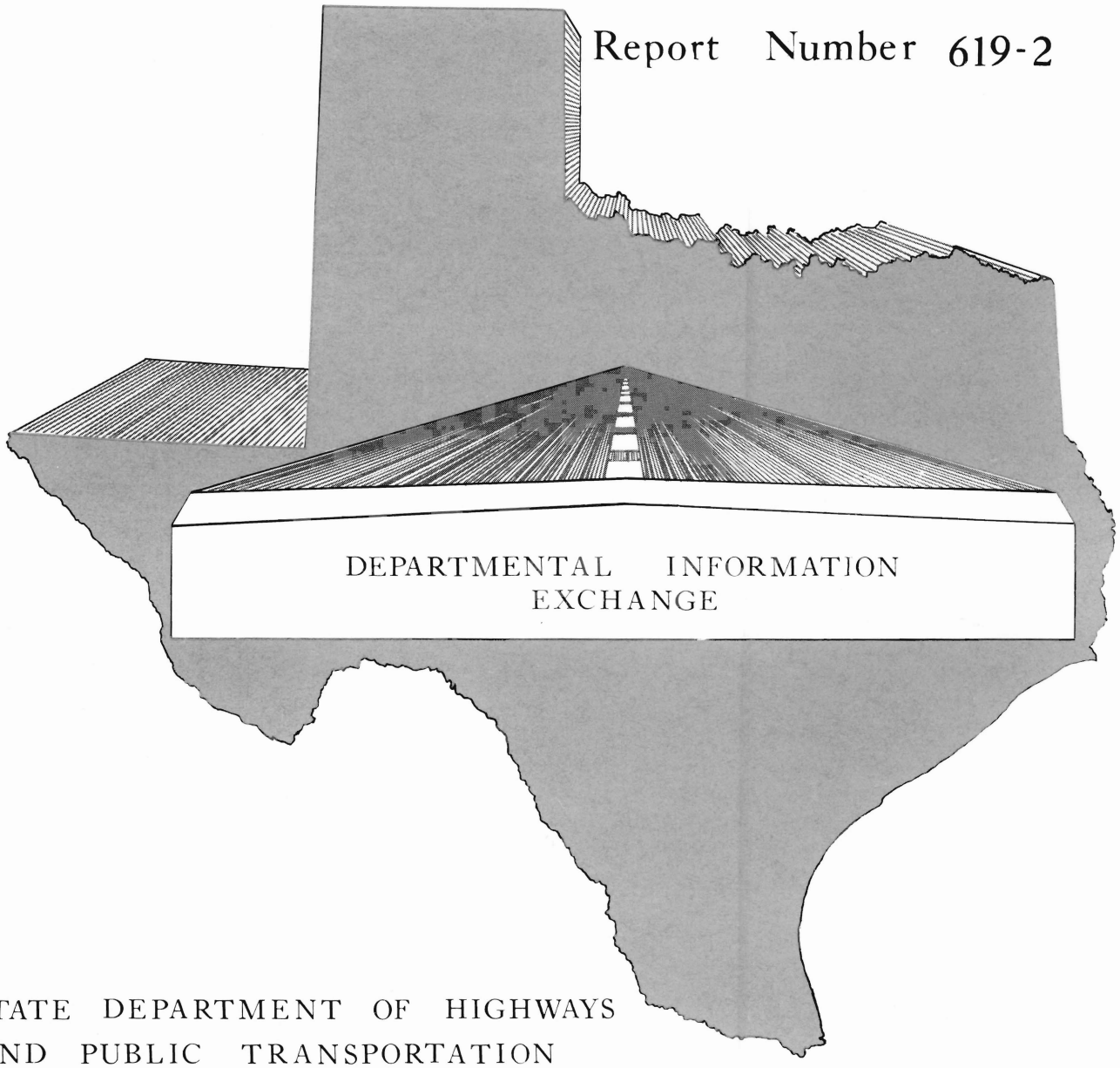
EXPERIMENTAL PROJECTS

CONCRETE OVERLAY
COLORADO RIVER BRIDGE
DISTRICT 7

Report Number 619-2



STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWATX78-619-2		

4. Title and Subtitle	5. Report Date
Concrete Overlay - Colorado River Bridge - District 7	December 1977
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
W. P. Harrington	Experimental Project 619-2

9. Performing Organization Name and Address	10. Work Unit No.
Texas State Dept. of Highways & Public Transportation P. O. Box 5051 Austin, Texas 78763	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address Texas State Dept. of Highways & Public Transportation P. O. Box 5051 Austin, Texas 78763	Final May 1969 - December 1977
	14. Sponsoring Agency Code

15. Supplementary Notes

Work done in cooperation with Federal Highway Administration

16. Abstract

Slab deterioration on one of District 7's bridges crossing the Colorado River had reached a stage during 1969 where extensive repairs were necessary. The bridge had been constructed in 1956. It consisted of one 100' continuous I-beam, one 150' continuous I-beam, and one 230' continuous I-beam. The slab thickness was 6½", the roadway width 28', and the width between the individual I-beams 8'0". The ADT in 1977 was slightly less than 900 vehicles. When possible, unsound concrete was removed and repaired by sand blasting and re-filling all holes to the original level of the existing deck. The bridge armor joints were raised in elevation 1½" to match the new overlay. The additional steel was welded to the existing armor joints. The overlay was placed in sections one-half the width of the bridge in lengths corresponding to the bridge units. Finishing was achieved by a small vibrating screed. Curing was accomplished using wet mats, plastic sheets, and fog. Beam flexural strength, air entrainment and slump tests were run.

17. Key Words	18. Distribution Statement
Concrete overlay Bridge deck repair	No restrictions

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
unclassified	unclassified	26	

Form DOT F 1700.7 (8-69)

DISCLAIMER STATEMENT

The material in this report is experimental in nature, and is published for informational purposes only. Any discrepancies with official views or policies of the DHT should be discussed with the appropriate Austin Division prior to the implementation of the procedures or results.

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or policies of the Federal Highway Administration. This report does not constitute a standard, specification or regulation.

CONCRETE OVERLAY
Colorado River Bridge
District 7

Experimental Project
Report Number 619-2

Project No. M-454-1-31
State Highway 208
Coke County

Project Supervision and Testing Handled by:

James R. Evans, District Maintenance Engineer
Charles L. Kelly, Engineering Technician V

Report Prepared by

W. P. Harrington
Assistant District Engineer

December, 1977

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BACKGROUND

Bridge slab deterioration on one of District Seven's bridges crossing the Colorado River immediately south of Robert Lee in Coke County (Figure 1) had reached a stage during 1969 in which extensive repairs were necessary for the continued operation of the structure. This bridge had been completed during the year 1956, with dimensions as follows:

> The structure consists of one 100' I-beam continuous unit, one 150' I-beam continuous unit, and one 230' I-beam continuous unit. The slab thickness was 6½"; roadway width 28'; and the width between the individual I-beams 8'0". (See Figure 2)

The average daily traffic on this section of road (1977) is slightly less than 900 vehicles per day.

Upon review of this bridge deck condition with Mr. M. U. Ferrari, who was the contact representative of D-18, it was decided to proceed with the bridge deck repair of this structure in accordance with the method outlined by the Texas Transportation Institute Study No. 2-18-68-130.

File D-5 also reviewed proposed overlay in regard to additional dead load and resulting stresses on beam members. (See Letters Appendix B) Dr. Howard L. Furr was the project supervisor on this TTI study, and a copy of the instructions to the District for this bridge deck repair is included in Appendix A in memorandum form as it was furnished.

In this original plan, it was intended that ¼" diameter welded wire mesh was to be placed in the concrete overlay to serve as reinforcement; however, due to the difficulties of installation with the existing equipment and personnel provided by the District, it was decided that satisfactory

results could be expected with the elimination of this steel reinforcing wire mesh. Therefore, this mesh was not placed in any part of this concrete overlay on the bridge slab.

All of the work performed in this overlay operation was handled by District Maintenance personnel with the testing and material control being performed by the District Laboratory under field direction by Mr. Charles L. Kelly, Engineering Technician V. The concrete screed used for screeding the overlay concrete was borrowed from another District, and the equipment necessary for moisture fogging was leased from a private company.

PLACEMENT OPERATIONS

As outlined previously in this plan, considerable effort was made to remove and repair the unsound concrete in those areas of the original bridge deck. This was accomplished by removing the old concrete, thoroughly cleaning by sand blasting, and then refilling all holes to the original level of the existing bridge deck using the same concrete batch design as that used in the overlay operations. Bonding of these patches to the existing concrete was achieved by using the same grout mixture as that placed between the overlay and the original bridge deck.

Considerable patching was needed for this phase of work, and approximately 27 yards of concrete were used in this operation alone.

The bridge armor joints were raised in elevation one and one-half inches in order to match the new overlay being placed. This additional steel was welded to the existing armor joints.

Traffic was removed from this section of road, and was placed on an alternate route into Robert Lee. We were fortunate in this area in that this alternate route did not add undue inconvenience to the travelling public.

The overlay was placed on the bridge slab in sections one-half width of the bridge, and in lengths corresponding to the bridge units of 100', 150', and 230'. Finishing operations were achieved using a small vibrating screed that travelled on rails. The screed unit was pulled forward on these rails by using a small (garden-type) tractor attached to the unit with a cable. Wood floats were used for final finishing operations over the entire overlay placement, and curing was accomplished using wet mats and plastic sheets.

After one section of the overlay had been placed, the slump on the overlay concrete was increased to approximately 4" in an attempt to decrease hair cracking as well as to allow some additional time for the finishing operations. Difficulty had previously been experienced in the final finish on the overlay due to rapid drying. Some difficulty had also been experienced in placing the grout used as the bonding agent between the existing slab and overlay concrete because of drying too fast before the overlay could be placed. It became apparent that it was necessary to place this grout material on the deck shortly after it was batched. The grout material was mixed in a small mixer as needed to stay ahead of the overlay concrete. Batching proceeded in small volume increments and placed as soon as mixing operations were completed to avoid any premature setting action. A wheel barrow was utilized to transport grout from mixer to placement site. The concrete for the overlay was mixed in three sack batches and transported from the mixer to placement location using a front end loader. A graduated cylinder was utilized to add air entrainment agent to the batch.

Text beams for flex testing were obtained from each pour, as well as cylinders being cast for compressive strengths and shrinkage molds were obtained. The concrete design, as well as the grout batch design are shown on Figures 3, 4, 5, and 6.

The cylinders and shrinkage molds were submitted to Dr. Furr of TTI for testing and evaluation. A summary of the flex beam, air entrainment, and slump tests are shown in the Summary of Tests in Figure 7.

Immediately following placement and screeding operations, fog curing was initiated. Mats or plastic sheets were placed for 6 day curing as soon as concrete setting allowed.

As previously mentioned, the vibrating screed was moved forward using a small tractor. This operation proved somewhat undesirable since uniform grade was difficult to achieve and some high and low places resulted. Finishing, using wood hand floats, followed in an attempt to correct these deficiencies. Hand finishing was also necessary to finish off concrete adjacent to bridge curbs.

No temporary transverse headers were set during these pouring operations. Length of the pour depended on the bridge units themselves; the pour beginning at one armor joint and proceeding to the next.

Linseed oil treatment was made on the completed overlay approximately 4 weeks after placement. Structure was not opened to traffic until after linseed oil treatment had been completed.

CONCLUSIONS

This bridge slab overlay project has been in service since the time of placement during the month of October, 1969, until the present time. Appendix C shows recent photos of the overlay surface. Some transverse, as well as slight longitudinal cracking has appeared in this overlay; however, this cracking does not appear to be serious, and the overlay is considered to be performing satisfactorily. The finishing operations on the concrete overlay using a vibrating screed and later wood floats resulted in a riding surface on the overall structure somewhat of a lesser quality than desirable. In future overlay projects of this type, it may be desirable to consider alternate finishing operations that would result in a better riding quality.

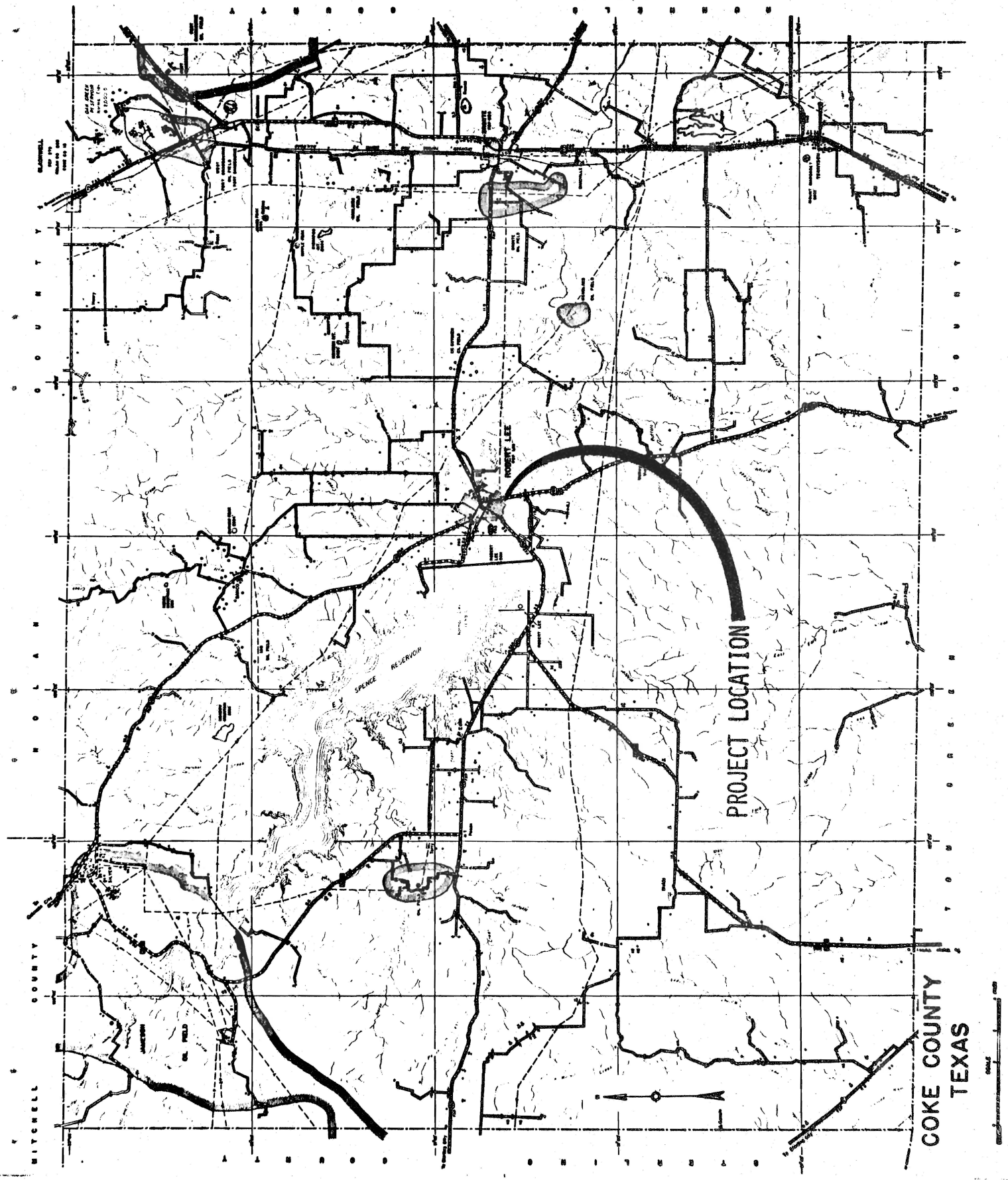
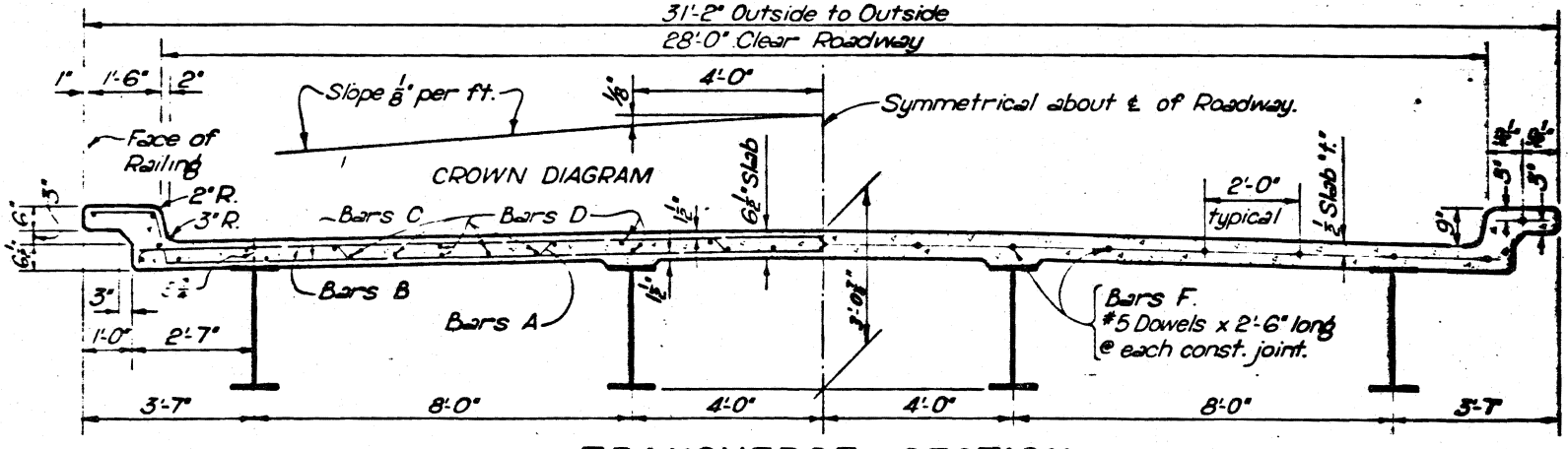

PROJECT LOCATION
COKE COUNTY
TEXAS
ROBERT LEE
SPENCE RESERVOIR

Figure 1



TRANSVERSE SECTION

Figure 2
8

Texas Highway Department
Construction Form 309

County: COKE
Project:
Date: 9-29-69

CONCRETE DESIGN WORK SHEET
(NATURAL AGGREGATES)

Design No: 1

Colorado River Bridge
at Robert Lee, Texas,
St. Hwy. 208

AGGREGATE CHARACTERISTICS:

	SP. GR	SSD Unit Wt. Lbs./Cu. Ft.	% SOLIDS
Fine Aggregate (FA)	2.64	105.0	63.6
Coarse Aggregate (CA)	2.66	97.8	58.8
Water			

Cement Type III - Alamo

DESIGN FACTORS:

Cement Factor (CF), 7 sacks per cubic yard of concrete
Coarse Aggregate Factor (CAF), .70
Water Factor (WF), 5.25 gal. per sack of cement
Air Factor (AF), 0 %

BATCH FACTOR:

$$\frac{\text{Size of Batch (Full Size)}}{\text{Yield for 1-Sk. Batch}} = \frac{27}{3.857} = 7$$

BATCH DESIGN (ONE SACK)	VOLUMES: 1-SK. BATCH (CU. FT.)		VOL. TO WT. (LB.) VOL. X 62.5 X SP. GR	1-SK. BATCH WTS.	FULL SIZE BATCH FACTOR	FULL SIZE BATCH WTS.
1. Concrete Yield = Cu. Ft. per Cu. Yd. / CF	27/7 = 3.857					
2. Volume CA = Yield X CAF X Solids	3.857 × .70 × 58.8 =	1.508	X 62.5 X 2.66 =	264.0	7	* 1848
3. Volume Mortar = Yield — Vol. CA	3.857 − 1.508 = 2.269					
4. Volume Water = WF / Gal. Water per Cu. Ft.	5.25/7.5 =	.700	X 62.5 X 1.00 =	43.8	7	* 306.6
5. Volume One Sk. Cement	=	0.485	X 62.5 X 3.10 =	94.0	7	658
6. Volume Entrained Air = Yield X AF	0 x 0 =	0				
7. Volume Paste = Vol. Cem. + Water + Air	0.485 + .700 + 0 = 1.185					
8. Volume FA = Vol. Mortar — Paste	2.269 − 1.185 =	1.084	X 62.5 X 2.64 =	178.9	7	* 1252
9. Yield (Summation of 2, 4, 5, 6 & 8 to Check No. 1 Above)		= 3.857				

10. Fine Aggregate Factor = Vol. FA / (FA Solids X Vol. Mortar) = 1.084 / (63.6 X 2.269) = .76

* Correct For Free Moisture or Absorption.

#1 - 1010
#2 - 1045
Avg.- 1028

REMARKS: Volumes in Above Are Absolute Unless Otherwise Noted.
Water Added at Mixer Must Include the Liquid of the Admixtures.

SLUMP - 2" - Beams 1, 2, 3, & 4

Figure 3

Texas Highway Department
Construction Form 309

County: COKE
Project:
Date: 9-29-69

CONCRETE DESIGN WORK SHEET
(NATURAL AGGREGATES)

Design No: 1A

Colorado River Bridge at Robert Lee, Texas, St. Hwy. 208

AGGREGATE CHARACTERISTICS:

	SP. GR	SSD Unit Wt. Lbs./Cu. Ft.	% SOLIDS
Fine Aggregate (FA)	2.64	105.0	63.6
Coarse Aggregate (CA)	2.66	97.8	58.8

Water: Reduced 40% of Vol. of Air

Cement: Type III - Alamo

DESIGN FACTORS:

Cement Factor (CF), 7 sacks per cubic yard of concrete
Coarse Aggregate Factor (CAF), .70
Water Factor (WF), 5.25 gal. per sack of cement
Air Factor (AF), 4 %

BATCH FACTOR:

$$\frac{\text{Size of Batch (Full Size)}}{\text{Yield for 1-Sk. Batch}} = \frac{27}{3.857} = 7$$

BATCH DESIGN (ONE SACK)	VOLUMES: 1-SK. BATCH (CU. FT.)		VOL. TO WT. (LB.) VOL. X 62.5 X SP. GR	1-SK. BATCH WTS.	FULL SIZE BATCH FACTOR	FULL SIZE BATCH WTS.
1. Concrete Yield = Cu. Ft. per Cu. Yd. / CF	27/7 = 3.857					
2. Volume CA = Yield X CAF X Solids	3.857 × .70 × 58.8 =	1.588	X 62.5 X 2.66 =	264.0	7	*1848
3. Volume Mortar = Yield — Vol. CA	3.857 − 1.588 =	2.229				33.5
4. Volume Water = WF / Gal. Water per Cu. Ft.	5.27/7.5 = .700 .062 =	.638	X 62.5 X 1.00 =	39.9	7	*279.3
5. Volume One Sk. Cement	=	0.485	X 62.5 X 3.10 =	94.0	7	658
6. Volume Entrained Air = Yield X AF	3.857 x 4% =	.154				
7. Volume Paste = Vol. Cem. + Water + Air	0.485 + .638 + .154 =	1.277				
8. Volume FA = Vol. Mortar — Paste	2.269 − 1.277 =	.992	X 62.5 X .264 =	163.7	7	*1146
9. Yield (Summation of 2, 4, 5, 6 & 8 to Check No. 1 Above)	=	3.857				
10. Fine Aggregate Factor = Vol. FA / FA Solids X Vol. Mortar	= .992 / 63.6 x 2.229 =	.70				

#1A - 893
#2A - 868
Avg. - 881

* Correct For Free Moisture or Absorption.

REMARKS: Volumes in Above Are Absolute Unless Otherwise Noted.
Water Added at Mixer Must Include the Liquid of the Admixtures.

(Air Agent (8ml per cu/ft)) Slump - 2½" - Beam 1A, 2A, 3A, 4A
Air - 3.2%

Figure 4

Texas Highway Department
Construction Form 309

County: COKE
Project:
Date: 9-28-69

CONCRETE DESIGN WORK SHEET
(NATURAL AGGREGATES)

Design No:

Colorado River Bridge
at Robert Lee, Texas
St. Hwy. 208

AGGREGATE CHARACTERISTICS:

	SP. GR	SSD Unit Wt. Lbs./Cu. Ft.	% SOLIDS
Fine Aggregate (FA)			
Coarse Aggregate (CA)			
Water			
Cement			

DESIGN FACTORS:

Cement Factor (CF), _____ sacks per cubic yard of concrete
Coarse Aggregate Factor (CAF), _____
Water Factor (WF), _____ gal. per sack of cement
Air Factor (AF), _____ %

BATCH FACTOR:

$$\frac{\text{Size of Batch (Full Size)}}{\text{Yield for 1-Sk. Batch}} = \frac{27}{1.667} = 16.2$$

BATCH DESIGN (ONE SACK)	VOLUMES: 1-SK. BATCH (CU. FT.)		VOL. TO WT. (LB.) VOL. X 62.5 X SP. GR	1-SK. BATCH WTS.	FULL SIZE BATCH FACTOR	FULL SIZE BATCH WTS.
1. Concrete Yield = Cu. Ft. per Cu. Yd. / CF	27 =					
2. Volume CA = Yield X CAF X Solids	____ × ____ × ____ =	____	X 62.5 X ____ =	____		* ____
3. Volume Mortar = Yield — Vol. CA	____ — ____ =	____		5.64gal		91.4gal.
4. Volume Water = WF / Gal. Water per Cu. Ft.	7.5 =	.752	X 62.5 X 1.00 =	42.0	16.2	* 761.4
5. Volume One Sk. Cement	=	0.485	X 62.5 X 3.10 =	94.0	16.2	1523
6. Volume Entrained Air = Yield X AF	____ X ____ =	____				
7. Volume Paste = Vol. Cem. + Water + Air	0.485 + ____ + ____ =	____				
8. Volume FA = Vol. Mortar — Paste	____ — ____ =	.430	X 62.5 X 2.64 =	71	16.2	* 1150
9. Yield (Summation of 2, 4, 5, 6 & 8 to Check No. 1 Above)		= 1.667				3434
10. Fine Aggregate Factor = Vol. FA / FA Solids X Vol. Mortar	= ____ / X =	____				

* Correct For Free Moisture or Absorption.

REMARKS: Volumes in Above Are Absolute Unless Otherwise Noted.
Water Added at Mixer Must Include the Liquid of the Admixtures.

GROUT used to bond the Old and New Concrete.

Figure 5

Texas Highway Department
Form 231

60494-1066-30m

GENERAL TEST REPORT

Laboratory No. _____
Date Received _____ Date Reported 1969
Dist. or Res. Engr. James R. Evans
Address San Angelo, Texas
Sampler Charles L. Kelly
Sampler's Title Engr. Tech. V
Contractor _____
Sampled from Stockpile
(pit, quarry, car or stockpile)
Producer Cecil Montgomery Sand & Gravel
Quantity represented by sample _____
Has been used on _____
Proposed for use as _____

Material: Special Concrete

Control No.	Sect. No.	Job. No.
Coke		St. 208
County	**Federal Project No.**	**Hwy. No.**
7		
District No.	**Req. No.**	**Date Sampled**

Identification marks _____
Specification Item No. 420 & 421 (1962 Std.Spec.)
Material from property of Perciful Pit, Robert Lee, Coke Co., Texas

DETERMINATIONS

Fine Aggregate Perciful Pit, Robert Lee (Grade I - Item 421	Sp. Gr. Unit Weight % Solids	2.64 105.0 lbs./cu.ft. 63.6%
Coarse Aggregate (Grade 4 - Item 302	Sp. Gr. Unit Weight % Solids	2.66 97.8 lbs./cu.ft. 58.8 %

TEST BEAMS -

7 sack - Ref. Conc. - 2 In. Slump	#1 -	1010
	#2 -	1045
	Avg.	1028
7 sack - Conc. - 3.2% Air - 2½ In. Slump	#1A -	893
	#2A -	868
	Avg.	881

Cement - Type III - Alamo

Air Agent - Sika-Air - Used 8 ml./ cu.ft. Concrete.

Figure 6

Summary of Tests

Colorado River Bridge Overlay

(Trial Batch - 4.2% - Slump 2½ In.)

Date	Pour	Air	Slump	Flex Beam Test	Curing Method
10-9-69	100'	5.0%	2½		Mats
	Unit	4.3%	2-9/16		
	West				
	Side	4.2%	3½		
10-10-69	150'	4.3%	2½		Mats
	Unit	4.9%	3"		
	West	5.2%	4"		
	Side				
10-14-69	230'	6.8%	4"	660	Mats
	Unit	5.3%	3-3/4	675	
	West	5.2%	3½	Av 668	
	Side				
10-15-69	100'				
	Unit	7.8%	4	648	Plastic
	East	6.5%	3-3/8	675	Sheets
	Side	5.3%	3"	Av 662	
10-16-69	150'				
	Unit	6.0%	4"	605	Plastic
	East	4.8%	3½"	578	Sheets
	Side	4.4%	3"	Av 592	
10-20-69	230'				
	Unit	5.5%	3"	862	Mats
	East	4.5%	4½"	828	
	Side	4.7%	2-7/8"	Av 845	

Note: Cylinders and shrinkage molds obtained from pours on 10-9-69, 10-15-69, and cylinders only from pour on 10-20-69.

Figure 7

APPENDIX A

TECHNICAL MEMORANDUM

TEXAS TRANSPORTATION INSTITUTE

Cooperative Research Program
with
Texas Highway Department

HPR 1-(8)

TO: Mr. M. U. Ferrari, Contact Representative, D-18

STUDY NO. 2-18-68-130

FROM: Howard L. Furr, Study 6130, Parts 2 & 3, Project Supervisor

AREA NO. 6

SUBJECT:

DATE: June 5,,1969

Our laboratory studies show that overlays of portland cement concrete bonded to beams and shear-blocks of concrete have performed well in freeze-thaw durability tests, shear tests, and cyclic load tests.

It is our understanding that the test bridge crossing the Colorado River on Route 208 at Robert Lee, Coke County, Texas will be limited to a 1 1/2 inch overlay because of dead load limitations.

We propose that a 1 1/2 inch portland cement concrete overlay prepared as outlined below be placed on that structure to serve as the field study specimen of the project.

Plan:

The deck preparation will be carried out as outlined below. A portland cement grout will be used as the bonding agent between the old deck concrete and the fresh overlay concrete.

A 1/4 inch diameter welded wire mesh with wires on 4 inch centers both ways will be placed directly on top of the grouted deck to serve as reinforcement.

The overlay will be 1 1/2 inches thick and will be placed directly over the reinforcing mesh. One lane of the bridge will be overlaid with Type III cement concrete and the other lane with shrinkage compensating cement concrete.

A wet mat cure will be provided.

After drying and before the winter season, a 2-coat linseed oil mixture surface treatment will be applied to the overlay.

Details:

A. Preparation of Deck

1. Remove all unsound concrete to leave only sound, undelaminated material.
2. Sandblast the deck to expose coarse aggregate, clean any exposed steel, and remove spots of oil, grease, and other contaminants which might be detrimental to bonding of overlay to old concrete.

cc: Research Engineer, File D-8

3. Clean all steel exposed by deterioration or by operations in 1 and 2 on previous page.
4. Sweep the deck clean of debris and dust.

B. Fill Holes After Removal of Unsound Concrete

1. Thoroughly clean and dry the holes.
2. Thoroughly work grout into the dry base concrete in and around the hole. A stiff brush serves well for this purpose. The brush marks should not be higher than 1/8 inch when this operation is finished; on the average, the thickness of the grout will be about 1/16 inch.
3. When the grout dries to a damp condition, fill the hole with overlay concrete to the level of the deck surface. This concrete must be thoroughly packed to leave no void space and to insure good bonding to the base material.

C. Provide Grout Bonding Agent on Deck

1. Thoroughly clean and dry the deck.
2. Work grout into the deck thoroughly by broom or brush. Broom marks should not be higher than 1/8 inch, and the average thickness should be about 1/16 inch. Do not work so far ahead of the overlay operation that the grout will dry out.
3. When the grout dries to a damp condition the overlay concrete should be applied.

D. Place Reinforcing

1. The reinforcing mesh is placed directly on the grouted deck following immediately behind the grout brooms.
2. Anchor the wire mesh flat against the deck - steel studs driven into the deck concrete could be used for this.

E. Place Overlay Concrete

1. Place overlay concrete after reinforcing mesh is in place when the grout has dried to a damp condition.
2. Compact the overlay concrete with a vibrating screed so that the concrete flows around the wire mesh to leave no voids.
3. Finish the overlay surface. No additional water should be added to the concrete for finishing purposes.
4. Wet cure the overlay 6 days under wet mats.

F. Treat the surface of the overlay with applications of cut back linseed oil. The treatment should be made after the concrete has dried out and before the winter season.

Materials:

A. Cement - Type III cement should be used in the grout and in concrete overlay in one traffic lane. Shrinkage compensating cement should be used in the concrete overlay in the other traffic lane. (The cement used in our laboratory concrete of this type was Chem. Comp. Cement, El Toro brand, obtained from Southwestern Portland Cement Company, P.O. Box 1547, Odessa, Texas 79760)

B. Aggregates - Natural sand and gravel.
Use THD Concrete sand for grout and for concrete.

Use a gravel gradation of:

Size	% Retained
3/4	0
1/2	15
3/8	25
#4	58
#8	2

C. Air Entrainment Agent - Sika Aer was used in the laboratory at a rate of approximately 8 ml. of agent per cubic foot of concrete produced.

D. Reinforcing Steel - 1/4 inch x 4 inch x 4 inch welded wire mesh. (This smooth wire mesh is stocked by Peden Iron and Steel Co., Houston, Texas in 5 foot wide by 150 foot length rolls, 638 lb/roll.)

E. Mixes - Grout: (parts by weight), 1 part cement, 3/4 part saturated surface dry sand, 0.5 lb. water per lb. cement.
Overlay: (mix is the same for ordinary cement concrete as for shrinkage compensated concrete)
Weights per Cubic Year of Concrete:

Gravel	1846 lb.	(saturated surface dry)
Sand	1142 lb.	(saturated surface dry)
Cement	664 lb.	
Water	285 lb.	(2 to 2 1/2 inch slump desired)

Air entraining agent to produce 6% air.

TECHNICAL MEMORANDUM

TEXAS TRANSPORTATION INSTITUTE

Cooperative Research Program
with
Texas Highway Department

HPR 1-(8)

TO: Mr. M. U. Ferrari, Contact Representative, D-18

STUDY NO. 2-18-68-130

FROM: Howard L. Furr, Study 130, Parts 2 & 3, Project Supervisor

AREA NO. 6

SUBJECT: Howard L. Furr

DATE: July 23, 1969

Please refer to our Technical Memorandum of June 5, 1969 on Study 130.

In the plans for 1 1/2 inch thick overlay for the bridge on Route 208 at Robert Lee, Texas, we called for 1/4 inch diameter welded wire mesh to be installed. The mesh was to be laid flat on the deck slab after application of the grout binder. We have been informed by District 7 maintenance that this sequence of operations cannot be followed with available equipment.

Our tests have shown that the unreinforced overlay performed well in the laboratory, and we believe that it would be satisfactory in a field installation. We asked that the wire mesh be used originally because we felt that it would help distribute stresses over cracks in tensile regions, but we do not feel that its ommission would be detrimental.

In view of the difficulties with installation and of good laboratory performance with non-reinforced overlays of portland cement concrete, it is requested that plans for the job proceed with no steel reinforcing in the overlay. The remainder of the original plan would then apply with all references to welded wire mesh omitted.

cc: Research Engineer, File D-8

APPENDIX B

Form 433-B

INTEROFFICE MEMORANDUM

TO: Mr. Clyde F. Silvus

Date August 21, 1968

FROM: Archie J. Sherrod

Responsible

SUBJECT: Experimental Bridge Deck Overlay
Coke County SH 208
Control 454-1-15

Desk D-18M

We are considering the application of an experimental 1½" Portland cement concrete overlay to the Colorado River Bridge in District 7 in order to correct surface deterioration on the deck slabs.

During the course of our preliminary investigation of extreme fiber stresses in the I-Beam stringers of this structure, we found that the installation of the above mentioned overlay would result in slight overstresses at certain points as shown on the following page.

These figures were obtained from D-19 by means of the B30 Computer Program, "Continuous Beam Analysis".

We solicit your concurrence with the above described project.

DWMc:cas

AJS

DLH

(Typed Copy)

Form 433-B

INTEROFFICE MEMORANDUM

TO: Mr. Clyde F. Silvus

Date May 9, 1969

FROM: Archie J. Sherrod

Responsible

SUBJECT: Experimental Deck Overlay
Coke County, SH 208
Control 454-1-15

Desk D-18M

Reference is made to previous correspondence, a copy of which is enclosed.

As previously stated, a 1½" portland cement overlay would raise the stress level over the supports to approximately 22.5 ksi. By adding metal as you recommend we could reduce the stress, but it would require four 1" x 3" additions to the flanges to reduce the stress to an 18 ksi level. This would require a great deal of welding in a very awkward position. It appears that by welding in these high stress areas, we may induce more stress than we relieve through the addition of metal.

We would prefer not to provide additional section. Your early comments would be appreciated.

DLH:cah
Enclosures

(Typed copy)

Texas Highway Department
Form 2-68-21

47407- 1255- 50m

INTEROFFICE MEMORANDUM

TO: Mr. Archie J. Sherrod

Date May 15, 1969

FROM: Clyde F. Silvus

Responsible

SUBJECT: Coke County
Control 454-1-15
State Highway 208

Desk D-5

Experimental Deck Overlay

Reference is made to your memorandum of May 9, 1969 on the above subject.

In this case, we agree that additional cover plates are probably not essential.

Clyde F. Silvus

CFS/dc

APPENDIX C