firmly bound to the State of Arizona in the penal sum of $_____, for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Arizona Department of Transportation for the construction of Project_____, the design of which contemplates the extraction and removal of material from a source under the jurisdiction of the State Land Department.

NOW, THEREFORE, it is the condition of this bond that if the Principal shall fail to faithfully comply with the applicable terms and conditions of the Material Sales Agreement, between the State Land Department and the Arizona Department of Transportation, as determined by the State Land Commissioner, which terms and conditions are described in the specifications for the aforementioned project; then the above bounden Surety shall pay to the State Land Department the amount of loss as determined by the State Land Commissioner, resulting from Principal's failure to comply with the aforementioned Material Sales Agreement.

This surety bond shall remain in full force and effect for the term of the aforementioned project, except the Surety shall not be liable hereunder for a larger total amount, in the aggregate, than the penal sum of this bond.

IN WITNESS WHEREOF, the Principal and Surety have executed this Performance Bond and have affixed their seals, as appropriate, on the date indicated.

Principal: Seal	Surety: Seal
By (Signature):	Agency of Record:
Title:	Agency Address:
Date:	By (Signature):
Pit Serial No.:	Date:
State Land Department Reference Number:	

APPENDIX C

SHRP Construction Guidelines

TABLE OF CONTENTS

INTRODUCTION.....1

OBJECTIVE.....2

TEST SECTIONS.....2

ACTIVITIES ON CONTROL SECTION.....4

PAVEMENT PREPARATION/RESOTRATION.....8

- Joint and Crack Sealing.....9
- Partical Depth Patching.....12
- Full Depth Patching.....12
- Load Transfer Restoration.....14
- Full Surface Diamond Grinding.....16
- Undersealing.....18
- Subdrainage.....20
- Shoulder Rehabilitation.....21
- Crack/Break and Seat.....21
- Saw and Seal.....21

ASPHALT CONCRETE OVERLAY.....22

- Materials and Mix Design.....22
- Construction Operations.....24

SPECIAL CONSIDERATIONS.....25

DEVIATIONS FROM GUIDELINES.....26

APPENDIX A - TYPICAL PAVEMENT SECTIONS

APPENDIX B - MODEL SPECIFICATION FOR CRACK/BREAK AND SEAT OPERATIONS

APPENDIX C - ASPHALT CONCRETE MIX DESIGN AND FIELD CONTROL

SPECIFIC PAVEMENT STUDIES
CONSTRUCTION GUIDELINES FOR EXPERIMENT SPS-6, REHABILITATION OF JOINTED PORTLAND CEMENT CONCRETE PAVEMENTS

INTRODUCTION

This report describes the guidelines for the construction of test sections for the Specific Pavement Studies' SPS-6 experiment, Rehabilitation of Jointed Portland Cement Concrete Pavements. These guidelines have been developed by SHRP in cooperation with state and provincial highway agency personnel participating in various meetings, including a construction guidelines review meeting held in Ames, Iowa, May 8-9, 1990. The recommendations of the participants from seven states, Canada, United Kingdom, and the Federal Highway Administration and comments furnished by other highway agency personnel are incorporated in the guidelines outlined in this report. These guidelines will help participating highway agencies develop acceptable construction plans for test sections for this experiment.

The SPS-6 experiment, Rehabilitation of Jointed Portland Cement Concrete Pavements, requires the construction of multiple test sections with similar details and materials at each of twenty-four sites distributed in the four climatic regions. The experimental design and construction considerations for this experiment are described in the document, "Specific Pavement Studies: Experimental Design and Research Plan for Experiment SPS-6, "Rehabilitation of Jointed Portland Cement Concrete Pavements," April 1989. The experiment has been developed as a coordinated national experiment to address the needs of the highway community at large and not only the participating highway agencies. Therefore, it is important to control construction uniformity at all test sites to reduce the influence of construction variability on test results. Consequently, the construction guidelines outlined int his report must be followed by all participating highway agencies to accomplish the desired objectives of the experiment.

OBJECTIVE

The objective of this document is to provide guidelines for preparing and constructing SPS-6 test sections to maximize uniformity of these procedures across all projects. More specifically, the objectives are:

- To review the major construction features of the different test sections.
- To describe the details of the three major experimental levels of test section preparation (minimal and intensive restoration and crack/break and seat).
- To provide specifications for materials to be used such as joint and crack sealants and asphalt concrete.
- To provide specifications and details for typical repair and restoration items such as patches, retrofitted dowels, and joint and crack sealing.
- To describe the construction operations and as-built requirements (surface roughness).

In addition, special considerations related to geometric corrections and treatments that should not to be performed on the test sections are addressed in this document.

TEST SECTIONS

The combinations of experimental factorsfor the seven SPS-6 test sections, designated Section 2 through Section 8, are listed in Table 1. In addition, a control section which receives only limited routine-type maintenance, designated Section 1, is included in the experiment. The test section numbers shown in this table are used to reference the test sections in the remainder of this document.

Table 1. SPS-6 test section numbering scheme.

SPS-6 SECTION NO.	PREPARATION	OTHER TREATMENTS	OVERLAY THICKNESS, inch
1	Routine Maintenance	-	0
2	Minimum Restoration	-	0
3	Minimum Restoration	-	4
4	Minimum Restoration	Saw and Seal Joints in AC Overlay	4
5	Intensive Restoration	-	0
6	Intensive Restoration	-	4
7	Crack/Break and Seat	-	4
8	Crack/Break and Seat	-	8

Typical cross sections illustrating the combinations of restoration and/or overlay for the test sections are presented in Appendix A for illustrative purposes. The details of the cross sections at a test site will probably differ from those shown in Appendix A depending on the characteristics of the existing pavement structure. The participating highway agency must develop the typical sections for the proposed test site following the guidelines outlined in this document.

Table 2 presents a summary of the types of treatments and/or restoration that should be applied to each test section. Table 3 highlights the applicable rehabilitation treatments for each test section. Only those treatments listed in Table 3 are required and no other repairs or treatments should be performed.

ACTIVITIES ON CONTROL SECTION

Repairs and other activities on the control test section (Section 1) should be limited to only those maintenance activities needed to keep the section in a safe and functional condition. Although the project has fallen to a condition level requiring rehabilitation, overlay and extensive repairs on the control section must be avoided at the start of the study. The rate of change in the condition of the control section will be used as an indicator of the change be expected on the other test sections had they not been rehabilitated.

Maintenance activities should be performed on the control test section (Section 1) in accordance with the standard procedures of the agency. These procedures may differ from those described in this document for the rehabilitation of the other test sections (Sections 2 through 8).

In general, maintenance treatments on the SPS-6 control section should be limited to those permitted in "Guidelines for Maintenance of General Pavement Studies' (GPS) Test Sections," SHRP-LTPP-OM-001, July, 1988.

Table 2. Summary of rehabilitation treatments for SPS-6 test sections.

TEST SECTION DETAILS AND TREATMENT OPTIONS	SURFACE PREPARATION							
	Rou tine	Minimal			Intensive		Crack & Seat	
Section number	1	2	3	4	5	6	7	8
Section length (100 ft)	5	10	5	5	10	5	5	5
Overlay thickness (in.)	0	0	4	4	0	4	4	8
Joint sealing	X	X	N	N	R&R	N	N	N
Crack sealing	X	X	N	N	R&R	N	N	N
Partial depth patch	N	X	X	X	R&R	R&R	N	N
Full depth patch/joint repair	N	X	X	X	R&R	R&R	N	N
Load transfer restoration	N	N	N	N	B	B	N	N
Full surface diamond grinding	N	X	N	N	A	N	N	N
Undersealing	N	N	N	N	X	X	N	N
Subdrainage	N	N	N	N	A	A	A	A
Crack/Break and seat	N	N	N	N	N	N	A	A
Saw and seal	N	N	N	A	N	N	N	N

X - Apply treatment as warranted
R&R -Remove & replace existing, and apply additional as warranted
N - Do not perform
B - Full depth dowelled patch or retrofit dowels in slots
A - Apply treatment regardless of condition or need

Table 3. Highlights of rehabilitation treatments for SPS-6 test sections.

Section 1	Routine maintenance only as per agency practice 3-5 years of service desired
Section 2	Minimal surface preparation, no overlay • perform joint and crack sealing, if warranted • perform partial and full depth patching, if warranted • perform full surface diamond grinding, if warranted
Section 3	Minimal surface preparation with 4 inch overlay • perform partial and full depth patching, if warranted • place a 4-in. thick HMAC overlay
Section 4	Minimal surface preparation with saw and seal 4 inch overlay • perform partial and full depth patching, if warranted • place a 4-in. thick HMAC overlay • saw and seal overlay over existing PCC pavement joints and working cracks
Section 5	Intensive surface preparation, no overlay • remove and replace existing joint and crack sealing • perform additional joint and crack sealing, if warranted • remove and replace existing partial and full depth patches • perform additional partial and full depth patching, if warranted • correct poor load transfer at joints and/or working cracks by full depth patching or retrofitting dowels • perform full surface diamond grinding • retrofit subsurface edge drainage system • perform undersealing, if warranted
Section 6	Intensive surface preparation with 4 inch overlay • remove and replace existing partial and full depth patches • perform additional partial and full depth patching, if warranted • correct poor load transfer at joints and/or working cracks by full depth patching or retrofitting dowels • retrofit subsurface edge drainage system • perform undersealing, if warranted • place a 4-in. HMAC overlay

Table 3. Highlights of rehabilitation treatments for SPS-6 test sections (continued).

Section 7	Crack/break and seat section with 4 inch overlay • crack/break and seat • retrofit subsurface edge drainage system • total section length including transitions should be at least 1500 ft (500 ft transitions at each end) • place a 4-in. HMAC overlay
Section 8	Crack and seat section with 8 inch overlay • crack/break and seat • retrofit subsurface edge drainage system • place an 8-in. thick HMAC overlay

Patching in the control section (Section 1) should be limited to that normally performed by agency maintenance personnel as a short duration activity. This repair should be made with a cold mix or HMAC, unless the agency commonly uses other materials and procedures for this maintenance activity. The types of distress treated in this activity would be limited to spalling or scaling confined to the upper 1/3 of the slab. However, if cracking or deterioration extends into the lower portion of the slab and thus restoration with full depth patching is required, the SHRP regional office should be notified. The following guidelines should be observed for patching as part of routine maintenance on the control sections:

- Only materials with a successful performance history should be used.

- Agency practice should be used to prepare the surface before patching. This generally requires saw cuts at least 2 inches deep at locations 3 to 4 inches outside the defective area, and carefully removing the deteriorated concrete without fracturing underlying sound concrete. If the repair is required at a joint, all joint sealant adjacent to the patch should be removed and a bond breaker is placed to separate patch area from the adjacent joints.

- The final surface shall be smooth and flush with existing surface. Transverse joint openings must be preserved and sealed. Traffic should not be allowed until after the repair material has fully cured.

PAVEMENT PREPARATION/RESTORATION

In the experimental design, preparation and/or restoration of the existing pavement is classed into three levels: minimal, intensive and crack and seat or break and seat. These preparation treatments and/or restoration levels are applied with and without HMAC overlays. In one test section, the overlay will be sawed and sealed over the existing pavement joints and working cracks. The types of treatments and/or restoration required for each test section are listed in Tables 2 and 3. Guidelines for performing these treatment and restoration

items are described in this report. These guidelines should be followed when constructing the test sections to ensure a reasonable construction uniformity among all test sites.

Joint and Crack Sealing

No joint or crack sealing repair or replacement should be performed on the test sections receiving overlays (Sections 3, 4, 6, 7, and 8). The following guidelines should be followed for performing joint and crack cleaning and sealing on those sections receiving no overlay (Sections 2 and 5):

- For the test section receiving minimal preparation and no overlay (Section 2), only those cracks and joints that have not been previously sealed or those exhibiting defective seals (sealant has either become dislodged or cracked so that the sealant no longer provides an effective barrier to entry of moisture or debris) should be cleaned and resealed following the guidelines described later in this section. A sealant type similar to that previously used in the test section may be used.

- For the test section receiving intensive preparation and no overlay (Section 5), all crack and joint sealants should be removed and replaced. Also, cracks and joints that have not been previously sealed should be cleaned and sealed. Sealant type may be different than that previously used in the test section. However, the same sealant type should be used for both crack and joint sealing.

- The following guidelines should be observed for preparation, sealing and repair of cracks:

  - Cracks that are less than 1/8 inch wide and exhibiting no spalling shall not be widened or sealed.

- Cracks that are less than 1/8 inch wide and exhibiting faulted and/or rough edges but no spalling shall be routed or sawed and than sealed.

- Crack that are 1/8 to 3/4 inch wide and exhibiting no or minor spalling shall be routed or sawed and then sealed.

- Cracks that are 1/8 to 3/4 inch wide and exhibiting moderate to severe spalling shall be repaired by partial-depth patch and then sealed. Use backer rod if required by agency practice.

- Cracks that are more than 3/4 inch wide and exhibiting no spalling shall be routed and then sealed. Use backer rod if required by agency practice.

- Cracks that are more than 3/4 inch wide and exhibiting moderate to severe major spalling shall be repaired by full depth patch.

The following guidelines should be observed for joint and crack sealing:

- Procedures and materials which have proven to work best for the agencies are to be used for the test sections. No new experimental sealants shall be used for the test sections.

- Field Poured Liquid Sealant (FPLS) use should conform to ASTM D/3405, "Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements." Requirements for penetration and bond may be modified for cold climates. Silicone sealant should be used according to agency requirements.

- A rectangular joint plow or diamond saw blade (for hardened sealant) shall be used for cleaning joints. Use of "V" shaped plow, high pressure water blasting or sand blasting are not allowed. Preformed compression seals should be manually removed.

- Refacing is required to provide the specific shape factor or when old sealants are not completely removed. In no case shall the refaced joint opening be larger than 1 1/2 inch. A shape factor (width to depth ratio) between 0.67 and 1 is suitable for field poured type sealants. Low modulus silicone sealant may have a shape factor up to 2 or as recommended by the manufacturer.

- After sawing, sandblasting is required for removal of fines on the sidewalls before sealing.

- A single blade cut shall be used to remove incompressible materials from the bottom of the joints. Power driven wire brushes and high pressured water shall not be used.

- The FPLS shall not over fill the joint reservoir. A gap of 1/4 to 1/8 inch is required between the top of the surface of the sealant and the surface of the pavement. Traffic should not be allowed until the sealant has fully cured.

- Resealing and shape factor requirements for the longitudinal centerline joints are less stringent. These joints should be cleaned to a depth of approximately 3/4 inch and a width of 1/4 inch.

- The longitudinal shoulder joints should be at least one inch wide if vertical settlement is expected to occur. A sealant with a proven satisfactory performance history should be used. Otherwise, improved rubber asphalt sealant, silicones or crumb rubber asphalt can be used.

- Crack cleaning and sealing or sealant replacement should be performed using the same procedures and materials used for the joints. However, rotary impact routers should not be used during routing and sawing.

Partial Depth Patching

Partial depth patching, as illustrated in Figure 1, shall be performed to repair areas with spalling or scaling confined to the upper half of the concrete slab and contains no cracks that extend throughout the slab thickness. Coring at representative joints may be necessary to determine the depth of deterioration. Full depth patching will be required if full depth cracks exist. Partial depth patching should be performed on all minimal preparation test sections (Sections 2, 3, and 4) only if warranted. However, all existing partial depth patches on the intensive preparation test sections (Sections 5 and 6) should be removed and replaced. The following guidelines should be observed when performing partial depth patching:

- Vertical saw cuts, approximately 1.5 to 2 inch deep, should be performed outside of deteriorated area so that the remaining vertical faces are sound and provide a suitable bonding surface. The unsound material should be carefully removed to prevent damage to the edges.

- Patch material should be portland cement concrete (PCC) or other approved materials. Cement grout may be used for developing bond.

- No organic compounds (asphalt concrete, epoxies, etc.) should be used.

Full Depth Patching

Full depth patches, as illustrated in Figure 2, shall be used to repair deteriorated joints and working cracks that are too wide to be sealed. Full depth patching should be performed on all minimal preparation test sections (Section 2, 3, and 4) only if warranted. However, all existing full depth patches on the intensive preparation test sections (Section 5 and 6) should be

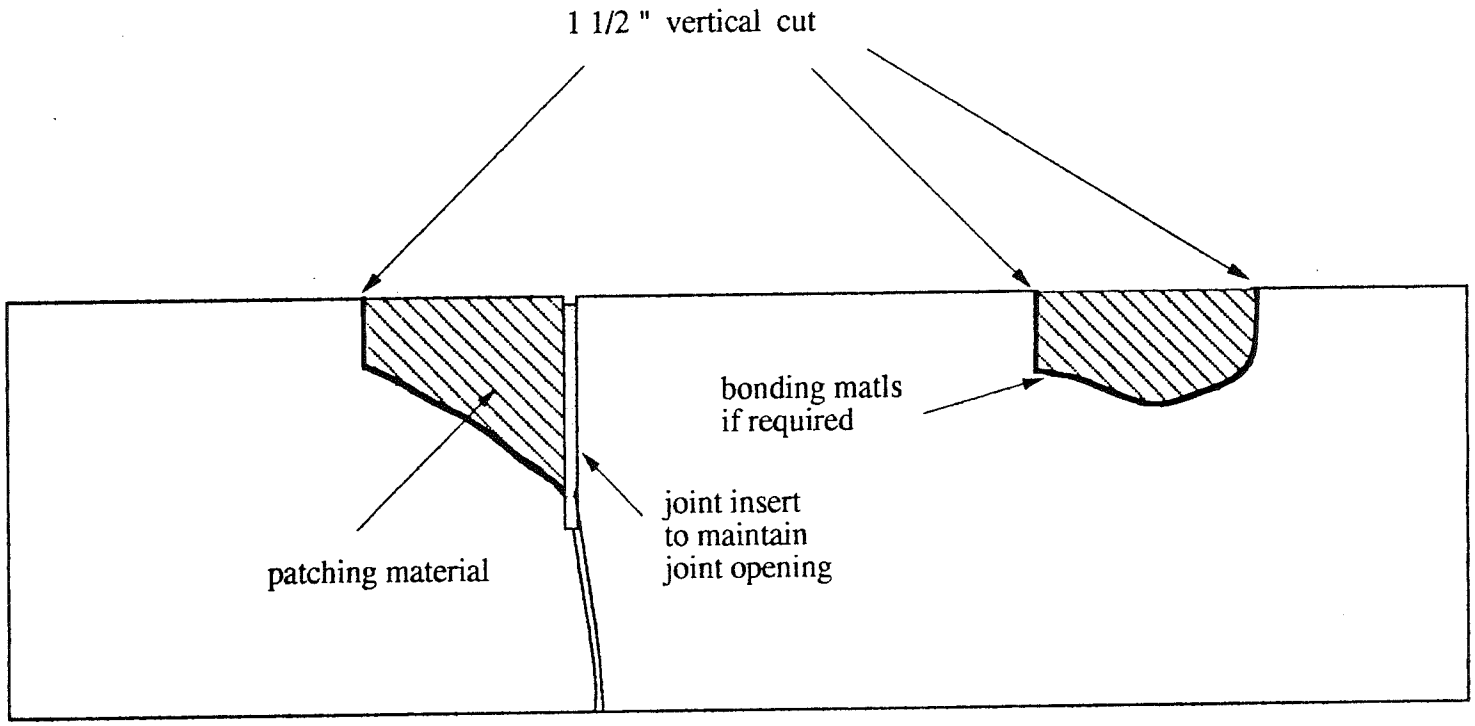
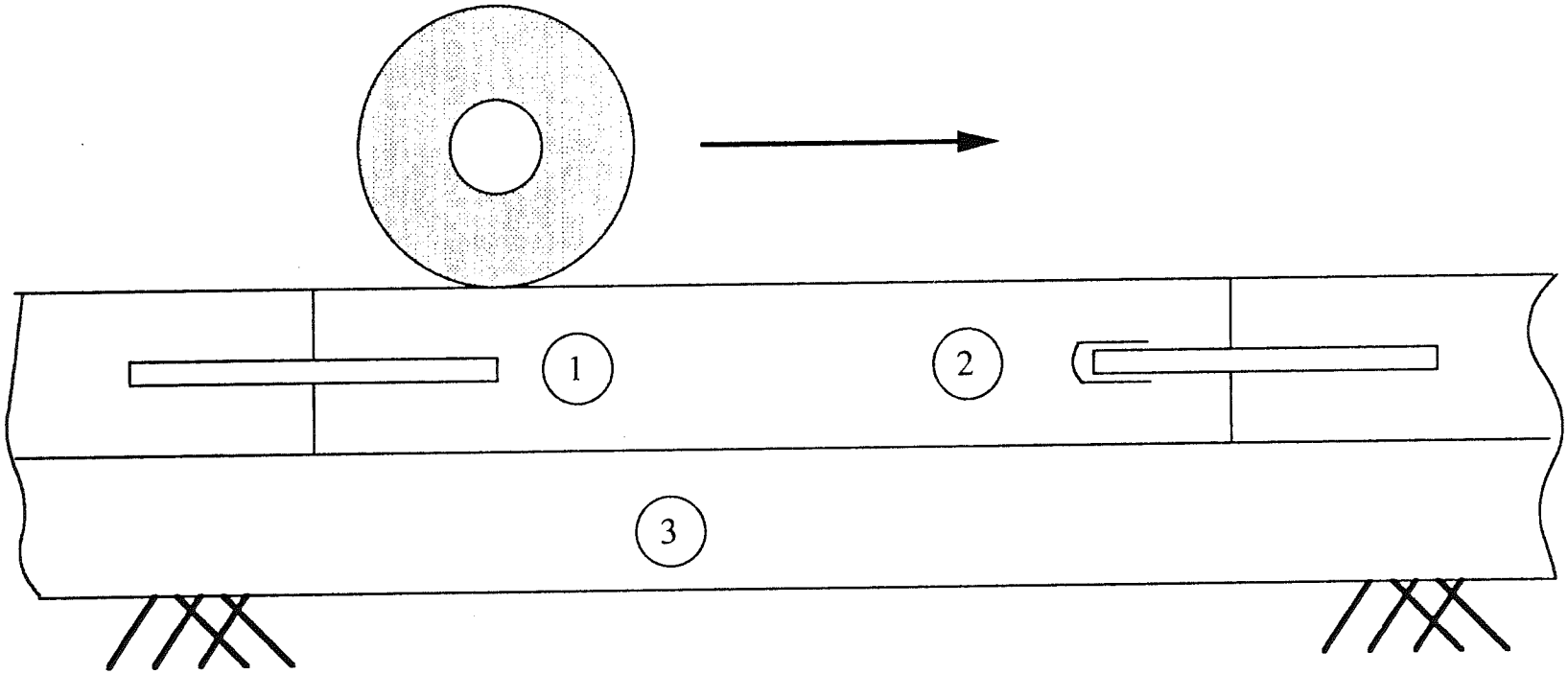


Figure 1 . Partial Depth Patching



1 Dowel or Deformed bar - Agency practice

2 Smooth dowel grouted in old pavement capped or debonding agent in patch

3 Subbase restored to proper condition

Figure 2. Full Depth Patch

removed and replaced. Full depth patching shall be performed in accordance with the following guidelines:

- Patches should be a minimum 6 feet in length and full lane width.
- Only portland cement concrete patching material should be used.
- After removal of the deteriorated pavement section, the exposed subbase must be restored to a suitable condition. Undercuts must be replaced to the existing grade level with similar materials. Patch thickness must be the same as the adjacent pavement slabs.
- Deformed tie bars or smooth dowels shall be used along the transverse edges of the patch and spaced according to agency requirements. However, at least 4 bars should be used per wheel path. Eighteen inch long, epoxy coated dowels with 1 1/4 inch (1 1/2 inch preferred) diameter and spaced 12 inches on centers are recommended.

Load Transfer Restoration

Restoration of load transfer shall be performed as required only on the intensive preparation test sections (Sections 5 and 6). Restoration of load transfer across joints without load transfer devices and working cracks shall be performed when the load transfer across these discontinuities is less than 70%. Load transfer should be measured with a heavy load (~ 9,000 lb) in early morning or during cool weather. Air temperature at time of testing should not be greater than 70° F. Load transfer is computed as follows:

$$LT = A * \delta_{ul}/\delta_l * 100$$

where

LT = percent load transfer

A = 1 if $X \leq 12"$

A = δ_o/δ_x if $X > 12"$

X = distance between deflection measurements points δ_o and δ_x, and δ_l and δ_{ul}, inches (it is preferred that $X \leq 12"$)

δ_o = center load deflection for midslab test (at same load level as δ_l)
δ_x = midslab deflection measured X distance from δ_o
δ_l = center load deflection for test at edge of crack or joint
δ_{ul} = deflection of the surface of the unloaded slab X distance from δ_l

Load transfer at joints and working cracks shall be restored by means of full depth patching or by use of retrofitted dowel bars. The following guidelines should be observed when performing load transfer restoration by means of retrofitted dowel bars:

- Retrofit smooth round dowels shall be installed in slots cut into the pavement surface, as shown in Figure 3.

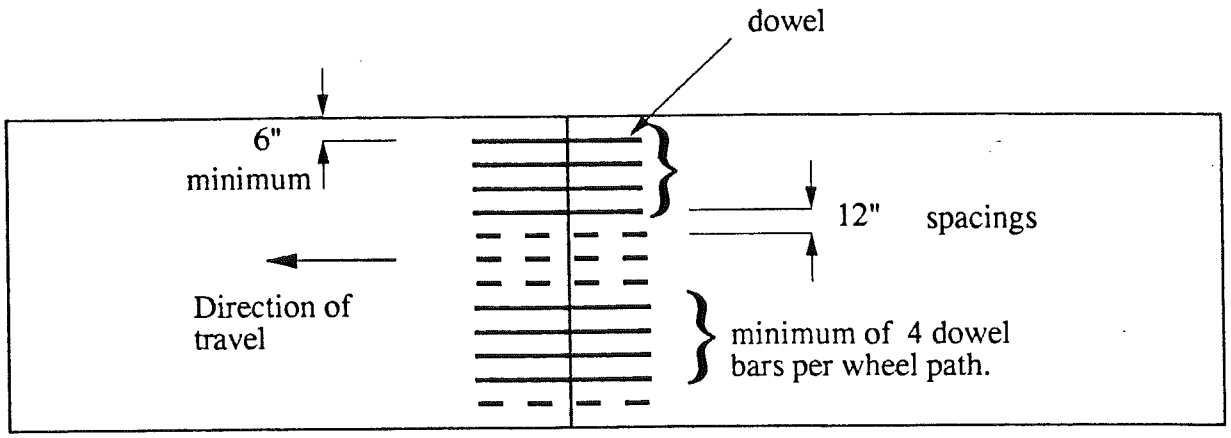
- Only 18-inch long epoxy coated, smooth, round dowel bars, with a minimum diameter of 1.25 inches (1.5 inches preferred) shall be used.

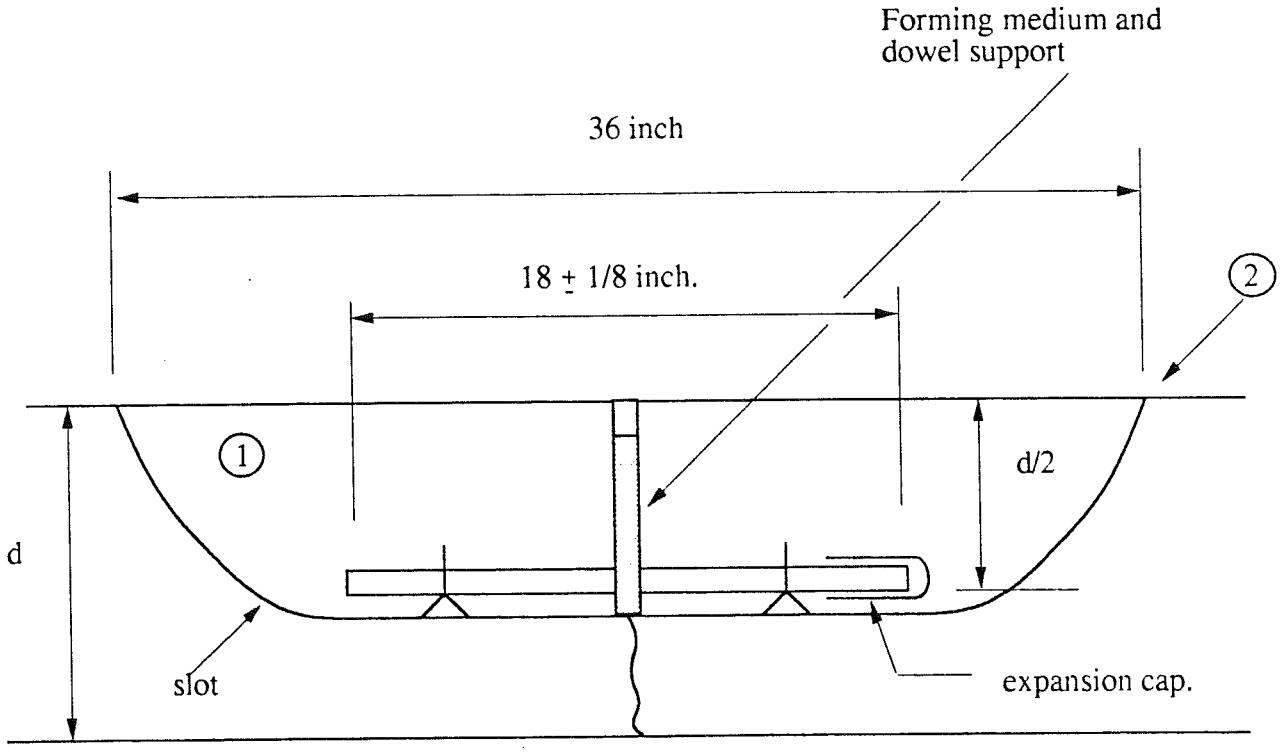
- Dowel bars should be spaced according to agency requirements, but at least 4 bars should be used per wheel path.

- Portland cement concrete or other suitable material shall be used to back fill around dowels.

Full Surface Diamond Grinding

The primary purpose of full surface grinding is to restore the transverse and longitudinal profile distorted due to the effects of faulting, warping, abrasive wear in the wheel paths, or non-uniform volume change of the subgrade. Full surface grinding should be performed on Section 2 if warranted. However, the entire surface of Section 5 must be ground regardless of the surface condition.





(1) Clean and prime saw area with cement grout, backfill with PCC after dowel installation. Maintain joint opening

(2) Slot width 3 1/2 " min. and 4 " max.

Figure 3. Retrofitted Dowel Bar System

Grinding of the surface of Section 2 may be performed if warranted by the following criteria:

- At least 10% of the joints and working cracks in the section exhibit faulting over 25% or more of each joint or crack length of ≥ 0.25 and ≥ 0.40 inch for JPCP and JRCP, respectively.

- At least 10% of the transverse cracks and joints in JRCP that are spaced at 20 to 30 feet intervals exhibit faulting ≥ 0.25 inches.

- Transverse cross slope is less than 1.5% (to improve cross slope for drainage considerations).

- Prorated profile index over the test section length is greater than 20 inches per mile, as measured with the California Profilograph.

To be suitable for grinding, pavement sections candidate must be structurally sound regardless of the extent of cracking. Grinding shall be performed continuously over the entire length of the test section. Spacing of the diamond blades may be adjusted depending on the hardness of the concrete aggregates following the local practices. Grinding shall be performed to obtain a pavement surface with a prorated profile index less than 7 inches per mile as measured with a California Profilograph.

Undersealing

Undersealing (also known as subsealing) beneath the concrete slab may be reformed only on the intensive preparation test sections (Sections 5 and 6). The purpose of undersealing is to fill small voids between the slab and subbase and help restore full support to the slab and seal interface water flow channels. Undersealing should not be used to adjust the vertical profile of the slabs. Undersealing should be performed only where the existence of voids beneath the concrete slab can be demonstrated according to current engineering practice used by the agency. Undersealing should be performed following those representing

the agency's practice. However, the following guidelines should be observed when performing undersealing:

- Undersealing should be performed prior to surface diamond grinding.

- Only pozzolanic-cement grouts (natural or synthetic) or limestone-cement grouts are permitted. Fly ash shall conform to ASTM designation C 618 for either Class C or Class F.

- Limestone and crystalline structures used in the grout shall be spherical with a gradation of 95% passing No. 30 sieve and 30% passing the No. 200 sieve.

- Additives and admixtures may be used if proven to work successfully.

- Injection grout holes shall be placed at least 3 ft away from any existing subsurface drainage structures.

- An inspection hole should be located near pavement edge to monitor the entry of grout into any existing subsurface drainage system.

- Grout pumping shall be stopped if any of the following conditions occur:

  - Vertical movement of the slab or shoulder is detected.
  - Grout is observed coming out of observation holes or subsurface drainage structures.
  - A rapid increase in pumping pressure occurs.

- Any grout entering pavement joints shall be removed to maintain proper joint openings.

- Any cracks developed due to the undersealing operations must be sealed by epoxy injection (structural repair) or repaired by full depth patches.

kept off the subsealed area until the grout cures
um of 2 hours.

ealing should be performed before installing subdrainage.

ow-up testing should be performed to assess undersealing effectiveness
he agency's procedure. Alternatively, undersealing effectiveness may be
luated by measuring slab deflection at joints under truck loading before and
after undersealing using the procedure described in AASHTO Guide Specification
for Highway Construction, 1988.

Subdrainage

- Retrofitted subsurface drainage systems are required on all intensive preparation and crack/break and seat test sections (Sections 5,6,7, and 8). The following guidelines shall be followed for retrofitted subsurface drainage:

- Retrofitted subsurface drainage systems shall be limited to longitudinal edge drains and outflow pipes.

- Edge drains on the crack/break and seat sections (Sections 7 and 8) should be installed prior to crack and seat or break and seat operation.

- The agency shall design the subsurface edge drainage system following local design practice. Local design details such as drain geometry (width, depth), filter materials, permeable drainage materials, collector pipes and outlet system which have been used successfully by the agency may be used. Aternatively, the procedures used by another agency or those recommended by AASHTO may be used. Experimental or unproven treatments should not be used.

- Trenching must be performed with care to maintain correct grade. Plowing is not permitted. Excess soil remaini

of the concrete slab shall be removed. Care must be taken to eliminate unplanned local high points in edge drain trenches during installation.

- Edge drains that exist prior to rehabilitation must be cleaned and restored to ensure working condition.

Shoulder Rehabilitation

Agencies should perform routine repair, maintenance and level up of the existing shoulders as required. Tied portland cement concrete shoulders shall not be added to any of the test sections. The shoulder for Section 8 (crack/break and seat with an 8-inch overlay) may need to be widened to accomodate slope requirements.

Crack/Break and Seat

Sections 7 and 8 will be subjected to crack/break and seat operations prior to placement of the overlay. Appendix B contains construction specifications for crack/break and seat operations. The terms "crack and seat" and "break and seat" are used for JPCP and JRCP, respectively.

Saw and Seal

Saw and seal treatment applies only to Section 4, (minimum preparation with 4 inch overlay). This work consists of marking, sawing, cleaning, and sealing of joints in the HMAC overlay. The following guidelines should be followed for these operations:

- The location of the joints and working cracks in the existing pavement must be referenced prior to placement of the overlay so that the joints in the overlay can be sawed within one inch of these locations.

- Sawing of the joints in the overlay shall be initiated between 3 to 7 days after the placement of the asphalt concrete surface course. For a two lift construction, joints must be sawed in the first lift if the second lift will be placed more than 7 days after the first lift.

- Saw and seal should be performed above only transverse joints and working transverse cracks. The saw cut must extend beyond the edge of the existing concrete pavement into the asphalt concrete shoulder for a minimum of 36 inches.

- The saw cut should be at least 1 1/2 inches deep and a minimum of 3/8 inch wide.

- Shape factors (width to depth ratio) should be based on agency practice or as recommended by the sealant manufacturer.

- The sawing and sealing operations must be performed continuously on the test section using a diamond saw capable of producing a straight, uniform, vertical cut. All saw cuts in the test section must be performed during the same day.

- The saw cuts must be thoroughly cleaned by water blasting and should be completely dry before sealing.

ASPHALT CONCRETE OVERLAY

This section of the report addresses material requirements, mix design, and construction operations for the HMAC overlays required for Sections 3, 4, 6, 7, and 8.

Materials and Mix Design

It is not practical nor feasible to specify either the same mix, mix design, or even mix design method for all test locations. To promote uniformity

across test sites, design of the asphaltic concrete mixes shall be performed in compliance with the guidelines contained in the revised FHWA Technical Advisory T5040.27, "Asphalt Concrete Mix Design and Field Control," March 10, 1988 with the mix design criteria revision to conform to the Asphalt Institute Manual, MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types," 1988. A copy of these guidelines is reproduced in Appendix C of this report.

In accordance with the FHWA Technical Advisory and the Asphalt Institute Manual, the asphalt concrete mixtures should be designed to the following specifications:

Marshall	-	Compaction blows	75
		Stability (Minimum)	1,800
		Flow	8 to 14
Hveem	-	Stability (Minimum)	37
		Swell (Maximum)	0.03 in.
Air Voids	-		3 to 5%

Agencies using non-standard Hveem or Marshall mix design procedures, should design mixes to achieve design indices equivalent to those obtained using these standard procedures.

The asphalt concrete shall be mixed using only virgin materials which have not been used in previous construction. Recycled asphalt pavement (RAP) materials shall not be used for the test sections.

Aggregates used in the mix shall be new material of the highest quality available to the agency. These aggregates shall conform to the following guidelines:

- A minimum of 60% crushed coarse material (retained on #4 sieve) with two crushed faces.
- A minimum sand-equivalent value of 45 as obtained following AASHTO Method of test T 176.

- A dense aggregate gradation.

Grade and characteristics of the asphalt cement used in the mix should be selected by the agency based on normal practice. Asphalt cements with low temperature susceptibility (PVN $\geq$ -0.5) are recommended.

Additives, such as lime, which are routinely used by an agency are permitted in the mix design. Experimental additives or modifiers should not be used in the test sections, but may be used in supplemental test sections.

Construction Operations

Asphalt concrete construction operations shall be performed in compliance with the guidelines presented in the FHWA Technical Advisory T5040.27 and the high quality construction practice employed by the participating agency. Adequate attention shall be given to details and control of mix plant, hauling, placement and compaction operations on the test sections to prevent construction practices which are known to result in poor performance of pavements. In addition, care should be taken to ensure that the construction of the test sections is performed in a manner consistent with normal highway construction practices.

The following construction related guidelines shall be followed:

- Lift thickness shall be limited to a maximum of 4.0 inches.

- The asphalt concrete mix shall be placed only after the contractor has satisfactorily demonstrated proper placement and compaction procedures on non-test section locations.

- Longitudinal joints shall be located within 1 foot of the center of a lane or within 1 foot of the center of two adjacent lanes.

- All transverse construction joints in the overlay shall be placed outside the test sections, e.g. within the transitions between test sections.

- The as-compacted average thickness of the asphalt concrete overlay in the test sections shall be constructed to within ± 1/4 and ± 1/2 in. for the 4 and 8-in. thick overlays,respectively (i.e. 4 ± 1/4 and 8 ± 1/2 inch).

- The finished surface of the asphalt concrete overlay should be smooth and provide an excellent ride level. Construction should be aimed to achieve a pro-rated profile index of less than 10 inches per mile as measured by a California type Profilograph and evaluated as outlined in California Test 526.

SPECIAL CONSIDERATIONS

The following treatments are specifically not to be performed on any of the test sections:

- Lane widening. Widening of the test lane will alter the characteristics and behavior of the test sections and thus "confound" the factors and effects to be evaluated.

- Geotextiles. The use of geotextiles on the pavement or as part of the overlay is not included as a main factor in this experiment. Geotextile may be used by participating agencies in supplemental test sections.

These exclusions are not intended to lessen the importance of these treatments in concrete pavement rehabilitation, but to enable a proper evaluation of the main study factors in a reasonable experiment. The inclusion of such factors as geotextiles or lane widening on an uncontrolled basis would confound measurement of the main factor effects included in the study and

diminish the results of this experiment. Further, the inclusion of such factors would require a larger size experiment to properly evaluate the effects of these factors on pavement performance.

Surface friction courses may be used on asphalt concrete overlays if required by the participating agency. In this case, the thickness of the friction course should be limited to 3/4 inch and should not be considered as part of the thickness of the dense graded asphalt overlay specified for the test section.

DEVIATIONS FROM GUIDELINES

An agency that desires to participate in the SPS-6 experiment but finds it necessary to deviate from some of the guidelines described in the report should review these deviations with the SHRP Regional Office or SHRP headquarters. SHRP will assess the implications of these deviations on the study objectives. If the implications of the non-compliance appear minimal, the deviations will be accepted, otherwise SHRP will suggest alternatives for consideration by the participating agency.

APPENDIX A

TYPICAL PAVEMENT SECTIONS
FOR SPS-6 EXPERIMENT,
REHABILITATION OF JOINTED PORTLAND CEMENT CONCRETE PAVEMENTS

APPENDIX A - TYPICAL PAVEMENT SECTIONS FOR SPS-6 EXPERIMENT, REHABILITATION OF JOINTED PORTLAND CEMENT CONCRETE PAVEMENTS

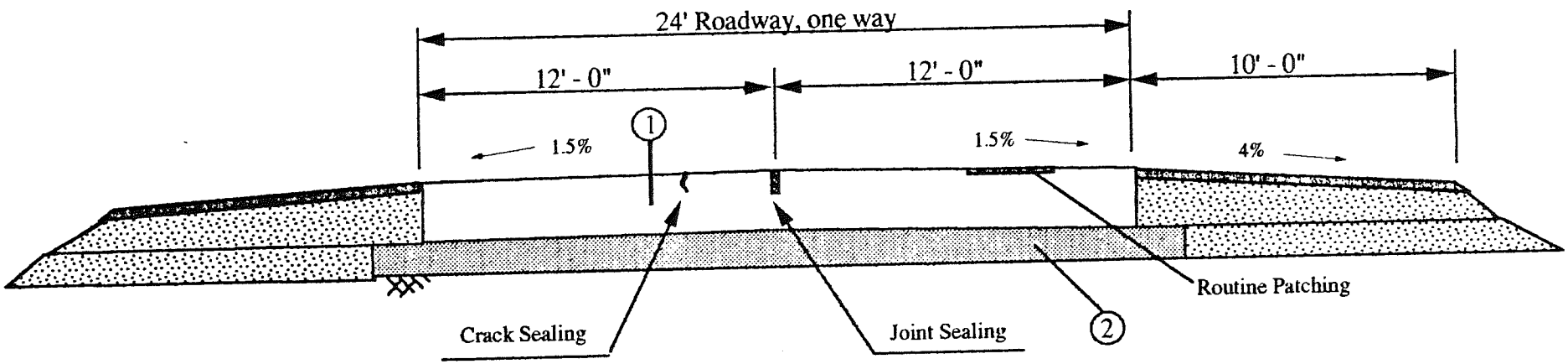
The typical cross sections presented in this document were developed for the hypothetical existing pavement structure shown in Figure A1. The depicted pavement structure is two lanes of a four lane divided highway structure with a crowned cross section. The pavement structure is assumed to consist of a subbase (treated or untreated) and a concrete slab (JPCPor JRCP). Since no rehabilitation treatments will be applied to the control section at the start of the study, this figure also represents the cross section of the control section (Section 1).

The typical sections for the test sections are shown in Figures A2 through A9. The specific restoration combinations and thicknesses shown in these figures illustrate the expected treatments for the test sections. Participating agencies may alter some of the cross section details to meet local design and construction practice, but must stay within the limits defined in this document.

Test sections requiring miminal level of restoration with and without an overlay (Sections 2, 3, and 4) are shown in Figures A2, A3, and A4. Section 2, shown in Figure A2, is a 1,000 ft long test section that will receive no overlay. Figure A3 illustrates Section 3, a 500 ft long test section that will receive a 4 in. thick HMAC overlay. The overlay may be placed in one or two lifts. Section 4, shown in Figure A4, is a 500 ft long test section similar to Section 3, except that joints must be sawed and sealed in the overlay over existing joints and working cracks in the existing concrete pavement.

Test sections requiring an intensive level of restoration with and without an overlay (Section 5 and 6) are shown in Figure A5 and A6. Section 5, shown in Figure A5, is a 1,000 ft long test section that will receive no overlay. Figure A6 illustrates Section 6, a 500 ft long test section that will receive a 4-in. thick HMAC overlay.

Test section requiring crack/break and seat operations prior to overlay placement (Sections 7 and 8) and shown in Figures A7 and A8. Section 7, shown in Figure A7, is a 500 ft long test section that will receive a 4-in. thick HMAC overlay. Section 8, shown in Figure A8, is a similar to Section 7 except that an 8-in. thick HMAC overlay will be placed. The 8-in. overlay may be placed in two or more lifts so that lift thickness does not exceed 4 in.

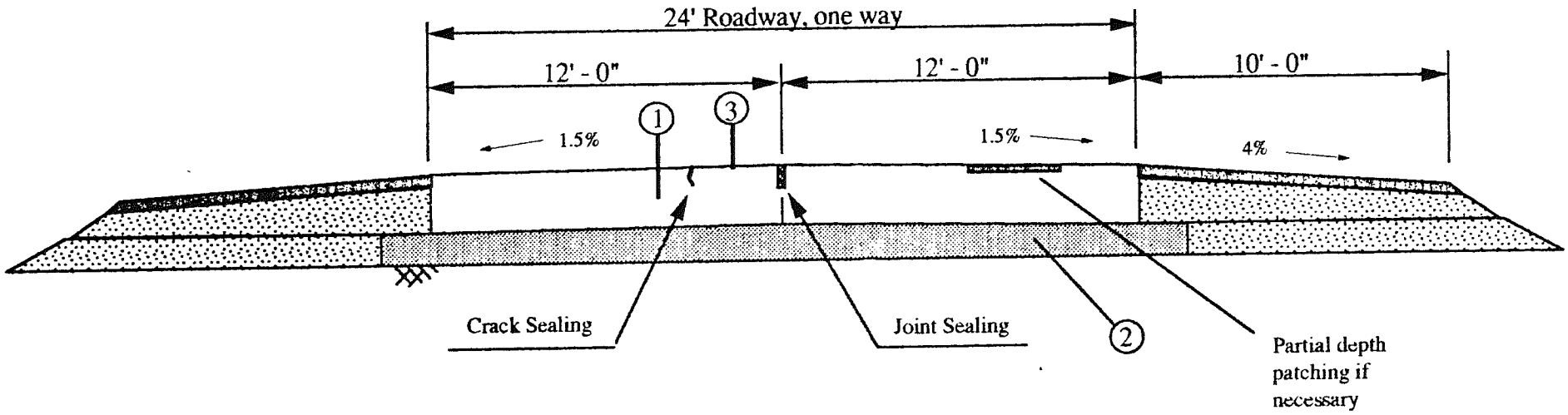


LEGEND

1 8" - 10" JPCP/ JRCP

2 Treated Subbase / Untreated Subbase

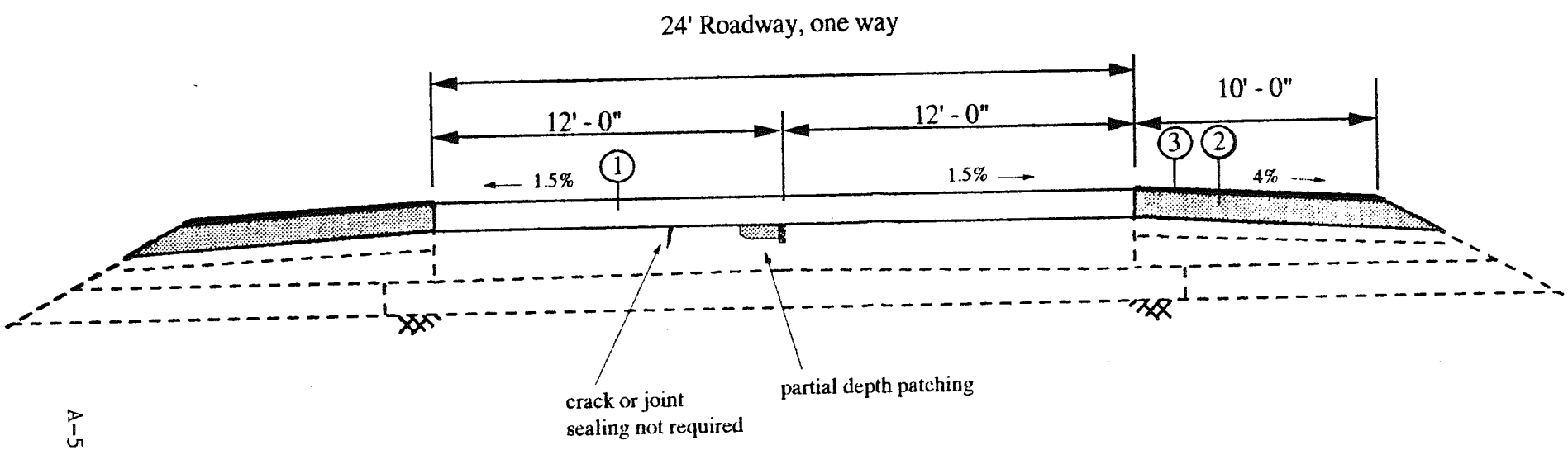
Figure A 1. SPS-6 Section 1 with routine maintenance no overlay. (500 ft.)



LEGEND

1. 8" - 10" JPCP/ JRCP
2. Treated Subbase / Untreated Subbase
3. Full Surface Grinding if Necessary Also Perform Full Depth Patching if Necessary

Figure A 2. SPS-6 Section 2 with minimum restoration and no overlay. (1000 ft.)



LEGEND

1. HMAC Surface Course - Single or Two Lifts
2. Shoulder Materials-Agency Practice
3. Surface Treatment Course

----- Existing Pavement

Figure A 3. SPS-6 section 3 with minimum restoration with 4-inch overlay. (500 ft.)

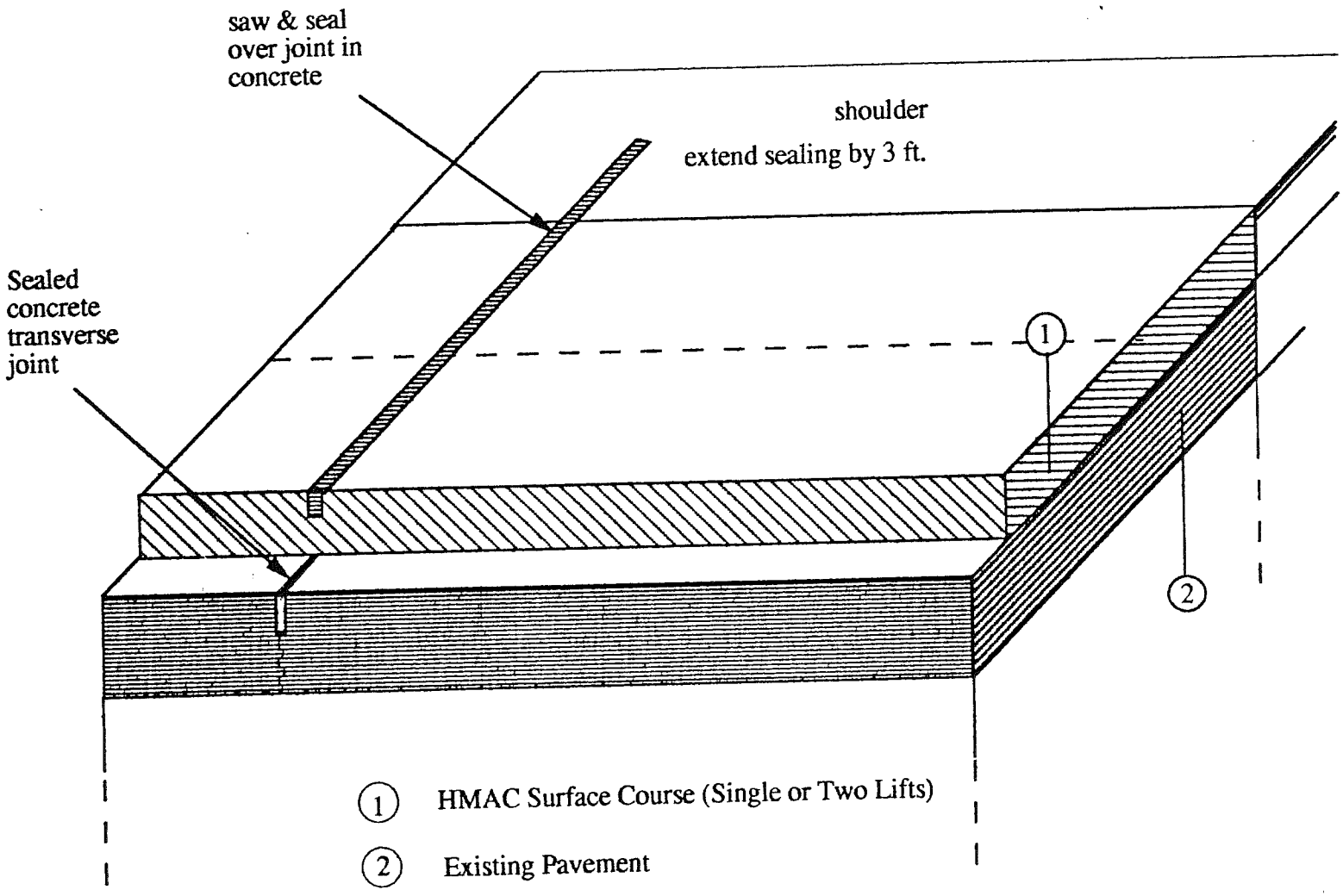
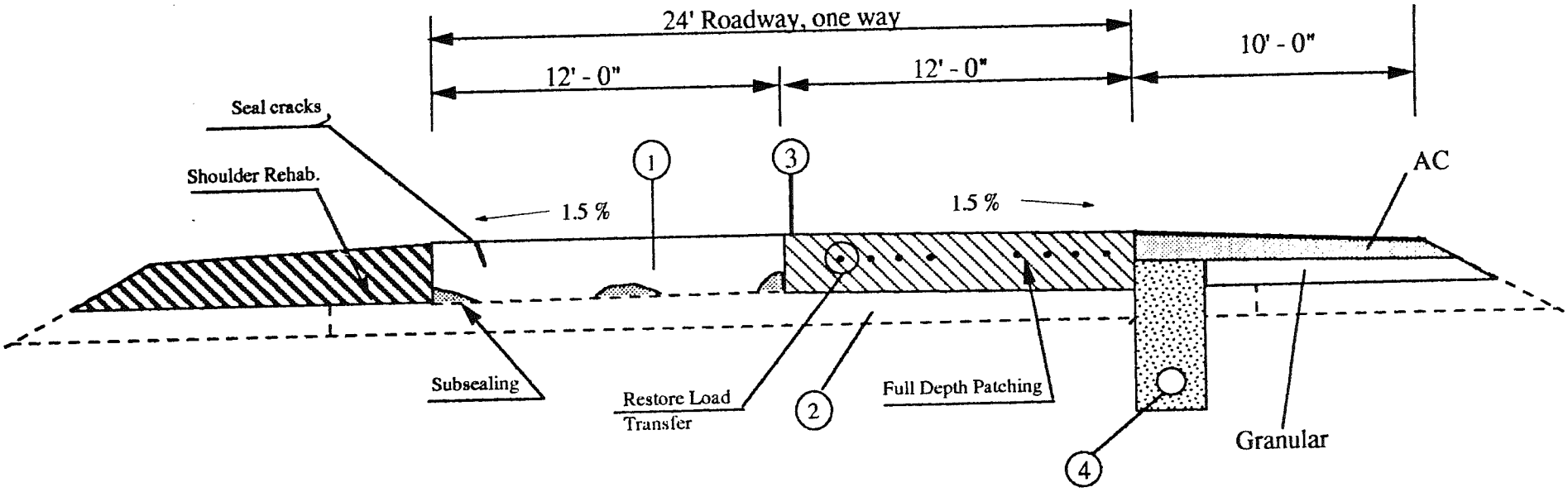


Figure A 4. SPS-6 section 4 with minimum restoration and saw and seal joints in 4-inch overlay. (500 ft.)

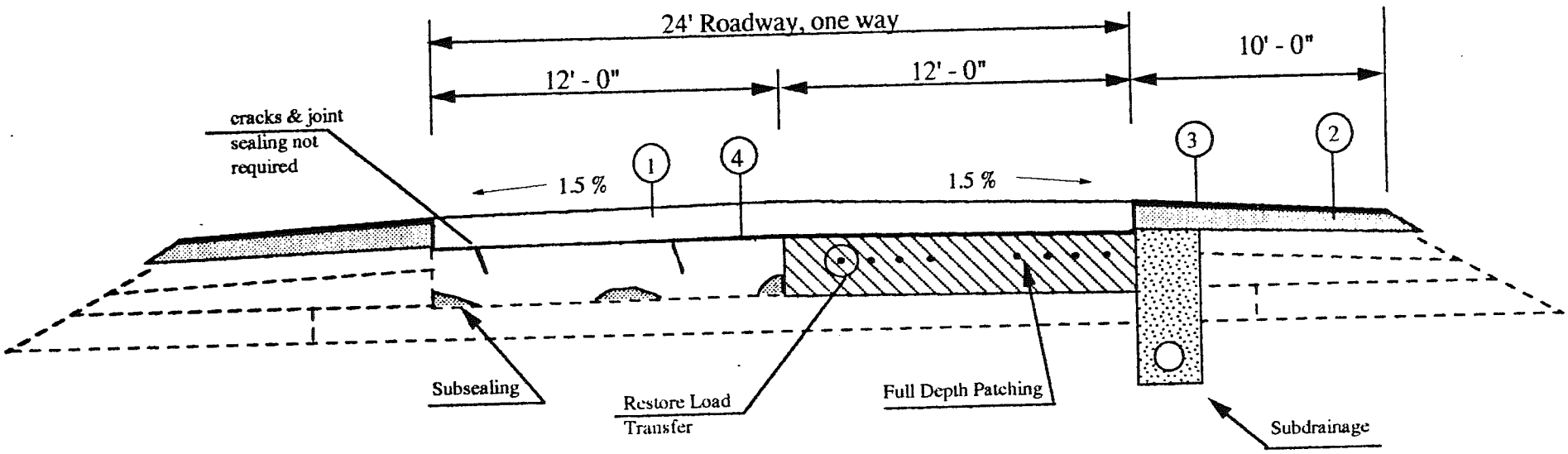


LEGEND

1. 8"- 10" JPCP/JRCP
2. Treated/Untreated Subbase
3. Grinding of Whole Pavement
4. Subdrainage at Edge

------ Existing Pavement

Figure A 5. SPS-6 section 5 with maximum restoration and no overlay. (1000ft.)



LEGEND

1. HMAC Surface Course Single or Two Lifts
2. Shoulder Materials -Agency Practice
3. Surface Treatment Course
4. Surface grinding - Grinding of Whole Pavement Not Required.

------ Existing Pavement

Figure A 6. SPS-6 section 6 with maximum restoration and 4-inch overlay. (500ft.)

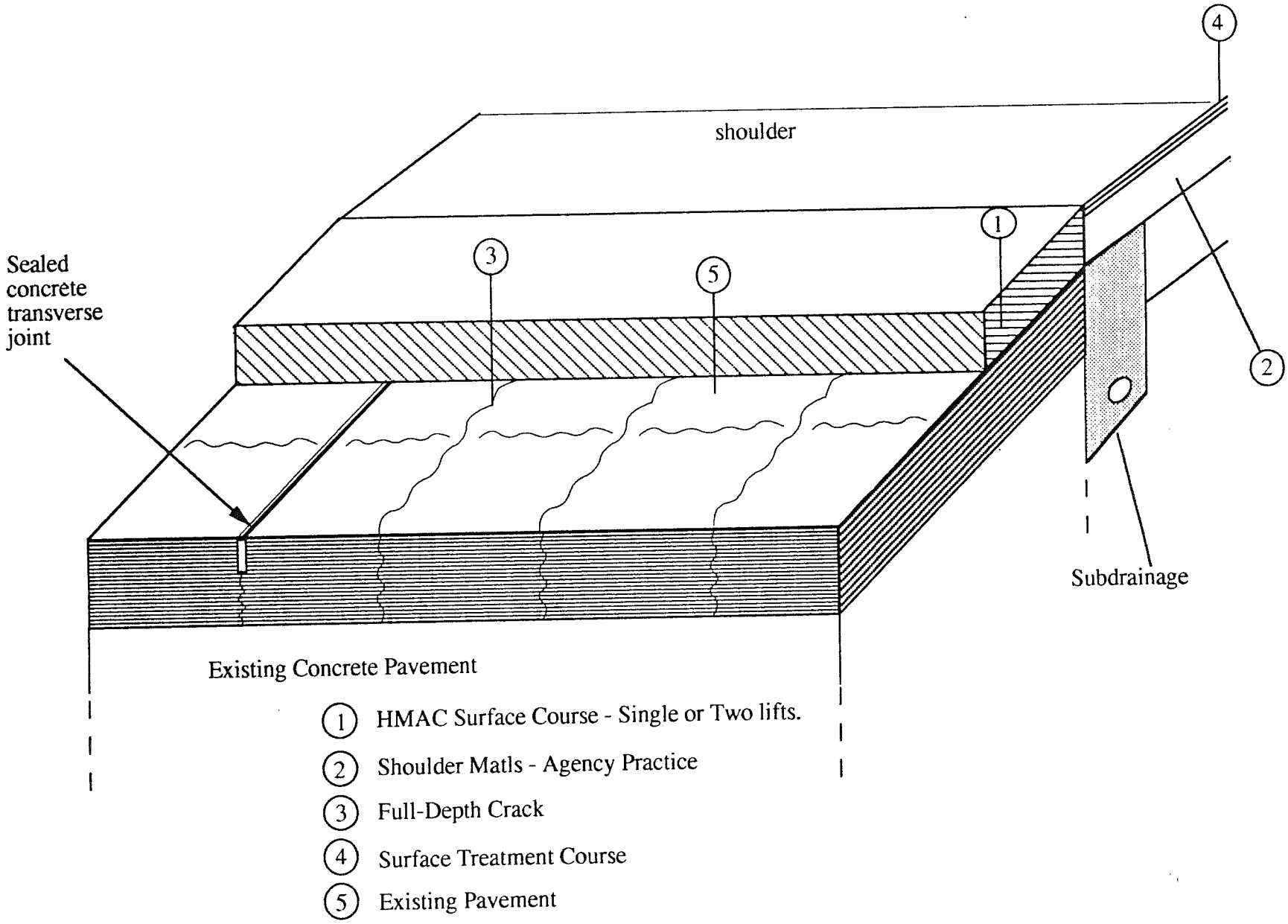


Figure A 7. SPS-6 section 7 with Crack and Seat with 4-inch overlay. (500 ft.)

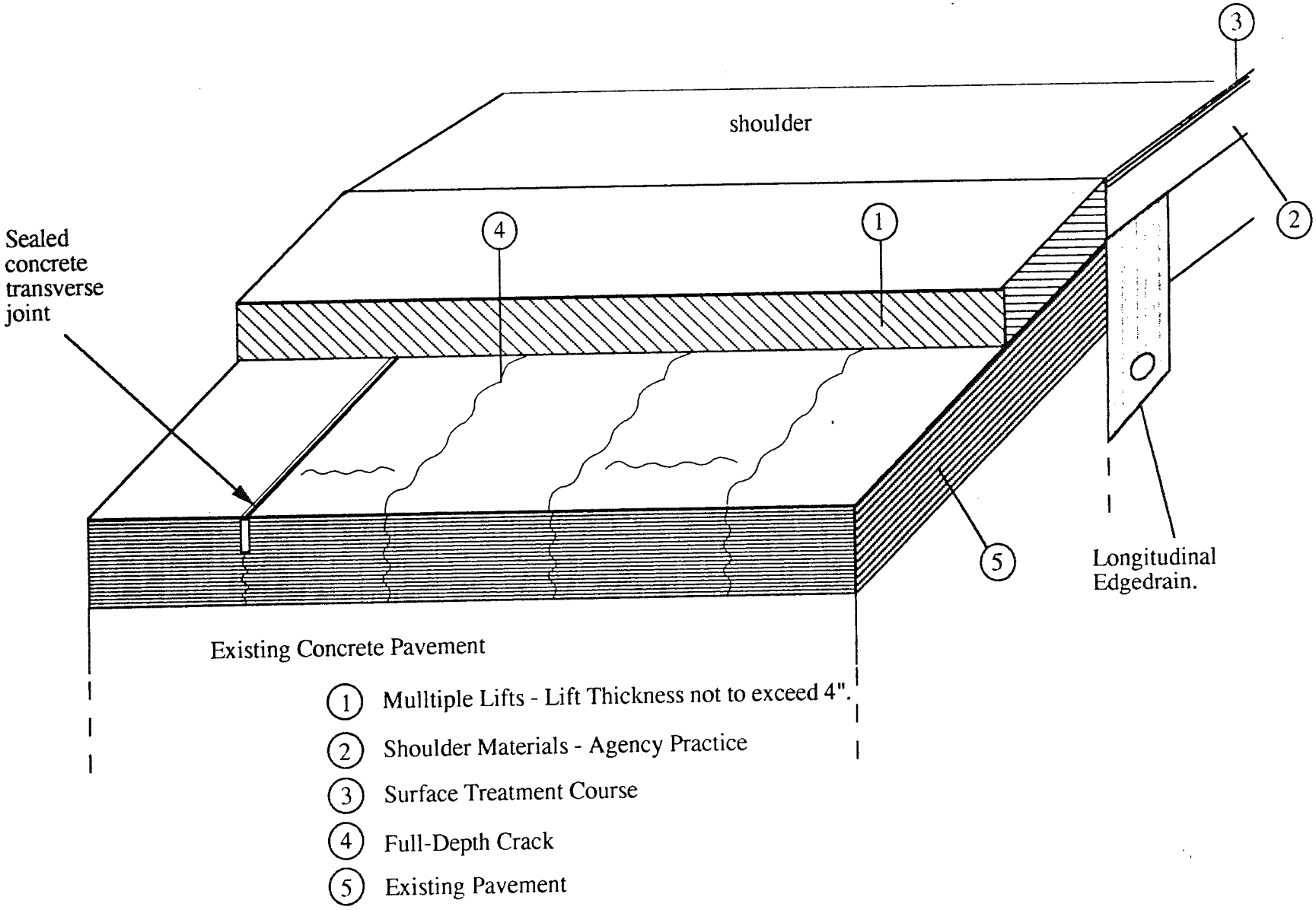


Figure A 8. SPS-6 section 8 with Crack and Seat with 8-inch overlay. (500 ft.)

APPENDIX B

MODEL SPECIFICATION FOR CRACK/BREAK AND SEAT OPERATIONS

APPENDIX B - MODEL SPECIFICATION FOR CRACK/BREAK AND SEAT OPERATIONS

DESCRIPTION

Crack and seat will be performed on jointed plain concrete pavements (JPCP) and break and seat on jointed reinforced concrete pavements (JRCP) prior to placement of a bituminous concrete overlay. Both of these processes will be "generically" referred to as cracking/breaking and seating (CBS) on existing Jointed Concrete Pavements (JCP) unless specifically differentiated for clarification. The work shall be performed in accordance with these specifications and in conformity with the lines, grades, and typical sections shown in the plans.

EQUIPMENT

The equipment for breaking the exposed JCP shall be approved by the Engineer and limited to the use of a "Guillotine" hammer or a "Pile Driver" hammer. The type of equipment used shall be capable of producing the desired cracking patterns described in these specifications and in the plans without significant displacement or spalling of the concrete. Further, the type of equipment used shall deliver such energy as necessary to provide a crack, distinguishable to the naked eye from a standing position, without the use of water or other materials, unless full-depth cracking has been established by coring.

A pneumatic tired roller of at least 50 tons shall be used for seating the broken slabs. Towing equipment shall have pneumatic tires and shall be capable of moving the roller forward and backward along predetermined lines.

The roller shall consist of four heavy pneumatic tire wheels mounted on a rigid steel frame. The wheels shall be evenly spaced in one line across the width of the roller and shall be arranged so that all wheels will carry approximately equal loads when operated over an uneven surface. The maximum center to center spacing between adjacent wheels shall not exceed 32 inches.

The tires shall be capable of operating at inflation pressures ranging from 90 to 150 pounds per square inch. The Contractor shall furnish the Engineer charts or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loading for particular tires furnished.

Ballast to obtain the weight directed by the Engineer shall consist of ingots of known unit weight, or sand bags with a unit weight of 100 pounds or bags of other material of known unit weight, or other suitable material such that the total weight of the ballast used can be readily determined at all times. There shall be a sufficient amount of ballast available to load the equipment to a maximum gross weight of at least 30 tons, preferably 50 tons.

CONSTRUCTION DETAILS

Before CBS operations begin, the Engineer will designate test strips. The Contractor shall crack/break the test strips using varying impact energies and striking patterns until full-depth breaking/cracking is established to the satisfaction of the Engineer. The pavement shall then be seated in a uniform manner to determine the number of passes so as to firmly seat the broken pieces against the subgrade. The impact energy, striking pattern, and number of passes for seating will then be required on the test sections. Cores should be taken within the test strips and as necessary throughout the rest of the breaking sections at locations designated by the Engineer to assure that full depth slab breaking is being achieved in accordance with the plans and this Specification. Debonding of the concrete from the reinforcing steel is required.

The full width of the existing JCP slab shall be broken by such equipment and by such a method so as to produce full-depth cracks.

Existing JRCP slabs shall be broken such that the majority of the broken pieces shall be 18 inches in size. No remaining piece should exceed 24 inches in any edge dimension. No more than 20 percent of the material shall have the maximum edge dimension. The pieces must generally be rectangular or diamond in shape.

Existing JPCP slabs shall be cracked such that the majority of the cracked surface material shall be no more than 3 feet in any edge dimension. The pieces must be generally in rectangular or square in shape.

Care must be taken to prevent the formation of continuous longitudinal breaks. The pavement shall be broken transversely such that the cumulative length of longitudinal breaks do not exceed 125 percent of the slab length.

CBS of JCP slabs will not be permitted over drainage facilities or utility lines such as gas, water, telephone, etc. nor on bridge approach slabs or decks.

The Contractor shall conduct the CBS operation in such a manner as to protect vehicles in the adjacent lane from flying debris.

Following CBS, the pavement shall be seated with a number of passes determined in the test section and conforming to the requirements for Equipment in this Specification. Any dust, dirt and debris in joints, cracks or on the surface shall be removed or swept away by use of a power broom or compressed air prior to placement of the overlay. Loose pieces of broken concrete that are not firmly seated shall be removed and replaced by patching as directed by the Engineer.

No traffic will be permitted on the broken and seated portion of the roadway until after the first course of the bituminous concrete overlay has been placed.

Placing of the first course of bituminous concrete shall follow the CBS, seating, and sweeping operation as closely as practicable, but in no case shall the broken JCP slab remain exposed more than 48 hours. If this 48-hour requirement is not met, CBS operations shall be suspended until all existing broken/cracked pavement has been covered by at least one course of the bituminous concrete overlay. All bituminous concrete overlay base and/or binder courses shall be placed and completed within a 10 working-day period.

The sequence of operations in conjunction with this item shall be performed in the following order:

1. Determine crack/break configuration, load energy, and number of passes for seating in test site

2. CBS existing JCP (core to check crack propagation)

3. Clean all joints, cracks and surface

4. Remove loose pieces and patch as directed by the Engineer

5. Apply tack coat

6. Place overlay

APPENDIX C

ASPHALT CONCRETE MIX DESIGN AND FIELD CONTROL

FHWA Technical Advisory T 50540.27

March 10, 1988

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

SUBJECT	FHWA TECHNICAL ADVISORY
ASPHALT CONCRETE MIX DESIGN AND FIELD CONTROL	T 5040.27 March 10, 1988

Par. 1. Purpose
2. Cancellation
3. Background
4. Materials
5. Mix Design
6. Plant Operations
7. Laydown and Compaction
8. Miscellaneous

1. PURPOSE. To set forth guidance and recommendations relating to asphalt concrete paving, covering the areas of materials selection, mixture design, and mixture production and placement. The procedures and practices outlined in the Technical Advisory (TA) are directed primarily towards developing quality asphalt concrete pavements for high-type facilities. The TA can also be used as a general guide for low-volume facilities.

2. Cancellation. Federal Highway Administration (FHWA) Technical Advisory T 5040.24, Bituminous Mix Design and Field Control, dated August 22, 1985, is cancelled.

3. BACKGROUND

a. Over one-half of the Interstate System and 70 percent of all highways are paved with hot-mix asphalt concrete. Asphalt concrete is probably the largest single highway program investment today and there is no evidence that this will change in the near future. However, there is evidence that the number of premature distresses in the nation's recently constructed asphalt pavements is increasing. Heavier truck axle weights, increased tire pressures, and inadequate drainage are some of the factors leading to the increase in premature distress. The FHWA has been concerned with the deterioration in quality of asphalt concrete pavements for many years and in 1987 a special FHWA Ad Hoc Task Force studied two of the most common distresses existing today and subsequently issued a report titled "Asphalt Pavement Rutting and Stripping." The report contained both short-term and long-term recommendations for improving the quality of asphalt pavements.

b. With the variables of environment, component materials, and traffic loadings found throughout the United States, it is not surprising that there are many State-to-State or regional variations of design and construction requirements. No one set of specifications can achieve the same results in all States because of the factors mentioned above. However, there are many things that States can do to improve their current mix design and field control procedures to ensure that quality asphalt pavements will be constructed. This TA incorporates many of the FHWA Task Force recommendations and presents the current

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state-of-the-art in materials, mix design, plant operation, laydown and compaction, and other areas relating to quality hot-mix asphalt pavements.

4. MATERIALS

a. Aggregate is the granular material used in asphalt concrete mixtures which make up 90-95 percent of the mixture weight and provides most of the load bearing characteristics of the mix. Therefore, the quality and physical properties of the aggregates are critical to the pavement performance. The following is recommended:

(1) Aggregates should be non-plastic. The presence of clay fines in an asphalt mix can result in problems with volume swell and adhesion of asphalt to the rock contributing to stripping problems. The minus #4 sieve material should have a minimum sand equivalent value of 45 using the test method described in the American Association of State Highway and Transportation Officials (AASHTO) specification (AASHTO T176).

(2) A limit should be placed on the amounts of deleterious materials permitted in the aggregates. Specifications should limit clay lumps and friable particles to a maximum of one percent.

(3) Durability or weathering resistance should be determined by sulfate soundness testing. Specifications should require a sodium or magnesium sulfate test using the limits described in the AASHTO specification M29.

(4) Aggregate resistance to abrasion should be determined. Specifications should require a Los Angeles abrasion loss of 45 percent or less (AASHTO T96).

(5) Friction between aggregate particles is dependent on aggregate surface roughness and area of contact. As surface friction increases, so does resistance of the mix to deformation. Specifications should require at least 60 percent of the plus #4 sieve material to have at least two mechanically induced fractured faces.

(6) The quality of natural sand varies considerably from one location to another. Since most natural sands are rounded and often contain a high percentage of undesirable materials, the amount of natural sand as a general rule should be limited to 15 to 20 percent for high volume pavements and 20 to 25 percent for medium and low volume pavements. These percentages may increase or decrease depending on quality of the natural sand and the types of traffic to which the pavement will be subjected.

(7) For adequate control, aggregate gradations should be specified from the maximum particle size to the #200 sieve so each successive sieve opening is about 1/2 the previous sieve opening (for example, 1 inch, 1/2 inch, #4, #8, #16, #30, #50, #100, #200). The only accurate method to determine the amount of minus #200 sieve material is to perform a wash gradation in accordance with AASHTO T27 and AASHTO T11.

(8) The ratio of dust (minus #200 sieve material) to asphalt cement, by mass, is critical. Asphalt concrete mixes should require a maximum dust asphalt ratio of 1.2 and a minimum of 0.6.

(9) A tool which is very useful in evaluating aggregate gradations is the 0.45 power gradation chart. All mixes should be plotted on these charts as part of the mix design process (Attachment 1).

(10) An aggregate's specific gravity and absorption characteristics are extremely important in proportioning and controlling the mixture. It is recommended that AASHTO T209 be used to determine the maximum specific gravity of asphalt concrete mixes. States not using AASHTO T209 should be aware of the difficulty of determining the theoretical maximum density using individual ingredient specific gravities and their percentages in the mixture. These difficulties will result in inaccuracies in determining the specific gravity of the mixture. These inaccuracies will carry through to the calculation of the densities in the compacted mat and may result in improperly compacted pavements. It is also necessary to determine the bulk dry specific gravity of the aggregate in order to determine the voids in the mineral aggregate (VMA).

The target value for VMA should be obtained through the proper distribution of aggregate gradation to provide adequate asphalt film thickness on each particle and accommodate the design air void system. In addition, tolerance used in construction quality control should be such that the mix designed is actually produced in the field.

b. Asphalt grade and characteristics are critical to the performance of the asphalt pavement. The following is recommended:

(1) Grade(s) of asphalt cement used in hot-mix paving should be selected based on climatic conditions and past performance.

(2) It is recommended that asphalt cement be accepted on certification by the supplier (along with the testing results) and State project verification samples. Acceptance procedures should provide information on the physical properties of the asphalt in a timely manner.

(3) The physical properties of asphalt cement that are most important to hot-mix paving are shown below. Each State should obtain this information (by central laboratory or supplier tests) and should have specification requirement(s) for each property except specific gravity.

(a) Penetration 77° F

(b) Viscosity 140° F

(c) Viscosity 275° F

(d) Ductility/Temperature

(e) Specific Gravity

(f) Solubility

(g) Thin Film Oven (TFO)/Rolling TFO; Loss on Heating

(h) Residue Ductility

(i) Residue Viscosity

(j) Low temperature cracking is related to the physical properties of the asphalt and may be increased by the presence of wax in the asphalt. The low temperature ductility test at 39.2° F (4° C) can indicate where this may be a problem. The test is performed at a pull speed of 1 cm/min. Typical specification requirements are:

AASHTO M226	Table 2
AC 2.5	50 + cm
AC 5	25 + cm
AC 10	15 + cm
AC 20	5 + cm

(4) The temperature viscosity curves or absolute and kinematic viscosity information should be available at the mixing plant for each shipment of asphalt cement. This can identify a change in asphalt viscosity which necessitates a new mix design. Each State should provide temperature/viscosity information on the asphalt used in the laboratory mix design to the projects. Differences in the viscosity (as well as the penetration) of the asphalt from the asphalt used in the mix design may indicate the necessity to redesign the mix (Attachment 2).

5. MIX DESIGN

a. Asphalt concrete mixes should be designed to meet the necessary criteria based on type of roadway, traffic volumes, intended use, i.e., overlay on rigid or flexible pavements, and the season of the year the construction would be performed. Each State's mix design criteria should be as follows.

Property	Heavy Traffic Design (>1,000,000 ESAL*)	Medium Traffic Design (10,000-1,000,000 ESAL)	Light Traffic Design (<10,000 ESAL)
Marshall			
Compaction Blows	75	50	35
Stability (min.)	~~1,500~~ 1,800**	~~750~~ 1,200**	~~500~~ 750**
Flow	8-~~16~~ 14**	8-~~18~~ 16**	8-~~20~~ 18**
Hveem			
Stability (min.)	37	35	30
Swell (max)**	0.030 in.	0.030 in.	0.030 in.
Void Analysis			
Air Voids	3-5	3-5	3-5

* Equivalent Single Axle Load

** Revised to conform to the Asphalt Institute MS-2, Table III-2, 1988

MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE (VMA)

Nominal Maximum Particle Size U.S.A. Standard Sieve Designation	Minimum Voids in Mineral Aggregate Percent
No. 16	23.5
No. 8	21
No. 4	18
3/8 in.	16
1/2 in.	15
3/4 in.	14
1 in.	13
1-1/2 in.	12
2 in.	11.5
2-1/2 in.	11

b. Standard mix design procedures (Marshall, Hveem) have been developed and adopted by AASHTO, however, some States have modified these procedures for their own use. Any modification from the standard procedure should be supported by correlation testing for reasonable conformity to the design values obtained using the standard mix design procedures.

c. Stripping in the asphalt pavements is not a new phenomenon, although the attention to it has intensified in recent years. Moisture susceptibility testing should be a part of every State's mix design procedure. The "Effect of Water on Compacted Bituminous Mixtures" (immersion compression test) (AASHTO T165) and "Resistance of Compacted Bituminous Mixture to Moisture Induced Damage" (AASHTO T283) are currently the only stripping test procedures which have been adopted by AASHTO. The AASHTO T283, commonly known as the Lottman Test, requires that the test specimens be compacted so as to have an air void content of 7 $\pm$ 1 percent, while AASHTO T165 does not. This air void content is what one would expect in the mat after construction compaction. There is considerable research underway on developing better tests for determining moisture damage susceptibility of the aggregate asphalt mixtures. One of the most promising test procedures is that developed by Tunnicliff and Root as reported in the National Cooperative Highway Research Program (NCHRP) Report 274. This test is similar to AASHTO T283, but it takes less time to perform. In the majority of cases hydrated lime and portland cement have proven to be the most effective anti-stripping additives.

d. The determination of air voids in the laboratory mix is a critical step in designing and controlling asphalt hot-mix. In order to determine air voids, the theoretical maximum density or the maximum specific gravity of the mix must be determined. This can be accomplished by using the "Maximum Specific Gravity of Bituminous Paving Mixtures" (Rice Vacuum Saturation) (AASHTO T209).

e. Proper mix design procedures require that each mix be designed using all of the actual ingredient materials including all additives which will be used on the project.

f. The complete information on the mix design should be sent to the plant. The following information should be included in the mix design report and sent to the plant.

(1) Ingredient materials sources

(2) Ingredient materials properties including:

(a) Specific gravities

(b) L. A. Abrasion

(c) Sand equivalent

(d) Plastic Index

(e) Absorption

(f) Asphalt temperature/viscosity curves or values

(3) Mix temperature and tolerances

(4) Mix design test property curves

(5) Target asphalt content and tolerances

(6) Target gradations for each sieve and tolerances

(7) Plot of gradation on the 0.45 power gradation chart, and

(8) Target density

g. Formal procedures should be established to require that changes to mix designs be approved by the same personnel or office that developed the original mix design.

h. After start-up, the resulting mixture should be tested to verify that it meets all of the design criteria.

6. PLANT OPERATIONS

a. In order to assure proper operation, an asphalt plant must be calibrated and inspected. Plant approval should be required and should cover each item on the asphalt plant checklist (Attachment 3).

b. To avoid or mitigate unburned fuel oil contamination of the asphalt mixture, the use of propane, butane, natural gas, coal or No. 1 or No. 2 fuel oils is recommended.

c. If the asphalt cement is overheated or otherwise aged excessively, the viscosity of the recovered asphalt will exceed that of the original asphalt by more than four times. However, if the viscosity of the recovered asphalt is less or even equal to the original viscosity, it has probably been contaminated with unburned fuel oil.

d. For drum mixer and screenless batch plants there should be three separate graded stockpiles for surface courses and four for binder and base courses. Each stockpile should contain between 15 to 50 percent by weight of the aggregate size in the mix design. The plus #4 sieve aggregate stockpile should be constructed in lifts not exceeding 3 feet to a maximum height of 12 feet. There should be enough material in the stockpiles for at least 5 days of production. The plant should be equipped with a minimum of four cold feed bins with positive separation.

e. Control testing of gradation and asphalt content should be conducted to assure a quality and consistent mixture. In many States, the contractor or supplier is required to do this testing.

f. Acceptance testing should be conducted for gradation and asphalt content of the final mixture.

g. The plotting of control and acceptance test results for gradation, asphalt content, and density on control charts at the plant provides for easy and effective analysis of test results and plant control.

h. The moisture content of the aggregate must be determined for proper control of drum mixer plants. The asphalt content is determined by the total weight of the material that passes over the weigh bridge with the correction made for moisture. Sufficient aggregate moisture contents need to be performed throughout the day to avoid deviations in the desired asphalt content.

i. Moisture contents of asphalt mixtures is also important. The extraction and nuclear asphalt content gauge procedures will count moisture as asphalt. For this reason, a moisture correction should be made. In addition, high moisture contents in asphalt mixtures can lead to compaction difficulty due to the cooling of the mix caused by evaporation of the moisture. This is particularly important with drum mixer mixes which require moisture for the mixing process. Some States specify a maximum moisture content behind the paver. A recommended maximum moisture content behind the paver is 0.5 percent.

7. LAYDOWN AND COMPACTION

a. Prior to paving start-up, equipment should be checked to assure its suitability and proper function. Project equipment approval should include the items shown on the project inspection checklist (Attachment 4).

b. Paving start-up should begin with a test strip section. This will allow for minor problems to be solved, establishment of roller patterns and number of passes, and will assure that proper placement and compaction can be attained.

c. In order to assure proper placement and compaction, it is essential that the mat be placed hot. Establishment of and compliance with the following items should be included; minimum mix, underlying pavement, and ambient temperatures. Cold weather and early or late season paving should be avoided. The practice of raising the temperature of the mixture to combat the cold conditions should not be permitted, as this will contribute to excessive aging of the asphalt cement.

d. The use of a pneumatic roller in the compaction process is strongly encouraged. When used in the intermediate rolling it will knead and seal the mat surface and aid in preventing the intrusion of surface water into the pavement layers. It will also contribute to the compaction of the mat.

e. Density requirements should be established to result in an air void system in the mat of 6-8 percent immediately after construction. This allows for the inherent additional densification under traffic to an ultimate air void content of about 3-5 percent. Density acceptance specifications should require a percentage of maximum density as determined by AASHTO T209. A percentage of test strip density or Marshall laboratory density can be used provided each is related to the maximum density. The specified density should be attained before the mat temperature drops below 175° F.

f. Density measurement should be accurate, taken frequently, and the results made available quickly for each day of production. Density should be determined by test cores, or by properly calibrated nuclear test gauges. Specifications should require several tests to be averaged to determine density results for acceptance.

g. Successive hot-mix courses should not be placed while previous layers are wet. To avoid, or minimize the penetration of water into base and binder courses, paving operations should be scheduled so that the surface layer(s) is placed within a reasonable period after these courses are constructed. To the greatest extent possible, construction should be planned to avoid the necessity of leaving layers uncovered during wet seasons of the year.

8. MISCELLANEOUS

a. Some States have established procedures to accept out-of-specification material and pavement with a reduction in price. These procedures include definition of lot size/production time, tolerances, and pay factor reductions for ingredient materials, combined mixture properties, pavement density, pavement smoothness, and lift thickness.

b. Prior to the start of production and placement operations, a preplacement conference, including all the paving participants, should be held. This conference would define duties and responsibilities for each phase of the operation as well as problem solving procedures.

c. During start-up it is very effective to have a construction and/or materials specialist at the project site to assist in identifying and solving any problem that develops.

d. Because asphalt hot-mix pavement construction is complex, it requires that each person involved understand his/her function thoroughly. It is also helpful if each person has a basic understanding of each of the many phases involved. It is recommended that States develop or use existing training to address these phases of asphalt paving.

Ronald E. Heinz
Associate Administrator for
Engineering and Program Development

4 Attachments

AGGREGATE GRADATION

It has long been established that gradation of the aggregate is one of the factors that must be carefully considered in the design of asphalt paving mixtures, especially for heavy duty highways. The purpose in establishing and controlling aggregate gradation is to provide sufficient voids in the asphalt aggregate mixture to accommodate the proper asphalt film thickness on each particle and provide the design air void system to allow for thermal expansion of the asphalt within the mix. Minimum voids in the mineral aggregate (VMA) requirements have been established and vary with the top aggregate size.

Traditionally, gradation requirements are so broad that they permit the use of paving mixtures ranging from coarse to fine and to either low or high stability. To further complicate matters, different combinations of sieve sizes are specified to control specific grading ranges. Standardization of sieve sizes and aggregate gradations, which has often been suggested, is not likely to occur because of the practice of using locally available materials to the extent possible.

In the early 1960's, the Bureau of Public Roads introduced a gradation chart (Figure #1) which is especially useful in evaluating aggregate gradations. The chart uses a horizontal scale which represents sieve size openings in microns raised to the 0.45 power and a vertical scale in percent passing. The advantage in using this chart is that, for all practical purposes, all straight lines plotted from the lower left corner of the chart, upward and toward the right to any specific nominal maximum particle size, represent maximum density gradations. The nominal maximum particle sieve size is the largest sieve size listed in the applicable specification upon which any material is permitted to be retained. An example is shown in Figure #2.

The gradations depicted in Figure #3 and #4 are exaggerated to illustrate the points being made. By using the chart, aggregate gradations can be related to maximum density gradation and used to predict if the mixture will be fine or coarse textured as shown in Figure #3.

Soon after the chart was developed, it was used to study gradations of aggregate from several mixtures that had been reported as having unsatisfactory compaction characteristics. These mixtures could not be compacted in the normal manner because they were slow in developing sufficient stability to withstand the weight of the rolling equipment. Such mixtures can be called "tender mixes." This study identified a consistent gradation pattern in these mixes as is illustrated in Figure #4.

Most notable is the hump in the curve near the #40 sieve and the flat slope between the #40 sieve and the #8 sieve. This indicates a deficiency of material in the #40 to 8# sieve range and an excess of material passing the #40 sieve. Mixtures with an aggregate exhibiting this gradation characteristic are susceptible to being tender, particularly if the fines are composed of natural sand.

As part of the bituminous mix design process, the aggregate gradation should be plotted on the 0.45 power gradation chart.

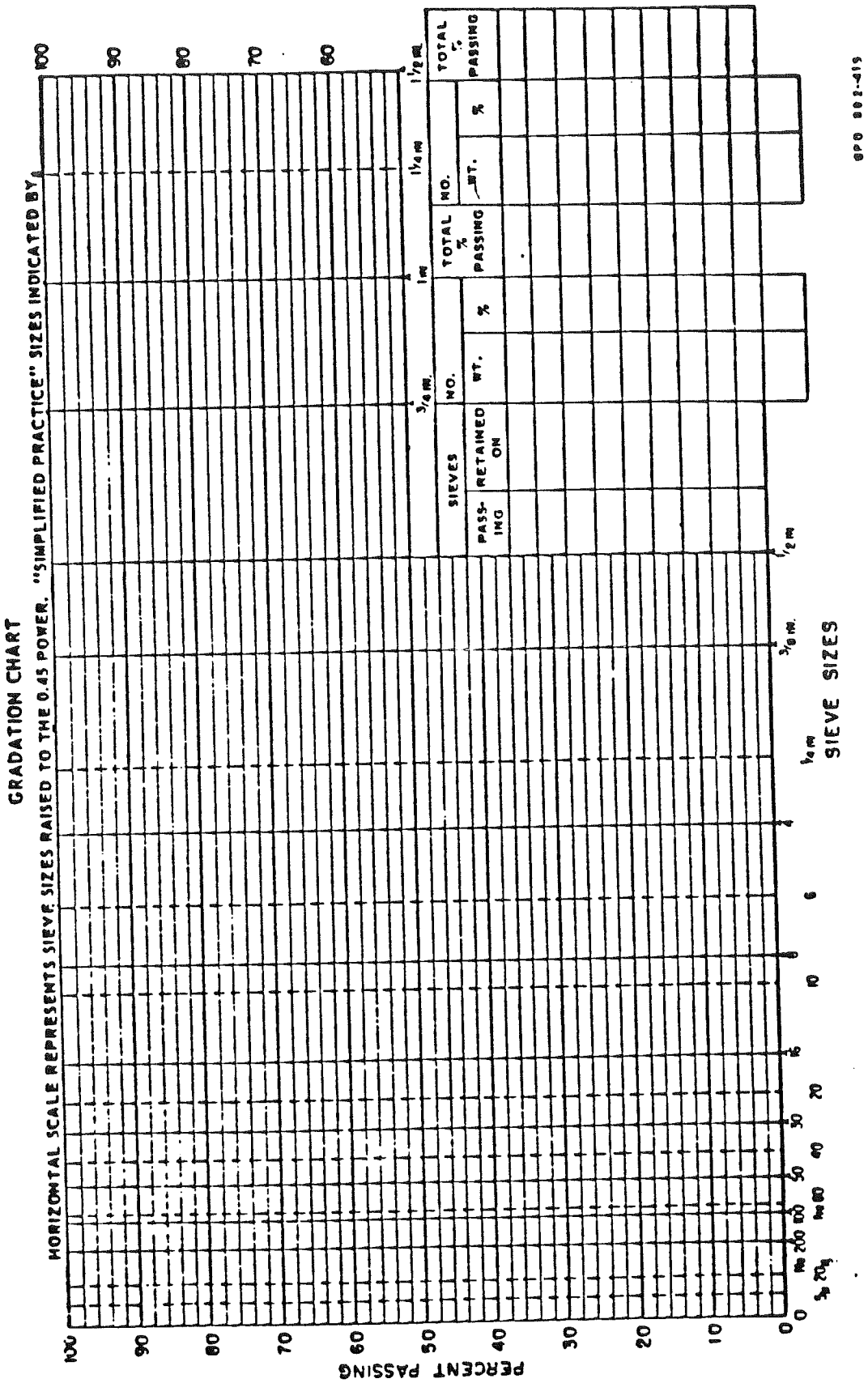

GRADATION CHART
HORIZONTAL SCALE REPRESENTS SIEVE SIZES RAISED TO THE 0.45 POWER. "SIMPLIFIED PRACTICE" SIZES INDICATED BY
PERCENT PASSING
SIEVE SIZES
SIEVES
PASS-ING
RETAINED ON
NO.
WT.
%
TOTAL % PASSING
TOTAL % PASSING

Figure #1

0.45 Power Gradation Chart

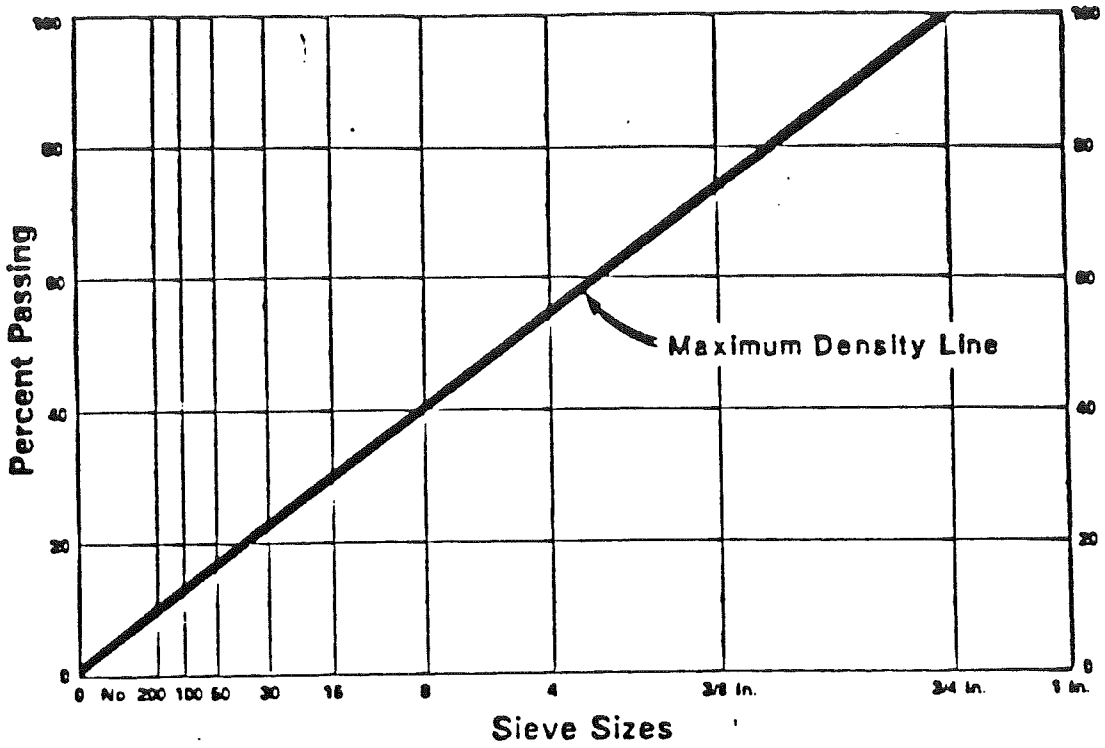


Figure #2

0.45 Power Gradation Chart

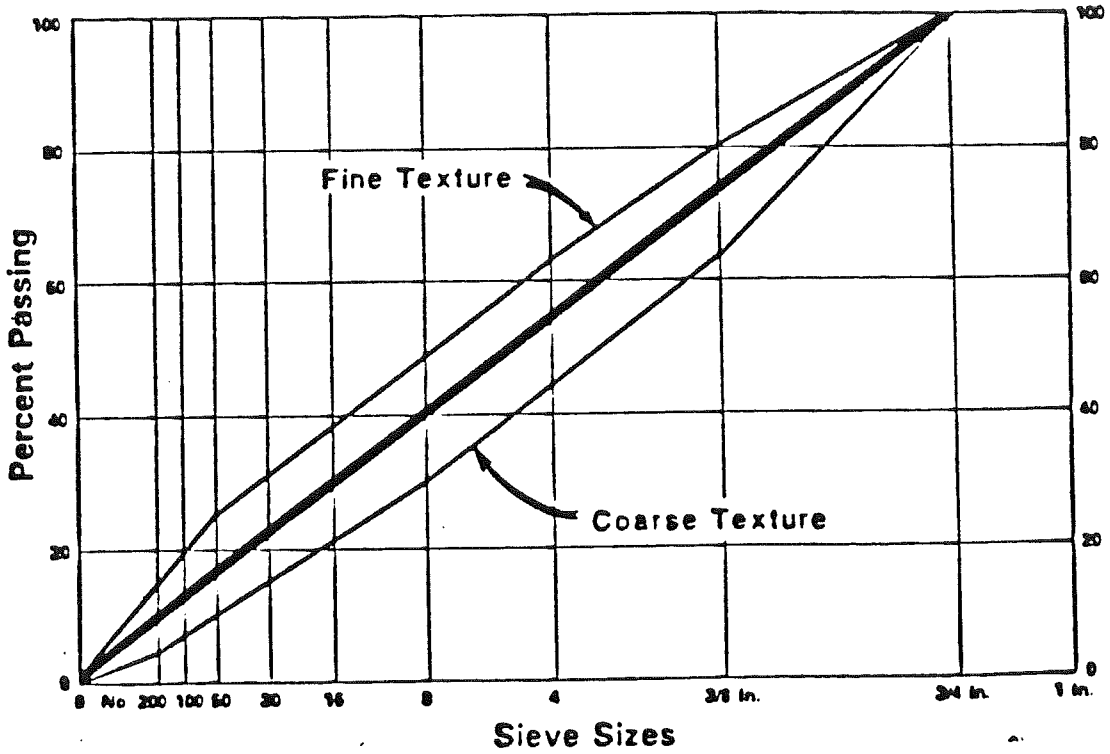


Figure #3

0.45 Power Gradation Chart

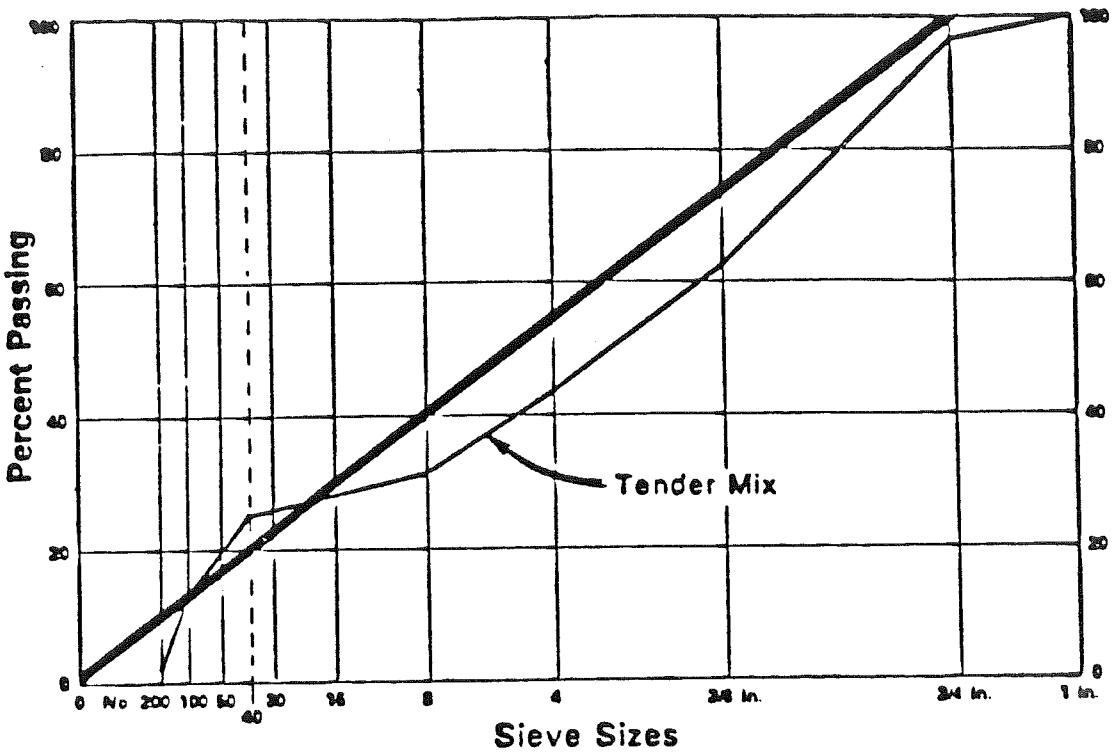


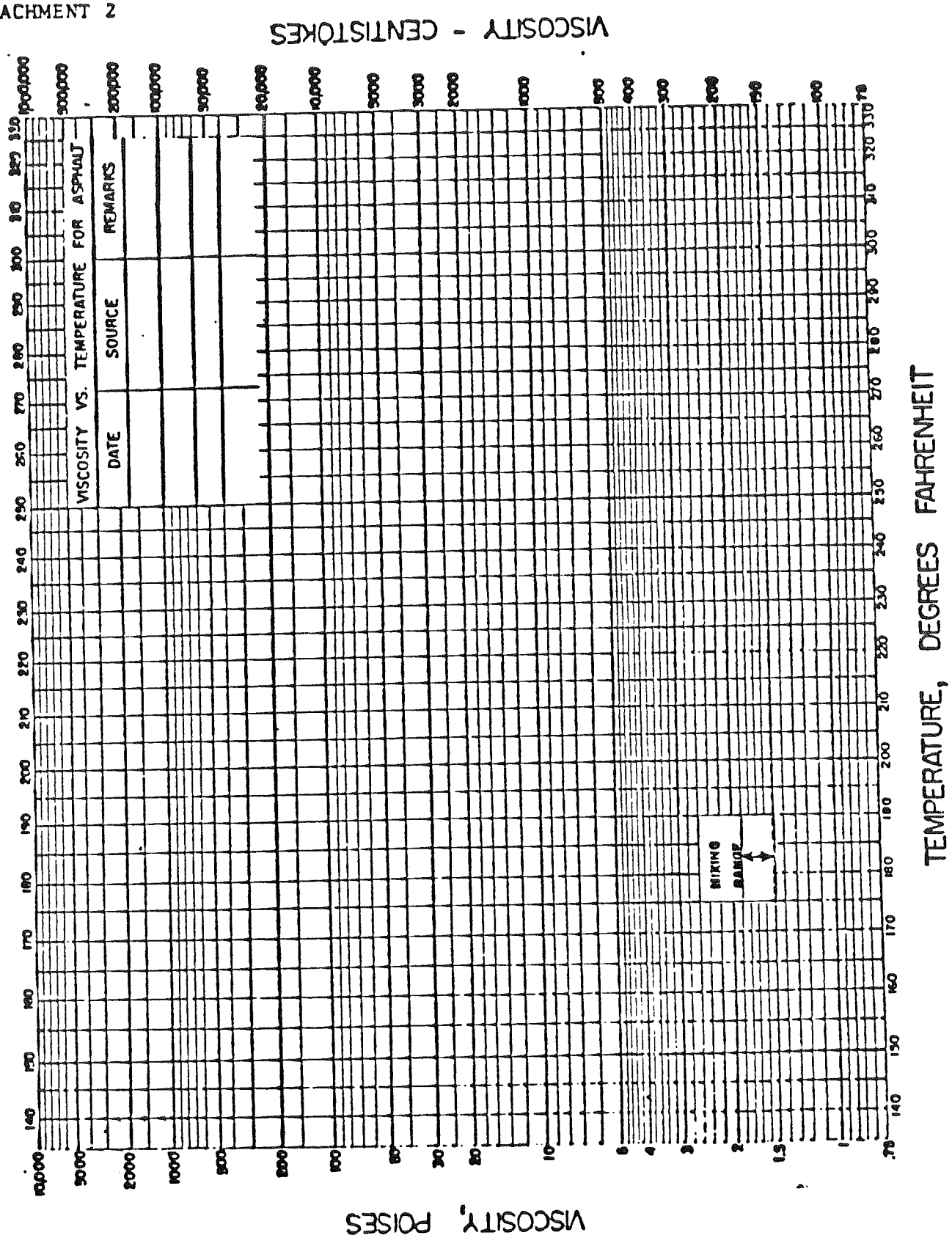
Figure #4

ASPHALT VISCOSITY

Each particular asphalt has a unique temperature-viscosity relationship. This relationship is sometimes described as temperature susceptibility. This temperature-viscosity relationship can be plotted on a modified semi-log chart as shown on the attached chart. These charts are very useful in determining the optimum mixing and compacting temperature of a particular asphalt. Past research has identified the optimum mixing temperature as that corresponding to a viscosity of 170 $\pm$ 20 centistokes, and the optimum compaction temperature as that corresponding to a viscosity of 280 $\pm$ 30 centistokes for laboratory mix design. The optimum mixing temperature should be identified for the asphalt used in the mix design and included in the mix design report which is sent to the production plant.

Prior to the oil embargo, there was a relatively fixed distribution system for crude oil. This allowed for a relatively uniform asphalt cement from each refinery. Highway agencies became familiar with the handling and performance characteristics of those asphalt cements. As a result of the embargo, a new variable distribution system is in place which allows shifting and blending of crude oils resulting in production of asphalt cements with very different temperature viscosity characteristics.

The attached chart will allow plotting the temperature-viscosity curve for the asphalts used in a State or a particular asphalt from a project. If the kinematic viscosity (275° F) of the asphalt being used changes from the kinematic viscosity of the asphalt used in the mix design by a factor of more than about two, a new mix design should be required.


VISCOSITY - CENTISTOKES
VISCOSITY VS. TEMPERATURE FOR ASPHALT
DATE
SOURCE
REMARKS
MIXING RANGE
TEMPERATURE, DEGREES FAHRENHEIT
VISCOSITY, POISES

MODEL CHECK LIST FOR ASPHALT PLANT

COMPANY _____

LOCATION _____ INSPECTED BY _____ DATE _____

TYPE PLANT AND MANUFACTURER NAME _____

MAXIMUM BATCH _____ LBS.

RATED TONS PER HOUR _____

PROJECT NO. _____ COUNTY _____

I. Stockpiles

1. Properly separated.
2. Material segregated.
3. Has contractor submitted and received approval of intended materials sources and job mix formula?
4. Is area clean and properly kept?

II. General Requires for all Plants

1. Are tanks for storage of asphalt cement equipped for heating the material under effective and positive control at all times?
2. Are tanks or storage material properly heated?
3. Is a circulating system for the asphalt cement of adequate capacity to provide proper and continuous circulation between storage tank and proportioning units during the entire operating period?
4. Is the discharge end of the asphalt cement circulating pipe kept below the surface of the material in the storage tank?
5. Are all pipe links and fittings steamed, oil jacketed, or otherwise properly insulated to prevent heat loss?
6. Is storage tank capacity such as to ensure continuous operation of the plant and uniform temperature of the asphalt cement when it is mixed with the aggregate?
7. Are tanks accurately calibrated to 100 gallons (378.5 L) and accessible for measuring the volume of the asphalt cement?
8. Is a sampling outlet provided in the asphalt feed lines?
9. Is a drainage receptacle provided for flushing the outlet prior to sampling?

III. Anti-Strip and Other Additive Systems

1. Is anti-strip material added at plant site?
2. If anti-strip material is added at plant site, does the anti-strip system meet specifications?
3. If other approved additives are used, are they handled in accordance with an established procedure?

IV. Cold Feed System

1. Number of cold bins._____
2. Does plant have mechanical or electrical means for uniformly feeding the aggregates into the dryer?
3. Does cold feed have a synchronized proportioning method when blending aggregates from two or more bins?
4. If mineral filler is required, is a separate bin provided?
5. Is the feeder for mineral filler furnished with the feeder drive positively interlocked and synchronized with the aggregate feeds?

V. Drier

1. Number of driers._____
2. Is a drier of satisfactory design provided?

VI. Dust Collectors and Emission Controls

1. What type dust collector is provided?
2. Can the material collected in the dust collector be wasted or any part or all of the material be returned to the aggregate mixture?
3. Does the plant meet applicable limitations on emissions?
4. Has company received a permit to operate from EPA?

VII. Thermometric Equipment

1. Is a recording pyrometer or armored thermometer located in the asphalt cement feed line near the discharge end at the mixer unit?
2. Is the plant equipped with recording pyrometers, or armored thermometers or other approved thermometric instruments at the discharge end of the drier?
3. Has accuracy of pyrometers or thermometers been checked?

VIII. Surge and Storage Bins

1. Is plant equipped with surge or storage bins?
2. What type bin? Surge or storage?
3. Is unit enclosed, insulated, weather proof?
4. Is unit equipped with material level indicator?
5. Is the indicator visible from plant operator or weigh master's station?
6. Does unit have approved thermometric instrument so placed to indicate automatically the temperature of mixture at discharge?

7. Is conveyer system covered and insulated (if necessary) so as to prevent excessive loss of heat during transfer of material from mixing plant to storage bin?
8. Does storage bin have acceptable heating system?
9. Has surge or storage bin received prior evaluation and approval before using?

IX. Safety and Inspection Provisions

1. Are gears, pulleys, chains, sprockets, and other dangerous moving parts thoroughly protected?
2. Is an unobstructed and adequately guarded passage provided and maintained in and around the truck loading space for visual inspection purposes?
3. Does plant have adequate and safe stairways or guarded ladders to plant units such as mixer platforms, control platforms, hot storage bins, asphalt storage tanks, etc. where inspections are required?
4. Is an inspection platform provided with a safe stairway for sampling the asphalt mixture from loaded trucks?

X. Truck Scales

1. Are scales capable of weighing the entire vehicle at one time?
2. Do scales have digital printing recorder or automatic weight printer?
3. Have scales been checked and certified by a reputable scale company in the presence of an authorized representative of the highway department?
4. Date checked _____ Agency Name _____
5. Is copy of certification available?
6. Remarks _____

XI. Transportation Equipment

1. Are truck bodies clean, tight, and in good condition?
2. Do trucks have covers to protect material from unfavorable weather conditions?
3. Is soapy water or other approved products available for coating truck bodies to prevent material from sticking? Diesel fuel should not be used.
4. Type of material used. _____

XII. Provisions for Testing

1. Does size and location of laboratory comply with specifications?
2. Is laboratory properly equipped?
3. Is laboratory acceptable?

SPECIAL REQUIREMENTS FOR BATCH PLANTS

XIII. Weigh Box or Hopper

1. Is weigh box large enough to hold full batch?
2. Does gate close tightly so that material cannot leak into the mixer while a batch is being weighed?

XIV. Aggregate Scales

1. Are scales equipped with adjustable pointers or markers for marking the weight of each material to be weighed into the batch?
2. Are ten 50-lb. (22.7 kg) weights available for checking scales?
3. Has accuracy of weights been checked?
4. Have scales been checked and certified by a reputable scales company in the presence of an authorized representative of the highway department?
   Date checked _____ Agency Name _____
   Is copy of certification available?
   Remarks _____
   _____
   _____
   _____
   _____
5. If the plant is equipped with beam type scales, are the scales equipped with a device to indicate at least the last 200 lb. (97 kg) of the required load?

XV. Asphalt Cement Bucket

1. Is bucket large enough to handle a batch in a single weighing so that the asphalt material will not overflow, splash or spill?
2. Is the bucket steamed, or oil-jacketed or equipped with properly insulated electric heating units?
3. Is the bucket equipped to deliver the asphalt material over the full length of the mixer?

XVI. Asphalt Cement Scales

1. Have scales been checked and certified by a reputable scale company in the presence of an authorized representative of the highway department?
   Date checked _____ Agency Name _____
   Is copy of certification available?
   Remarks _____

   _____

2. Are scales equipped with a device to indicate at least the last 20 lb. (9.1 kg) of the approaching total load?

XVII. Screens

1. Condition of screens. Satisfactory _____ Unsatisfactory _____
2. Do the plant screens have adequate capacity and size range to properly separate all the aggregate into sizes required for proportioning so that they may be recombined consistently?

XVIII. Hot Bins

1. Number of bins? _____
2. Are bins properly partitioned?
3. Are bins equipped with overflow pipes?
4. Will gates cut off quickly and completely?
5. Can samples be obtained from bins?
6. Are bins equipped with device to indicate the position of aggregate at the lower quarter point?

XIX. Asphalt Control

1. Are means provided for checking the quantity or rate of flow of asphalt material?
2. Time required to add asphalt material into pugmill.

XX. Mixer Unit for Batch Method

1. Is the plant equipped with an approved twin pugmill batch mixer that will produce a uniform mixture?
2. Can the mixer blades be adjusted to ensure proper and efficient mixing?
3. Are the mixer blades in satisfactory condition?
4. What is the clearance of the mixer blades? _____ in.
5. Does the mixer gate close tight enough to prevent leakage?
6. Does the mixer discharge the mixture without appreciable segregation?
7. Is the mixer equipped with time lock?
8. Does timer lock the weigh box gate until the mixing cycle is completed?

9. Will timer control dry and wet mixing time?
10. Can timer be set in 5 second intervals throughout the designated mixing cycles?
11. Can timer be locked to prevent tampering?
12. Is a mechanical batch counter installed as part of the timing device?

XXI. Automation of Batching

1. If the plant is fully automated, is an automatic weighing, cycling and monitoring system installed as part of the batching equipment?
2. Is the automatic proportioning system capable of weighing the materials within ± 2 percent of the total sum of the batch sizes?

SPECIAL REQUIREMENT FOR DRUM MIXERS

XXII. Aggregate Delivery System

1. Number of cold feed bins? _____
2. Are cold feed bins equipped with devices to indicate when the level of the aggregate in each bin is below the quarter point?
3. Does the cold feed have an automatic shut-off system that activates when any individual feeder is interrupted?
4. Are provisions available for conveniently sampling the full flow of material from each cold feed and the total cold feed?
5. Is the total feed weighed continuously?
6. Are there provisions for automatically correcting the wet aggregate weight to dry aggregate weight?
7. Is the flow of aggregate dry weight displayed digitally in appropriate units of weight and time and totaled?
8. Are means provided for diverting aggregate delivery into trucks, front-end loaders, or other containers for checking accuracy of aggregate delivery system?
9. Is plant equipped with a scalping screen for aggregate prior to entering the conveyor weigh belt?

XXIII. Asphalt Cement Delivery System

1. Are satisfactory means provided to introduce the proper amount of asphalt material into the mix?
2. Does the delivery system for metering the asphalt material prove accurate within ± 1 percent?
3. Does the asphalt material delivery interlock with aggregate weight control?
4. Is the asphalt material flow displayed in appropriate units of volume or weight and time and totaled?
5. Can the asphalt material be diverted into distributor trucks or other containers for checking accuracy of delivery systems?

XXIV. Drum Mixer

1. Is the drum mixer capable of drying and heating the aggregate to the moisture and temperature requirements set forth in the specifications, and capable of producing a uniform mix?
2. Does plant have provisions for diverting mixes at start-up and shutdowns or where mixing is not complete or uniform?

XXV. Is plant approved for use?
If not, explain what needs to be corrected. (Show Item Number)

_____
_____
_____
_____
_____
_____

PROJECT INSPECTION CHECKLIST

Compaction of Foundation

1. Have all courses of the foundation been compacted to required density?

Old Asphalt Pavement

1. Have all potholes been patched?
2. Have all necessary patches been made?
3. Have all loose material and "fat" patches been removed?
4. Have all depressions been filled and compacted?
5. Has fog seal been used on surface that has deteriorated from oxidation?
6. Has an emulsified asphalt slurry seal been applied on old surfaces with extensive cracking?

Rigid Type Pavement

1. Has pavement been under sealed where necessary?
2. Has premolded joint material and crack filler been cleaned out?
3. Have all "fat" patches been removed?
4. Has badly broken pavement been removed and patched?
5. Have all depressions been filled and compacted?

Incidental Tools

1. Do incidental tools comply with specifications? _____
2. Are all necessary tools on job before work begins?

The Engineer and the Contractor

1. Have the engineer and inspectors held a preliminary conference with the appropriate contractor personnel?
2. Has continuity of operations been planned?
3. Has the number of pavers to be used been determined?
4. Have the number and type of rollers to be used been determined?
5. Has the number of trucks to be used been determined?
6. Has the width of spread in successive layers been planned?
7. Is it understood who is to issue and who is to receive instructions?
8. Have weighing procedures and the number of load tickets to be prepared been determined?
9. Have procedures for investigation of mix been agreed upon?
10. Has method of handling traffic been established?

Preparation of Surface

1. Have all surfaces that will come into contact with the asphalt mix been cleaned and coated with asphalt?
2. Has a uniform tack coat of correct quantity been applied?

Asphalt Distributor

1. Does the asphalt distributor comply with specifications?
2. Are the heaters and pump in good working condition?
3. Have all gauges and measuring devices such as the bitumeter, tachometer, and measuring stick been calibrated?
4. Are spray bars and nozzles unclogged and set for proper application of asphalt?

Hauling Equipment

1. Are truck beds smooth and free from holds and depressions?
2. Do trucks comply with specifications?
3. Are trucks equipped with properly attached tarpaulins?
4. For cold weather or long hauls, are truck beds insulated?
5. When unloading, do trucks and paver operate together without interference?
6. Is the method of coating of contact surfaces of truck beds agreed upon?

Paver

1. Does the paver comply with specifications?
2. Is the governor on the engineer operating properly?
3. Are the slat feeders, the hopper gates, and spreader screws in good condition and adjustment?
4. Are the crawlers adjusted properly?
5. Do the pneumatic tires contain correct and uniform air pressure?
6. Is the screed heater working properly?
7. Are the tamper bars free of excessive wear?
8. Are the tamper bars correctly adjusted for stroke?
9. Are the tamper bars correctly adjusted for clearance between the back of the bar and the nose of the screed plate?
10. Are the surfaces of the screed plates true and in good condition?
11. Are mat thickness and crown controls in good condition and adjustment?
12. Are screed vibrators in good condition and adjustment?
13. Is the oscillating screed in proper position with respect to the vibrating compactor?
14. Is the automatic screed control in adjustment and is the correct sensor attached.

Spreading

1. Are the required number of pavers on job?
2. Is the mix of uniform texture?
3. Is the general appearance of the mix satisfactory?
4. Is the temperature of the mix uniform and satisfactory?
5. Does the mix satisfy the spreading requirements?
6. Has proper paver speed been determined?
7. Is the surface smoothness tolerance being checked and adhered to?
8. Is the depth of spread checked frequently?
9. Has the daily spread been checked?

Rolling

1. Are the required number of rollers on the job?
2. Is proper rolling procedure being followed?
3. Is the proper rolling pattern being followed?
4. Are joints and edges being rolled properly?

Miscellaneous

1. Are all surface irregularities being properly corrected?
2. Is efficient control of traffic being maintained?
3. Are sufficient samples being taken?
4. Are samples representative?
5. Have assistant inspectors been properly instructed?
6. Are inspection duties properly apportioned among assistants?
7. Are records complete and up-to-date?
8. Are safety measures being observed?
9. Has final clean-up and inspection been made?

APPENDIX D

Maps of Pavement Distress, Sample Locations and Deflection Test Locations

SPS-6 Preconstruction Pavement Distress Maps

PAVEMENT DISTRESS MAP LEGEND

0+00	—	STATION MARK (CROSS INDICATES LOCATION OF PAINTED CROSS ON PAVEMENT)
	—	DELINEATOR
	—	PAVEMENT MARKING
	—	PCC JOINT
	—	CRACK
	—	PATCHING
OR	—	POTHOLE (UNPATCHED)
	—	AREA CRACKING (ALLIGATOR)
	—	NDT TEST POINT
$_{C1}$	—	4" OD CORE OF PVMT. SURFACE & TREATED LAYERS: C-TYPE
$_{C1}$	—	6" OD CORE OF PVMT. SURFACE & TREATED LAYERS; C-TYPE
$_{C1}$	—	6" OD CORE OF PVMT. SURFACE; AUGERING OF UNBOUND GRANULAR BASE AND SUBBASE; THIN-WALLED TUBE AND/OR SPLITSPOON SAMPLING AS DIRECTED TO 5' BELOW TOP OF SUBGRADE: A-TYPE
$_{C1}$	—	12" OD CORE OF PVMT. SURFACE; AUGERING OF UNBOUND GRANULAR BASE AND SUBBASE AND UNTREATED SUBGRADE TO 12" BELOW TOP OF SUBGRADE FOR BULK SAMPLE RETRIEVAL; BA-TYPE

SPS-6 Preconstruction Sampling Locations

Section	Station	Offset	Core #
SHRP 040601 (SA S15)	-(0+05)	2	C30
	-(0+05)	3.5	C31
	-(0+05)	5	C32
SHRP 040601 (SA S16)	5+30	2	C33
	5+30	3.5	C34
	5+30	5	C35
	5+35	3	A12
SHRP 040603 (SA S12)	-(0+50)	2	C23
	-(0+50)	3.5	C24
	-(0+55)	5	A9
SHRP 040603 (SA S13)	10+30	3	A10
	10+35	3	C25
	10+35	6	C26
	10+40	3	BA10
	10+45	6	BA11
	10+50	3	BA12
SHRP 040604 (SA S9)	5+50	2	C17
	5+50	3.5	C18
	5+50	5	C19
SHRP 040605 (SA S14)	10+70	3	A11
	10+75	2	C27
	10+75	3.5	C28
	10+75	5	C29
SHRP 040606 (SA S6)	6+20	2	C12
SHRP 040607 (SA S5)	5+40	3	A5
	5+50	2	C9
	5+50	3.5	C10
	5+50	5	C11
SHRP 040608 (SA S3)	-(1+30)	3	A3
	-(1+35)	2	C5
	-(1+35)	3.5	C6
SHRP 040608 (SA S4)	5+45	2	C7
	5+45	3.5	C8
	5+50	3	A4
	5+55	3	BA1
	5+60	6	BA2
	5+65	3	BA3
SHRP 040609 (SA S1)	-(0+20)	2	C1
	-(0+20)	3.5	C2
	-(0+20)	5	C3
	-(0+25)	3	A1
SHRP 040610 (SA S7)	6+40	2	C13
	6+40	3.5	C14
SHRP 040611 (SA S8)	4+80	2	C15
	4+80	3.5	C16
	4+85	3	A6
	4+90	3	BA4
	4+95	6	BA5
	5+00	3	BA6
SHRP 040612 (SA S10)	-(0+50)	3.5	C20
	-(0+55)	3	A7
SHRP 040612 (SA S11)	5+54	2	C21
	5+54	3.5	C22
	5+60	3	A8
	5+65	3	BA7
	5+69	6	BA8
	5+75	3	BA9
SHRP 040613 (SA S2)	-(0+90)	2	C4
	-(0+95)	3	A2

TEST SECTIONS: 3, 6, 7, 8, 14, 15, 17 (10 slabs each)
Deflection Basin Testing Only (P1,P3)

TEST SECTION #	STATION #
3	1;60;121;165;211;266;327;385;444;505
6 & 14	3;44;91;168;210;260;315;363;420;495
7, 15 & 17	0;58;120;176;223;280;327;372;432;491
8	9;59;127;176;231;267;326;373;425;503

TEST SECTIONS: 1, 2, 5, 18 (10 slabs each for TS 1, 5 & 18)
All three passes: P1, P2, P3 (20 slabs for TS 2*)

*Test Section 2 is not 1000' in length, therefore, only 10 slabs may be tested. Section #18 -- Pick 10 slabs.

TEST SECTION #	STATION #	
1	-6;55;115;174;234;294;334;384;428;473	P1
	-7,-3,;50,56;110,116;169,176;235,240; 309,314;350,354;395,403;438,445;485,492	P2
	10;69;128;188;247;306;351;393;438;484 (These are the starting pts, find closest joint and test)	P3
2	7;71;128;191;249;300;365;439;492;535	P1
	1,10;68,75;122,129;188,193;247,251; 299,301;359,366;435,441;494,497;535,538	P2
	3;69;122;189;248;300;359;441;494;537; (These are the starting pts., find closest joint and test)	P3
5	4;124;242;312;385;481;587;702;822;915	P1
	-10,-3;109,116;228,235;302,304;374,377; 466,472;575,578;685,693;805,813;902,905	P2
	-11;109;227;301;375;466;575;686;806;904 (These are the starting pts., find closest joint and test)	P3

TEST SECTION: 4 (10 slabs)
Deflection Basin & Load Transfer (P1, P3)

TEST SECTION#	STATION #	
4	4;43;92;147;189;227;301;334;396;434	P1
	-1;41;82;143;185;220;291;331;387;429	P3

(These are the starting pts., find closest joint and test)

TEST SECTION: 9, 10, 11, 12, 13, 16, 19 (TS 9 & 13: 10 slabs)
All passes: P1, P2, P3 TS 10, 11, & 12: 5 slabs)

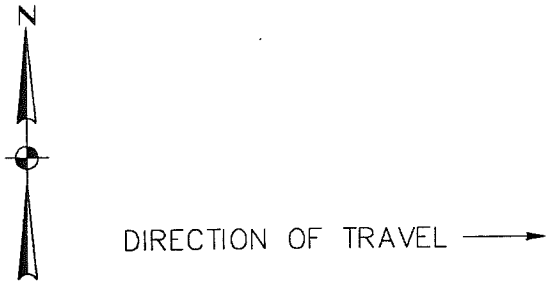
TEST SECTION #	STATION #	
9, 16 & 19	7;64;124;179;213;260;304;359;405;436	P1
	-2,6;57,65;118,125;177,181;253,260; 296,303;356,360;401,405;435,438; (one station is missing)	P2
	-4;54;115;174;206;252;295;354;399; 431; (These are starting pts., find closest joint and test)	P3
10	-3;122;319;426;573	P1
	-5,-3;113,121;312,319;424,427;567,573	P2
	-7,112;310;423;566 (These are starting pts., find closest joint and test)	P3
11	0;117;239;343;427	P1
	-6,2;119,124;233,240;339,343;420,427	P2
	-8;117;230;336;417 (These are starting pts., find closest joint and test)	P3
12	6;193;284;395;520	P1
	1,6;182,189;277,281;390,391;512,516	P2
	-3;181;278;469;588 (These are starting pts., find closest joint and test)	P3

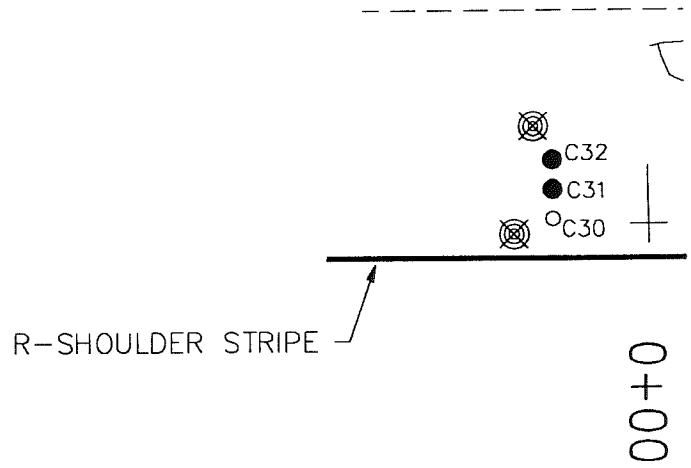
ARIZONA SPS-6 BULK SAMPLE AND NDT LOCATIONS

TEST SECTION #	STATION #	
13	4;42;89;137;183;234;272;327;402;457	P1
	-2,4;40,42;86,92;131,132;180,184; 233,235;269,273;323,330;396,402; 457,463;	P2
	-3;39;82;130;177;232;266;322;392; 455 (These are starting pts, find closest joint and test)	P3

BULK SAMPLE AREA

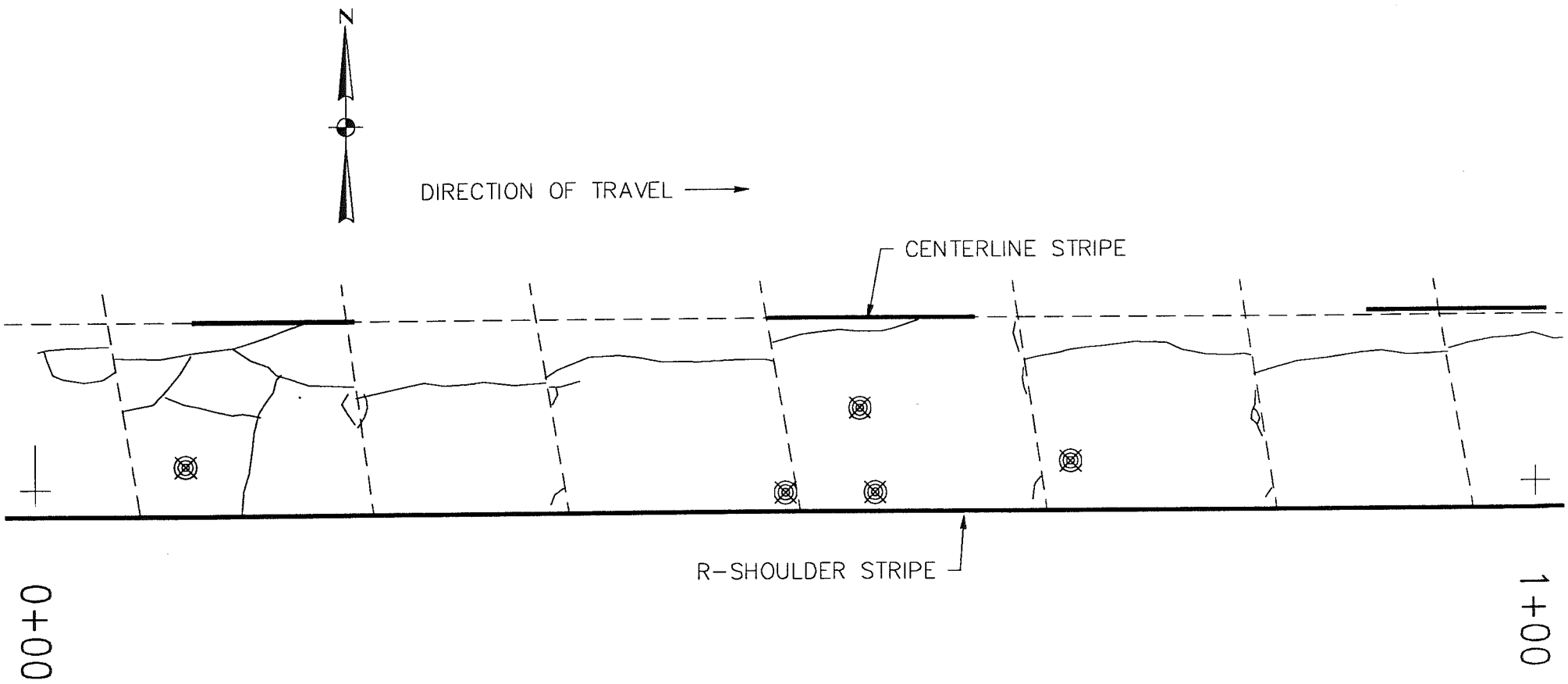
Section #	Station
040602	0-60
040604	0-50
040607	0-50





PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040601
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 7



PAVEMENT DISTRESS MAP

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SECTION ID	: 040601
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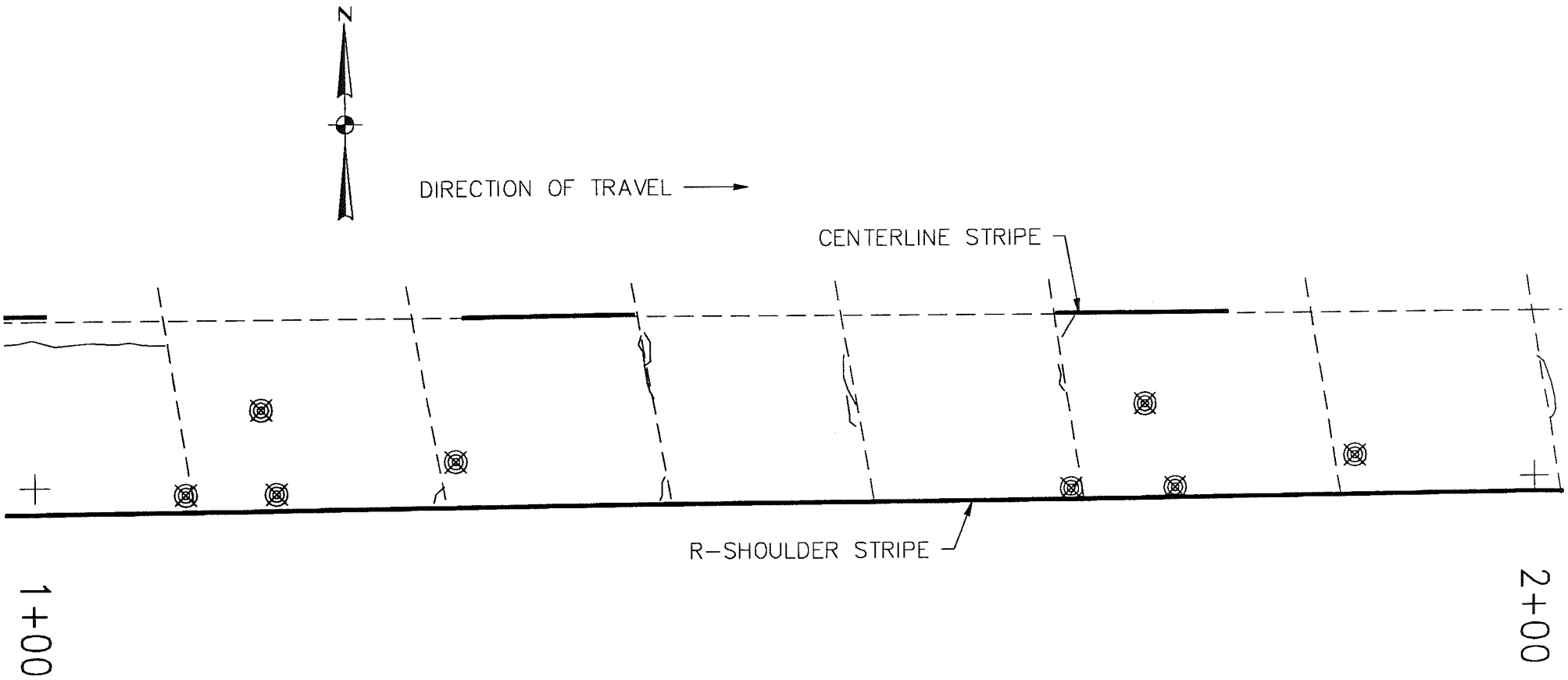
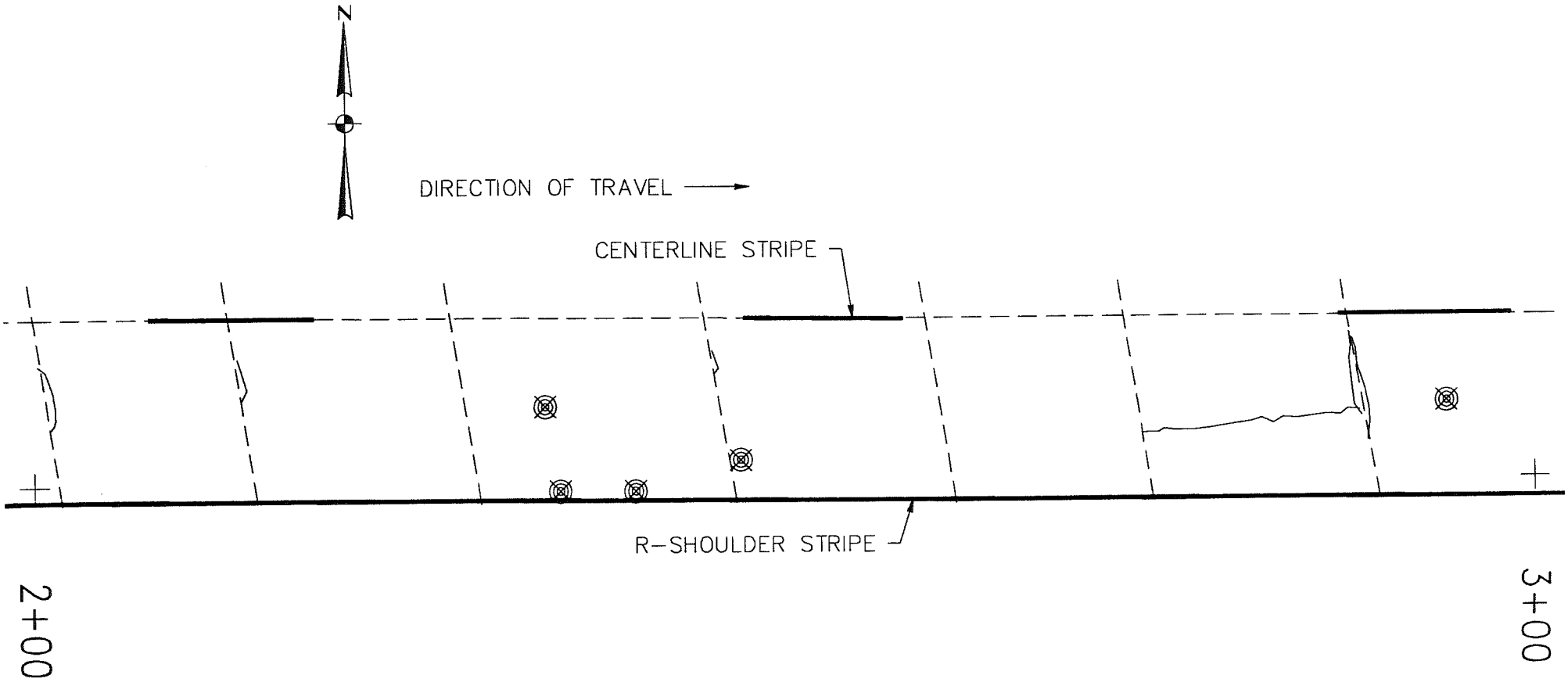
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 7



PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040601
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 7



PAVEMENT DISTRESS MAP

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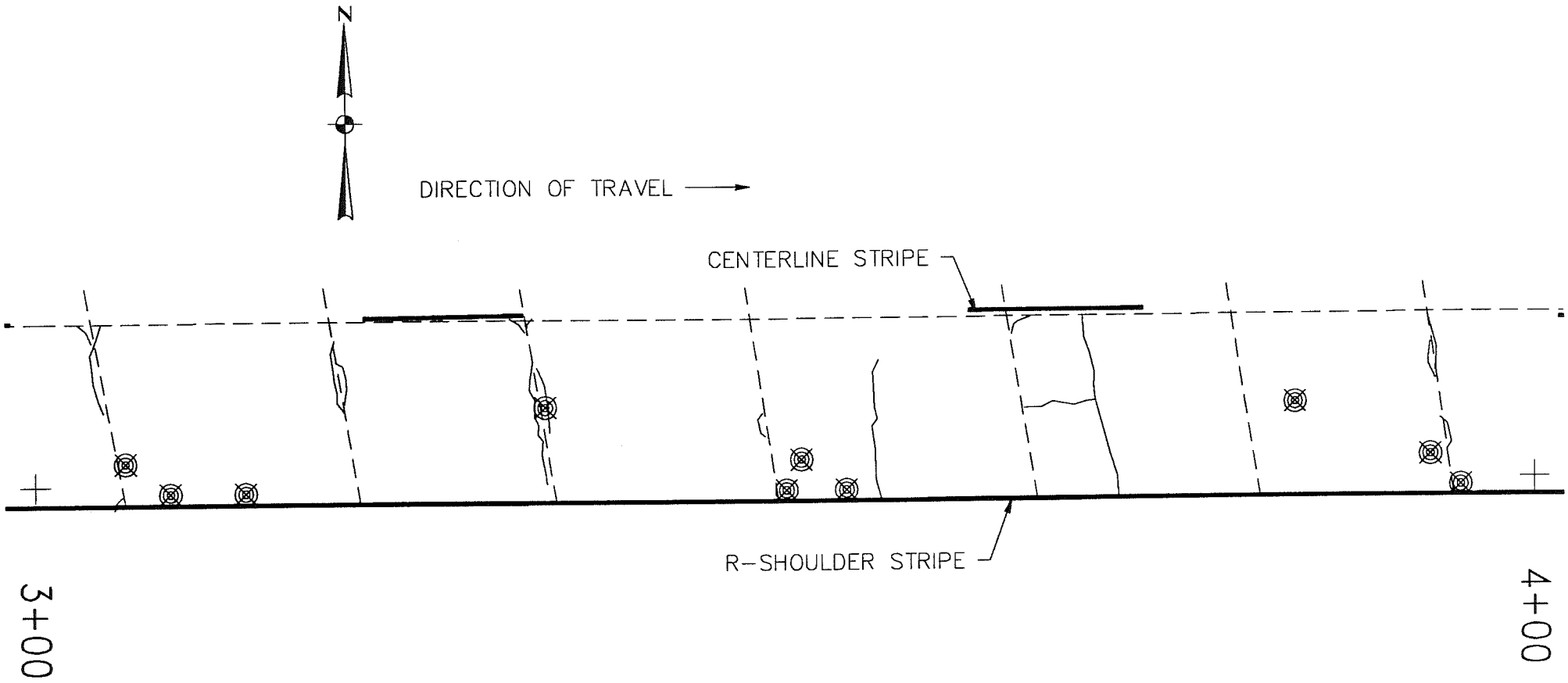
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 7



PAVEMENT DISTRESS MAP

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SECTION ID	: 040601
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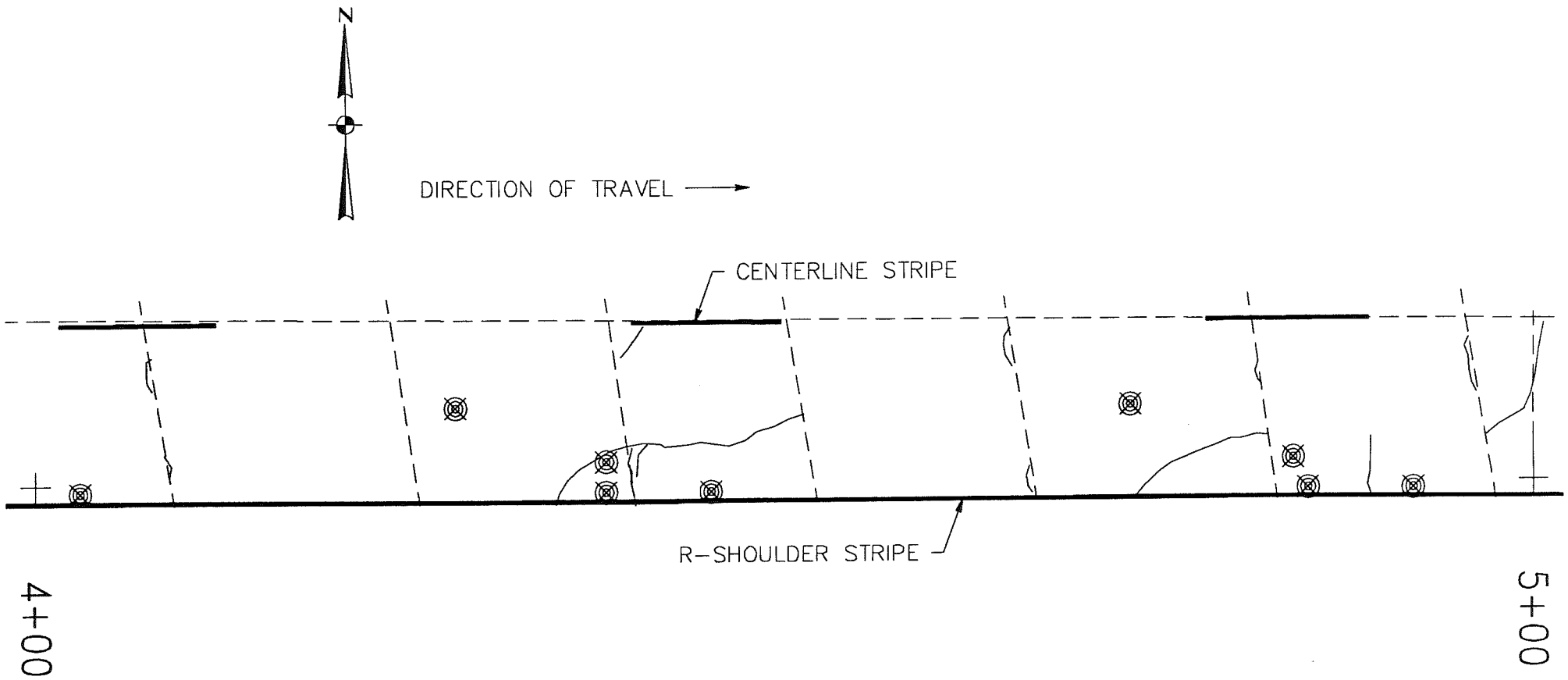
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 7



PAVEMENT DISTRESS MAP

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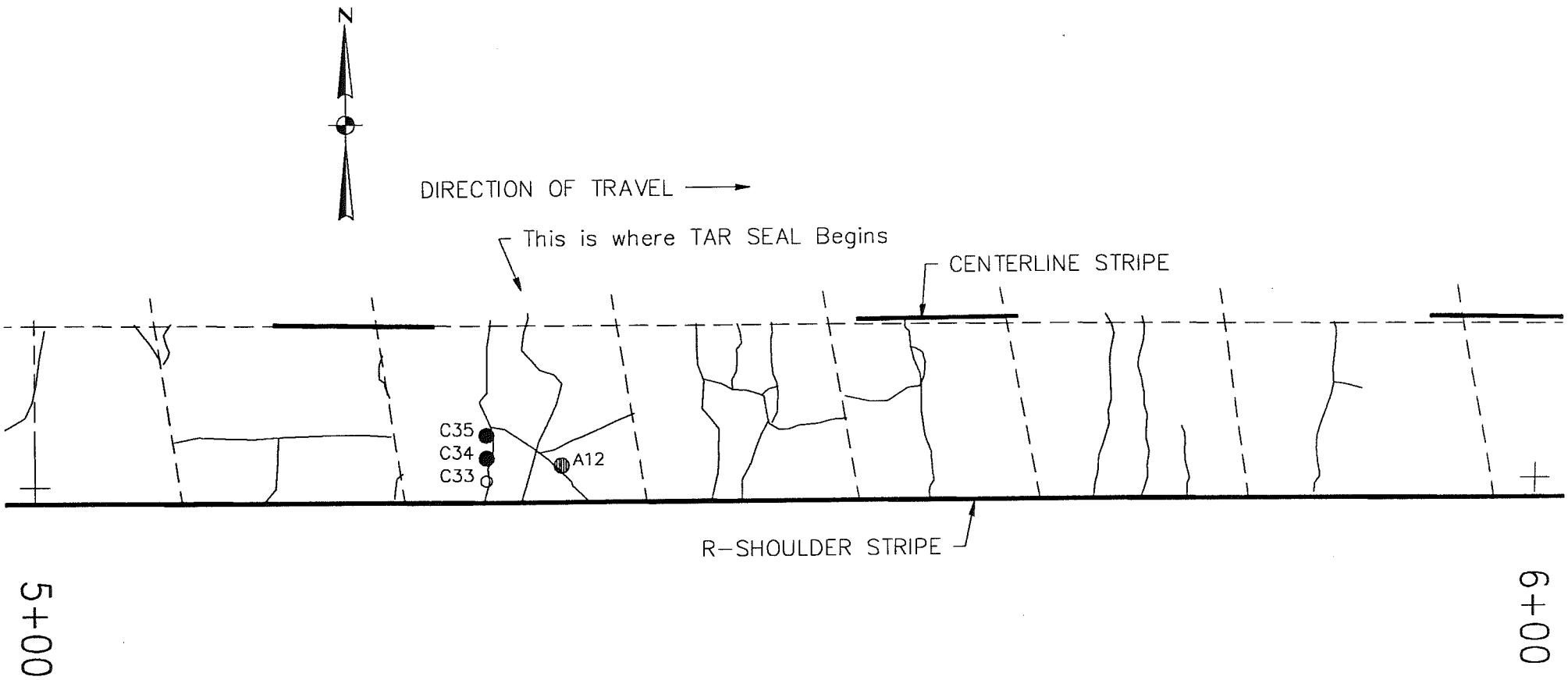

PAVEMENT DISTRESS MAP

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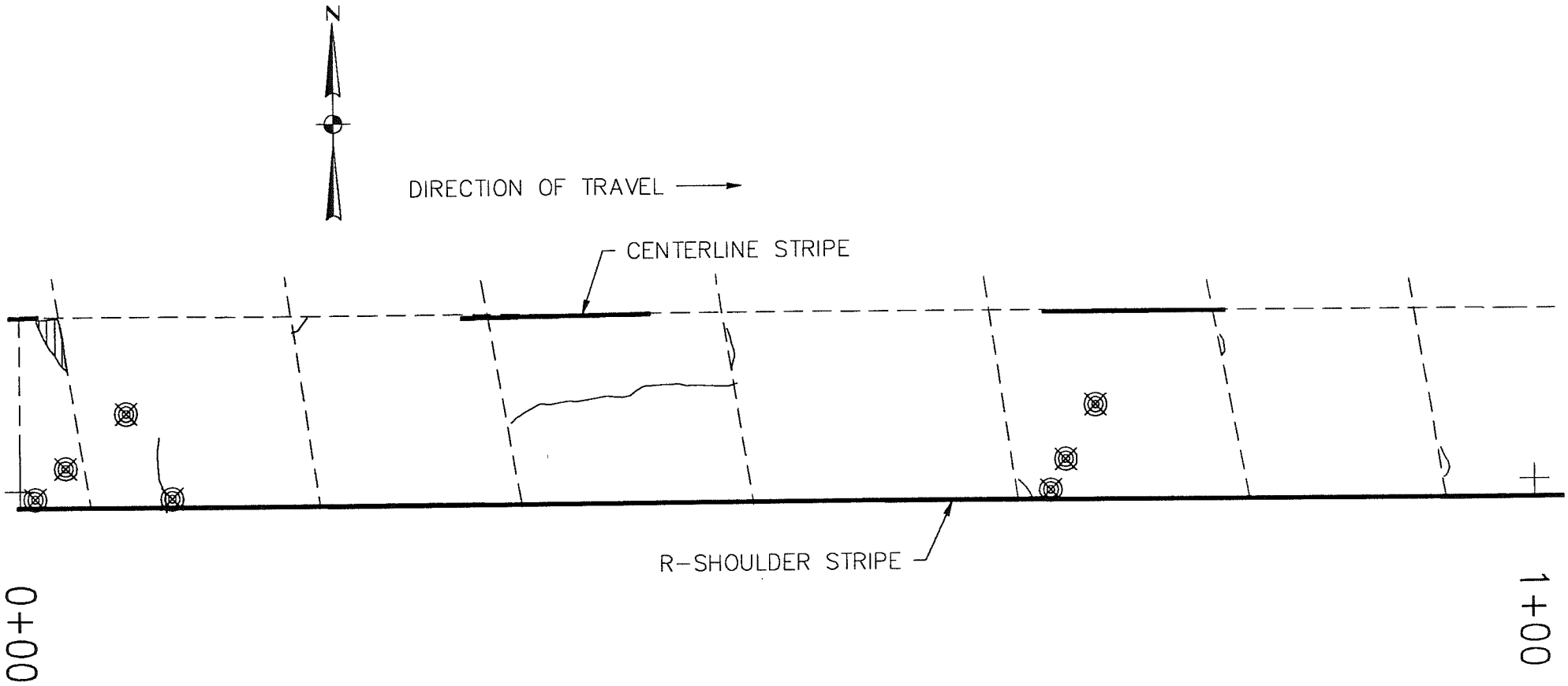
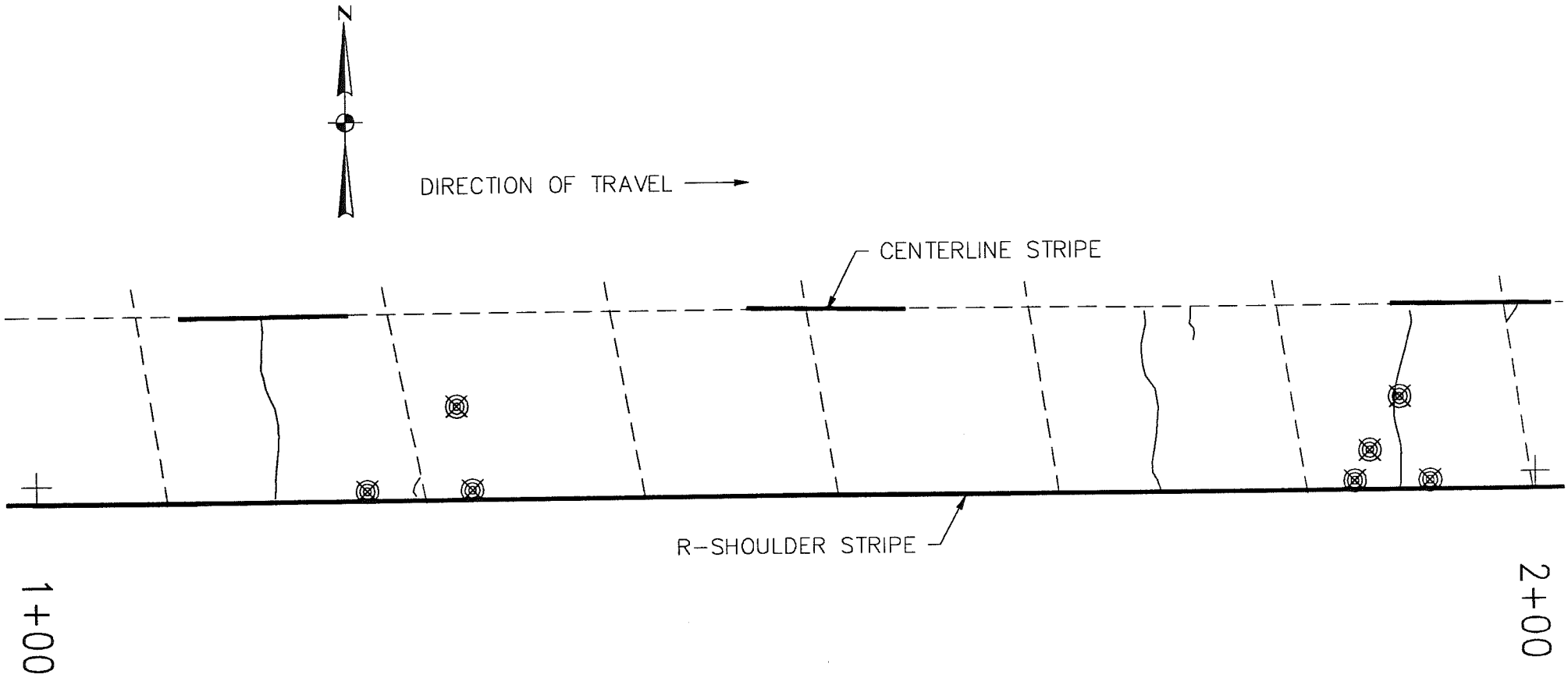
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 7 OF 7



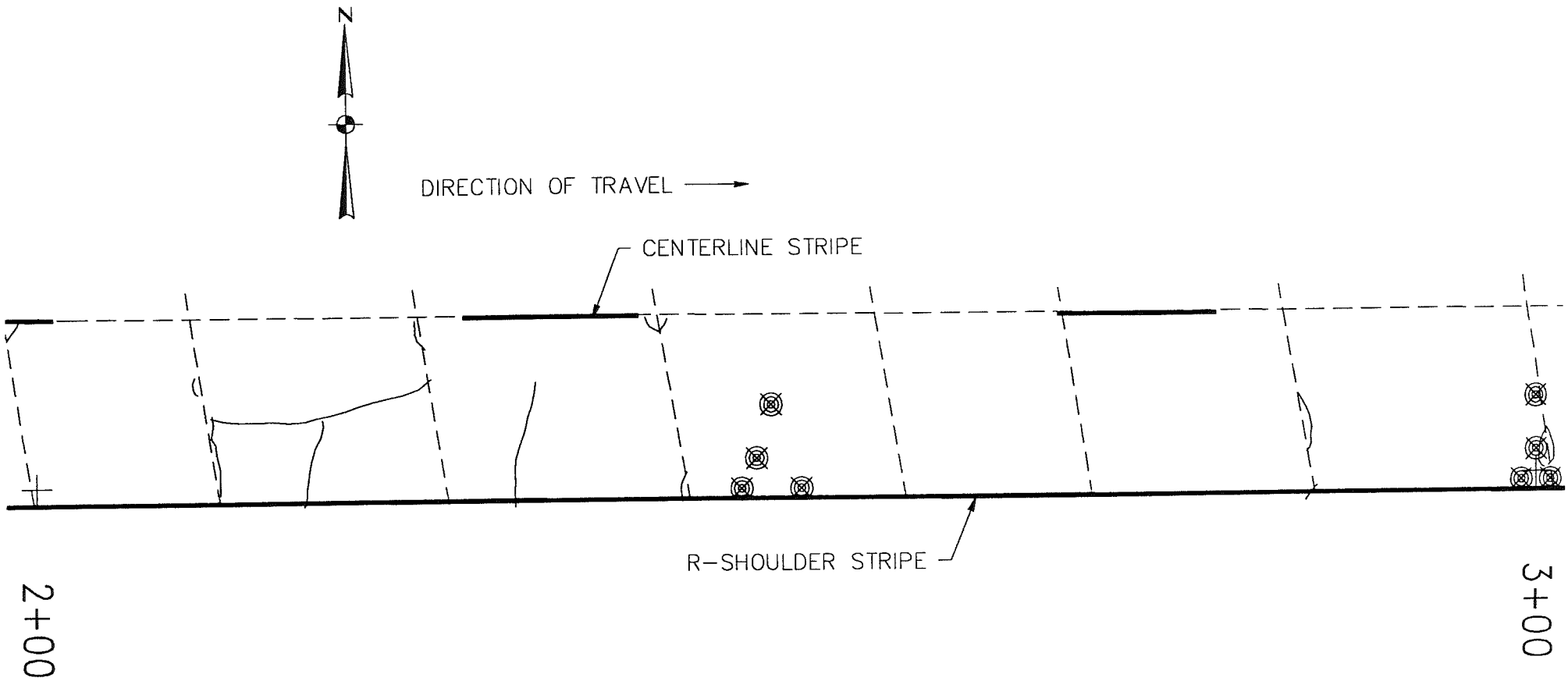
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040602
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 6



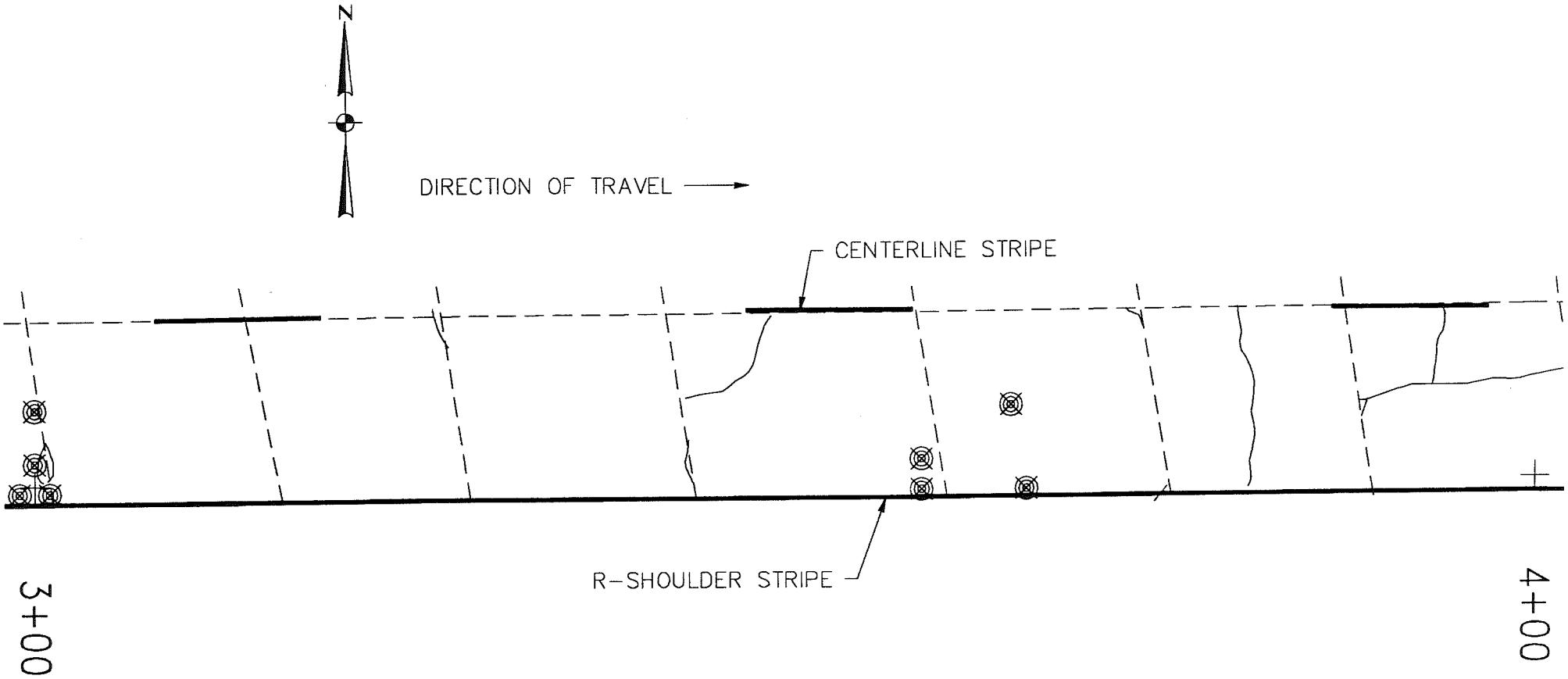
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040602
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 6



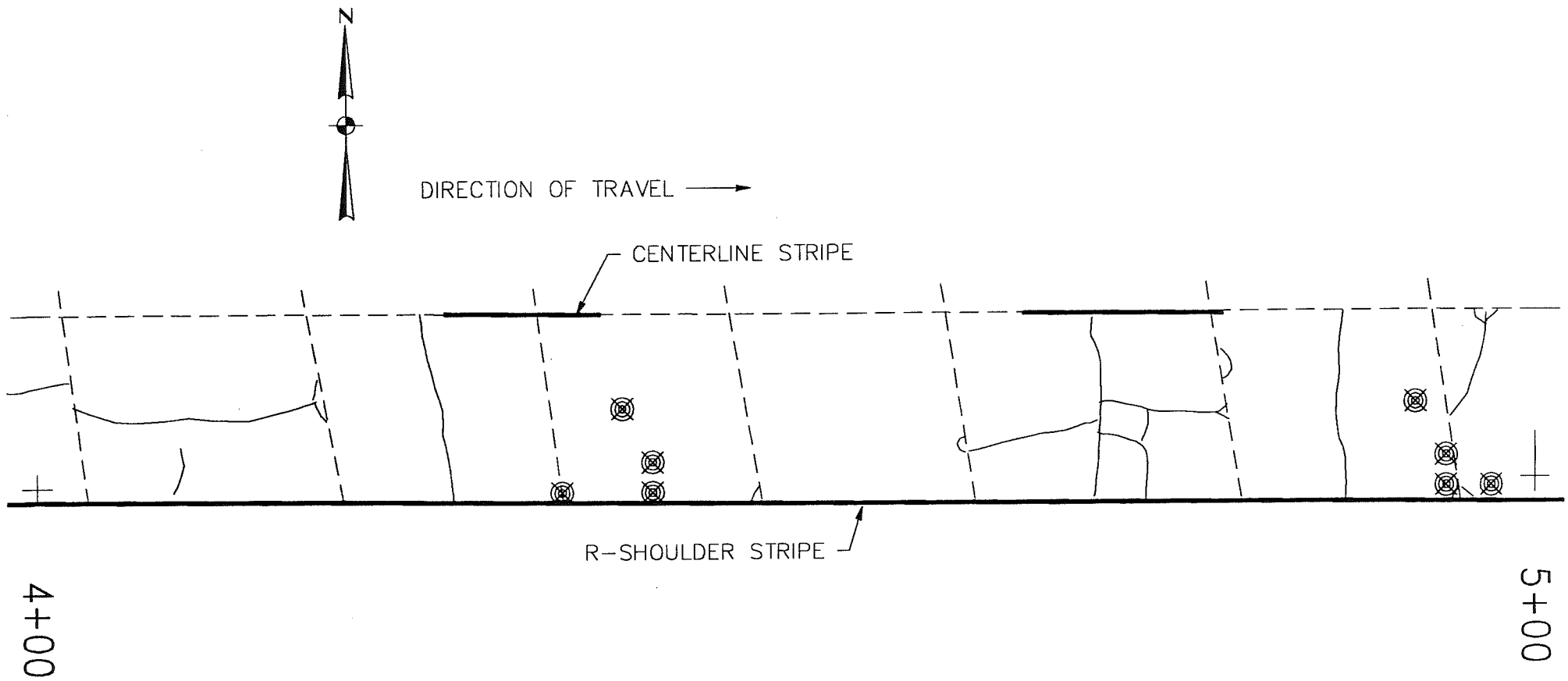
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040602
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 6



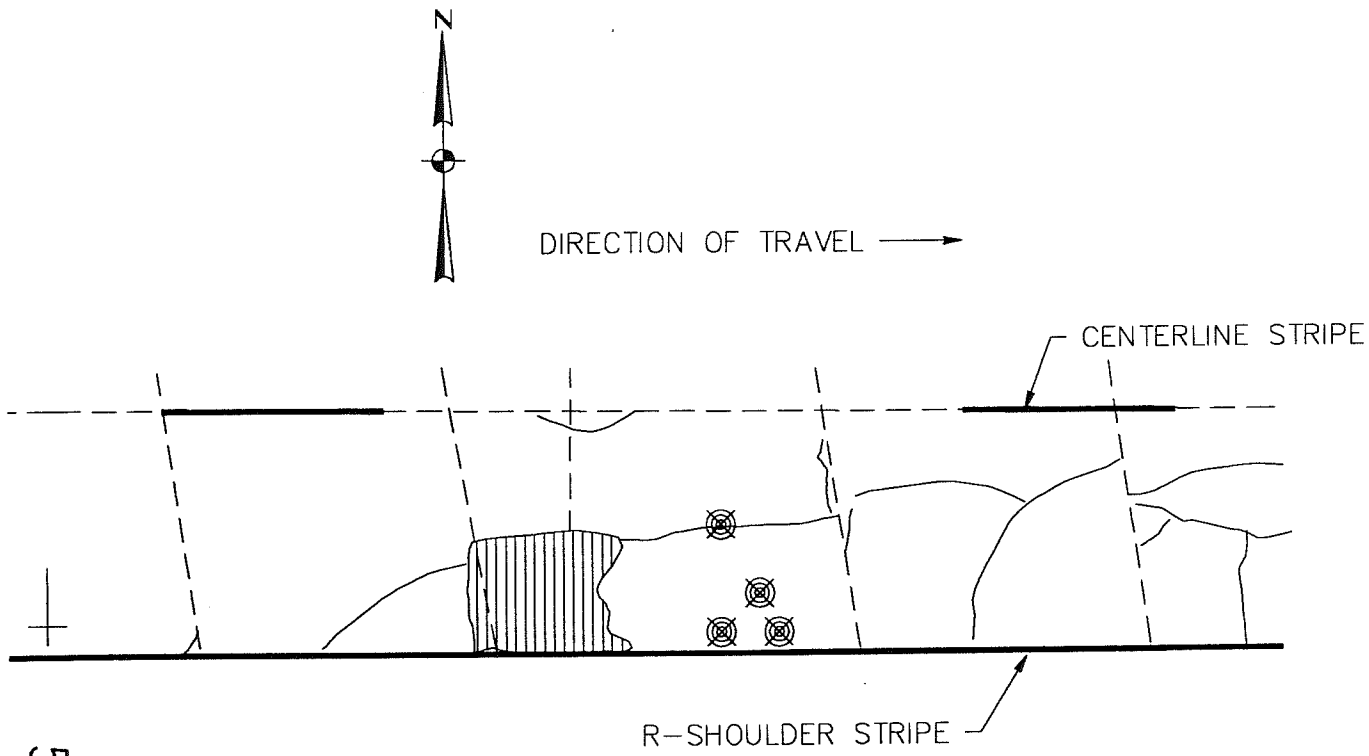
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040602
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 6



PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040602
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 6

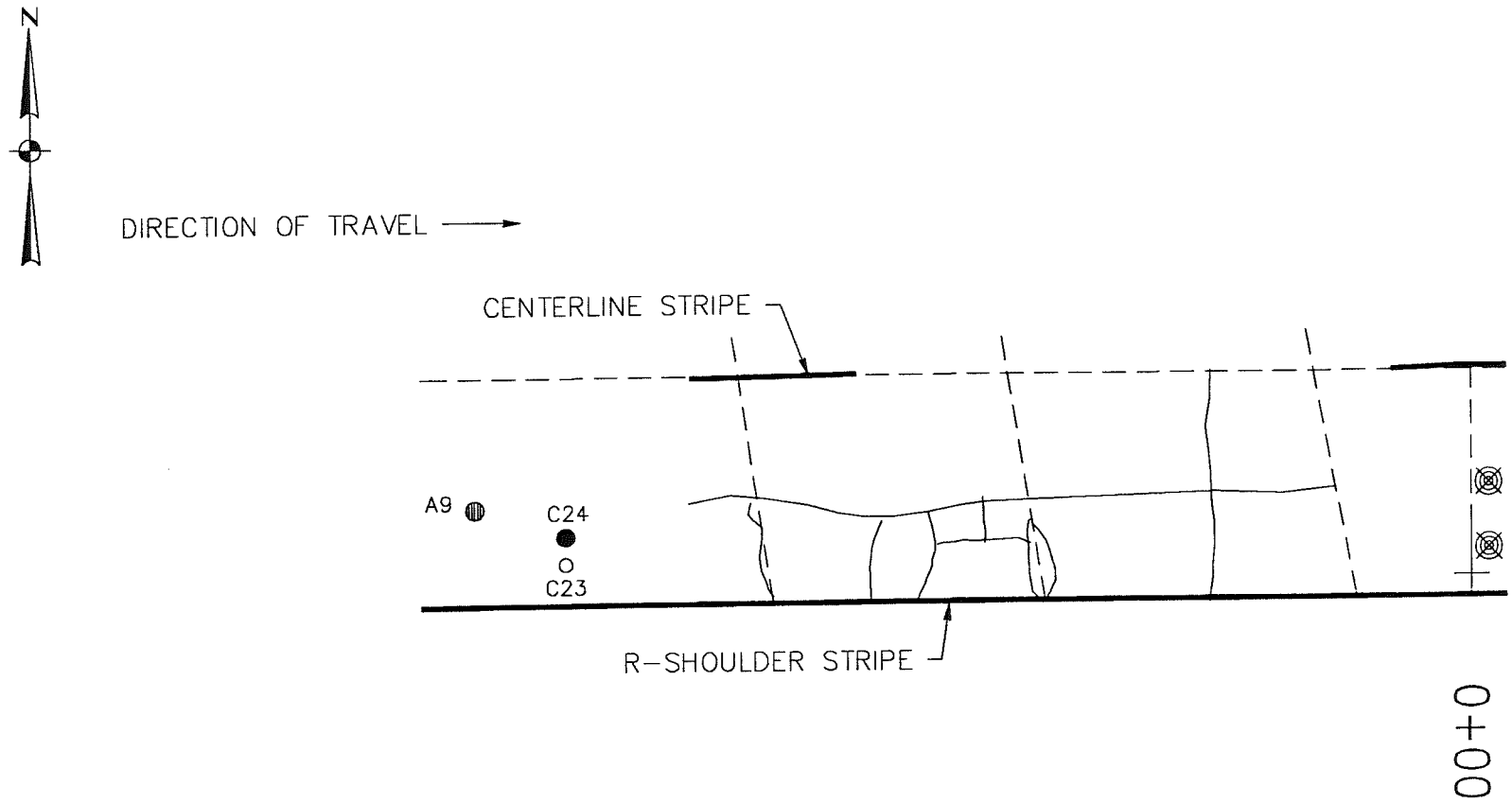


5+00

6+00

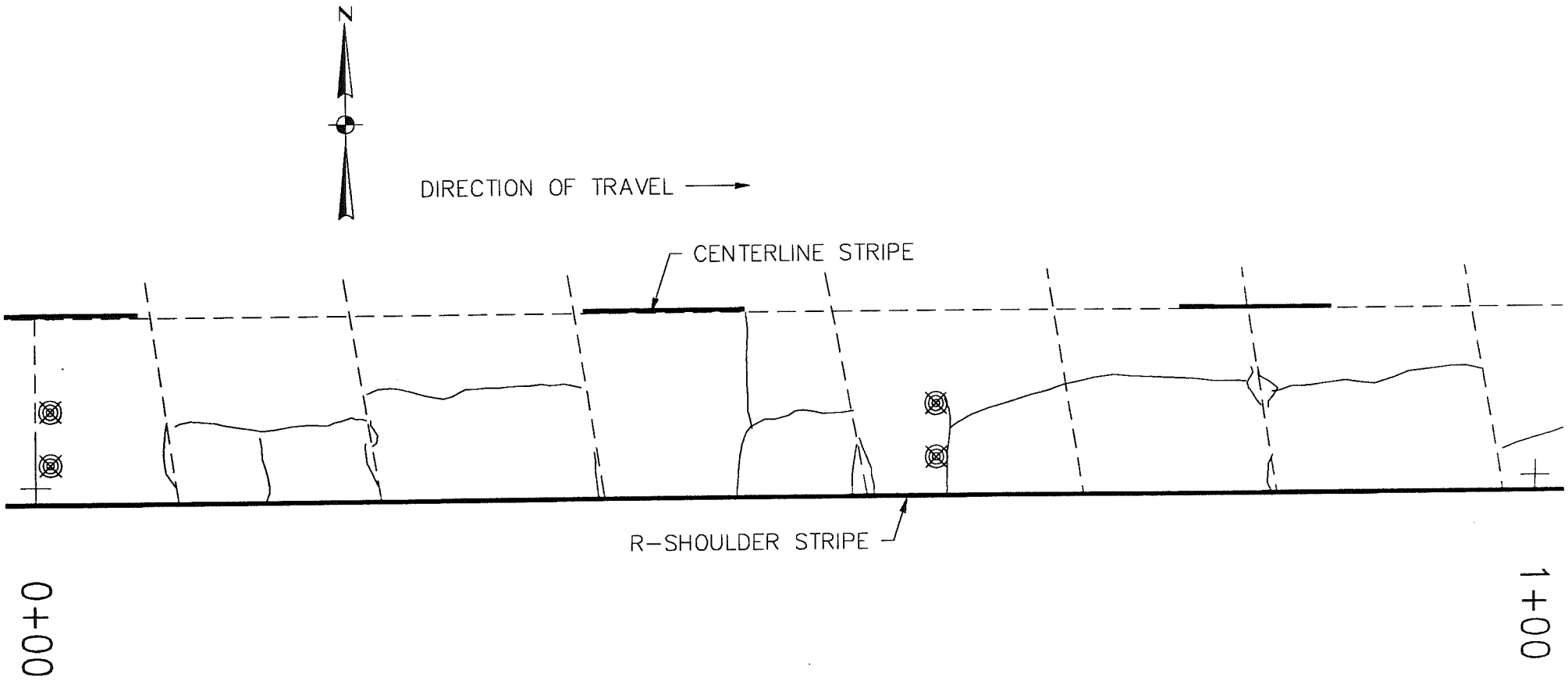
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040602
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 6



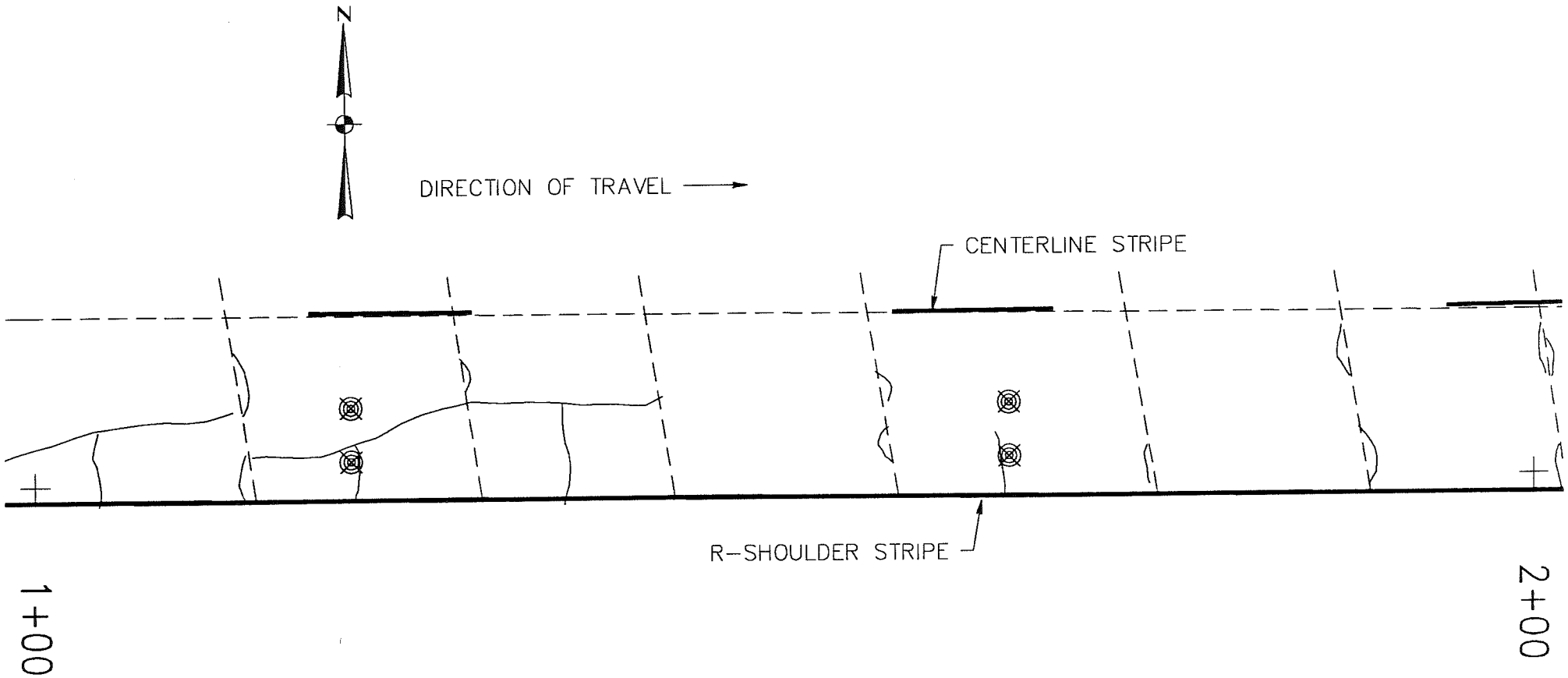
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 7



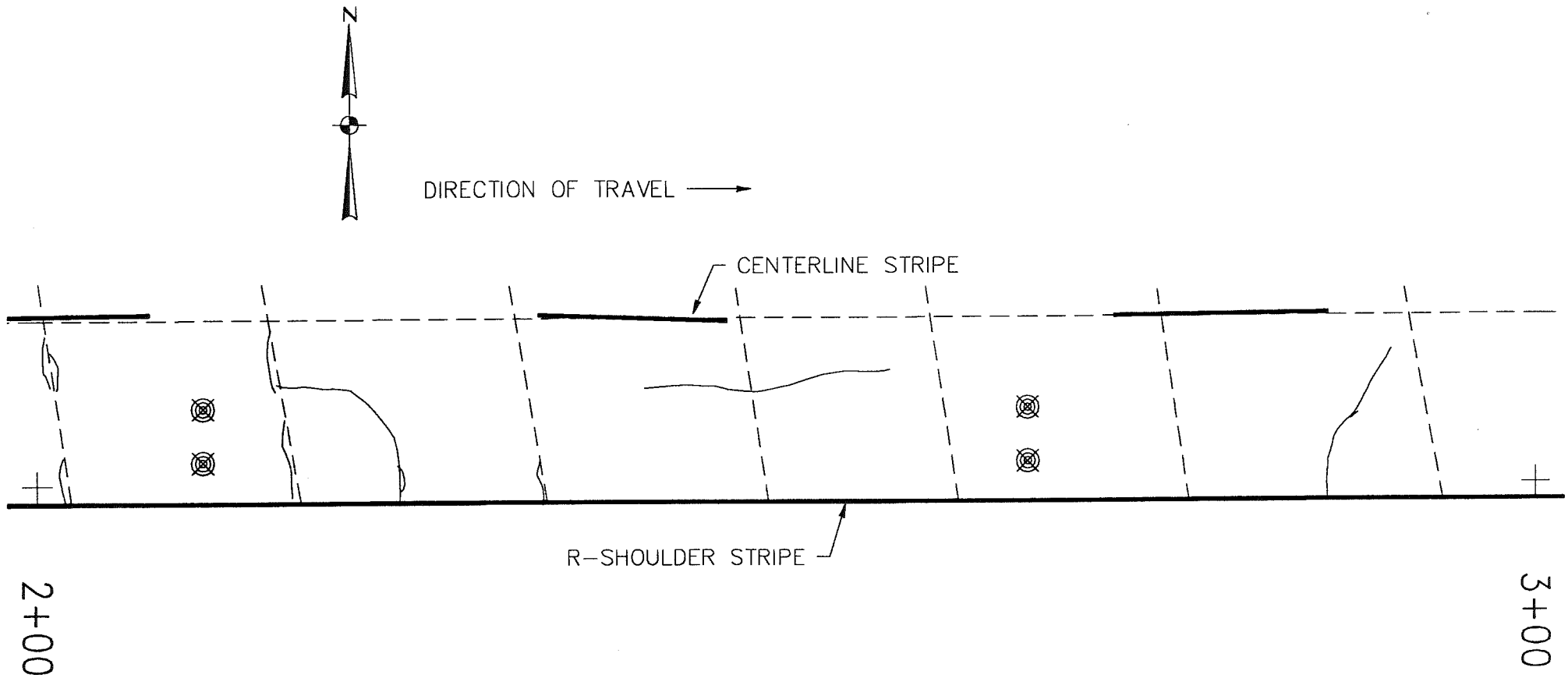
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 7



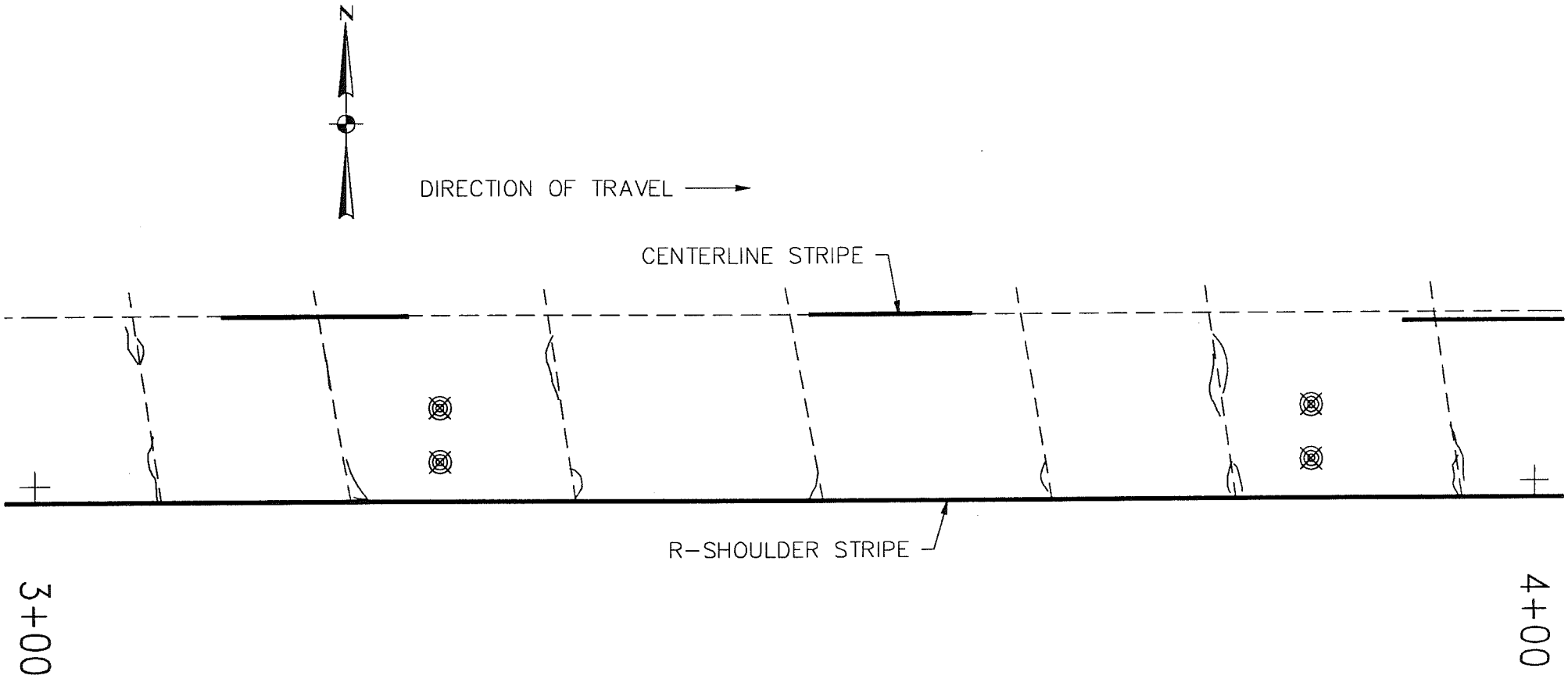
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 7



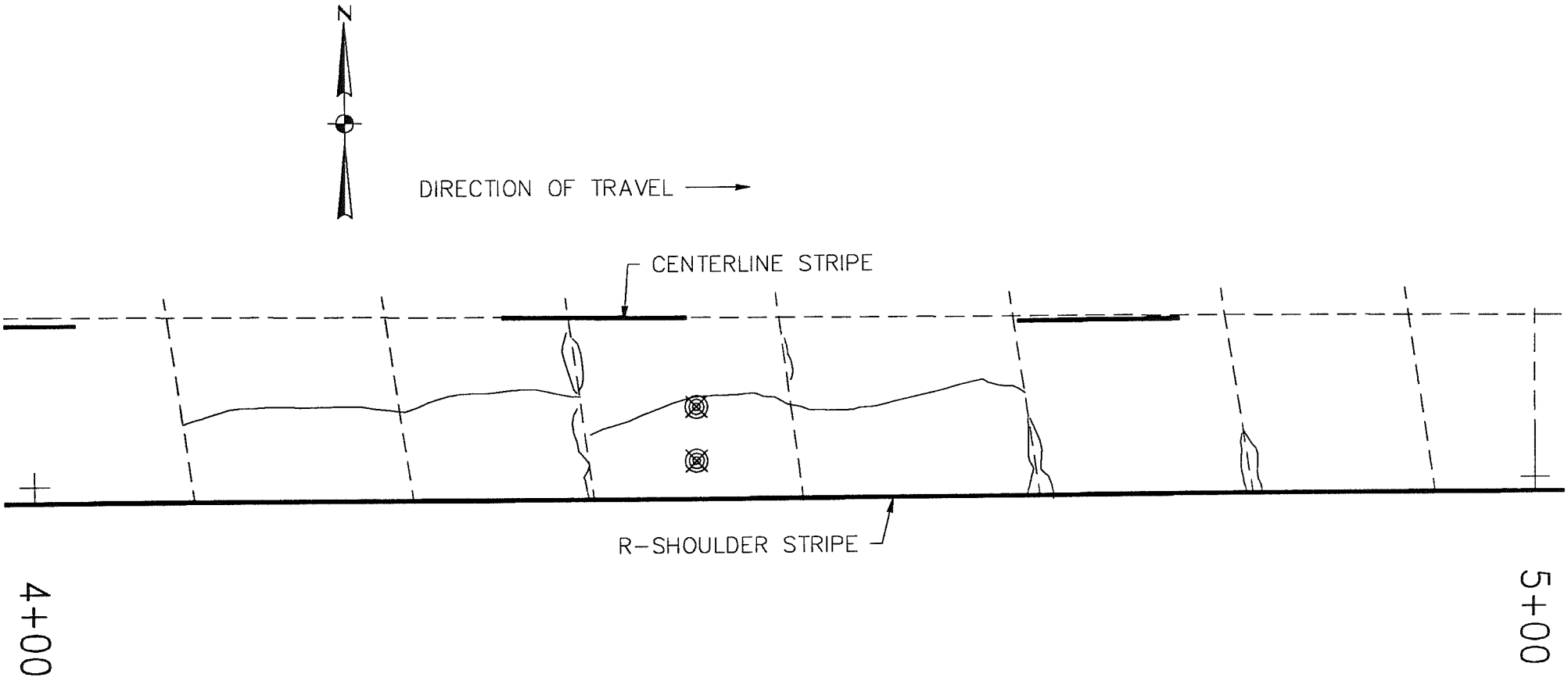
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 7



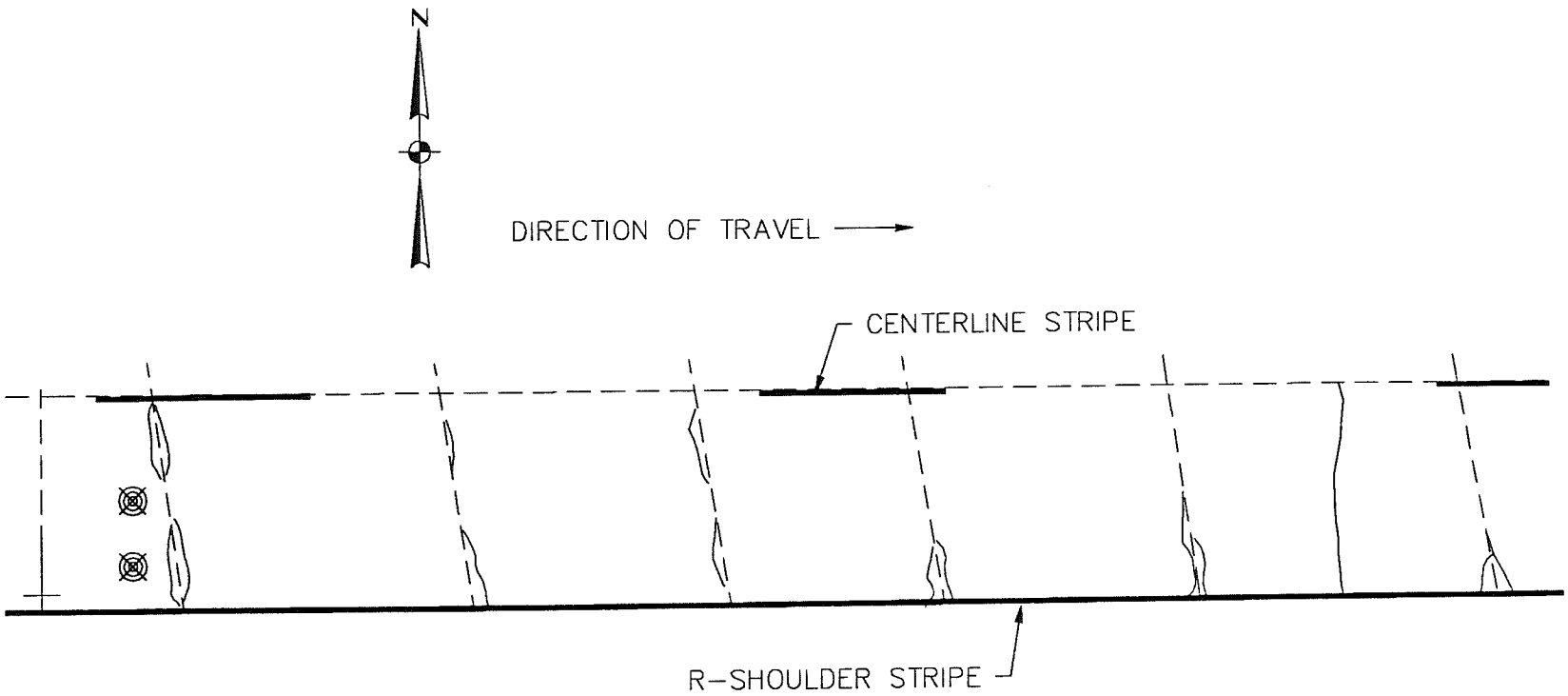
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 7



PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 7

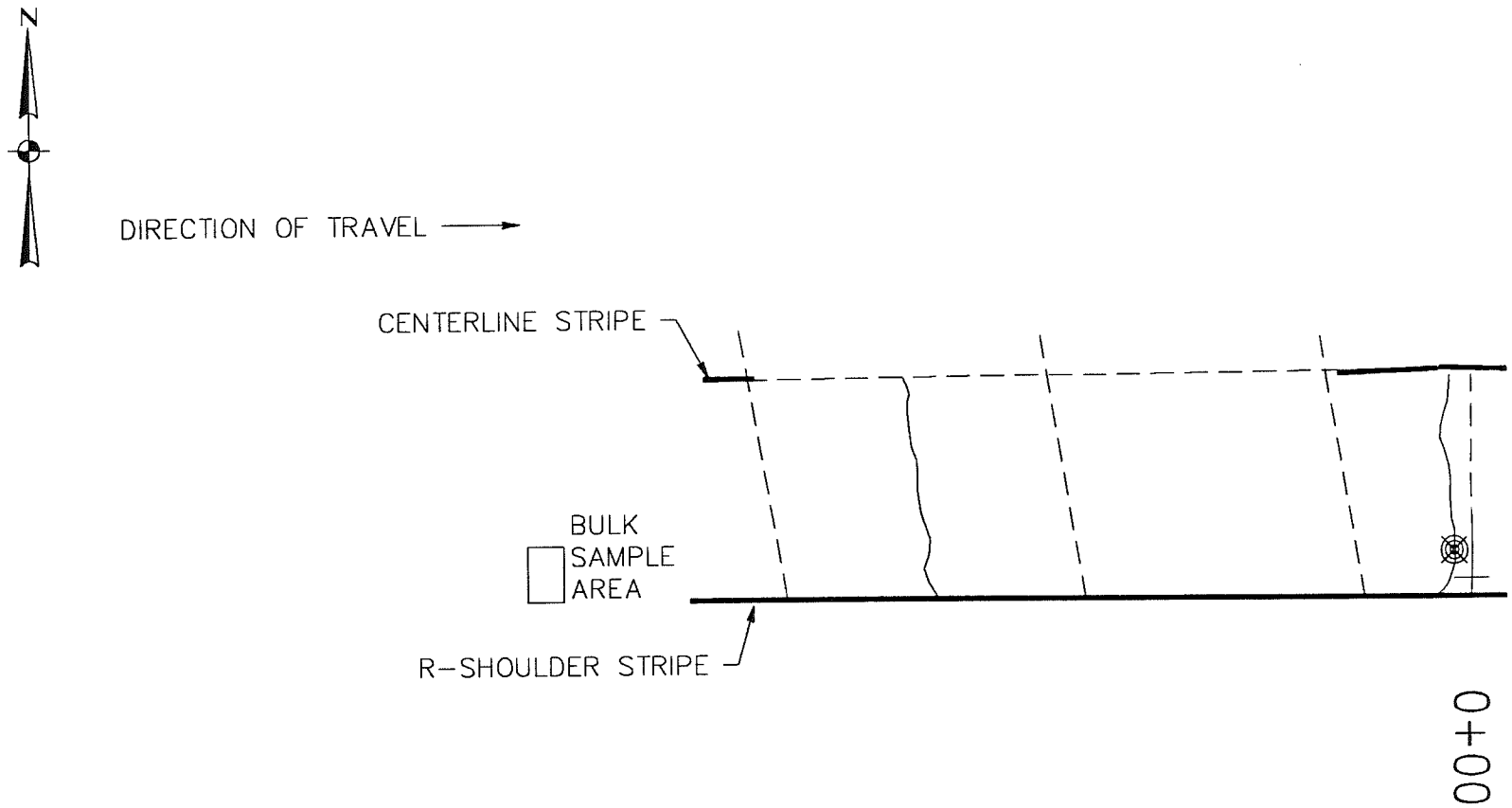


5+00

6+00

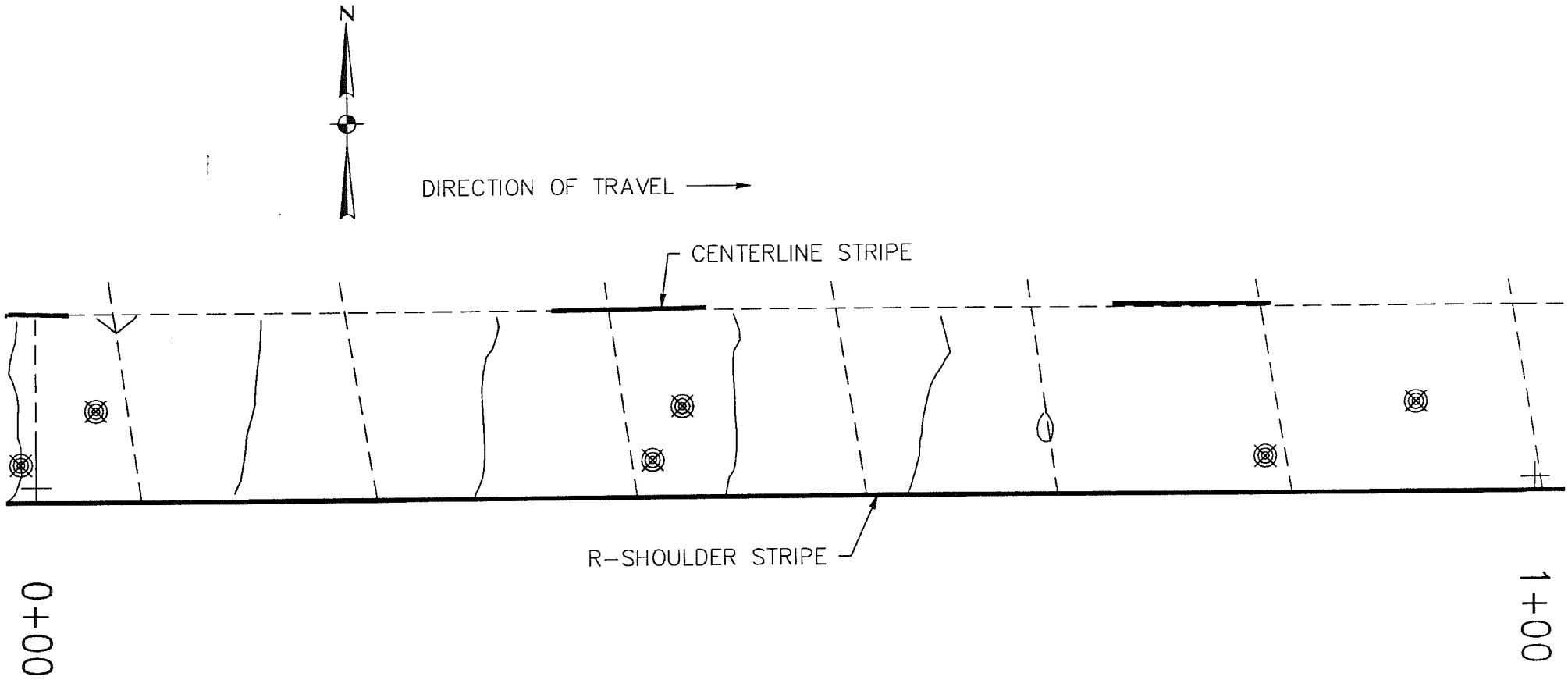
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040603
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 7 OF 7



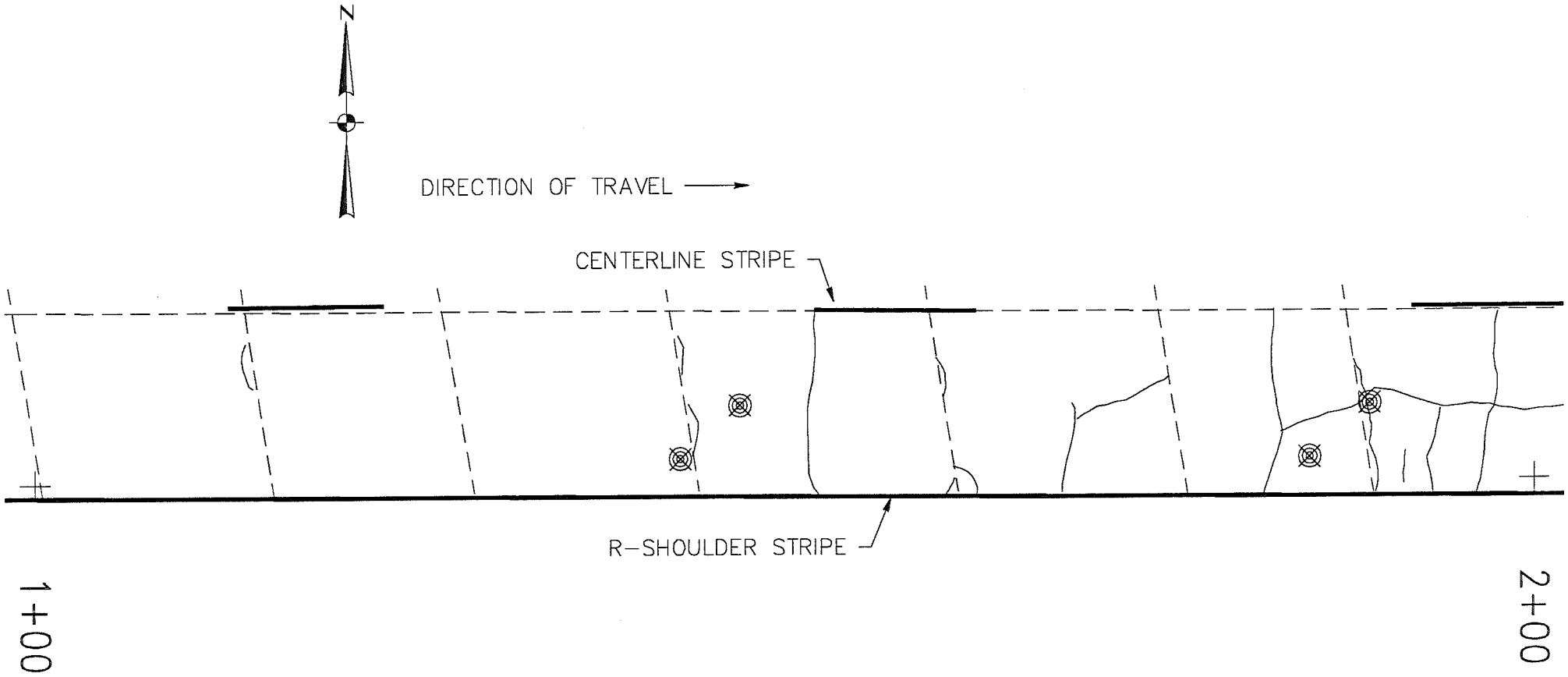
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 7



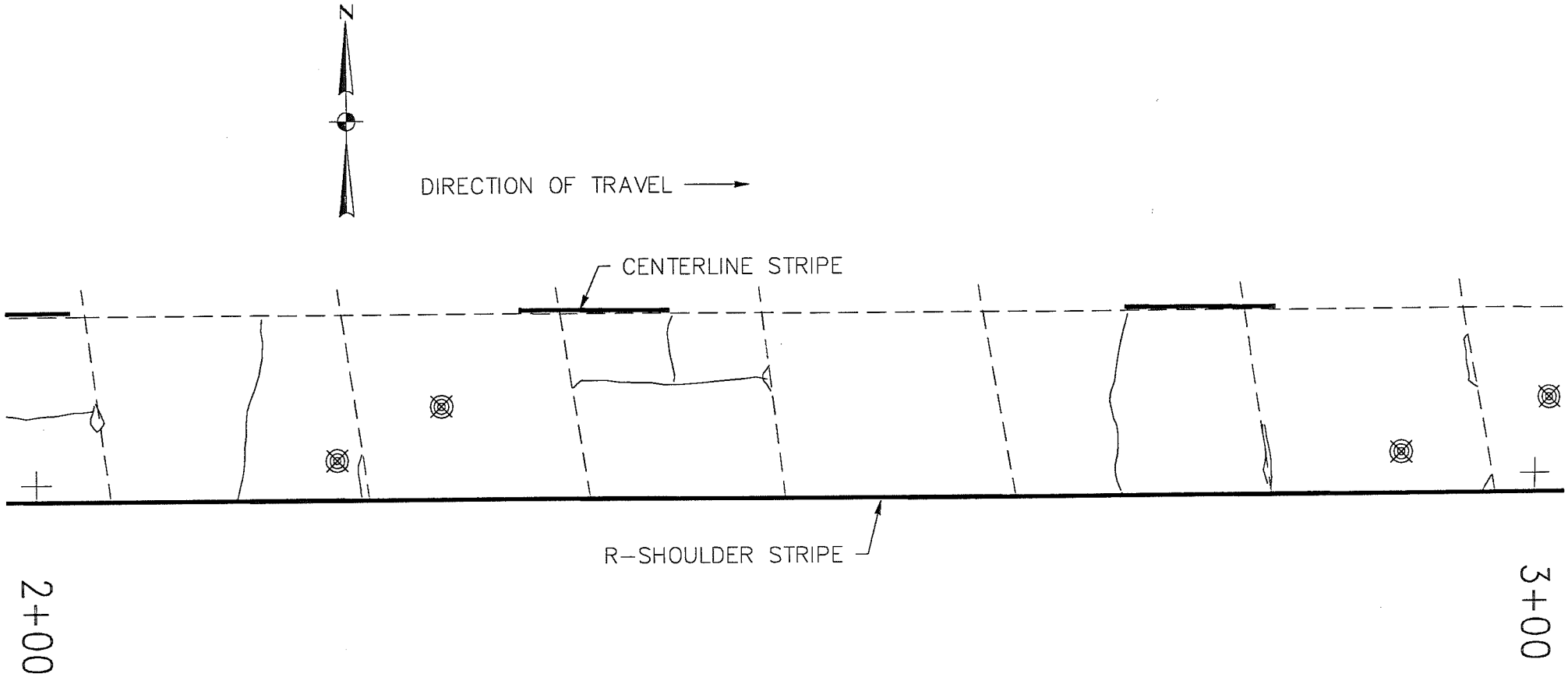
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 7



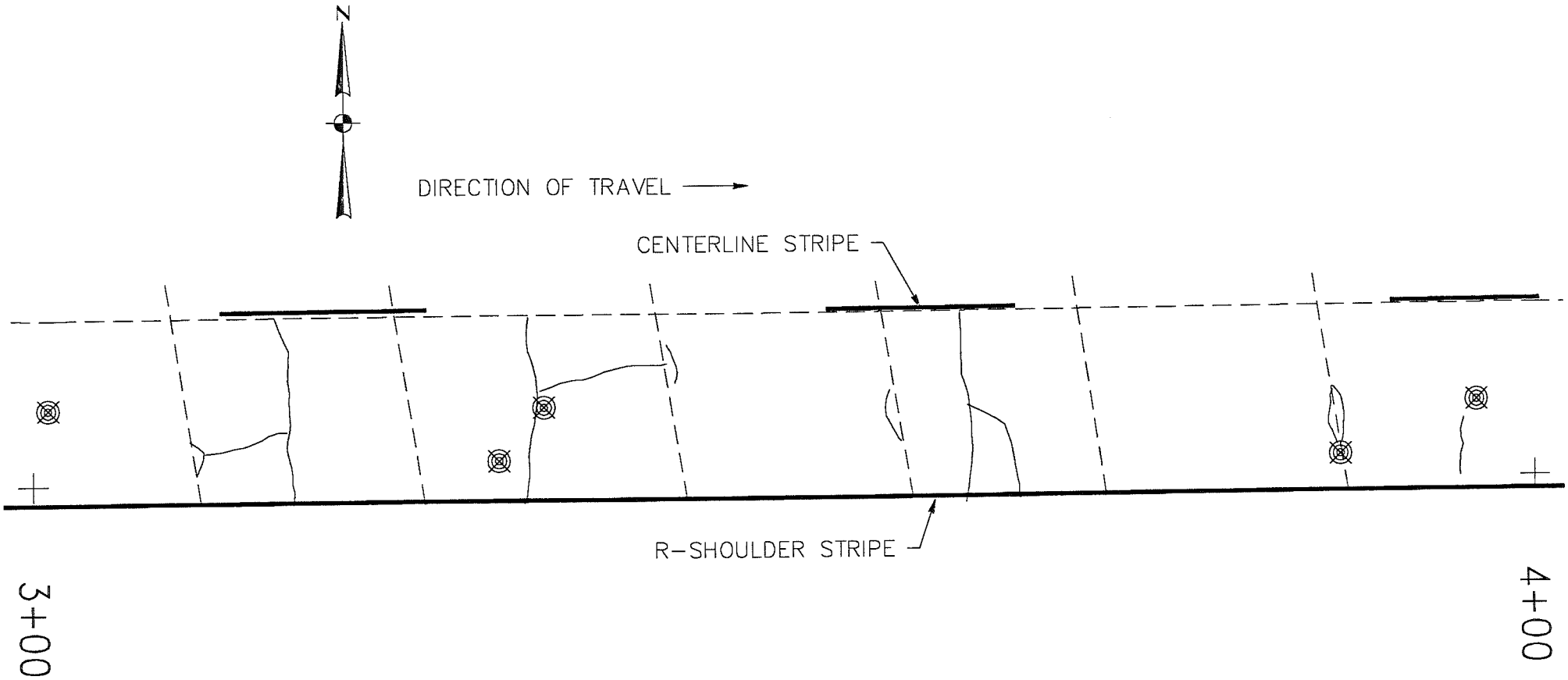
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 7



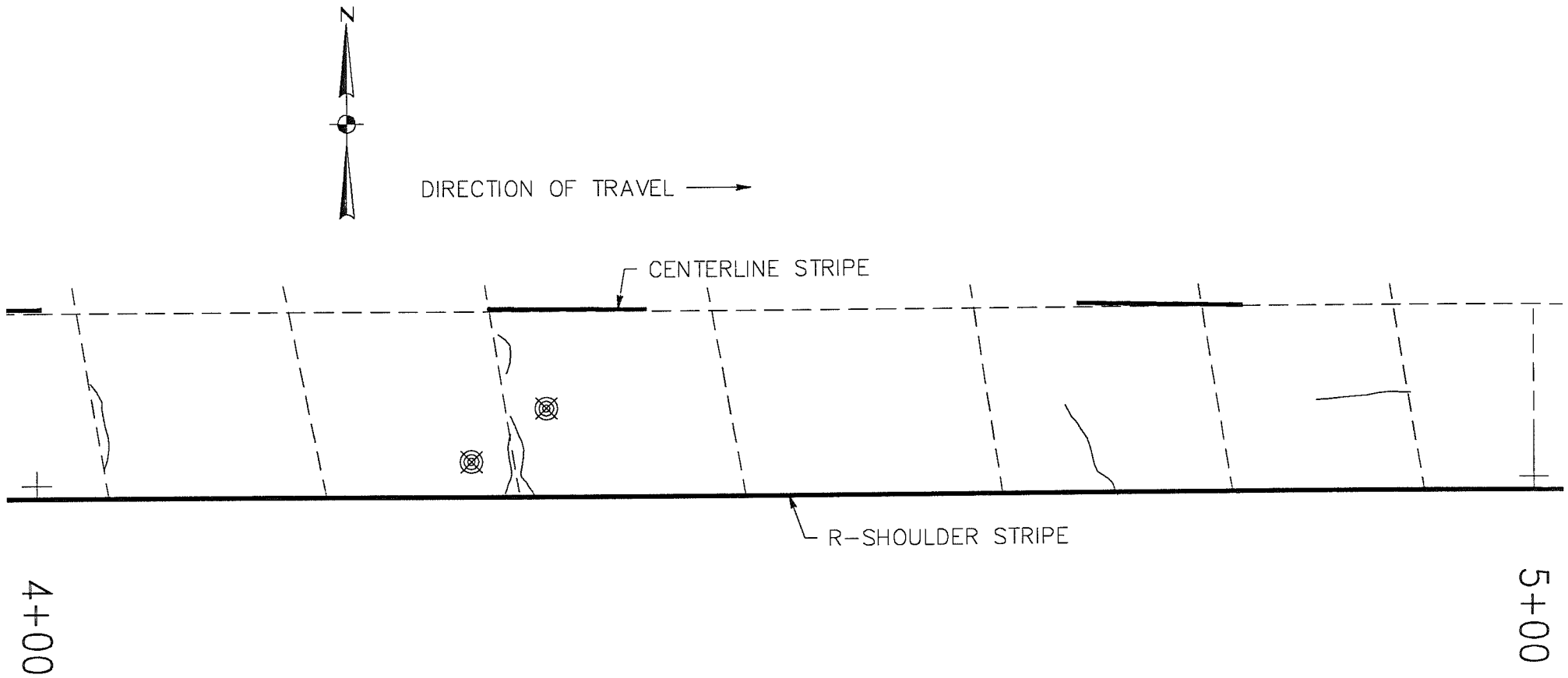
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 7



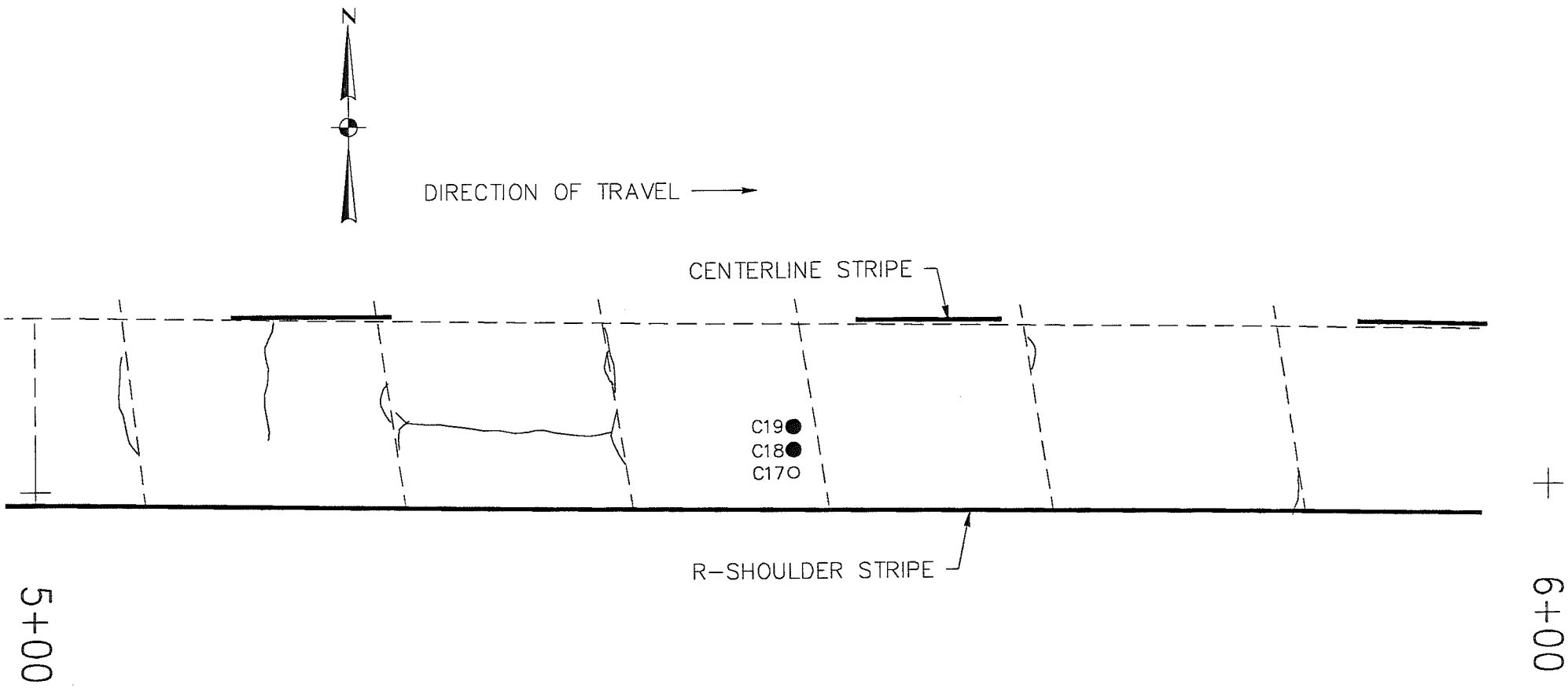
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 7



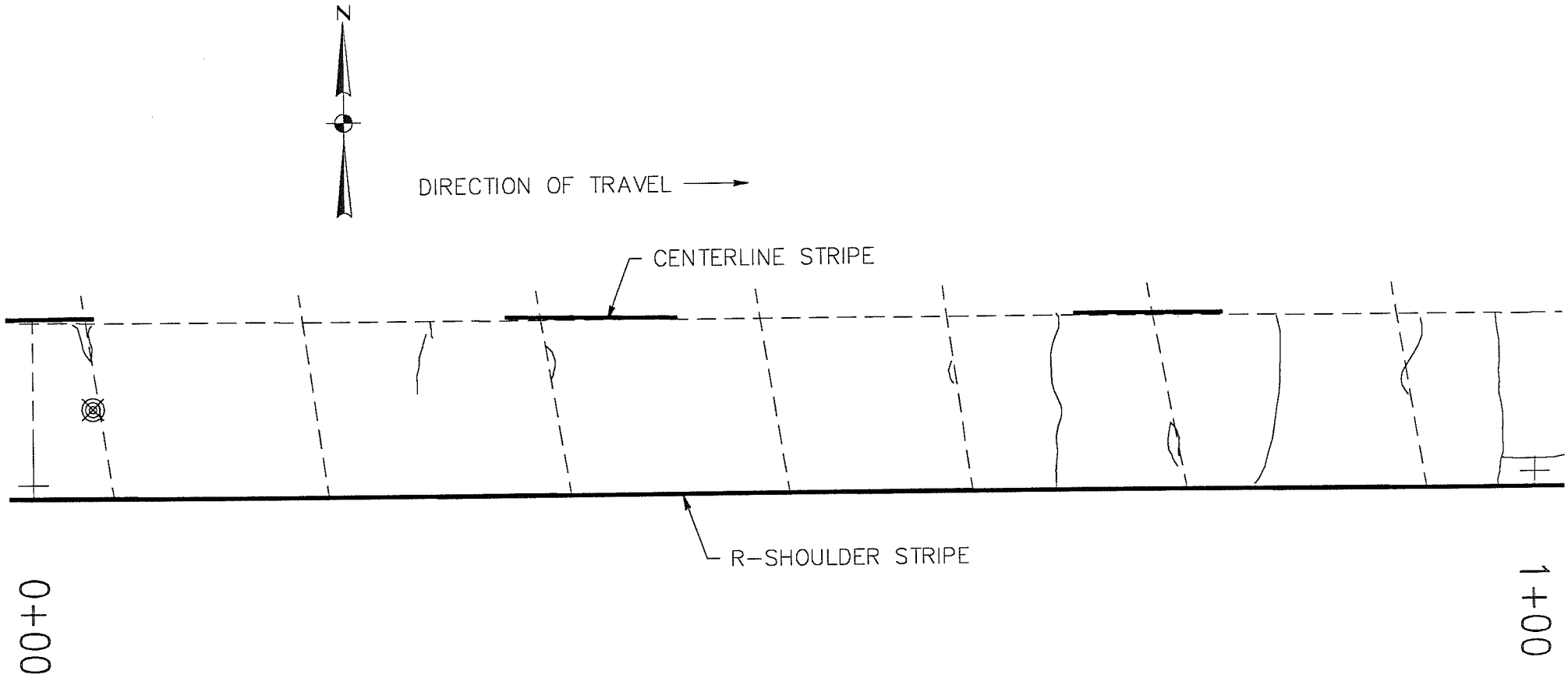
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 7



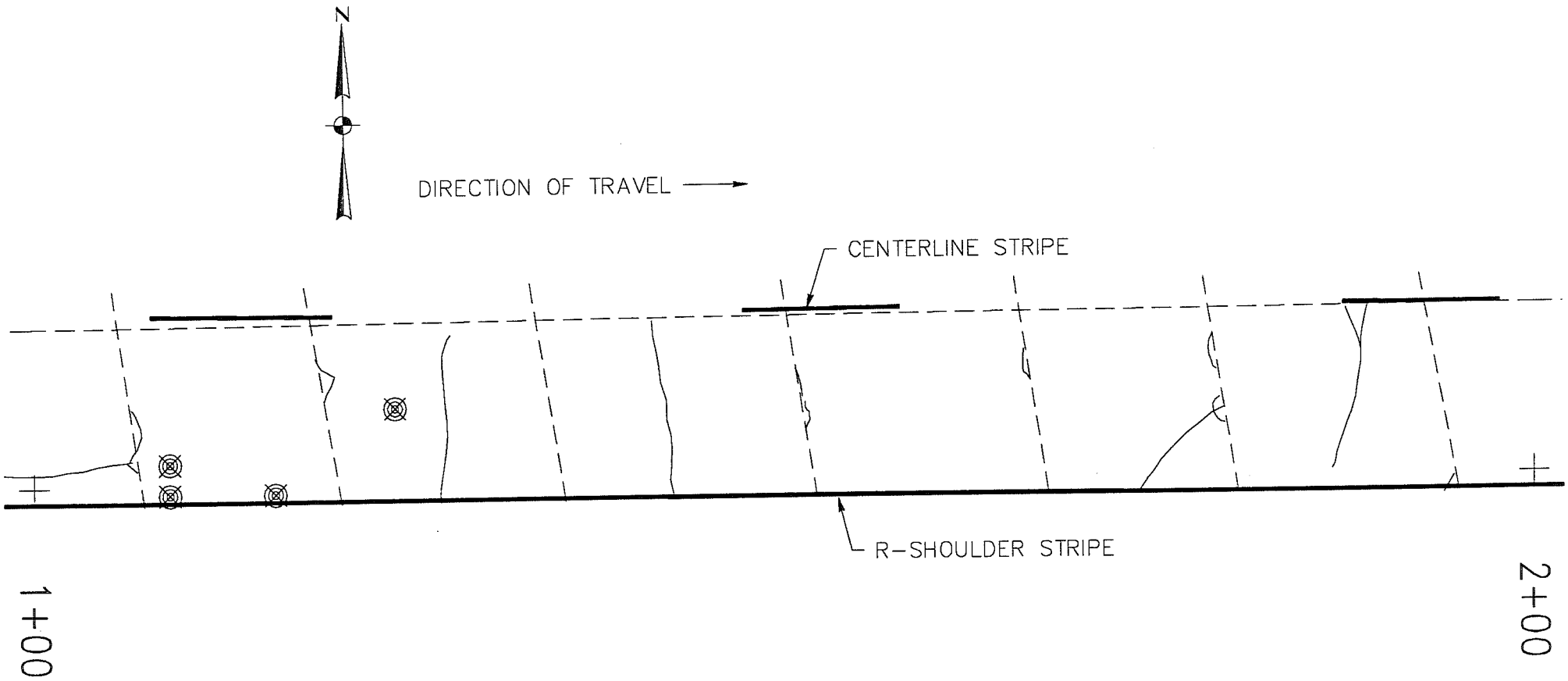
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040604
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 7 OF 7



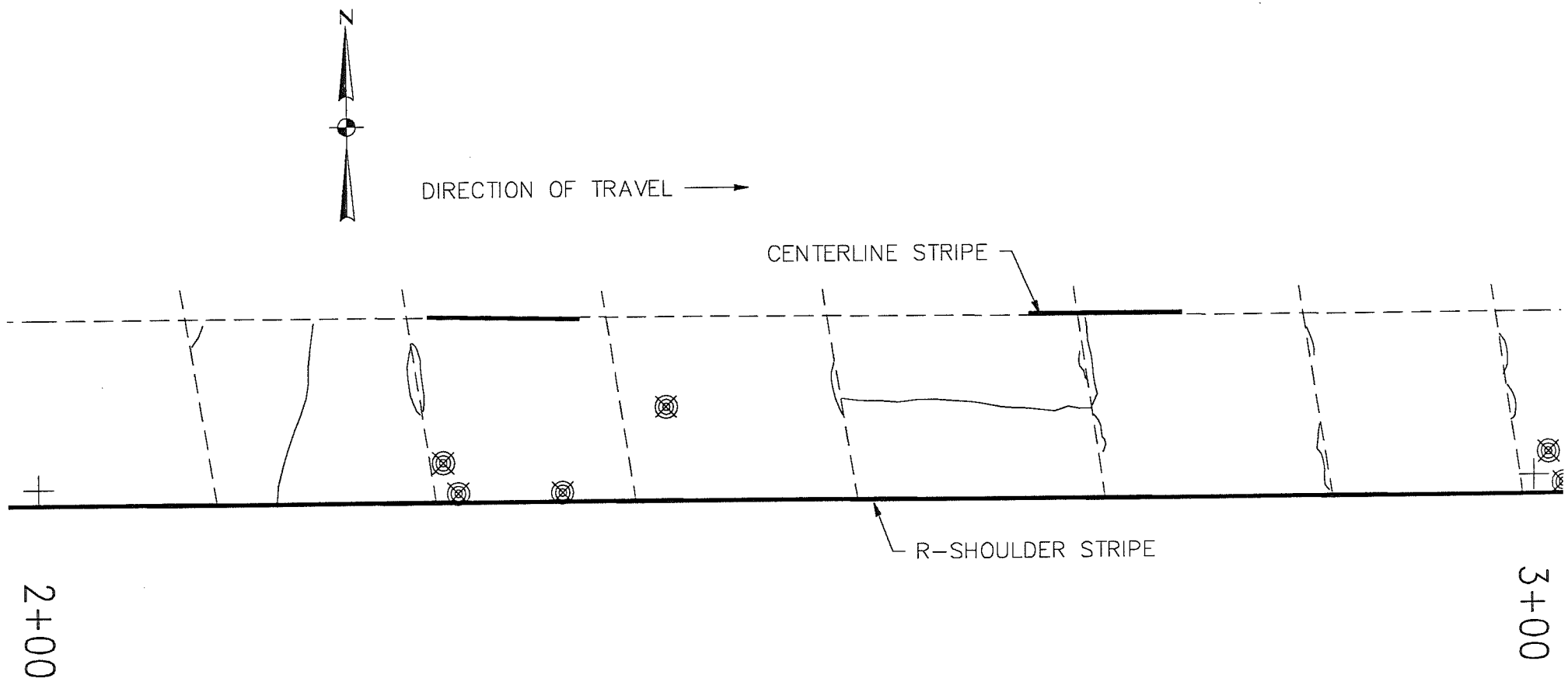
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040605
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 6



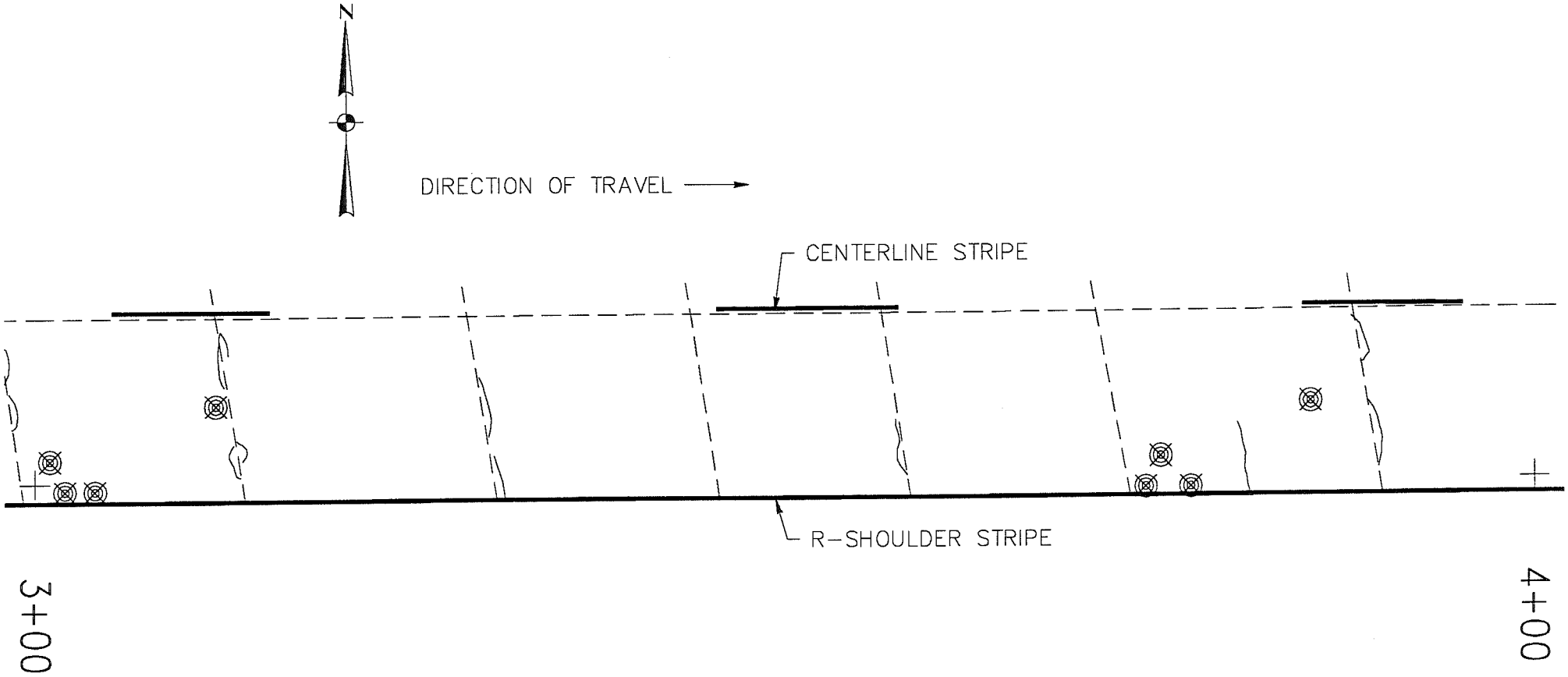
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040605
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 6



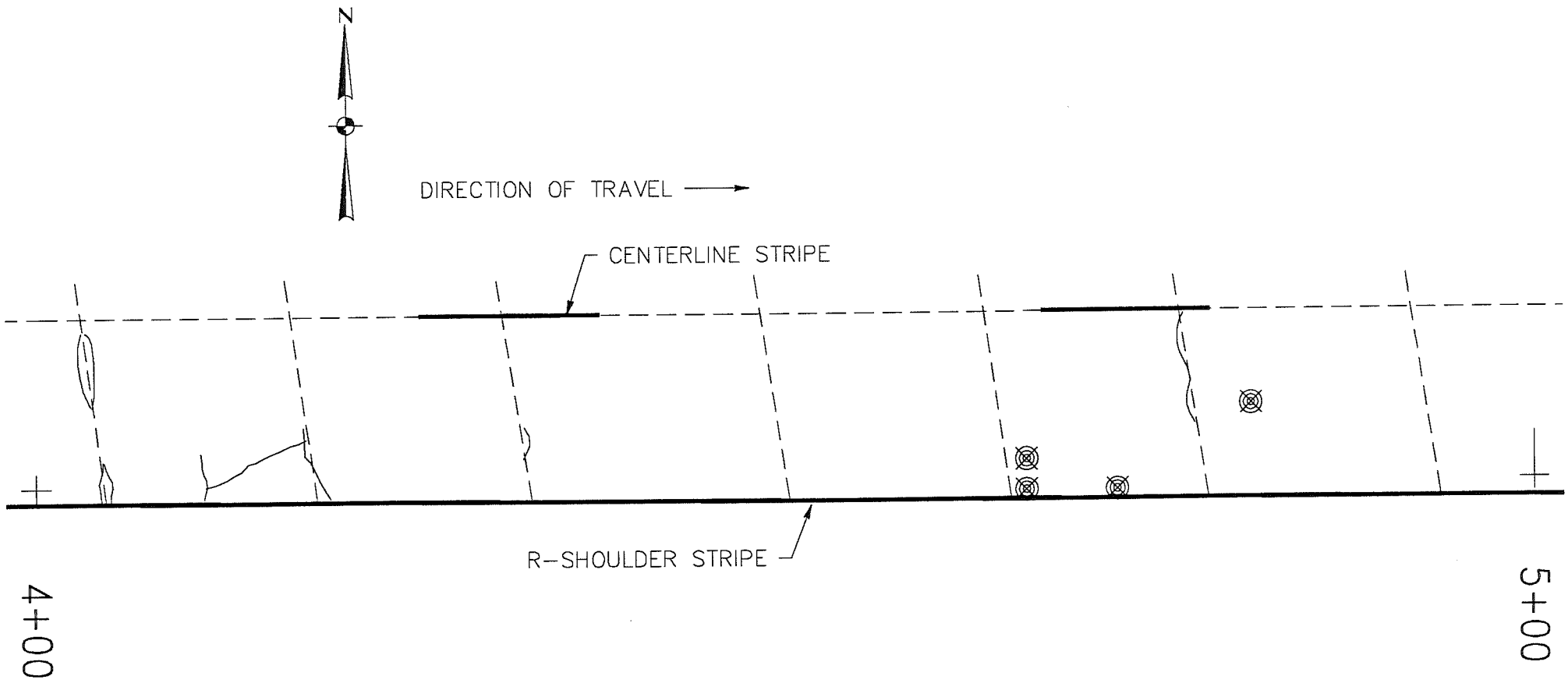
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040605
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 6



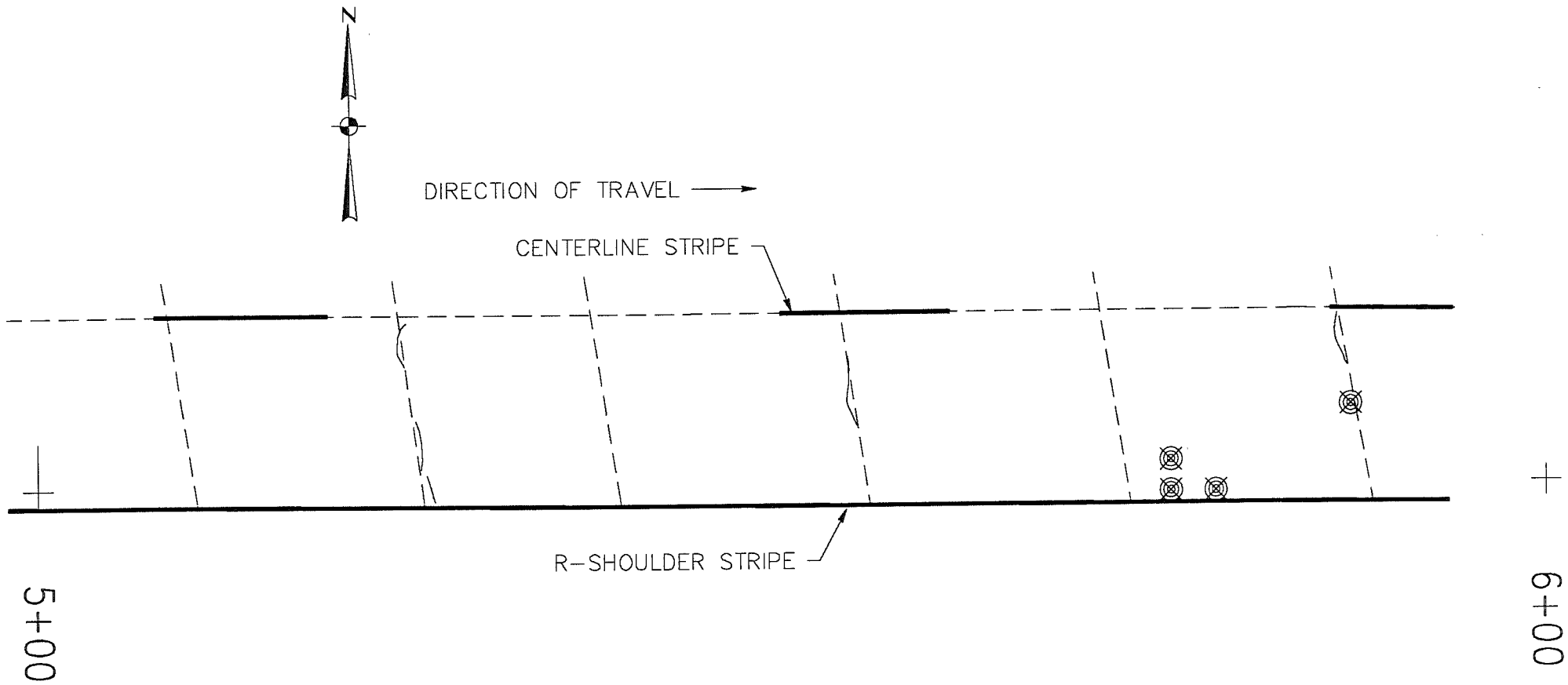
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040605
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 6



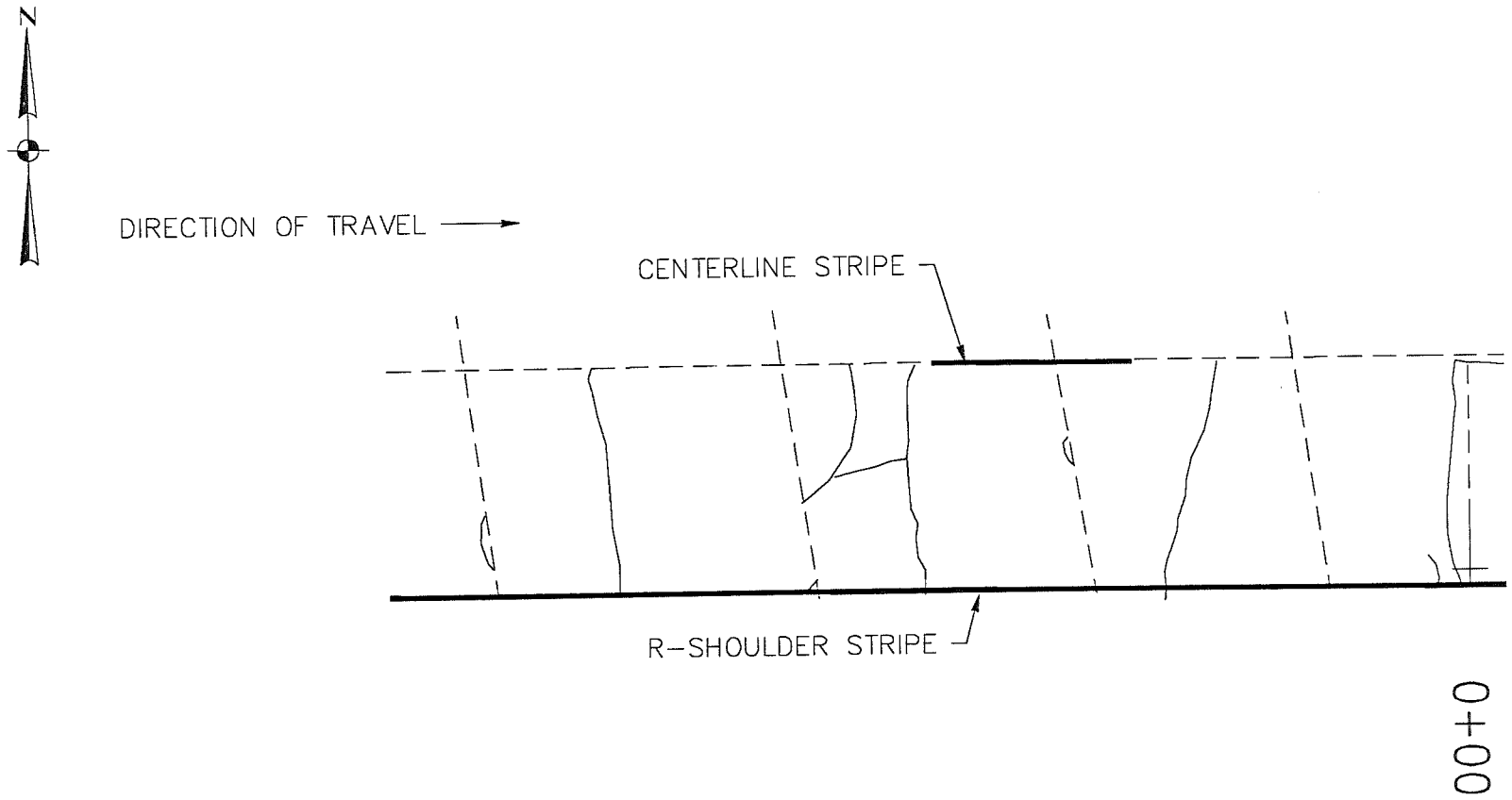
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040605
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 6



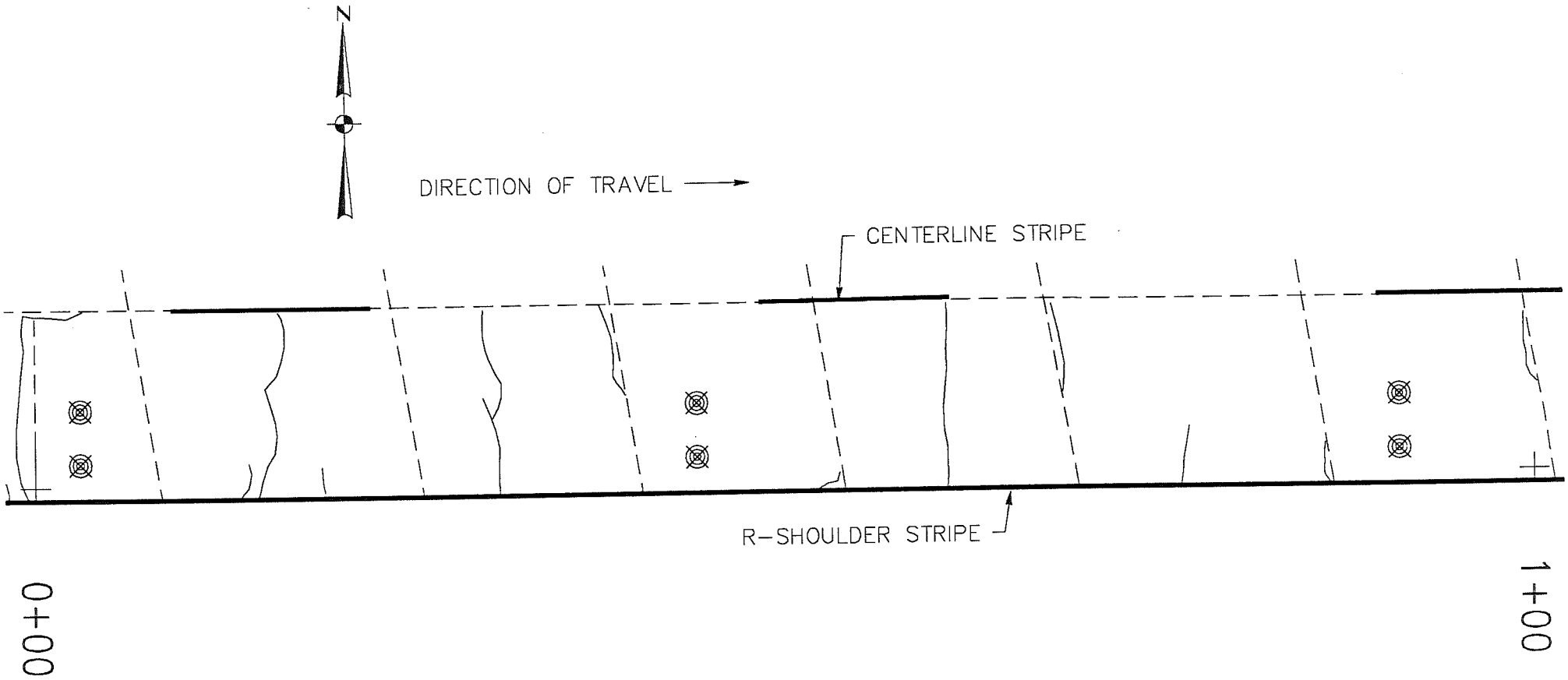
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040605
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 6



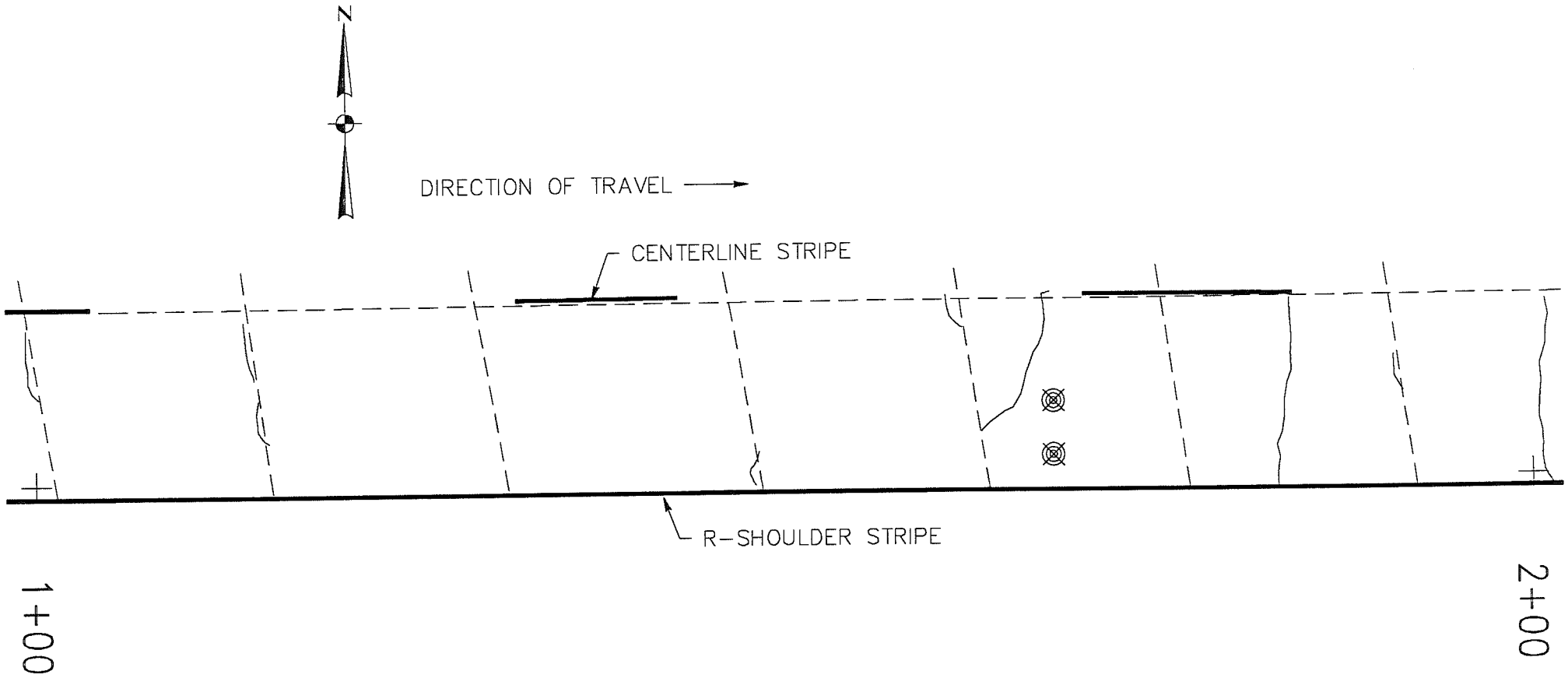
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 8



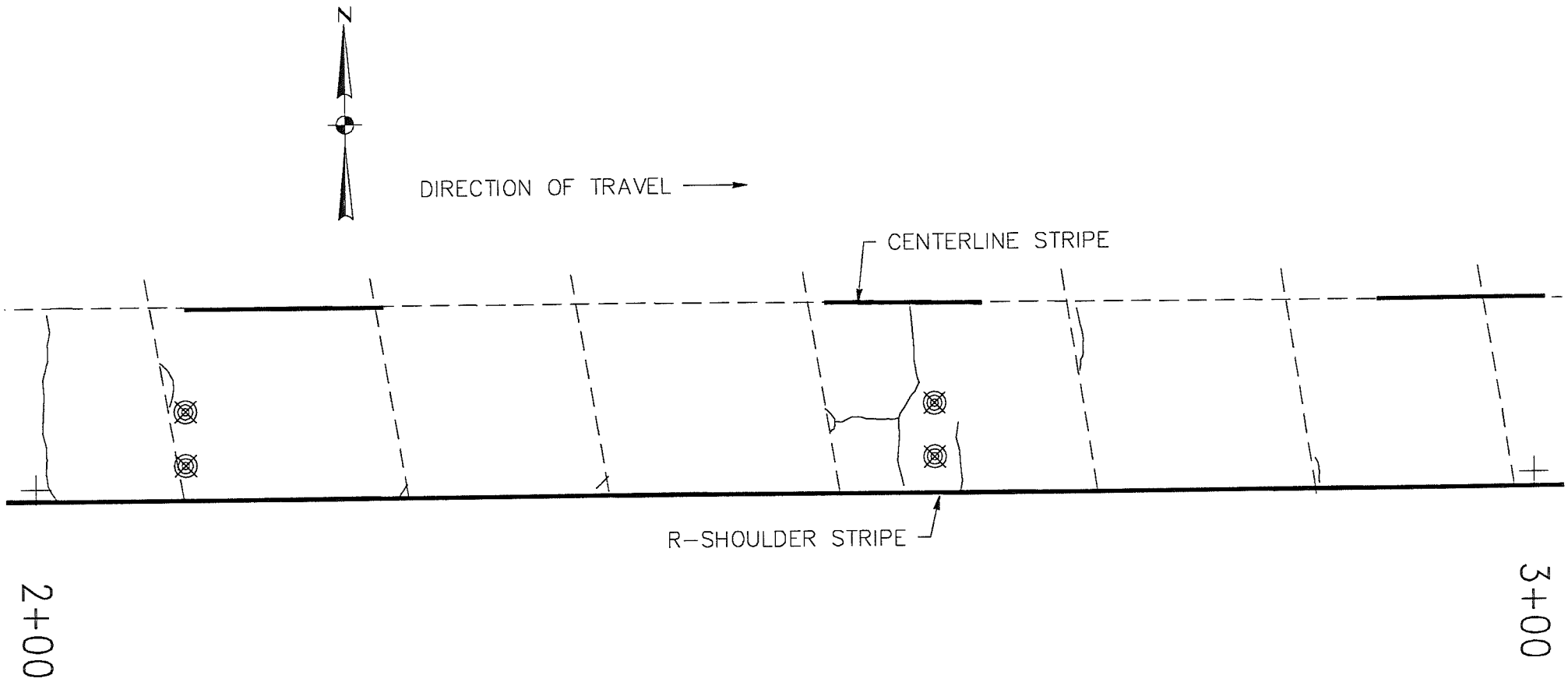
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 8



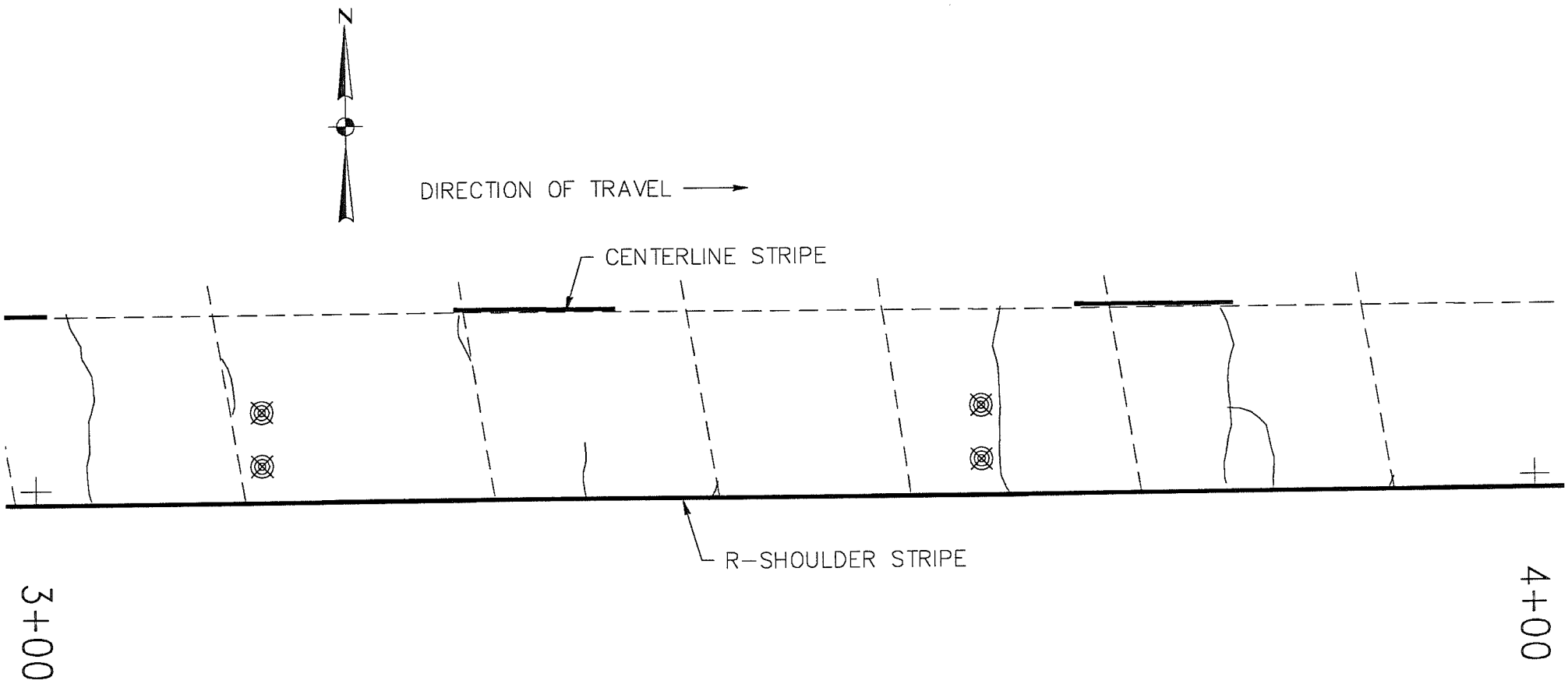
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 8



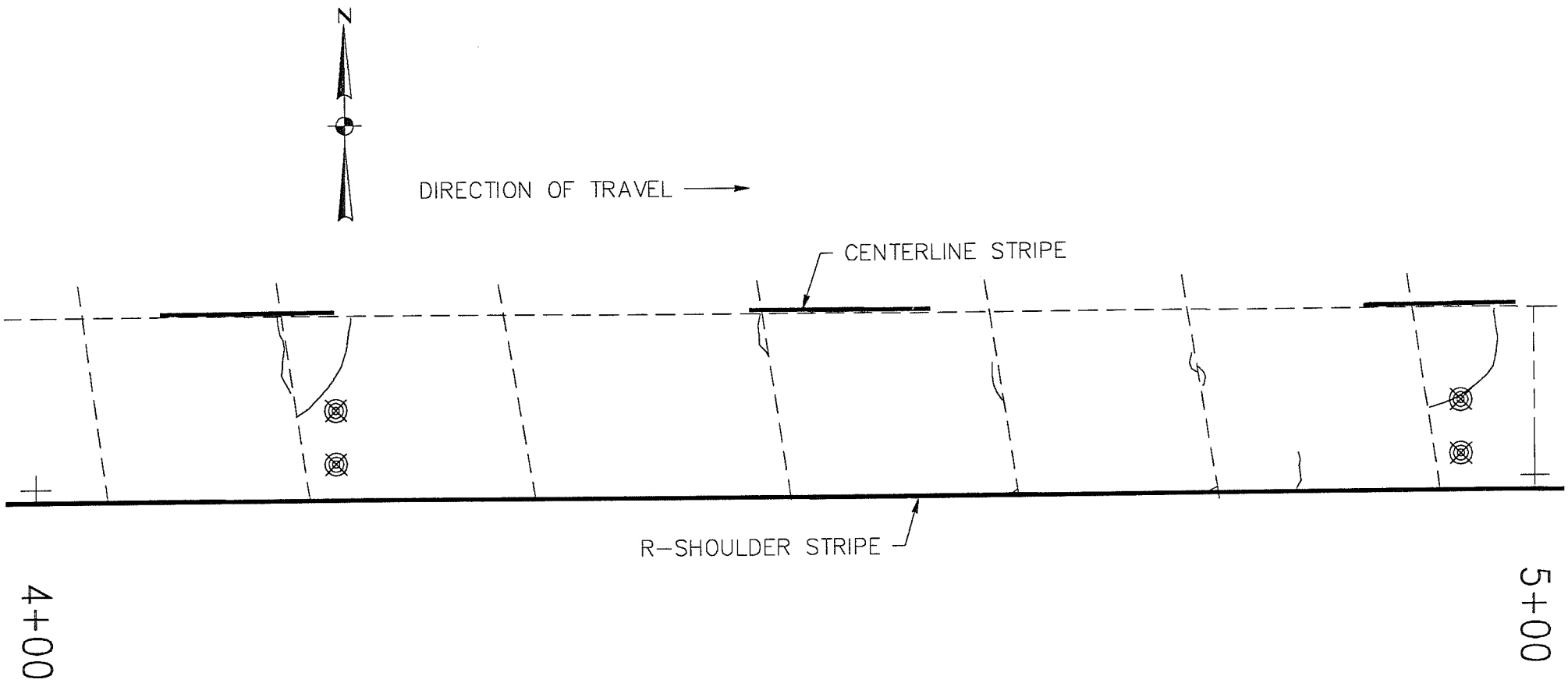
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 8



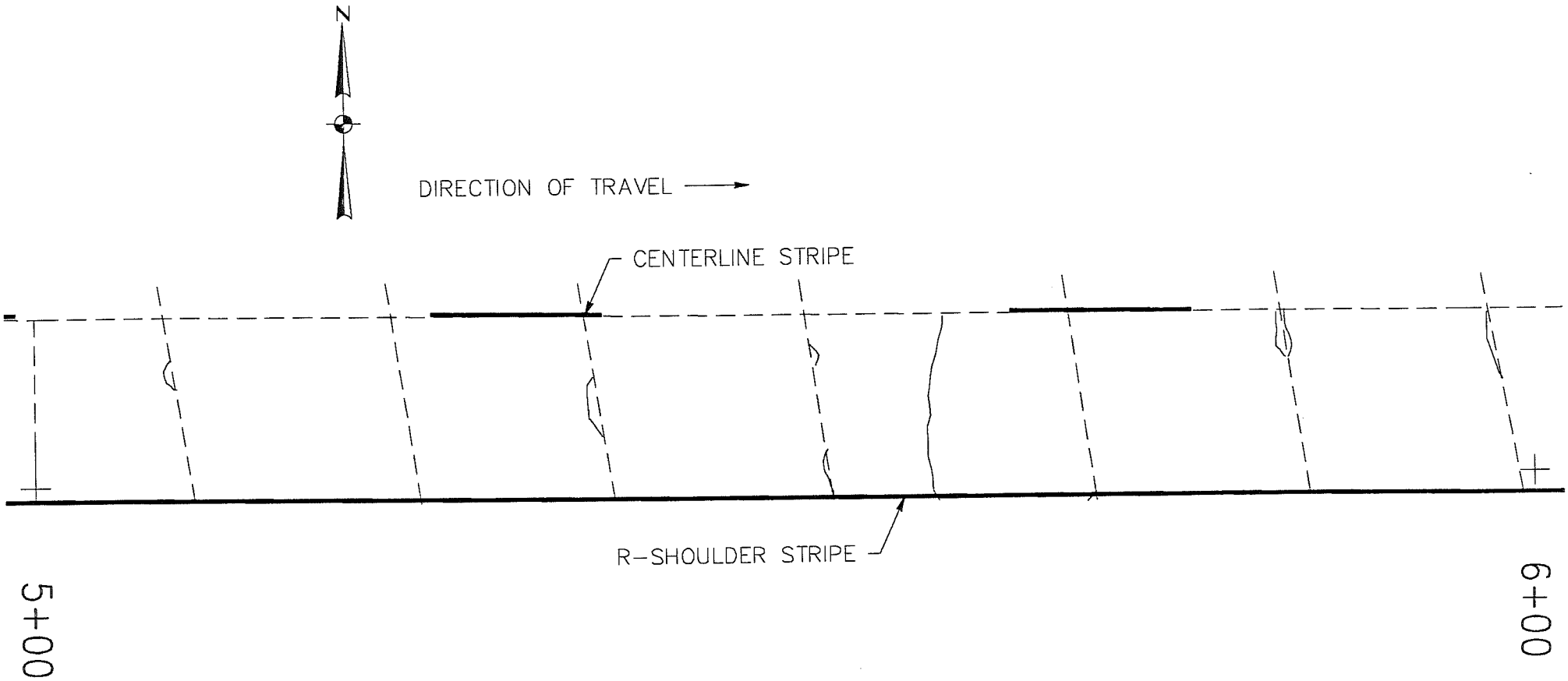
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 8



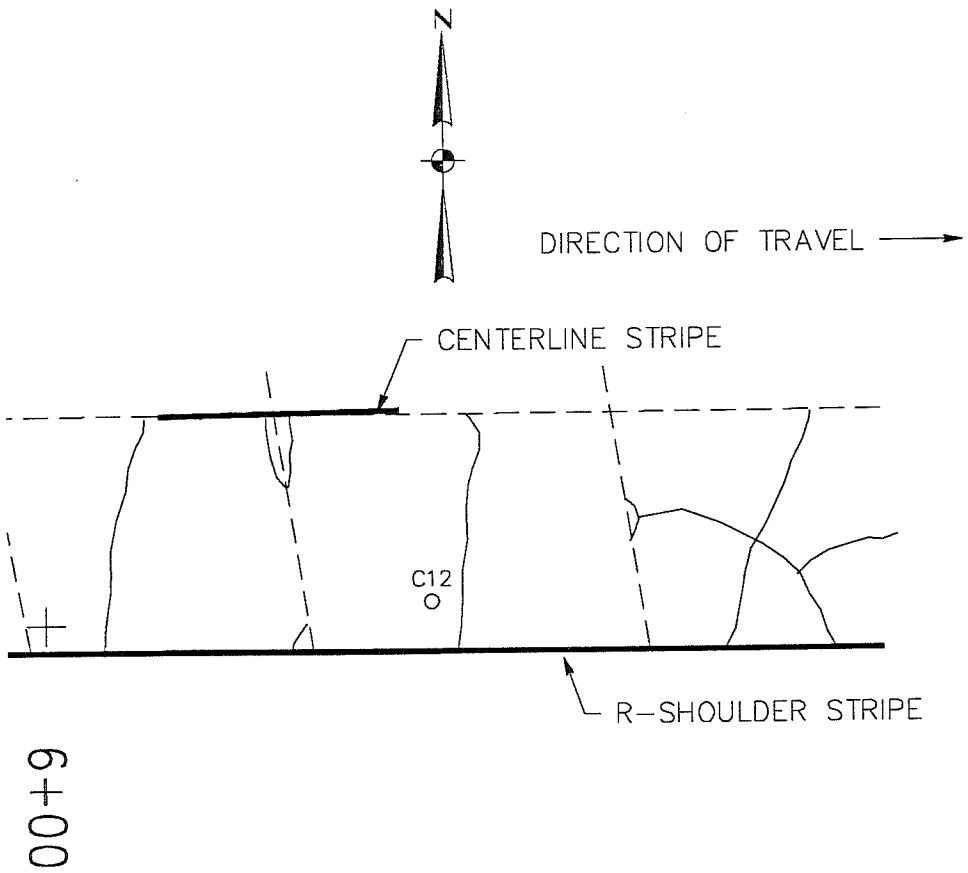
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 8



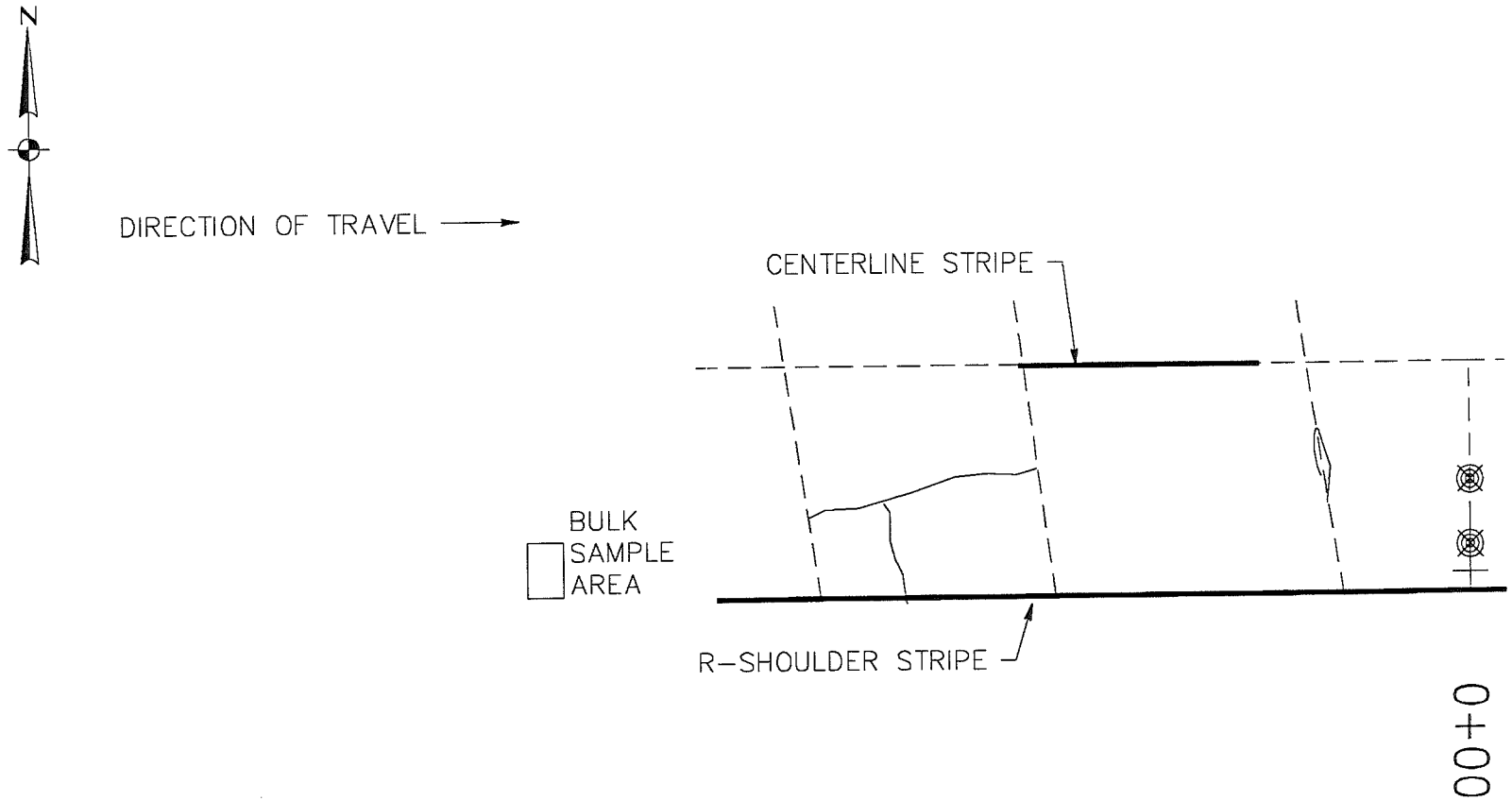
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 7 OF 8



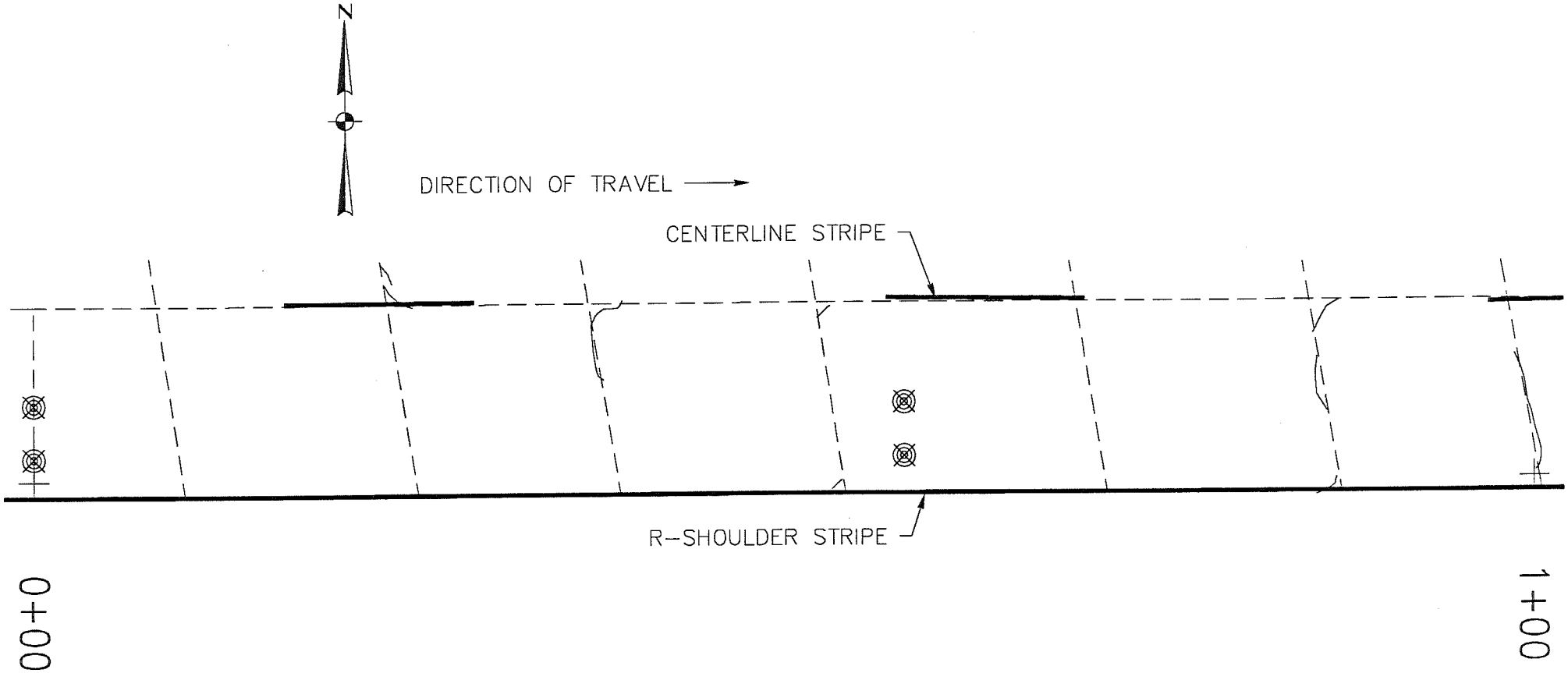
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040606
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 8 OF 8



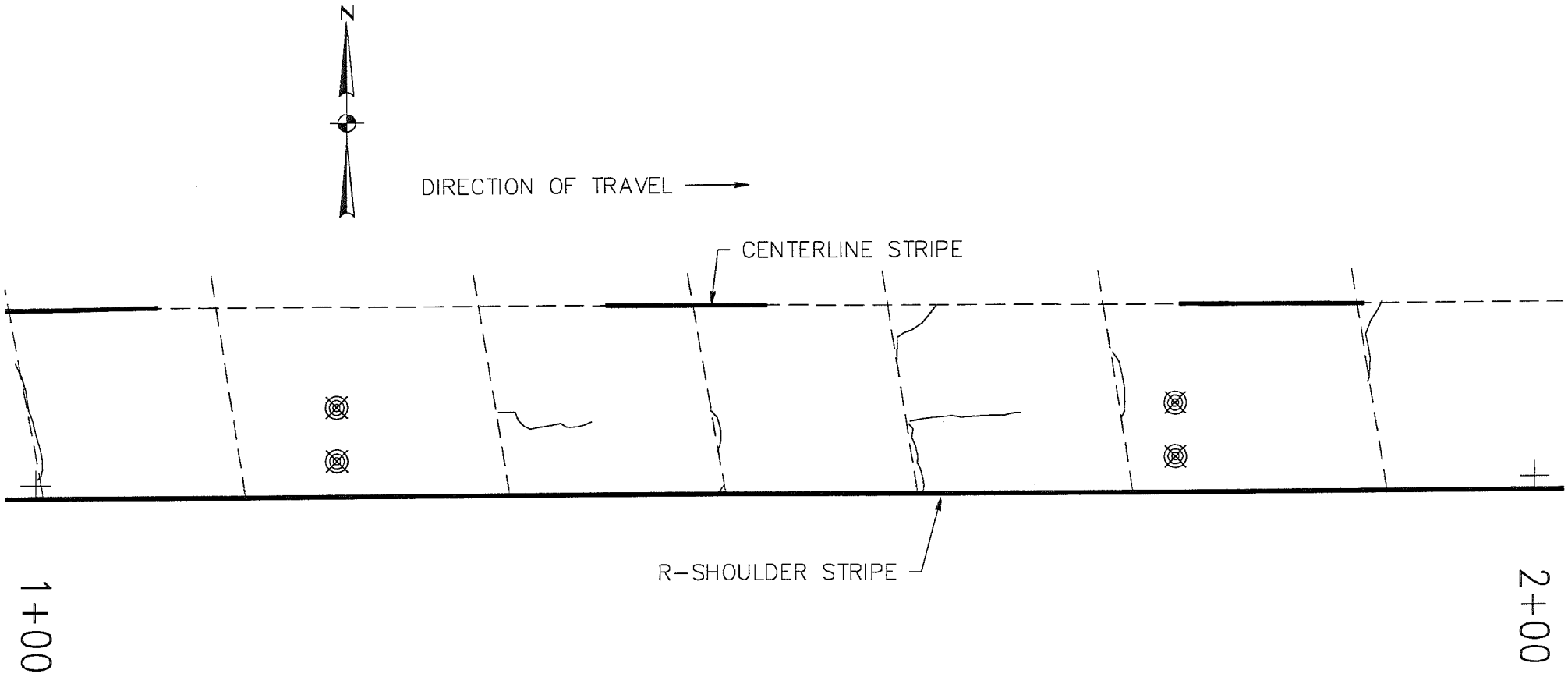
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 7



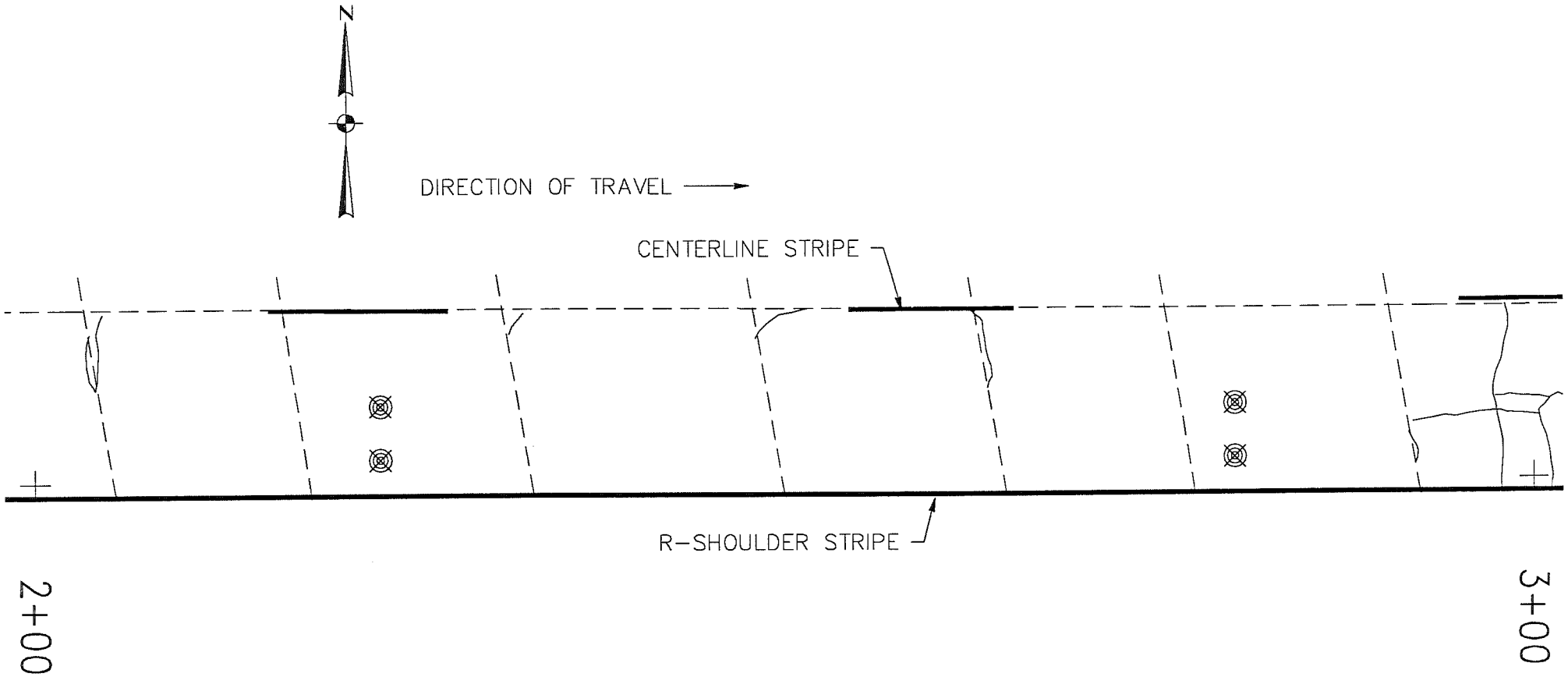
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 7



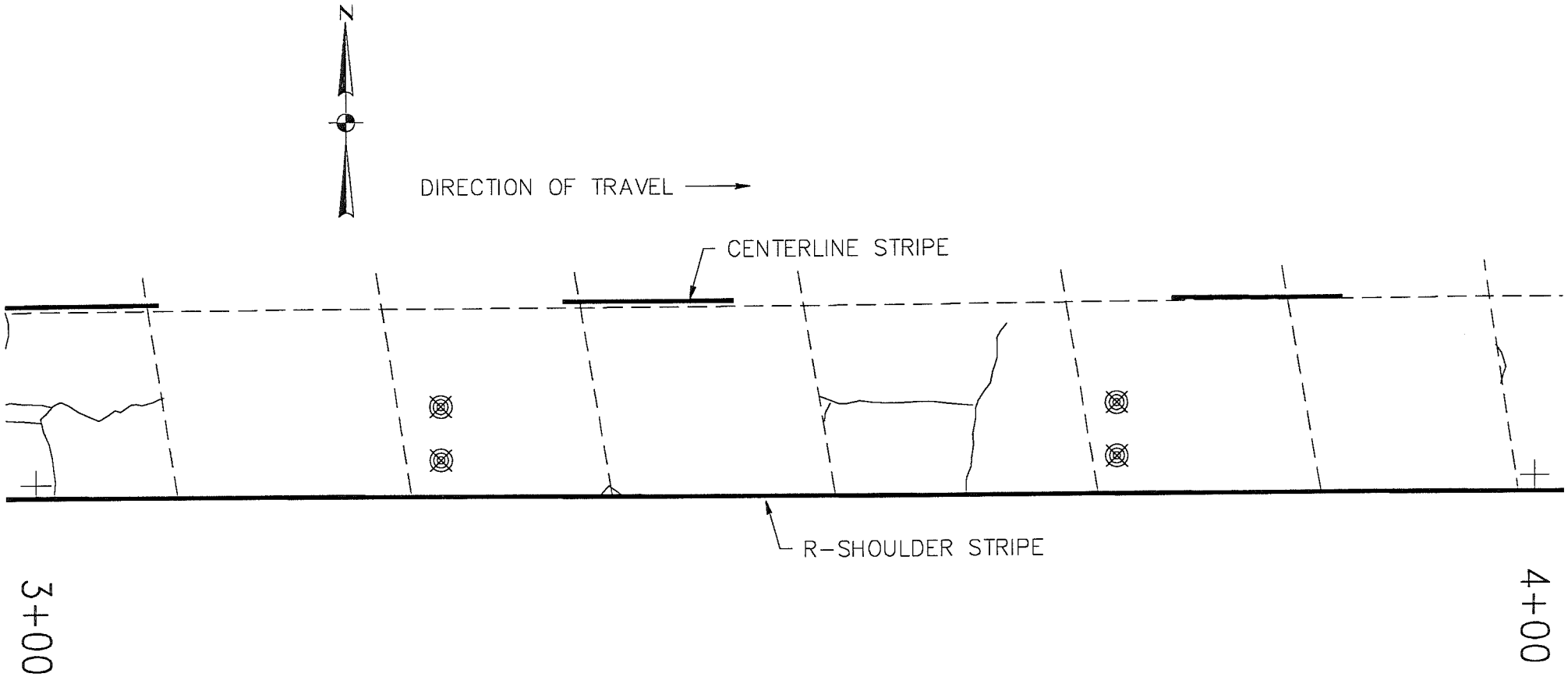
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 7



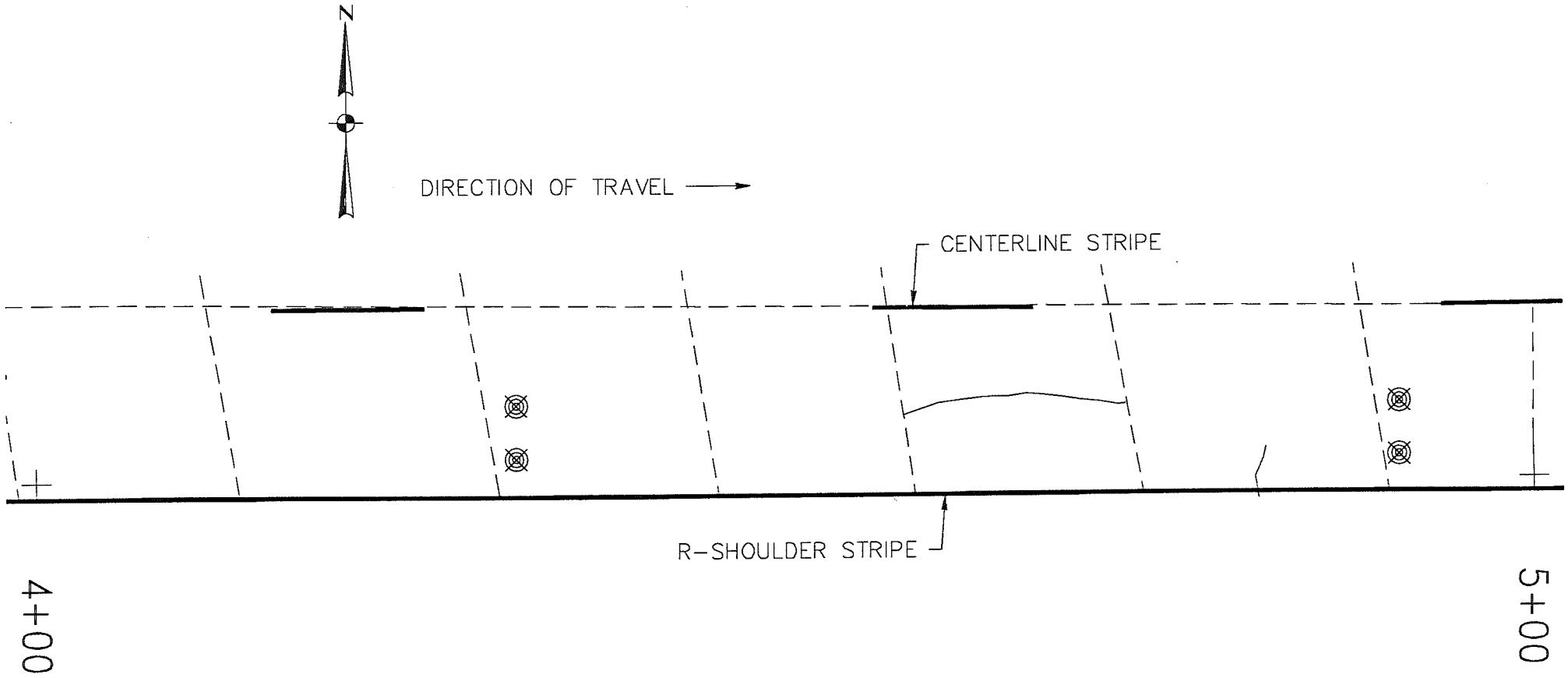
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 7



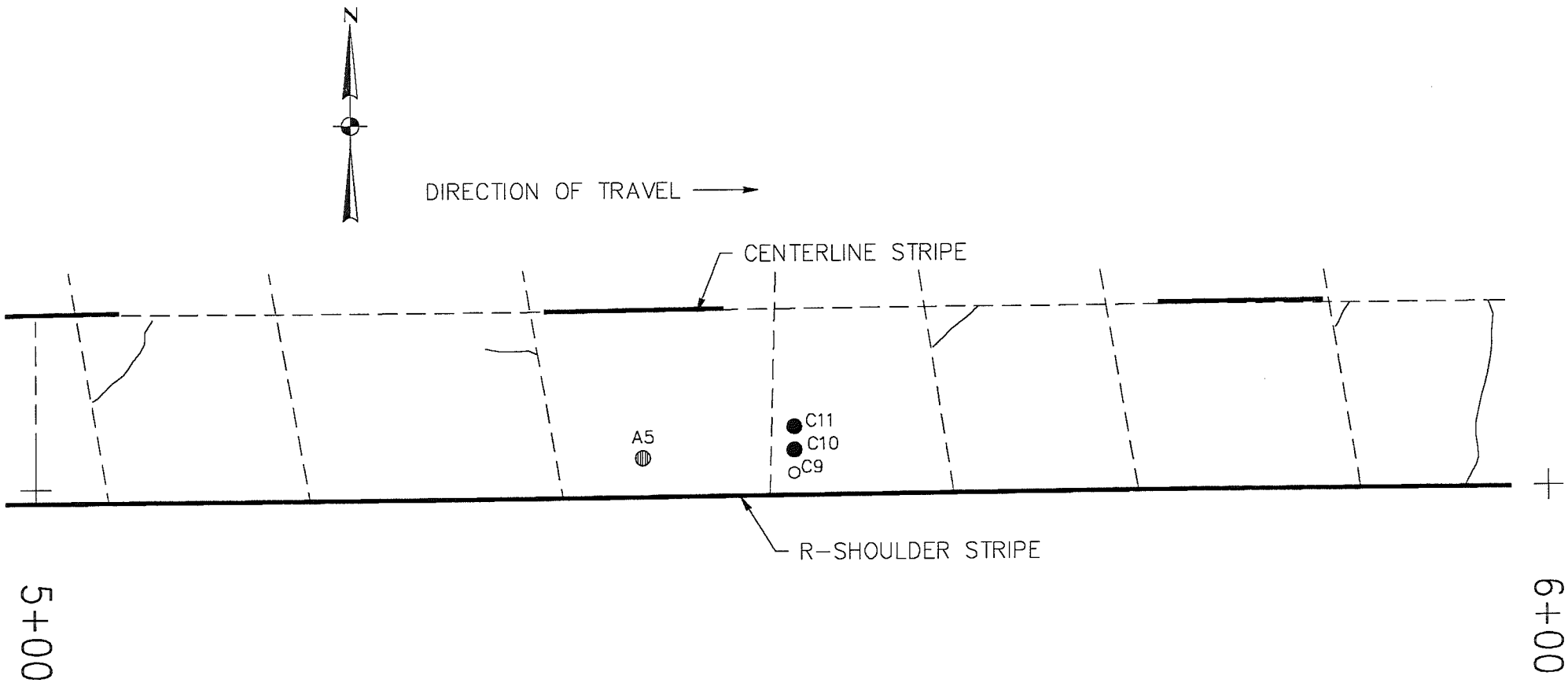
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 7



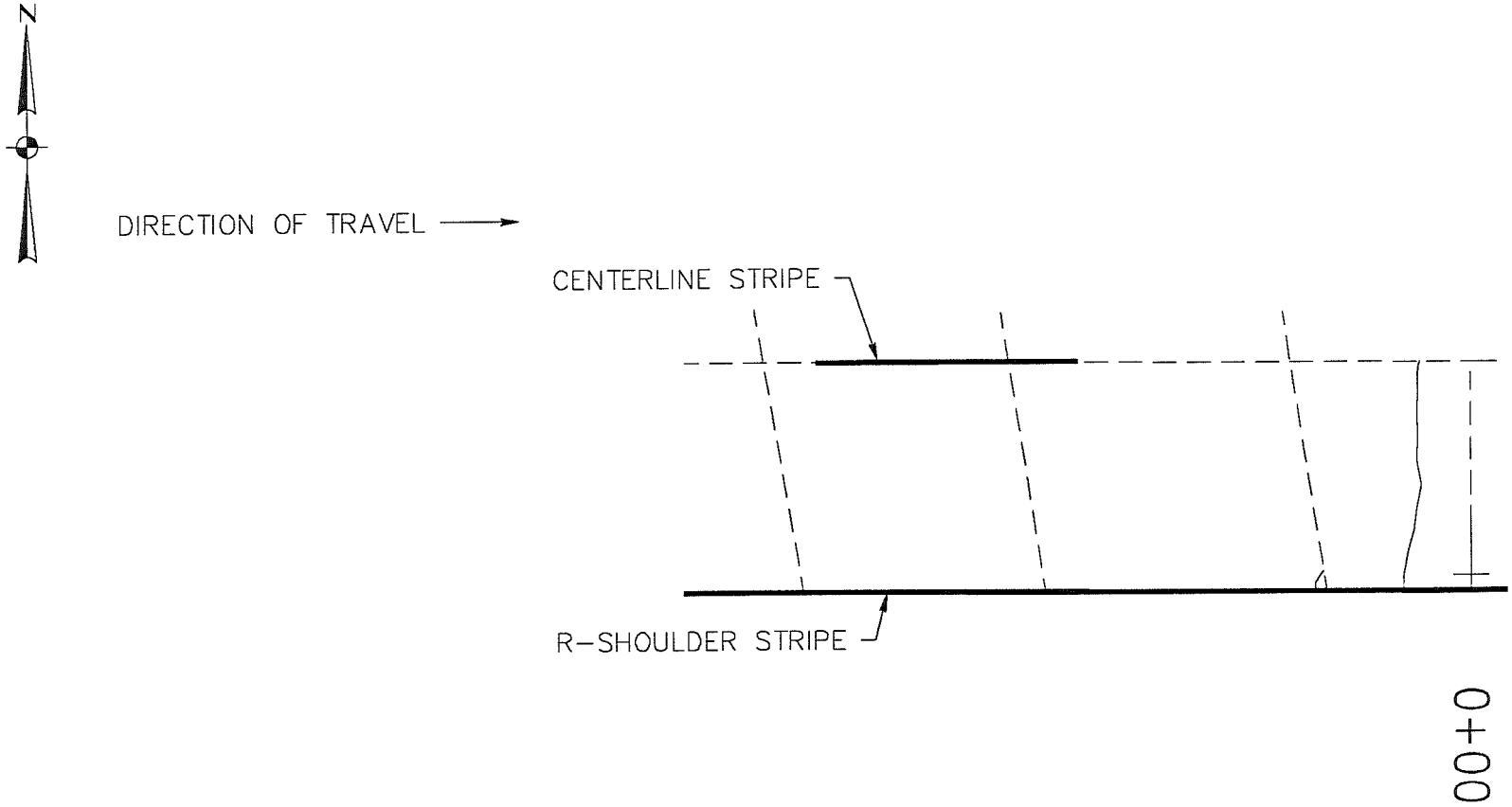
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 7



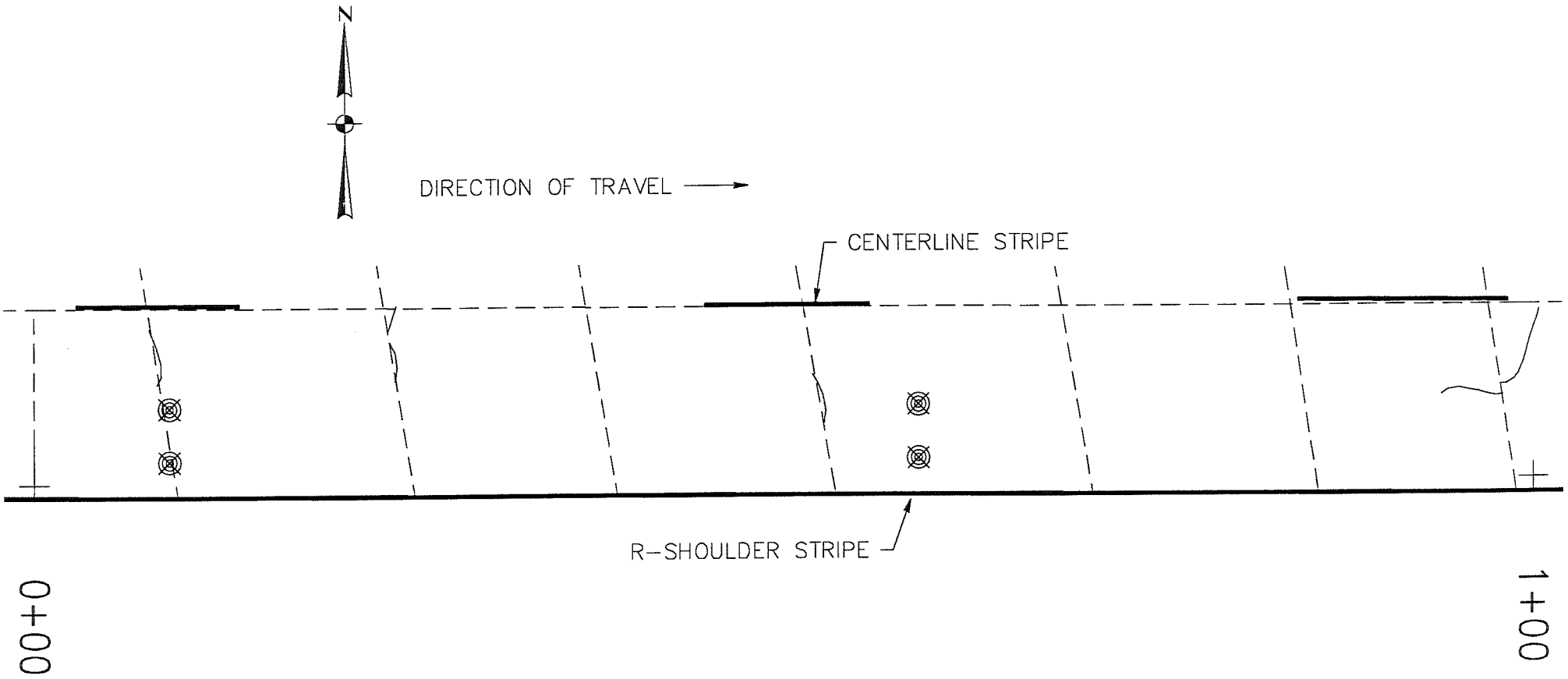
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040607
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 7 OF 7



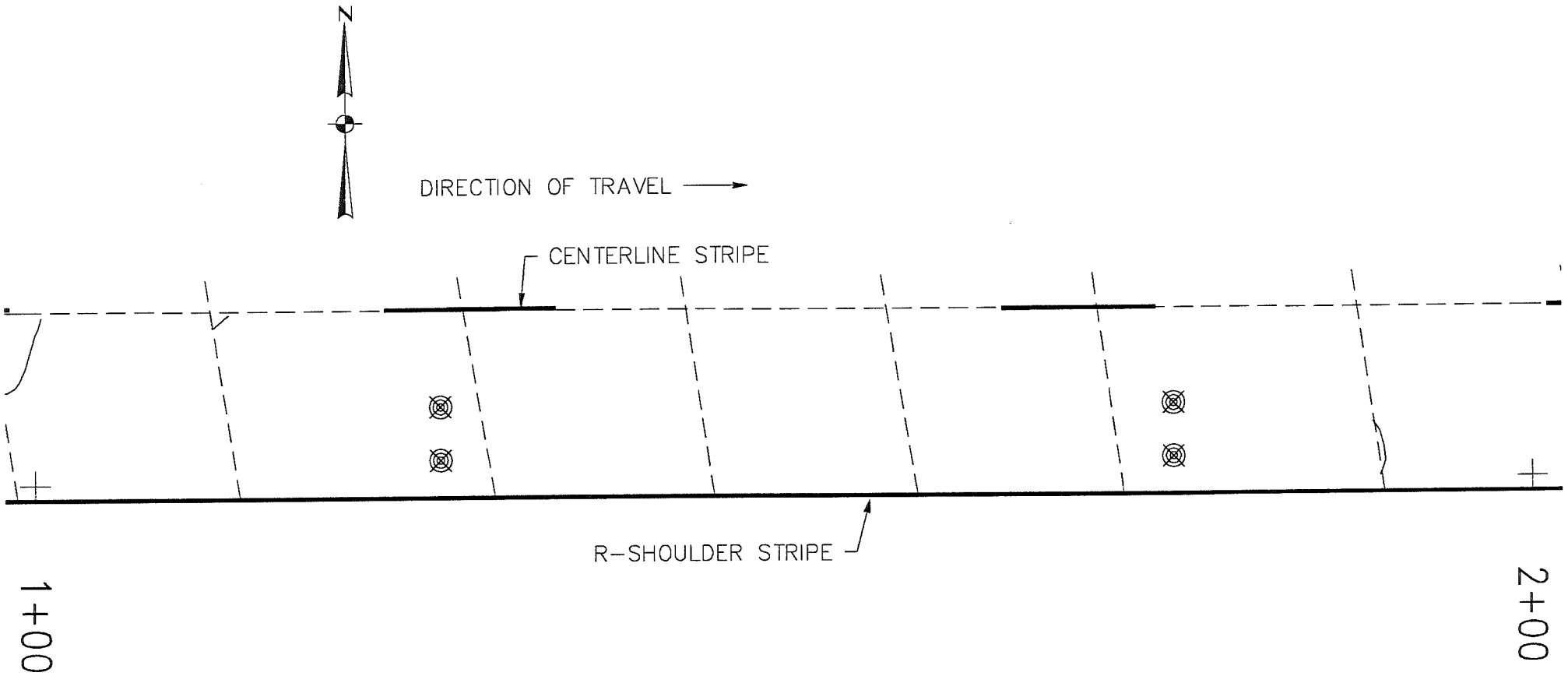
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 1 OF 7



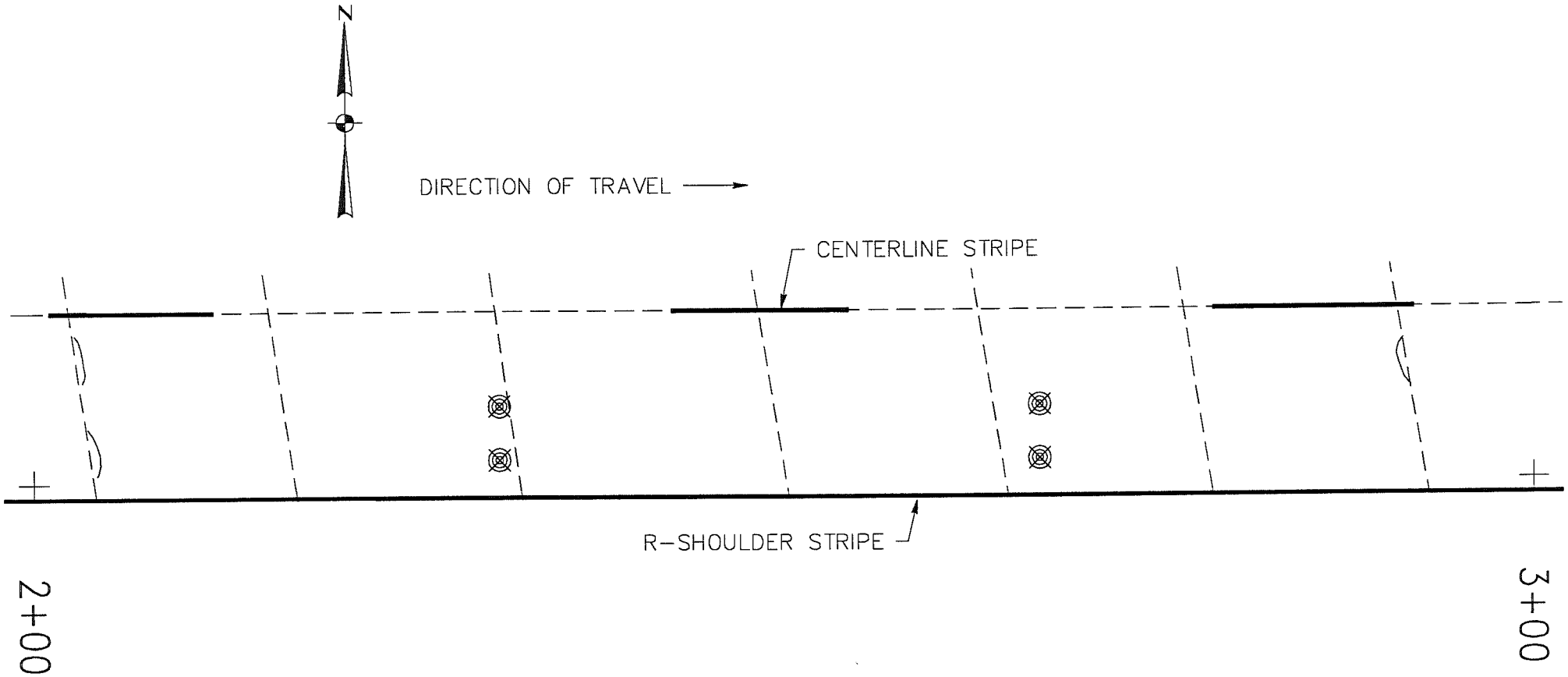
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 2 OF 7



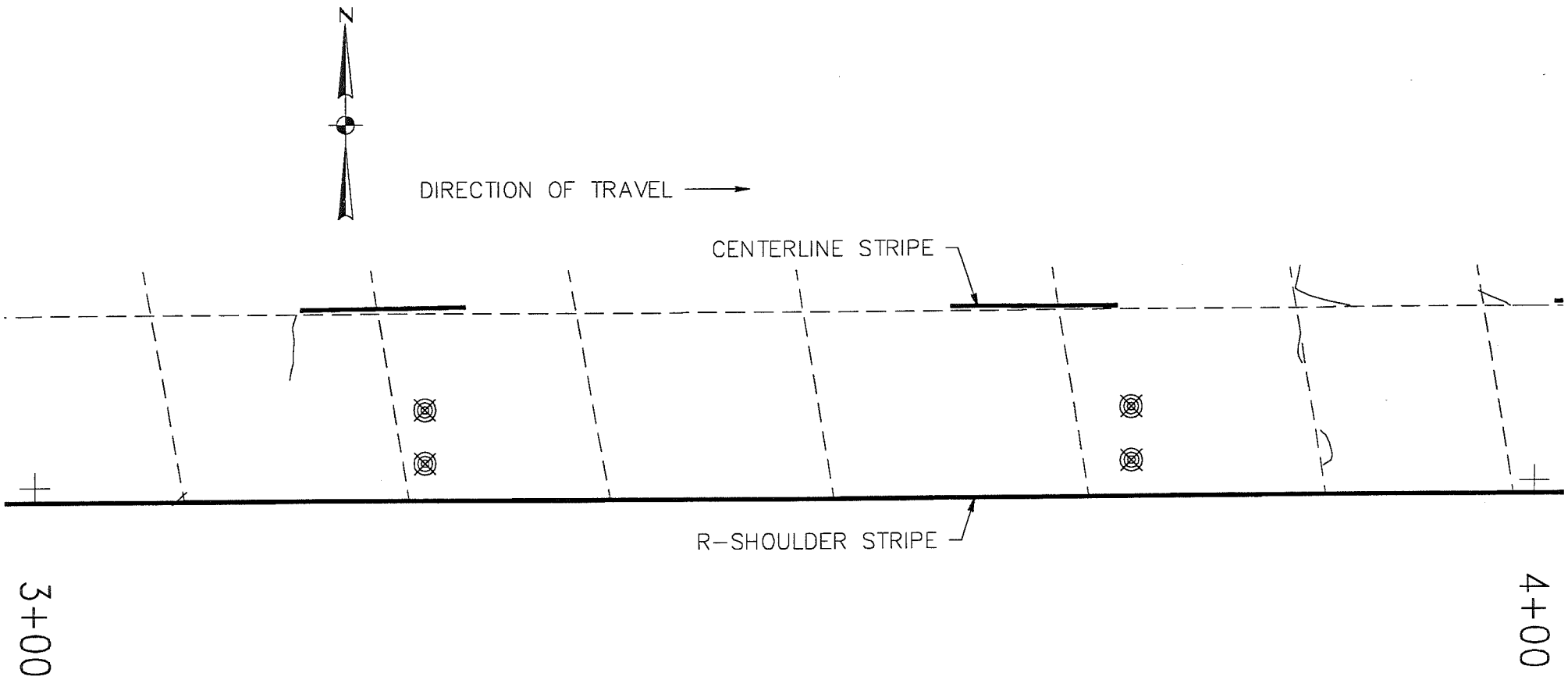
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 3 OF 7



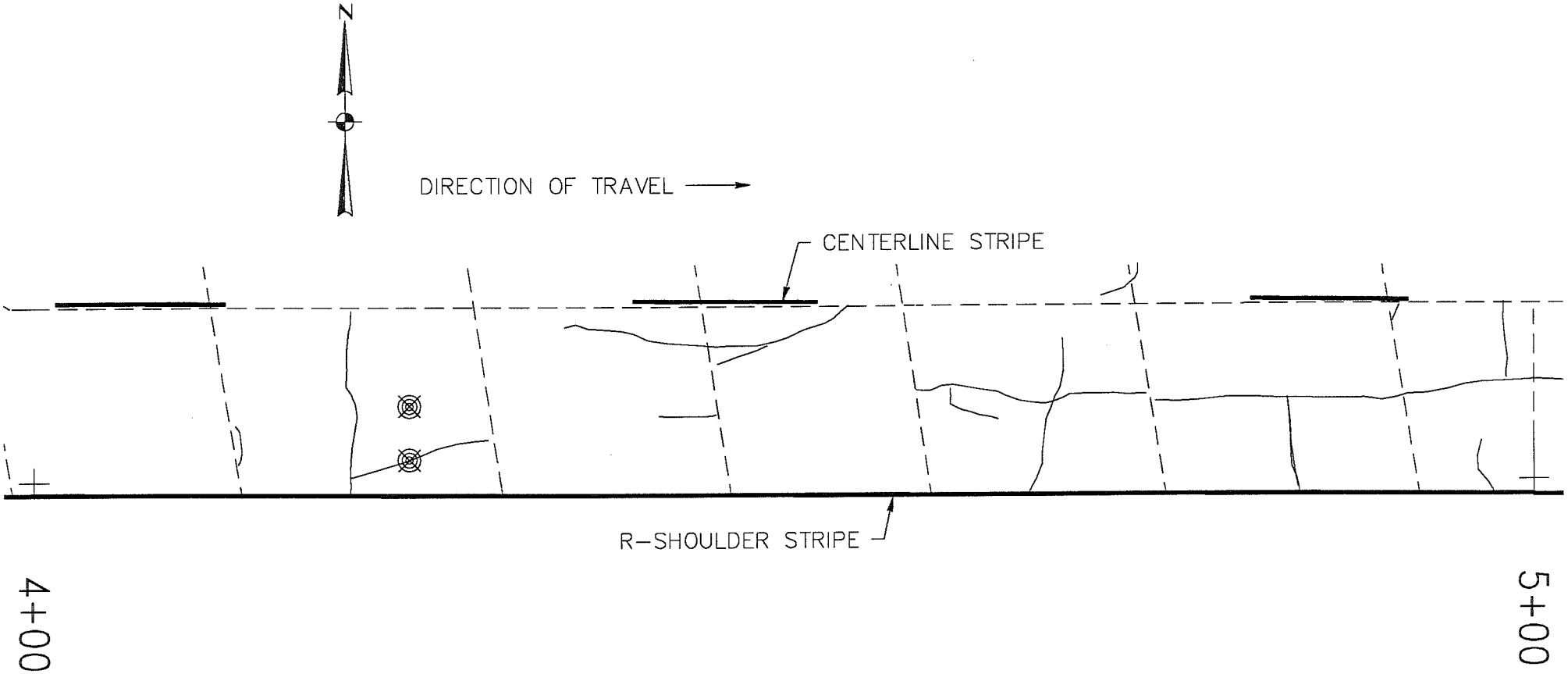
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 4 OF 7



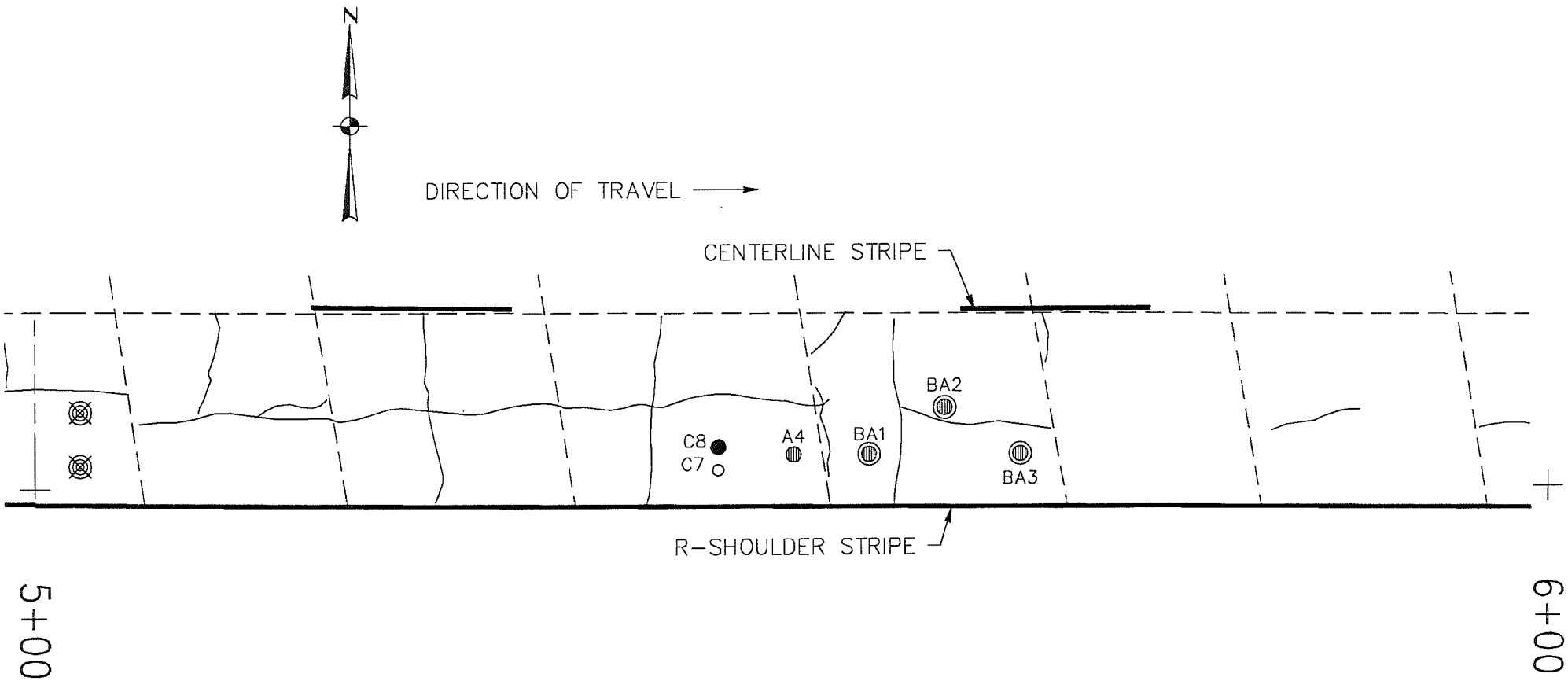
PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 5 OF 7



PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 6 OF 7



PAVEMENT DISTRESS MAP

STATE NAME	: ARIZONA
SECTION ID	: 040608
TRAFFIC ROUTE	: I-40 E
RECORD DATE	: 11/21/89
ORIG. DWG. SCALE	: 1" = 10'
SHEET	: 7 OF 7

APPENDIX E

Mix Designs for Materials

ARIZONA DEPARTMENT OF TRANSPORTATION

ARIZONA TRANSPORTATION RESEARCH CENTER

ARIZONA STATE UNIVERSITY
COLLEGE OF ENGINEERING & APPLIED SCIENCES
ENGINEERING RESEARCH CENTER
TEMPE, ARIZONA 85287-7306
U.S.A.

TELEPHONE: (602) 965-2368 FAX: (602) 965-9267

TRANSMISSION:

Date: 04/25/1990 Time: 10:10 (a.m./p.m.)MST

To: MR. DOUG FRITH
NICHOLS CONSULTING ENGRS CHTD.
RENO, NEV.

Phone #: (702) 329-4955 FAX#: (702) 329-5098

Subject: MIX DESIGN FOR VIRGIN/END PRODUCT AC (3/4") FOR SHRP SPS-6 PROJECT ON I-40 IN AZ.

Total number of pages: 9 (including this page)

From: DR. MUSTAQUE HOSSAIN
ARIZ. TRANSP. RESEARCH CENTER
ASU, TEMPE, AZ.

Comments: DOUG, I GOT THE MIX DESIGN YESTERDAY FROM DIST-IV, HOPE, IT IS NOT LATE.

FNF CONSTRUCTION, INC.
(602) 784-2910
(602) 829-8607 - Fax

RECEIVED
APR 2 6 1991
ARIZONA TRANSPORTATION
RESEARCH CENTER
A.D.O.T.
JUN 30 '90
ORG 4443

June 30, 1990

Arizona Dept. of Transportation
Highway Division
1801 S. Milton Drive
Flagstaff, Arizona 86001

Attn: Mr. Kent Link

RE: Cordes Junction - Flagstaff Highway,
Flagstaff-Walnut Canyon Highway,
ADOT Project No: I-17-3(111) and
No: I-40-4(123) & No I-40-4 (123) & (131).

Gentlemen:

Per Section 416 of the Standard Specifications we do hereby submit, for your review, an additional asphaltic concrete mix design for the above cationed project.

The attached mix design was prepared by Speedie and Associates under the direction of Mr. Donald Cornelison, P.E. This design is proposed for the 3/4" (end product) for the above job.

Please review at your earliest convenience and advise us as to any questions or comments you may have.

Respectfully submitted,
FNF CONSTRUCTION, INC.

Rick Kincaid
Project Manager

#3

RK/am

Enclosure

Sand Equivalent - 70 x 80% = 56 %
Coating Index 90 x 70% = 63 %
7-19-90

115 SOUTH 48TH STREET • TEMPE, ARIZONA 85281

NM CL96-27218 • NM GA96-27218 • CA 587527 • NV 0028660 • UT 043556

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / MATERIALS / SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029 • (602) 997-6391

JAMES A. SPEEDIE, P.E.
GREGG A. CREASER, P.E.
GARY E. STOCKER, P.E.
STEVEN A. GRIESS, P.E.

205-1611

June 23, 1990
Project No. 909990LA

A.D.O.T.
JUN 30 '90
ORG 4443

JUN 29 1990

Mr. Don Stout
FNF Construction
1921 S. Alma School Road
Mesa, Arizona 85210

Incorrect Cover Ltr

Re: ADOT Project Numbers IR-17-2(111), IR-40-4(123) and IR-40-4(131)
ADOT 3/4" Asphalt Mix Design

Dear Don,

As requested, we have completed an ADOT asphalt concrete mix design to be used on the above project.

The samples of aggregate used in the design were submitted by your personnel and were designated as a basalt coarse aggregate, a basalt intermediate aggregate, a basalt fine aggregate, a Flagstaff cinder product, a Mahan concrete sand, and a Winslow sand.

The asphalt cement used was grade AC-20 supplied by Sahuaro Petroleum and Asphalt Company from their Edgington refinery. The mineral admixture used was Type N Hydrated Lime supplied by Chemstar Lime. It was added wet to the mix at a rate of 1.5% by weight of the mineral aggregate.

Complete Marshall, Immersion Compression, and aggregate test results are enclosed on the mix design report. All testing was performed in accordance with current ADOT procedures.

If you have any questions, please do not hesitate to call.

Respectfully submitted,

SPEEDIE & ASSOCIATES

Donald L. Cornelison

Donald L. Cornelison, P.E.
Laboratory Manager

#4

SPEEDIE AND ASSOCIATES LABORATORY - MARSHALL MIX DESIGN REPORT

CLIENT: ~~FNF CONSTRUCTION~~

DATE: 6/29/90

PROJECT: WALNUT CANYON T.I.

PROJECT NO: IR-40-4(123) & (131); IM-17-2(111)

MIX DESIGNATION: ADOT 3/4" (MODIFIED)

SOURCE OF MAT'L: FLAG CINDERS, COCONINO CINDERS, WINSLOW

SOURCE OF SAMPLES: STOCKPILES

SAMPLED BY: CLIENT

LAB NO: 909990LA 0-125

PERCENT MINERAL ADMIX: 1.5

COMPOSITE GRADATION

MATERIAL I.D.		% USED W/O ADMIX	% USED W/ADMIX
BASALT	FINES	23 -22	21.7
FLAG	CINDERS	6	5.9
CONCRETE	SAND	0	0.0
WINSLOW	SAND	24 -24	23.6
BASALT	INTER	10 -10	9.9
BASALT	COARSE	38 -38	37.4
ADMIX			1.5

SIEVE	W/O ADMIX % PASSING	W/ADMIX % PASSING	SPEC LIMITS
1-1/2"	100	100	100
1"	100	100	100
3/4"	95	95	85-95
1/2"	78	79	
3/8"	66	65	60-75
1/4"	55	55	
#4	48	50	
#8	39	40	35-46
#10	38	39	
#16	32	33	
#30	23	24	
#40	17	18	11-19
#50	12	13	
#100	4	6	
#200	2.6	4.1	2.0-5.5

AGGREGATE PROPERTIES

	COARSE	FINE	COMBINED	SPEC
BULK OD SP GR	2.766	2.639	2.703	2.35-2.85
SSD SP GR	2.815	2.675	2.744	
APPARENT SP GR	2.903	2.738	2.819	
ABSORPTION	1.878	1.398	1.517	0-2.50
SAND EQUIVALENT			85	55 min
PLASTICITY INDEX			NP	
CRUSHED FACES			97	70 min
L.A. ABRASION "B"			[illegible]	5 max

DESIGN DATA

SPECIMEN	A	B	C	D	E
BIT. GRADE/SP GR	AC-20	1.021			
% OF BITUMEN	4.0	4.5	4.6	5.0	
BULK DENSITY (pcf)	148.6	150.1	150.0	151.6	
MARSHALL STABILITY (lb)	4420	4867	4879	4928	3000
FLOW	12	12	11	12	8
% AIR VOIDS	7.4	5.8	5.4	4.0	5.2
% VMA	15.0	14.6	14.5	14.2	14.5
% AIR VOIDS FILLED	50.7	60.6	62.8	71.6	
% EFF ASP TOTAL MIX	3.25	3.76	3.86	4.26	

4.86
4879

IMMERSION COMPRESSION

SAMPLE	AIR PSI	H2O PSI	RETENTION	% AC	% ADMIX
NO.1	633.1	542.0	85.6	4.6	1.5
NO.2					
NO.3					

RECOMMENDED BITUMEN CONTENT (%) = 4.6

ADDITIONAL DATA

MAXIMUM DENSITY	159.0 PCF @ 4.6 %
ASPHALT ABSORPTION ON DRY AGG (%)	0.79
ASPHALT TYPE	AC-20
ASPHALT SOURCE	SAHUARO/EDGINGTON
ADMIX TYPE	TYPE N HYDRATED LIME
ADMIX SOURCE	CHEMSTAR

REGISTERED PROFESSIONAL ENGINEER (CIVIL) 23216 DONALD L. CORNELISON 6-29-90 ARIZONA U.S.A.

MIX DESIGN VOID CALCULATIONS

CLIENT: FNF CONSTRUCTION

PROJECT: WALNUT CANYON T.I.

MIX DESIGNATION: ADOT 3/4" (MODIFIED)

SOURCE OF SAMPLES: STOCKPILES

LAB NO: 909930LA 0-125

DATE: 6/29/90

PROJECT NO: IR-40-4(123) & (131); IR-17-2(111)

SOURCE OF MAT'L: FLAG CINDERS, COCONINO CINDERS, WI

SAMPLED BY: CLIENT

PERCENT MINERAL ADMIX: 1.5

SPECIFIC GRAVITY DATA

	COARSE AGG	FINE AGG	COMBINED AGG
BULK OD	2.768	2.639	2.703
SSD	2.815	2.675	2.744
APPARENT	2.903	2.738	2.819
ABSORPTION	1.676	1.358	1.517

RICE TEST DATA

VOLUME	MAX SP GR	MTD	ZAC	ASPHALT SP GR	SAMPLE WEIGHT	EFFECTIVE SP GR	ASPHALT ABSORPTION	ADMIX SP GR
424.3	2.505	156.1	6.0	1.021	1062.9	2.761	0.791	2.20

VOID CALCULATIONS

ZAC	SP GR	UNIT WT	% AGG	% ADMIX	TOTAL % ADMIX	AGG VOLUME	ADMIX VOLUME	EFFECTIVE ASPHALT	ASPHALT VOLUME	VMA	EFFECTIVE VOIDS	VOI FILL
4.0	2.385	148.6	94.581	1.5	1.419	83.461	1.536	3.252	7.599	15.001	7.402	50.6
4.5	2.409	150.1	94.089	1.5	1.411	83.839	1.545	3.756	8.862	14.617	5.756	60.8
4.6	2.414	150.4	93.990	1.5	1.410	83.324	1.547	3.857	9.119	14.529	5.411	62.7
5.0	2.434	151.6	93.596	1.5	1.404	84.266	1.558	4.260	10.155	14.181	4.026	71.8

MARSHALL MIX DESIGN DATA

CLIENT: FNF CONSTRUCTION

PROJECT: WALNUT CANYON T.I.

MIX DESIGNATION: ADOT 3/4" (MODIFIED)

SOURCE OF SAMPLES: STOCKPILES

LAB NO: 909990LA 0-125

DATE: 6/29/90

PROJECT NO: IR-40-4(123) & (121); IR-17-2(111)

SOURCE OF MAT'L: FLAG CINDERS, COCONINO CINDERS, WINSLOW

SAMPLED BY: CLIENT

PERCENT MINERAL ADMIX: 1.5

%AC	ADMIX	SPEC #	SSD WEIGHT	H2O WEIGHT	AIR WEIGHT	SPECIFIC GRAVITY	UNIT WEIGHT	HEIGHT	DIAL READING	STABILITY	FACTOR	CORRECTED STABILITY	FLO
4.00	1.5%	1	1191.5	695.1	1186.2	2.390	148.9	2.450	595	4373	1.01	4417	1
		2	1183.1	689.7	1177.8	2.387	148.7	2.442	544	4002	1.04	4162	1
		3	1199.7	696.9	1196.5	2.380	148.3	2.491	631	4636	1.01	4682	1
		AVG				2.385	148.8					4420	1
4.50	1.5%	1	1201.7	720.2	1227.2	2.402	149.6	2.516	677	4971	0.99	4921	1
		2	1188.3	695.2	1185.1	2.408	150.0	2.443	640	4701	1.04	4889	1
		3	1191.5	693.8	1188.2	2.417	150.5	2.430	621	4562	1.05	4791	
		AVG				2.409	150.1					4867	
5.00	1.5%	1	1196.8	707.2	1195.2	2.426	151.2	2.448	658	4614	1.03	4752	
		2	1205.2	711.8	1201.9	2.436	151.8	2.423	695	5102	1.05	5357	
		3	1190.9	705.9	1187.9	2.439	152.0	2.419	605	4446	1.05	4669	
		AVG				2.434	151.6					4926	

EFFECT OF WATER ON COHESION OF BITUMINOUS MIXTURES

CLIENT: FNF CONSTRUCTION

DATE: 6/29/90

PROJECT: WALNUT CANYON T.I.

PROJECT NO: IR-40-4(123) & (131); IR-17-2(111)

MIX DESIGNATION: ADOT 3/4" (MODIFIED)

SOURCE OF MAT'L: FLAG CINDERS, COCONINO CINDERS,

SOURCE OF SAMPLES: STOCKPILES

SAMPLED BY: CLIENT

LAB NO: 909990LA 0-125

PERCENT MINERAL ADMIX: 1.5

PERCENT ASPHALT: 4.6

SPEC #	HEIGHT	SSD WT	H2O WT	AIR WT	SP GR	DENSITY	AVG SP GR	AVG DENSITY
1	4.063	1914.2	1081.6	1905.3	2.315	144.2		
2	4.070	1920.2	1100.7	1907.8	2.328	145.0		
3	4.027	1909.1	1096.1	1902.0	2.322	144.7	2.322	144.6
4	4.065	1911.9	1091.2	1904.2	2.320	144.5		
5	4.058	1915.2	1093.0	1907.5	2.320	144.5		
6	4.070	1913.6	1093.9	1905.4	2.325	144.8		

DESIGN DENSITY OF STABILITY SPECIMENS = 150.4

% OF LAB DENSITY = IMC DENSITY/STAB DENSITY x 100 = 144.6/150.4 x 100 = 96.2

LOAD = 2750 PSI

COMPRESSIVE STRENGTH OF DRY SPECIMENS:

SPEC #	LOAD FAIL POINT	AVG LOAD FAIL PT	PSI
1	8038		
2	7909	7959	633.1
4	7929		

COMPRESSIVE STRENGTH OF WET SPECIMENS:

SPEC #	LOAD FAIL POINT	AVG LOAD FAIL PT	PSI
3	6411		
5	6639	6512	542.0
6	7387		

INDEX OF RETAINED STRENGTH = PSI(WET)/PSI(DRY) x 100 = 542.0/633.1 x 100 = 85.6

COMPOSITE GRADATION

CLIENT: FNF CONSTRUCTION

DATE: 6/29/90

PROJECT: WALNUT CANYON T.I.

PROJECT NO: IR-40-4(123) 1 (131); IR-17-2(111)

MIX DESIGNATION: ADOT 3/4" (MODIFIED)

SOURCE OF MAT'L: FLAG CINDERS, COCONINO CINDERS, WINSLOW

SOURCE OF SAMPLES: STOCKPILES

SAMPLED BY: CLIENT

LAB NO: 90599001A 0-125

PERCENT MINERAL ADMIX: 1.5

ORIGINAL GRADATION-% PASSING

MAT'L NAME	MAT'L 1 BASALT FINES	MAT'L 2 FLAG CINDERS	MAT'L 3 CONCRETE SAND	MAT'L 4 WINSLOW SAND	MAT'L 5 BASALT INTER	MAT'L 6 BASALT COARSE	COMPOSITE % PASS (w/o ADMIX)	COMPOSITE % PASS (w/ADMIX)	GRADATION SPECS	SIEVE
% USED	22	6	9	24	10	28				
SIEVE										
1-1/2"	100.0	100.0	100.0	100.0	100.0	100.0	100	100	100	1-1/2"
1"	100.0	100.0	100.0	100.0	100.0	100.0	100	100	100	1"
3/4"	100.0	100.0	100.0	100.0	100.0	86.0	95	95	85-95	3/4"
1/2"	100.0	100.0	100.0	100.0	100.0	43.0	76	79		1/2"
3/8"	100.0	100.0	100.0	99.0	92.0	15.0	66	66	60-75	3/8"
1/4"	98.0	100.0	100.0	96.0	28.0	3.0	55	55		1/4"
#4	90.0	100.0	97.0	93.0	7.0	1.0	49	50		#4
#8	57.0	85.0	81.0	88.0	2.0	0.8	39	40	36-46	#8
#10	54.0	79.0	77.0	87.0	2.0	0.8	38	39		#10
#16	39.0	58.0	66.0	81.0	1.8	0.7	32	32		#16
#30	24.0	36.0	50.0	64.0	1.7	0.6	23	24		#30
#40	14.0	27.0	39.0	45.0	1.6	0.5	17	18	11-19	#40
#50	12.0	20.0	25.0	32.0	1.5	0.4	12	13		#50
#100	9.0	10.0	9.0	8.0	1.4	0.1	4	6		#100
#200	6.1	4.9	1.5	3.4	1.3	0.1	2.6	4.1	2.0-5.5	#200

MAT'L 1 = COCONINO CINDERS SALES
MAT'L 2 = FLAGSTAFF CINDERS SALES
MAT'L 3 = N/A
MAT'L 4 = WINSLOW SAND
MAT'L 5 = COCONINO CINDERS SALES
MAT'L 6 = COCONINO CINDERS SALES

ADDITIONAL TEST DATA

CLIENT: FNF CONSTRUCTION

PROJECT: WALNUT CANYON T.I.

MIX DESIGNATION: ADOT 3/4" (MODIFIED)

SOURCE OF SAMPLES: STOCKPILES

LAB NO: 909990LA 0-125

DATE: 6/29/90

PROJECT NO: IR-40-4(123) & (131); IR-17-2(111)

SOURCE OF MAT'L: FLAG CINDERS, COCONINO CINDERS, WINSLOW

SAMPLED BY: CLIENT

PERCENT MINERAL ADMIX: 1.5

AGGREGATE SPECIFIC GRAVITIES

MAT'L	COARSE AGGREGATE	FINE AGGREGATE
S.S.D. WT.	4065.0	500.0
O.D. WT.	3997.9	493.3
IMMERSED WT.	2620.8	982.0
FLASK & H2O	-	668.9
BULK O.D. SP. GR.	2.768	2.639
S.S.D. SP. GR.	2.815	2.675
APPARENT SP. GR.	2.903	2.738
% ABSORPTION	1.678	1.358

RICE TEST

	SAMPLE WT. (DRY)	FLASK + H2O	SAMPLE + FLASK + H2O	SAMPLE WT (S.S.D.)	SAMPLE VOLUME	MAXIMUM SP. GR.	MAXIMUM DENSITY
1	1061.4	3573.2	4316.2	1063.1	424.2	2.502	155.9
2	1061.6	3662.1	4302.0	1063.4	423.5	2.507	156.2
3	1065.6	3573.0	4221.6	1067.3	425.3	2.506	156.1
AVG	1062.9				424.3	2.505	156.1

SAND EQUIVALENT

	# 1	# 2	# 3	AVG.
SAND	4.5	4.6	4.8	
CLAY	7.2	7.0	7.3	
S.E.	62	66	66	65

CRUSHED FACES

TOTAL SAMPLE WT.	WT. CRUSHED	% CRUSHED FACES
300.1	275.6	91.9

FNF CONSTRUCTION, INC.

(602) 784-2910
(602) 829-8607 - Fax

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APR 2 4 '99

ARIZONA TRANSPORTATION
RESEARCH CENTER

ARAC

#2

August 6, 1990

Arizona Dept. of Transportation
Highway Division
1801 S. Milton Drive
Flagstaff, Arizona 86001

Attn: Mr. Kent Link

RE: Cordes Junction - Flagstaff Highway,
Flagstaff-Walnut Canyon Highway,
ADOT Project No: I-17-2(111) and
No: I-40-4(123) & No I-40-4 (131)

Gentlemen:

This letter is in regards to our request for a second ACAR mix design.

After review of percentages initially submitted, we hereby request the following changes:

FNF 1/2" Chip	22%
FNF 3/8" Chip	10%
FNF fines # 1	21%
FNF washed fines	9%
B&B intermediate	22%
B&B washed fines	16%

If you have any questions concerning these changes please contact me as soon as possible.

Respectfully submitted,
FNF CONSTRUCTION

E. VanBeek

Ed VanBeek
Engineer

EV/am

A.D.O.T.
AUG 07 '90
ORG 4443

ARIZONA DEPARTMENT OF TRANSPORTATION

MATERIALS SECTION

A.D.O.T.
AUG 10 '90
ORG 4443

FAX TRANSMITTAL SHEET

DATE: 08 / 10 / 90 9:40

TO: DON DORMAN
COMPANY: ADOT FLAGSTAFF
FAX NO.: 9-602-779-5905

FROM: RANDY SWICK MATERIAL SERVICES
FAX NO: (602) 255 - 7972

RE: ASPHALT RUBBER MIX DESIGN
#2

NUMBER OF PAGES IN THIS TRANSMITTAL (INCLUDING THIS SHEET): 3

NOTE: IF ANY OF THE COPIES ARE ILLEGIBLE, OR YOU DO NOT RECEIVE ALL PAGES, PLEASE CONTACT ME IMMEDIATELY AT:- [(602) 255 - 8204]

MATERIALS SECTION
ASPHALTIC CONCRETE (MODIFIED) ASPHALT RUBBER DESIGN

PROJECT NUMBER: IR-17-2(111), IR-40-4(123), IR-40-4(131). DATE: 08-10-90
DEVELOPED BY: ADOT CENTRAL LAB CONTRACTOR: FNF CONTRACTING
DESIGN NO. 90-317A

AGG.#	90-317	90-316	90-315	90-314	90-313	90-312	ACFC
TYPE	FNF1/2	FNF3/8	B&BWIN	FNFCR1	B&BWCF	~~FNFWCF~~	CHIPS
SOURCE	C-1272	C-1272	CM0131	C-1272	CM0131	C-1272	
% USE	~~22~~ 24	~~10~~ 12	~~22~~ 24	21	16	~~5~~ 3	

	TYPE	SOURCE	PERCENT	SP. GR.
AC-10/RUBBER		INTERNATIONAL SURF.	6.5	1.027
GRANULATED RUBBER	C106	INTERNATIONAL RUBBER	20.0	
ASPHALT CEMENT:	AC-10	SUNBELT REFINING		1.014
MINERAL ADMIXTURE:	LIME	CHEMATAR	1.0	2.20

SIEVE SIZE	GRADATION W/O ADMIX.		GRADATION WITH ADMIX.	GRADATION SPECIFICATIONS WITH ADMIX.
1/2 IN.	100		100	100
3/8 IN.	89	95/93	89	80 - 90
1/4 IN.	57		57	40 - 60
#4	44		45	
#8	26	22/30	27	26 - 34
#10	22		23	
#16	14		15	
#30	9		10	
#40	8	5/11	9	5 - 15
#50	6		7	
#100	4		5	
#200	2.5		3.5	0 - 3.5

AGGREGATE PROPERTIES: % ABRASION AT 100 REV:= 6, AT 500 REV:= 26.
SAND EQUIVALENT: 95 CRUSHED FACES: 91

SPECIFIC GRAVITIES:(O.D.)	COARSE	FINE	COMBINED	WATER ABS.
	2.788	2.779	2.784	1.72 %

MIX PROPERTIES: (AT 6.5% AC-10/RUBBER MIX)

STABILITY	2331
FLOW	18
VMA	18.1
AIR VOIDS	4.9
ASPHALT ABSORP.	1.00
BULK DENSITY	151.6
MAXIMUM DENSITY	159.4

REMARKS ON DESIGN:
THIS DESIGN REQUIRES A MINIMUM OF 20.0% GRANULATED RUBBER BE ADDED, BY WEIGHT, TO THE ASPHALT CEMENT.

APPROVED

A.D.O.T.

AUG 10 '90

ORG [illegible]

ARIZONA DEPARTMENT OF TRANSPORTATION

OFFICE MEMO

BITUMINOUS MIX DESIGN REPORT AND TRANSMITTAL

A.D.O.T.
OCT 02 '89
ORG 4443
10-3-89

September 27, 1989

To: Don Dorman
Transportation Engineering Specialist
District Four

From: Douglas A. Forstie
Assistant State Engineer
Materials Section

John -
Project File

Project No.: IR-40-4(124) TRACS No

Contractor: Tanner Construction

Mix Design Originating Lab: A.D.O.T. Central Laboratory

Originating Lab Mix Design Date: September 27, 1989

Mix Design Type: A.C.F.C. (SPEC. 407)

Attached is a copy of our test results identified as Lab No. 89-450A. This mix design is acceptable.

Project Notified of Results: Date - 09/27/89 Time - 10:15 am

Remarks: _____

Douglas A. Forstie

cc: Tom Foster
Greg Gentsch
Construction File

ACFC
SHRP Section

MATERIALS SECTION
ASPHALTIC CONCRETE FRICTION COURSE MIX DESIGN

PROJECT NUMBER: IR-40-4(124) CONTRACTOR: TANNER MIX TYPE: ACFC
ORIGINATING LAB: ADOT-CENTRAL DESIGN LAB NO: 89-450A DATE: 09/27/89

AGG. #	1	2	3	4	5	6
TYPE	3/8"	CRFINE	W-FINE			
SOURCE	CM0048	CM0048	CM0048			
% USE	90.0	4.0	6.0			

	TYPE	SOURCE	PERCENT	SP. GR.
ASPHALT CEMENT:	AC-20	PARAMOUNT	6.8	1.020

GRADATION (% PASSING)

SIEVE SIZE	TARGET GRADATION	GRADATION BAND
1.5 IN.		
1 IN.		
3/4 IN.		
1/2 IN.		
3/8 IN.	100	100
1/4 IN.	68	
#4	36	35 - 55
#8	12	9 - 14
#10	11	
#16	8	
#30	6	
#40	5	
#50	4	
#100	3	
#200	2.1	0 - 2.5

AGGREGATE PROPERTIES: % ABRASION AT 100 REV. 7 500 REV. 31 % LIMESTONE 0.20
SAND EQUIVALENT 60 FLAKINESS INDEX 14 % CRUSHED FACES 100

SPECIFIC GRAVITIES: O.D. COARSE 2.460 O.D. FINE 2.455 O.D. COMBINED 2.458
COMBINED WATER ABSORPTION: 2.81%

BULK DENSITY 122.4 #/FT^3

REMARKS ON DESIGN

APPROVED BY
Don Crum

THIS DESIGN REQUIRES THE USE OF 1% PAVE BOND SPEC.
BE ADDED, BY WEIGHT, TO THE LIQUID ASPHALT.

TEST RESULTS FOR ACFC MIX DESIGN, LAB # 89-450A , PROJECT NUMBER: IR-40-4(124)

AGGREGATE SAMPLES:

LAB #	TYPE	FROM	DATE	SOURCE	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#40	#200
89-450	3/8"	STOCKPILE	09/19/89	CM0048	100.0	100.0	100.0	100.0	64.0	29.0	4.0	2.0	1.60
89-449	CRFINE	STOCKPILE	09/19/89	CM0048	100.0	100.0	100.0	100.0	100.0	97.0	70.0	28.0	5.10
89-448	W-FINE	STOCKPILE	09/19/89	CM0048	100.0	100.0	100.0	100.0	100.0	100.0	93.0	34.0	2.70

AGGREGATE SOURCES:
SOURCE NO: CM0048 DESCRIPTION: UM #35 (HILL PIT).

SPECIFIC GRAVITY TEST(S):

TEST #	TYPE	SOURCE NO.	OD SP. GR.	SSD SP. GR.	WATER ABSORPTION	USED IN DESIGN?
1	FINE	CM0048	2.455	2.528	2.97 %	YES
1	COARSE	CM0048	2.460	2.527	2.72 %	YES

Tanner Construction
A Division of The Tanner Companies

3888 E. Broadway
P.O. Box 52151
Phoenix, AZ 85072-2151
602/437-7878

August 4, 1989

Arizona Department of Transportation
Highway Division, District 4
1801 S. Milton Rd.
Flagstaff, Arizona 86001

Attention: Mr. Ernest W. Colwell, P.E.
Senior Project Supervisor

Reference: ADOT Project No. IR-40-4(124)
Walnut Canyon - Winona
Tanner Job No. 2913-126

Subject: Asphaltic Concrete Friction Course (ACFC)

Gentlemen:

Tanner Construction respectfully requests the initiation of the Asphaltic Concrete Friction Course mix design for the above referenced project by the Department.

The following materials proposed for this mix were produced at the United Metro Hill Pit approximately fourteen miles north of Flagstaff on Highway 89, Commercial Source No.CM0048.

The materials to be submitted have been used in ADOT accepted 3/4" asphaltic concrete mixes. These materials will be stockpiled at Tanner Construction's hot plant site at United Metro Hill Pit. When production commences, the various materials will be blended using a continuous mix plant in accordance with current industry standards.

Tanner Construction proposes a three bin mix with the following:

Intermediate Aggregate	90%
Crusher Fines	4%
Washed Sand	6%

The AC-20 liquid asphalt will be supplied by Asphalt Applications Inc., with the asphalt source being the Paramount Oil Co. and will conform to the requirements of Section 1005, table 1005-1, of the Standard Specifications.

The asphalt cement liquid additive (Pave Bond Special) will be supplied by Sahuaro Petroleum and Asphalt Co.

As soon as practicable we request an ADOT witness of materials sampling by a Tanner Construction representative. If you should have any questions concerning this letter or any other matter, please do not hesitate to contact the undersigned at 526-4151.

Sincerely,

TANNER CONSTRUCTION

Mark Krumm
Project Supervisor

Julian Ray
Quality Control Supervisor

MK:drb

enclosure

RECEIVED