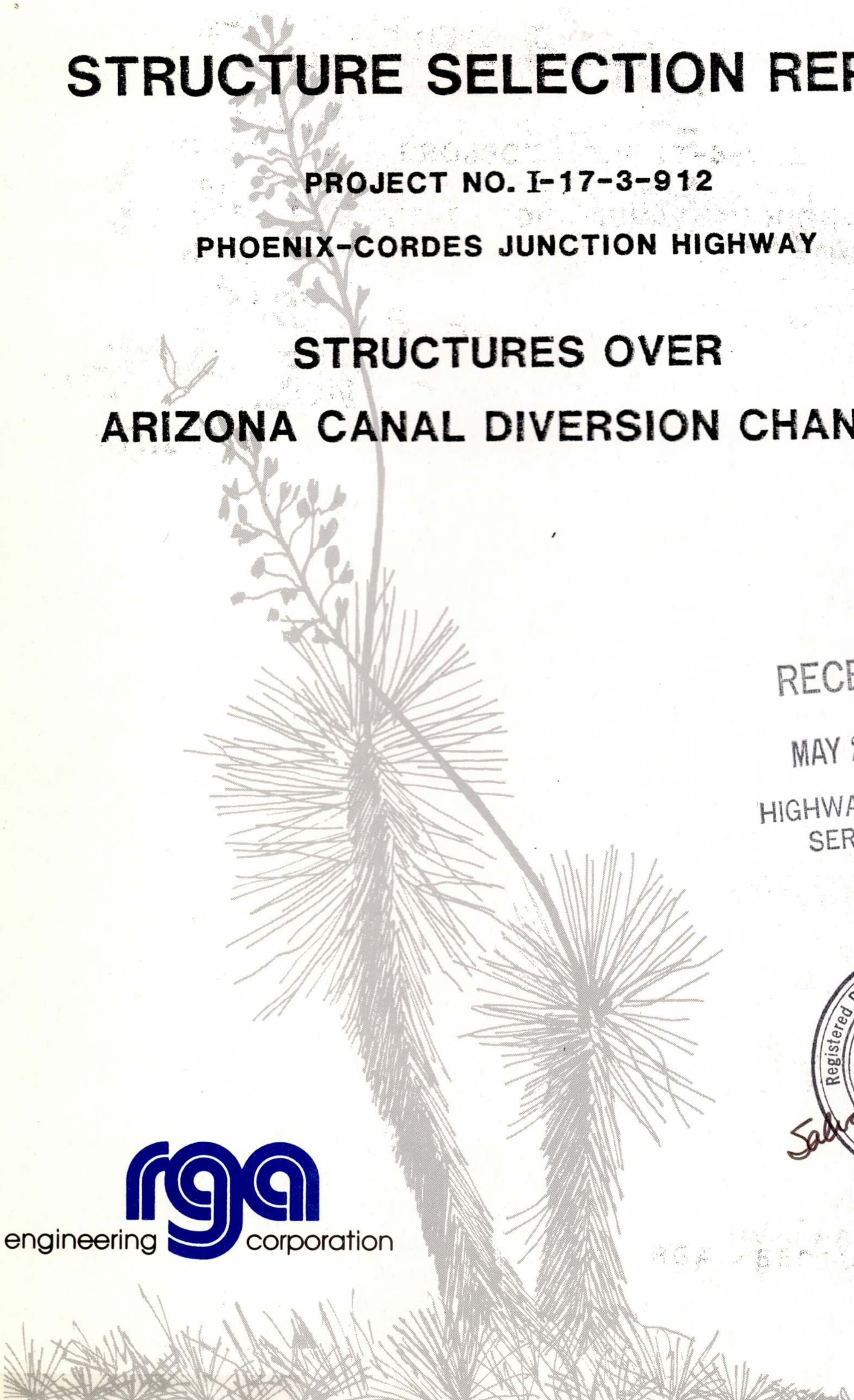
STRUCTURE SELECTION REPORT

PROJECT NO. I-17-3-912

PHOENIX-CORDES JUNCTION HIGHWAY

STRUCTURES OVER
ARIZONA CANAL DIVERSION CHANNEL



RECEIVED
MAY 28 1985
HIGHWAY PLANS
SERVICES

Registered Professional Engineer (Structural)
CERTIFICATE NO.
16089
SALVATORE E.
CACCAVALE
DATE SIGNED 5/24/85
ARIZONA U.S.A.

Salvatore E. Caccavale

rga engineering corporation

RGA #85003

MAY, 1985

...l Road • Phoenix, Arizona 85013 • (602) 266-6278

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TABLE OF CONTENTS

I. GENERAL

This report summarizes the results of an engineering study to select the most cost effective and functional bridge structures required for Interstate-17 to span the Arizona Canal and the new Arizona Canal Diversion Channel (See Figures 1 & 2). The structure selections were based on a relative cost comparison of various schemes using current construction prices and without considering some costs "common to" all schemes, such as, approach slabs, wing walls, diaphragms, medians and traffic barriers.

The proposed Arizona Canal Diversion Channel (A.C.D.C.) bridge will be designed to carry four lanes of highway traffic in each direction and a three-lane frontage road in each direction. At the present time, the requirements are only for three traffic lanes in each direction, a two-lane northbound frontage road, and a three lane southbound frontage road. The channel alignment will cause approximately a 15° skew in the new A.C.D.C. bridge, which is not enough to cause any structural design problems.

Three lanes of traffic in each direction, plus two one-lane frontage roads are required to remain open during construction. This causes several unique problems when coupled with the depth requirement for the bottom of the new diversion channel being approximately 29' below finish grade (See Figures 2 & 9). First, in order to maintain the traffic flow requirements, two permanent infill structures will have to be built between the existing highway and frontage road bridges. Second, one temporary bridge structure to the east for the northbound frontage road at the present Arizona Canal main channel will be needed. Third, with the addition of these infill and temporary structures, construction of the new bridge at the A.C.D.C. can be done in three segments with the rerouting of traffic meeting the stated requirements. The first segment will be the westernmost 60' (approximate) which will provide the southbound frontage road crossing at the A.C.D.C. This will be followed by the center portion, segment two (approximately 144' wide), carrying the main highway, and segment three (approximately 48' wide), carrying the northbound frontage road.

II. DESIGN CRITERIA

The following criteria referenced are applicable design specifications and policies:

A. Arizona Department of Transportation - Standard Specifications for Road and Bridge Construction, 1982 and current revisions.

B. AASHTO - A Policy on Geometric Design of Rural Highways, 1965.

C. AASHTO - A Policy on Design of Urban Highways and Arterial Streets, 1973.

D. AASHTO - Standard Specifications for Highway Bridges, 1977, and supplements thereto.

E. AASHTO - Guide for Selecting, Locating, and Designing Traffic Barriers, 1977. (To be used as a guide only.)

F. ADOT Structures Section - Reinforced Concrete Box Culvert Manual.

G. ADOT Drainage Design Services - Hydrologic Design for Highway Drainage in Arizona, and subsequent revisions thereto.

H. ADOT Drainage Design Services - Hydraulic Design Notes, distributed in 1969 and 1972.

I. AASHTO - Interim Guide for Design of Pavement Structures, 1972.

J. Federal-Aid Highway Program Manual - Volume 6, Chapter 7, Section 3, Subsection 2; "Hydraulic Design of Highway Encroachments of Flood Plains".

K. AASHTO - Manual on Foundation Investigations, 1978.

III. BRIDGES AT THE ARIZONA CANAL (MAIN CHANNEL)

There are to be three bridges constructed over the main channel of the Arizona Canal during this project. Two will be permanent bridges, infilled between the three existing Arizona Canal bridges and one will be temporary.

A. INFILL BRIDGES

It is recommended that the two permanent infill structures to be built between the existing bridges use a similar design and method of construction. The existing bridges are constructed of conventionally reinforced concrete (See Figures 3, 4, 5 & 6). The bridge decks are 12" thick (11" on the northbound frontage road) and have 16'-4" end spans and a 20'-0" center span. The deck spans are then supported by 15" pier walls and 12" abutment walls which are both founded on spread concrete footings approximately 4' to 5' below the canal bottom. The construction of these infill bridges in this manner will comply with Salt River Project (SRP) requirements that the same vertical channel clearance be maintained and that no adverse hydraulic effects occur in the canal flow characteristics.

These infill structures are to be constructed during the current year dry-up from October 1985 through November 1985. It is therefore recommended that the infill structure design and construction package be separated from the total project so that this package could be ready for bidding by August 1, 1985.

B. TEMPORARY BRIDGE

The third bridge to be constructed will be a single lane temporary bridge. This bridge will carry the northbound frontage road traffic during the construction of segments two and three of the A.C.D.C. bridge and can be removed after the traffic has been routed back onto the completed structure.

Two potential schemes were studied for providing this temporary crossing. The first was the use of a prefabricated steel highway bridge. The second was to make use of precast, prestressed box girders at an existing temporary detour bridge approximately 1300 feet to the east (upstream).

The first scheme would require the rental of a prefabricated bridge, shipping assembly, disassembly, repacking, and return shipping. It would utilize three 90' long steel trusses on each side of the bridge and have a wooden deck. The bridge could be founded on temporary wood cribbed bearing pads. It would provide a 12'-6" wide traffic lane measured from face-of-curb to face-of curb.

The second scheme would require partial disassembly of the Temporary Detour Bridge over the Arizona Canal at 25th Avenue. This bridge has been designed to carry earth moving equipment and is therefore capable of handling loads in excess of H20-44. Five of the 80' long precast, prestressed box girders would have to be removed and relocated downstream (westward) approximately 1300' to the I-17 site. There presently exists dirt access roads on both sides of the canal to facilitate this process. These girders would then be erected onto a sub-structure consisting of a concrete abutment cap with wing walls founded on 2' diameter drilled caissons. Drilled caissons are required because of the proximity of the girder ends to and possibly over the existing canal side slopes. This bridge will provide a 15'-0" wide traffic lane from face-of barrier to face-of barrier.

Under the assumption that the temporary bridge over the Arizona Canal would be required for approximately eight (8) months a comparative cost analysis showed the following totals:

Prefabricated, Steel Bridge	$48,620.00
Precast, Prestressed Box Girder Bridge	$50,580.00

It is noted that the steel truss bridge rents for $3,100.00/ monthly during the first 8 months and then rental drops to 2,170.00/monthly.

The costs of these two bridges are virtually identical (within 4%) if the eight month usage period is adhered to. If this time period is exceeded because of rain or other delays the cost of the prefabricated steel bridge will go up at a rate of $2,170.00/per month; whereas, there will be no change in the cost of the box girder scheme. This makes the box girder scheme more attractive because its cost will be more definite, not being time dependent because of rental charges. It is not likely that this construction can be done in a time period of less than 8 months; therefore, the possibility of renting a temporary bridge for a reduced amount of time was not considered. The box girder bridge also has the functional advantages of a wider traffic lane and a concrete driving surface (vs. a wood deck).

Based on the above discussed economics and aesthetic values it is recommended that the precast, prestressed box girder system be used for the required temporary bridge (See Figures 6 & 7).

IV. A.C.D.C. BRIDGE SUBSTRUCTURE

A. FOUNDATIONS

Two foundation schemes were reviewed were studied for this project taking into account ease of construction and economics. First, the channel may be excavated prior to the building of the bridge, or second, the bridge may be constructed first prior to the channel being dug. Because of the segmented construction of the A.C.D.C. bridge and traffic flow requirements, construction of a channel before the new bridge would require an extensive retaining wall system to hold back the 29 feet of earth surrounding the construction site. These walls would either be temporary or permanent and would be costly to the project, both financially and timewise. Also, because of the earth retainage requirements, the design and construction of this system may be impossible to build in a practical manner. It was therefore decided that the design of the new bridge encompass a method of construction that would allow all work to be done essentially at grade with minimum excavation required. To do this, the use of spread footings will be eliminated as a potential foundation scheme.

Foundation construction utilizing minimum excavation can be done by either drilling caissons or driving steel piles from an elevation slightly below existing grade and then completing the substructure and superstructure at that same elevation. With the bridge structure complete, the channel can then be excavated and lagging installed between the concrete caissons or steel piles as required to retain the earth embankments. Both the drilled concrete caisson and driven steel pile schemes would allow the vertical load carrying elements to span between the top and bottom of the channel and distribute the lateral earth pressures applied along the channel sides to the bridge deck above and the earth below.

This can be done using reinforced concrete caissons that are 2'-0" round at approximately 5'-0" centers. Preliminary soils information indicates that the earth behind the caissons will span approximately 3' to a depth of 15' to 20' below existing grade. It is also estimated that the abutment caissons would have to be 39' long for the two-span configuration and 46' long for the single open structure. The approximate cost for these drilled shafts is expected to be $42.00 per linear foot.

To provide a similar system using steel piles would require HP 14 x 89's, at approximately 4'-0" o.c. These piles would be 40' long, end bearing piles, for both the single and two span culvert configurations. Also because these piles would be unbraced for the upper 29 feet when the channel is excavated, permanent bracing would have to be provided to prevent compression flange buckling. The cost of these steel piles is expected to be in excess of $52.00 per linear foot when the costs for bracing are included.

It is estimated that the foundation scheme employing drilled concrete caissons will be the least expensive saving over $70,000.00 for the single span condition and $130,000.00 on the two span configuration. The increased costs per linear foot and the increased number of piles required make the steel pile scheme less cost effective.

It is also noted that the vertical alignment of the drilled caisson will be more dependable than a driven steel pile which may veer significantly out of plumb. This is an important factor because finished side walls are to be constructed directly against the caissons or piers after channel excavation has occurred.

B. ABUTMENT AND PIER CAPS

Abutment caps (and pier caps if needed) will be required to transfer earth pressure lateral loads from the drilled caissons to the bridge superstructure above. These caps will also provide bent type action in conjunction with the caissons for the resistance of lateral forces transverse to the roadways. These caps would also be required if a driven steel pile foundation system was used.

C. SIDEWALLS AND CHANNEL BOTTOM

A permanent retaining wall structure will be built after the channel has been completely excavated. These will also serve as the channel side walls.

A permanent channel bottom will be constructed in the future.

V. A.C.D.C. BRIDGE SUPERSTRUCTURE

The evaluation of the different superstructure framing schemes was based on economic, geometric, serviceability, ease of construction and maintenance considerations. Design of the various systems was based on HS20-44 highway loadings.

It was concluded from this analysis that a cast-in-place, post-tensioned box girder system would be the most appropriate superstructure framing scheme based on the above stated considerations. The following is a breakdown of the systems considered for the project. Where comparative costs are presented, they are not meant to indicate total construction costs. They are only relative costs of the principal structural items. Items such as traffic barriers, approach slabs, wingwalls, medians, and diaphragms being common to all schemes are not included. Because different superstructure systems will influence the size and cost of the corresponding substructure, a similar foundation system was designed and included in the relative scheme costs.

Systems investigated are as follows:

Scheme I: 114' single span, post-tensioned box girder with an 8-1/2" composite reinforced concrete deck.

Scheme II: 114' single span, prestressed, type VI AASHTO girders with a 7-1/2" composite concrete deck.

Scheme III: Two, 57' span, prestressed, type III AASHTO girders with a 7-1/2" composite concrete deck.

Scheme IV: Two, 57' span, precast, prestressed box girders with 1-1/2" asphaltic concrete wearing surface.

Steel plate girders with a composite concrete deck were not considered because of additional requirements for maintenance of corrosion protection and because past history has shown this system not to be competitive with those being studied.

A. SCHEME I:

This scheme consists of a post-tension, cast-in-place concrete box girder system. Each girder is approximately 8'-6" wide by 4'-8" deep including an 8-1/2" composite concrete deck and has a single span of 114'. With the superstructure depth being 4'-8", the required excavation and retaining structure costs at grade will be less than Scheme II (single span, AASHTO girder scheme considered) where the depth required is 6'-7-1/2". Also, it appears that existing roadway conditions will require a vertical discontinuity between each of the three bridge segments which can easily be handled by the post-tensioned box system with minor effects on total cost. An AASHTO girder system can also handle these vertical offsets, but will probably require two additional girders to do so. The addition of girders will have a more noticeable effect on total costs.

The comparative cost for this scheme is $34.07 per square foot ($978,730.00 total).

All schemes considered will require the bridge superstructure to be keyed into the abutments in a manner that will allow the transfer of lateral earth pressure loads to occur properly. The connection for this scheme will require that longitudinal movement first be allowed to occur during the post tensioning process and then be grouted in a manner to allow future lateral loads to shear into the superstructure.

B. <u>SCHEME II</u>

This scheme uses type VI AASHTO girders at 8'-4" o.c. with a 7-1/2" composite cast-in-place concrete deck. The type VI girders will span 114' and have a depth of 6'-0".

The main advantage of this scheme is that it will be the fastest to construct. The disadvantages of this scheme over Scheme I are primarily more excavation required for superstructure construction and more complex detailing and construction of the abutment configuration. In order to provide proper shear transfer to the bridge superstructure an integral abutment cap will be required.

The comparative cost for this system is $34.17 per square foot ($981,560.00 total).

C. SCHEME III

Scheme III is similar to Scheme II except that it employs type III AASHTO girders in a two-span configuration. The girders are on 7'-0" centers, span 57' and are 3'-9" deep with a 7-1/2" composite concrete deck.

The first advantage of this scheme is that it will be fast to construct; although, not as fast as Scheme II because of the center pier requirement. The second advantage is that it will have the relatively shallow superstructure (similar in depth to Scheme I).

In addition to the same disadvantages found in Scheme II, Scheme III also has disadvantages that will inherently accompany a two span configuration. These are the interruption of open channel flow caused by the center pier, the potential of debris build up at the center pier, and construction of the channel bottom may be more difficult with the obstruction caused by the pier.

The comparative cost for this scheme is $35.80 per square foot ($1,028,610.00 total).

D. SCHEME IV:

This scheme employs the use of precast, pre-stressed concrete box girders spanning 57' in a two-span configuration. Each girder is 27" deep x 4'-0" wide and will have a 1-1/2" thick asphaltic concrete friction course (wearing surface).

This scheme exceeds the others in two advantages. First, it will be the fastest to construct because there will be no forming requirements for the bridge deck; and second, it will have the most shallow superstructure. The disadvantages to Scheme IV are those of the two-span configuration as previously discussed and the lack of a continuous concrete deck which provides more satisfactory riding characteristics.

The comparative cost for this system is $34.59 per square feet ($993,770.00 total).

VI. SUMMARY AND RECOMMENDATIONS

Based on our analysis of the various site conditions and restrictions and substructure and superstructure schemes, we conclude and recommend the following:

A. Arizona Canal Infill Structures

Conventionally reinforced concrete decks, bearing walls, and spread footings to match existing bridge structures. (See Figures 3, 4, and 5.)

B. Arizona Canal Temporary Bridge

A precast, prestressed box girder bridge utilizing existing girders from the Temporary Detour Bridge over the Arizona Canal at 25th Avenue, owned by the Maricopa County Flood Control District. This bridge would be founded on a concrete abutment cap supported by 2'-0" diameter drilled caissons. (See Figures 6 and 7.)

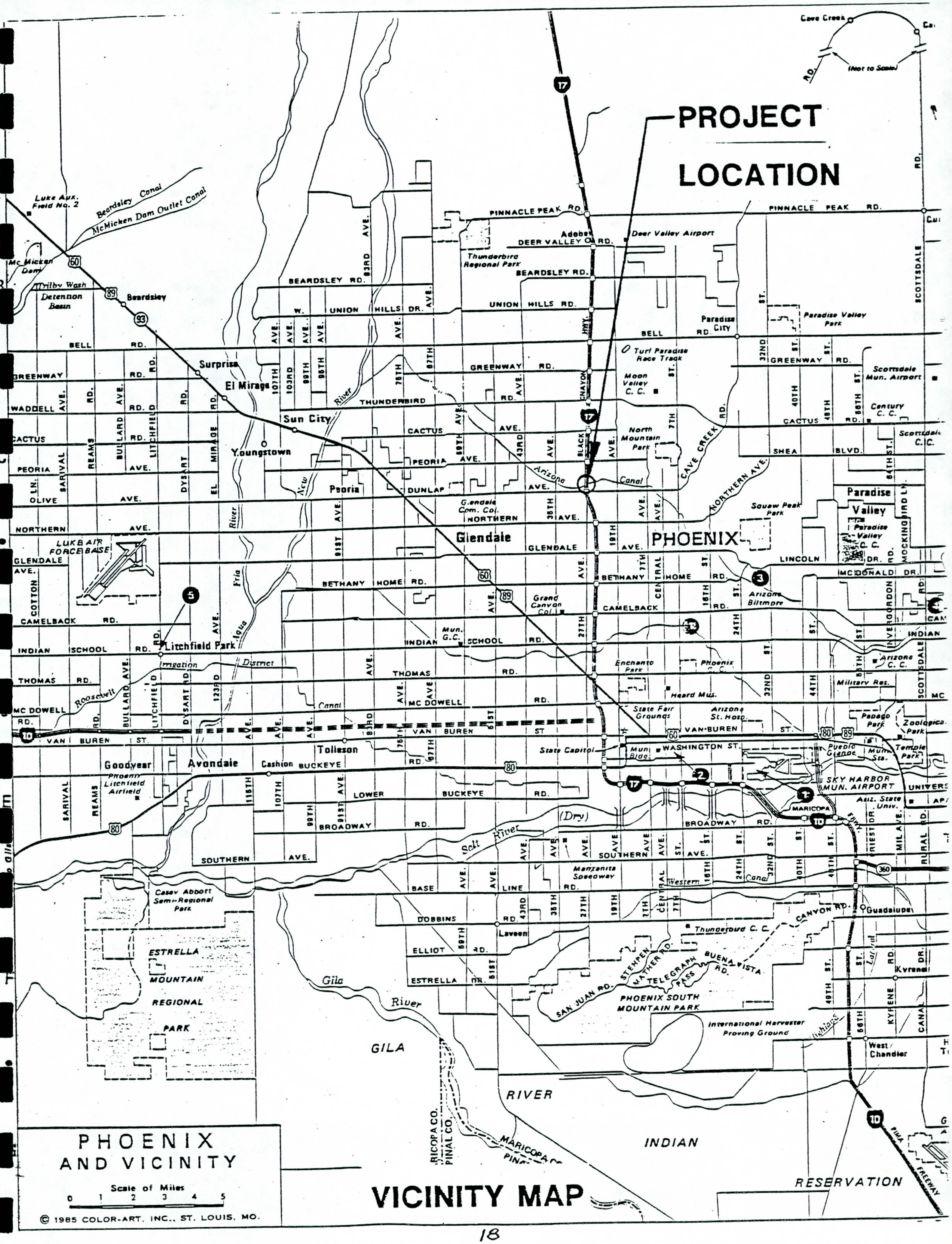
C. A.C.D.C. Superstructure

A post tensioned, cast-in-place, single span box girder. (See Figures 8 & 9.)

D. A.C.D.C. Substructure

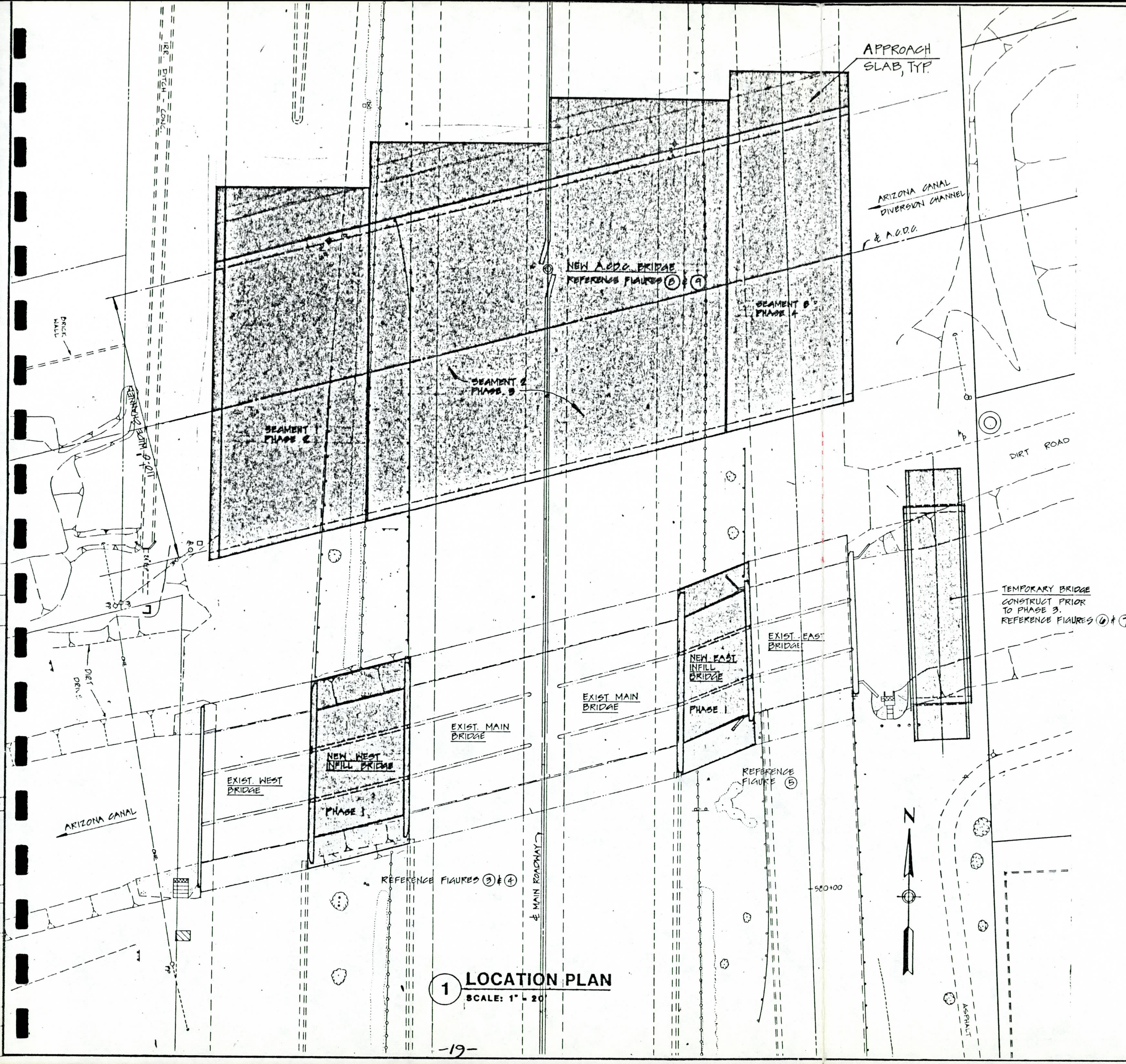
Concrete abutment caps on 2'-0" diameter concrete columns/ drilled caissons. (See Figures 8 & 9.)

FIGURES



VICINITY MAP

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA				



① LOCATION PLAN

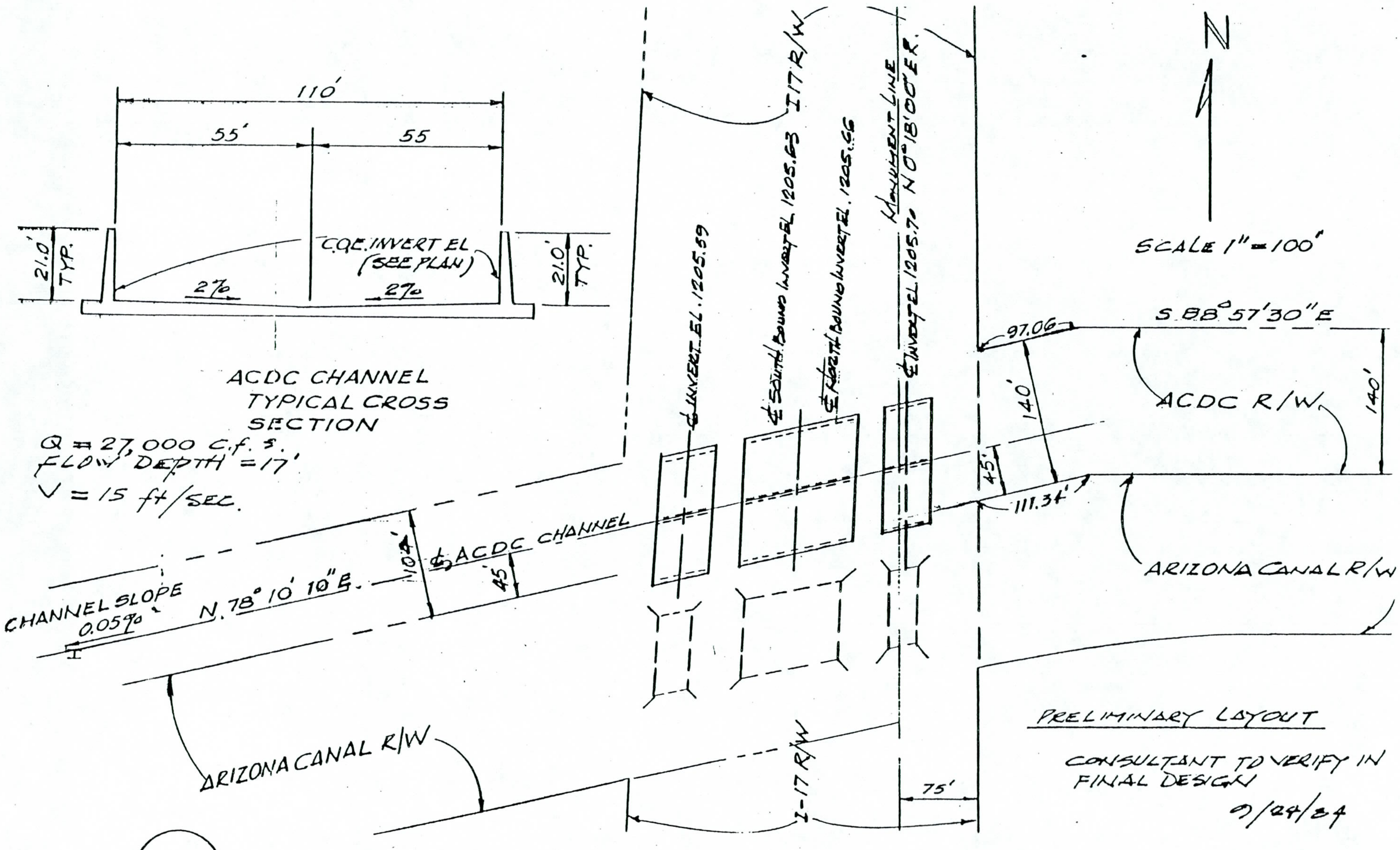
SCALE: 1" = 20'

	DATE
LAYOUT	
DESIGN	
DESIGN CK'D	
DRAWN	
DWG. CK'D	
APPROVED	

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

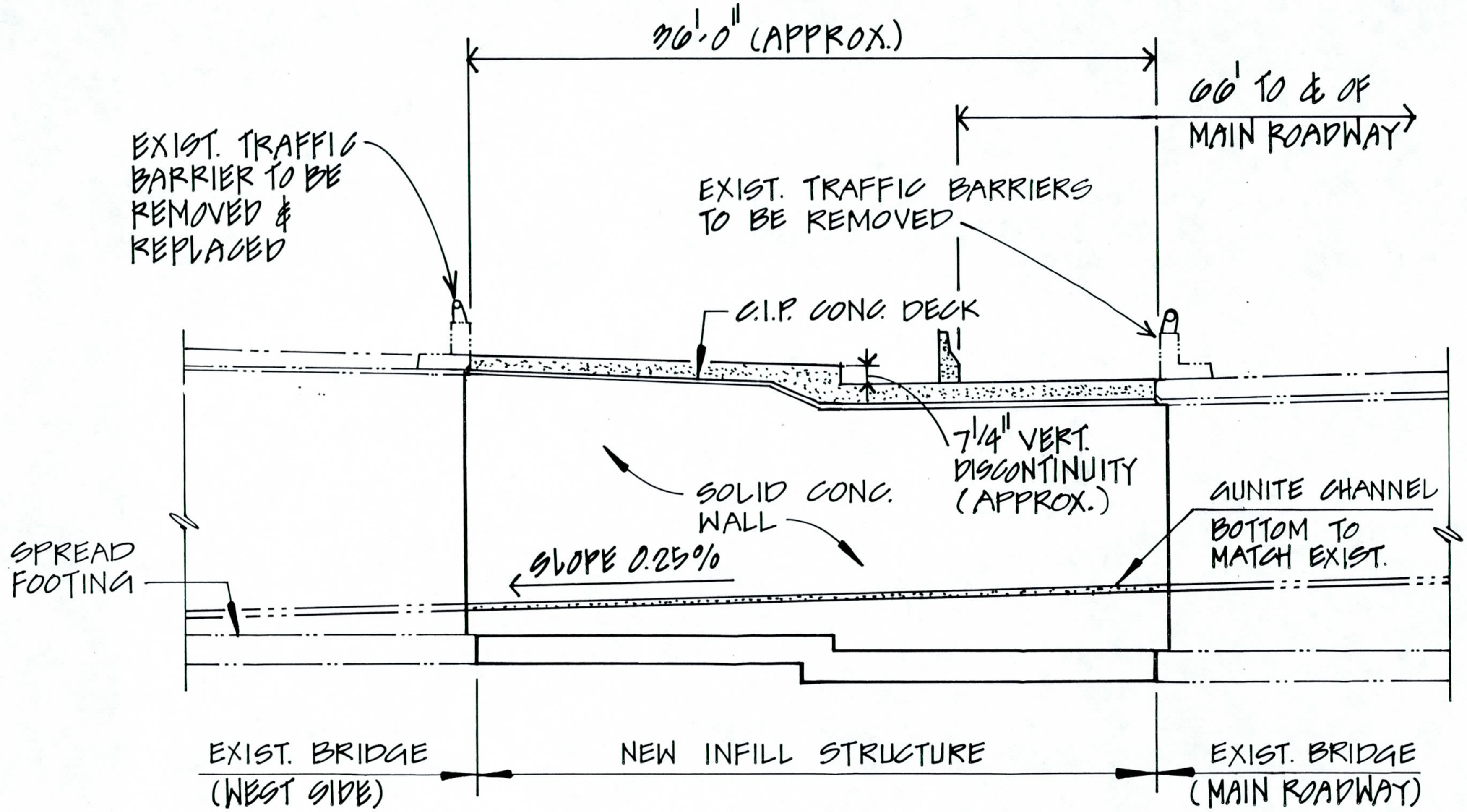
SHEET NO.	OF	ROUTE	MILEPOST	STRUCTURE NO.	PROJECT NO.	BRIDGE ENGINEER

* NOTE: BRIDGE STRUCTURE MUST CLEAR TOP OF WALL.



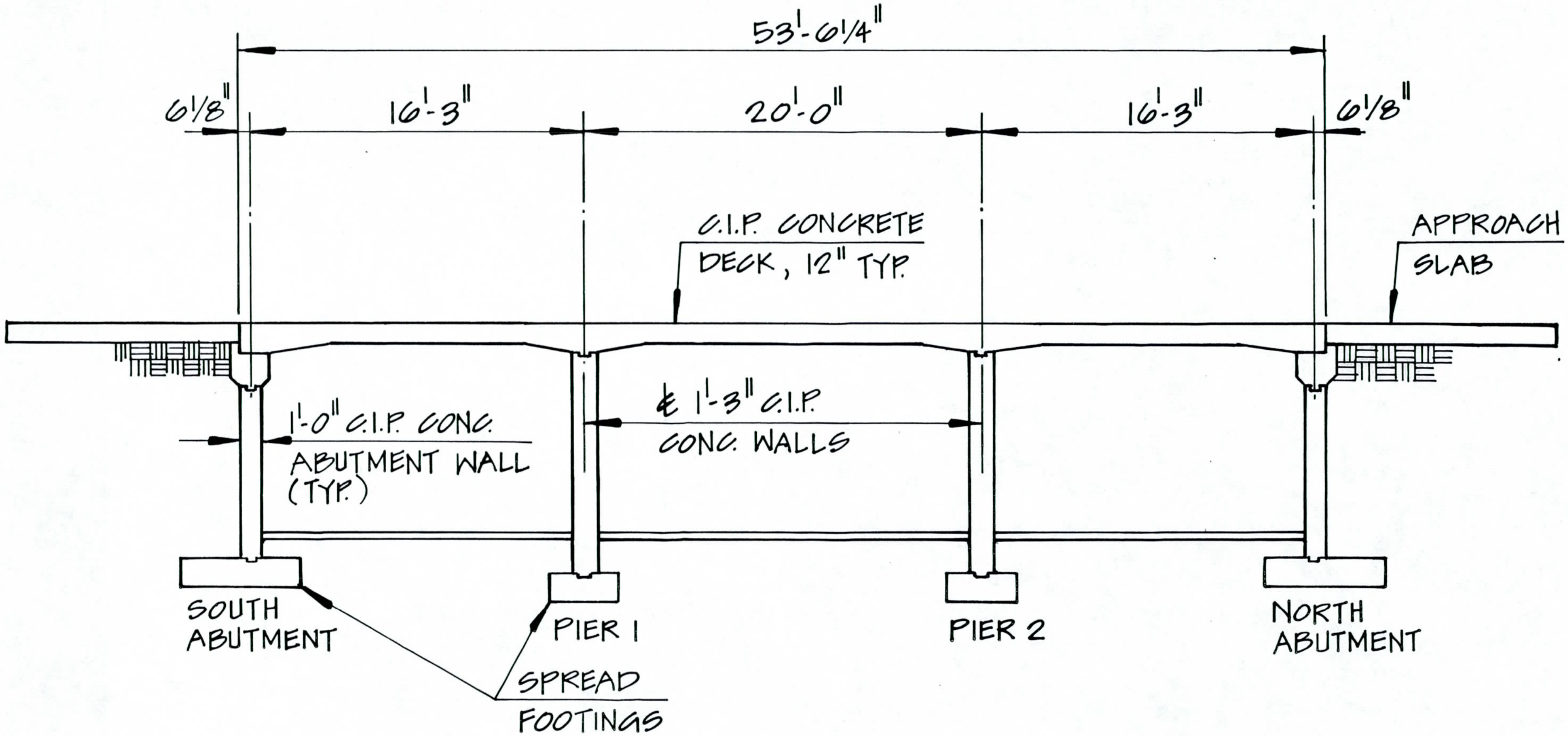
20

2



3 TRANSVERSE SECTION - WEST INFILL BRIDGE

rga engineering corporation



4 **LONGITUDINAL SECTION - WEST INFILL BRIDGE**

(EAST INFILL BRIDGE SIMILAR)

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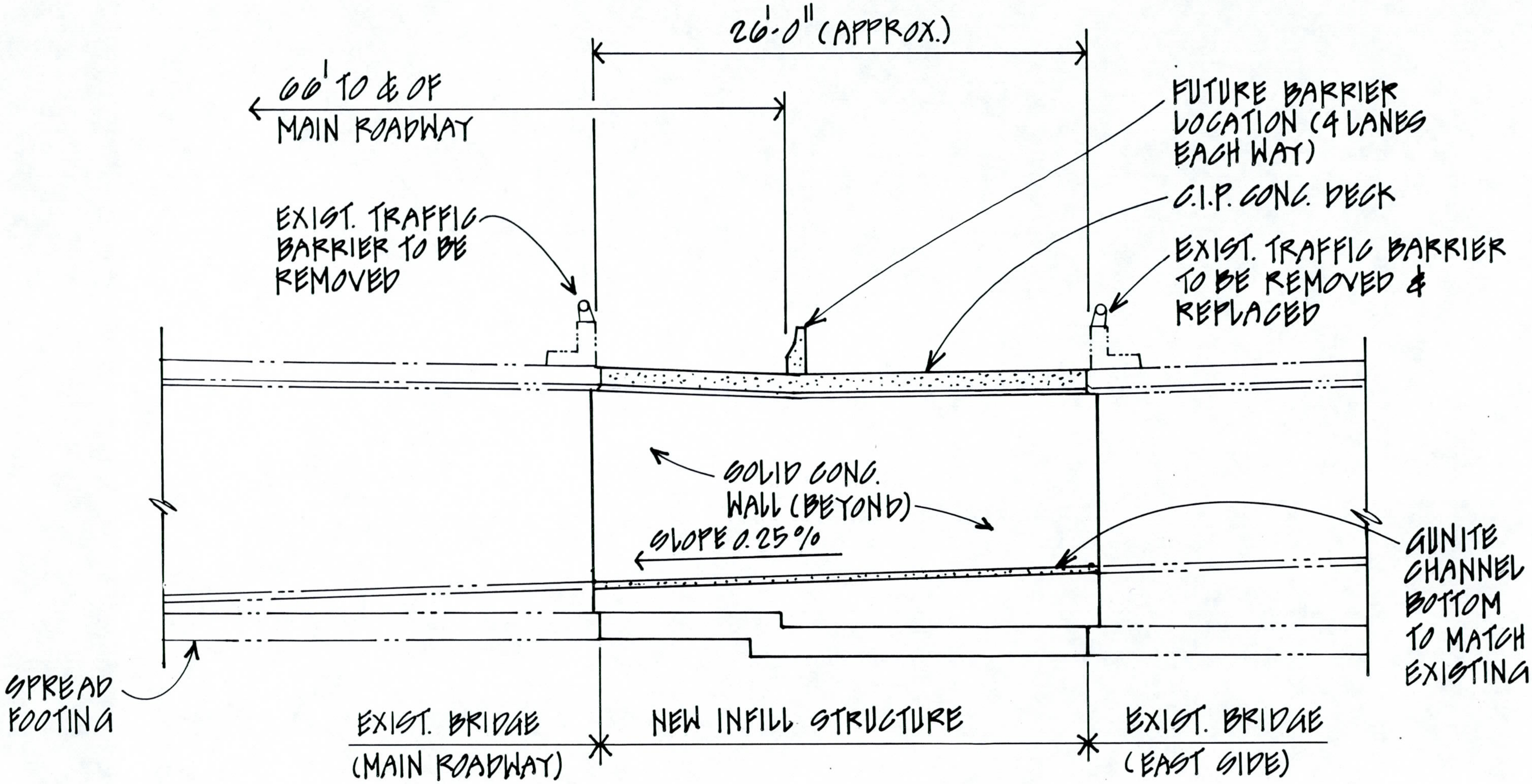

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5 TRANSVERSE SECTION - EAST INFILL BRIDGE

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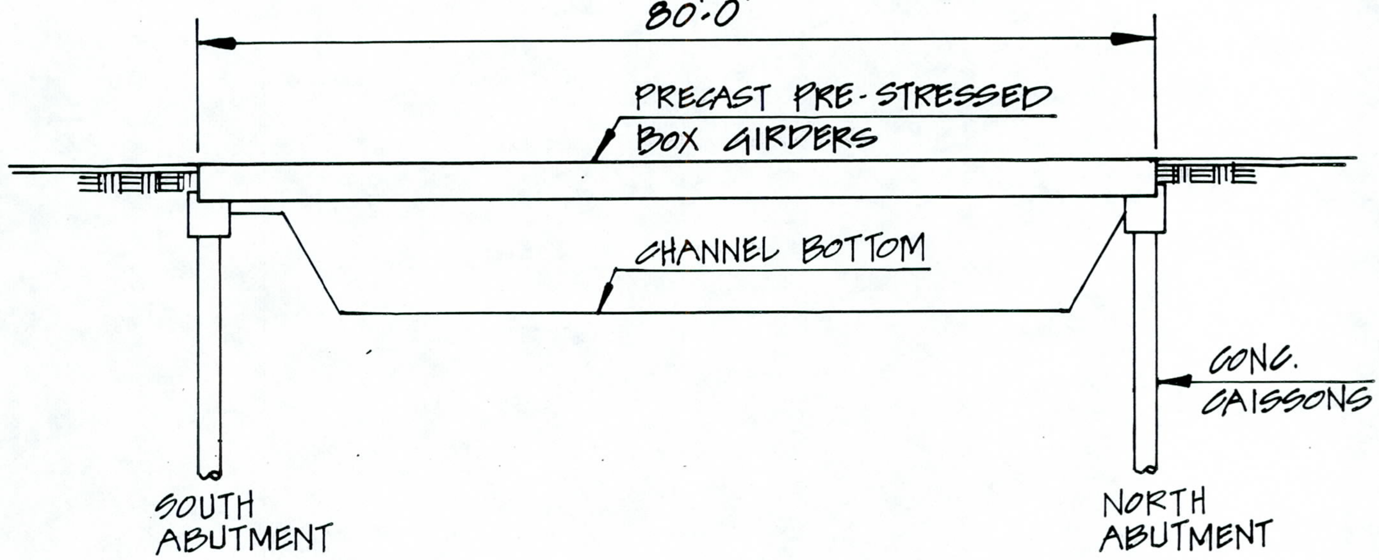
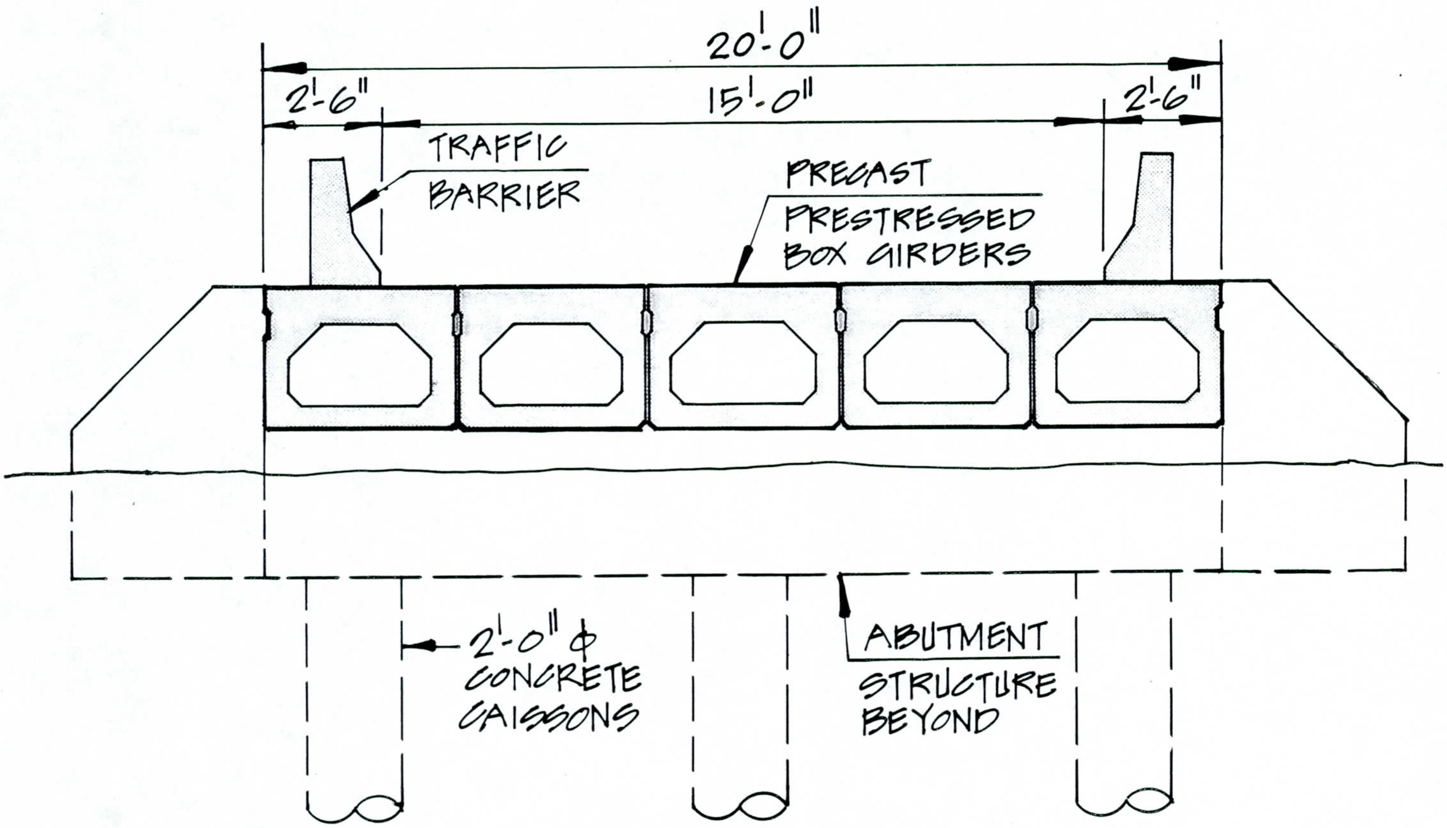


6 LONGITUDINAL SECTION OF TEMPORARY BRIDGE



7 TEMPORARY BRIDGE CROSS-SECTION

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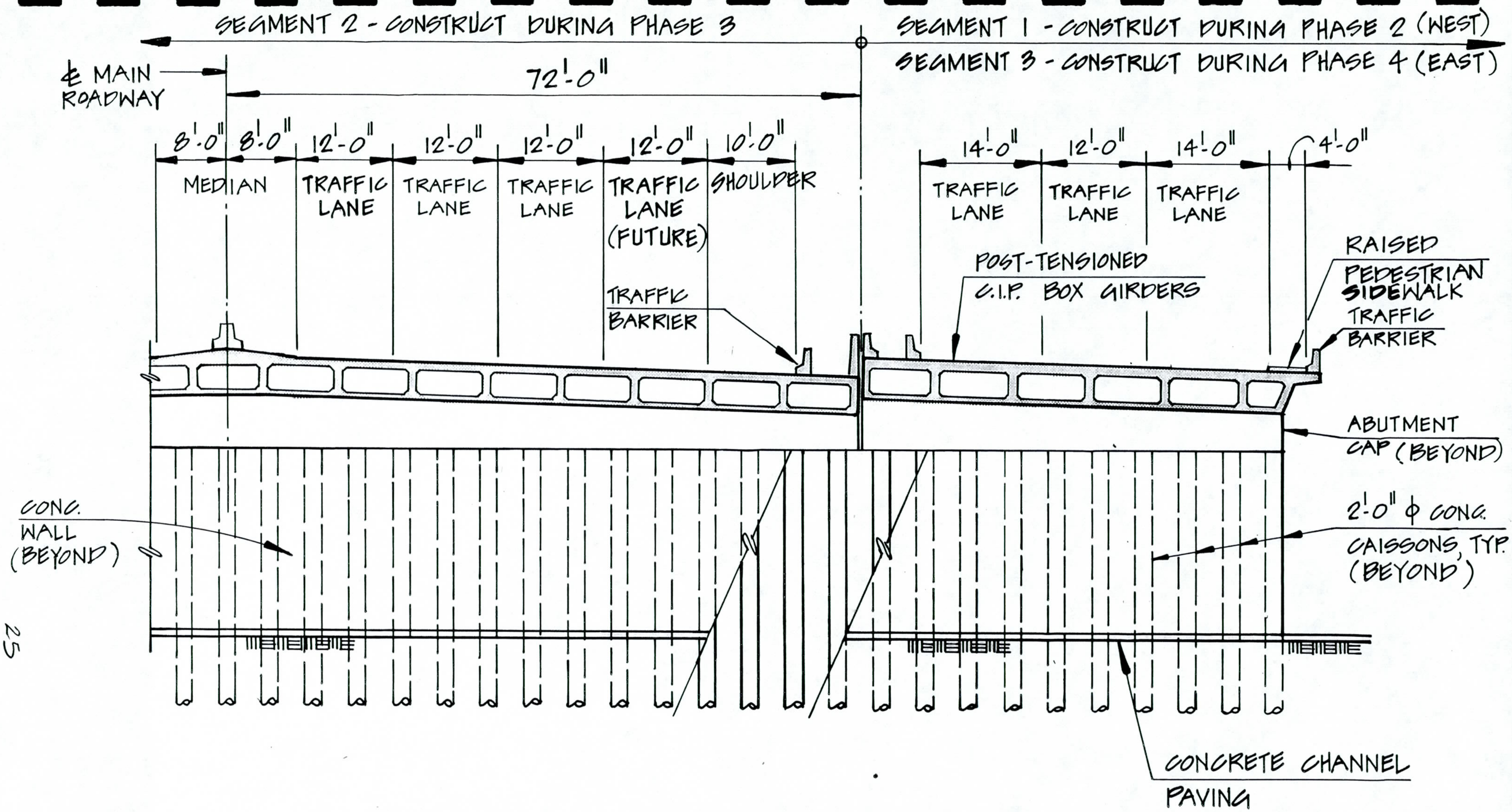

25

8 A.C.D.C. BRIDGE SECTION (FUTURE)
(EAST HALF SHOWN)

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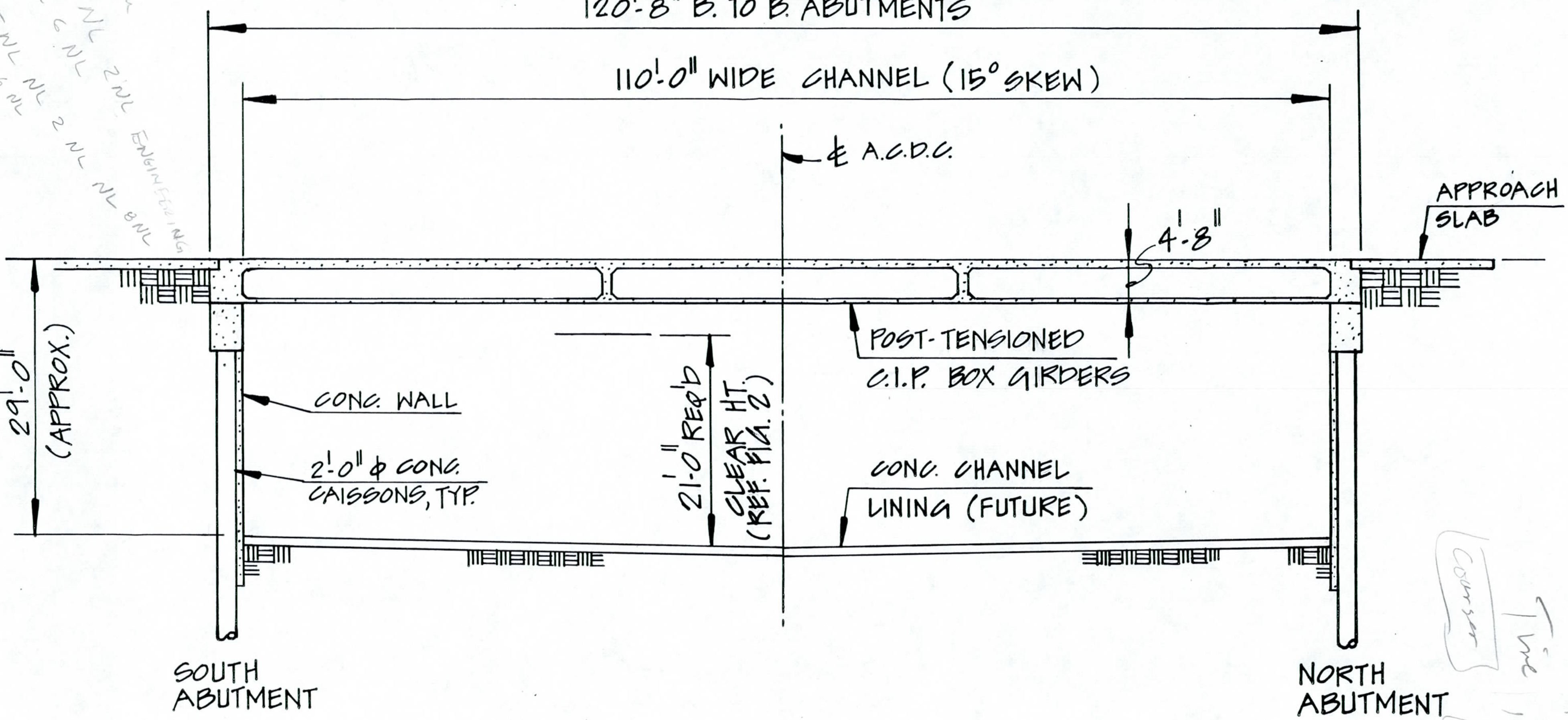

9 **LONGITUDINAL SECTION - A.C.D.C. BRIDGE**

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APPENDICES

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project I-17 BRIDGES / ACDC no. 85003

client ADOT design OAL date 5/85

subject TEMPORARY BRIDGE @ AZ. CANAL checked date

CONSTRUCTION COST ESTIMATE					
NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
PREFAB. STEEL TRUSS BRIDGE (90')		W/O RAMPS (PER BAILEY BRIDGES)			
	BRIDGE TRUSS RENTALS (TWO-				
	TRIPLES, SINGLE LANE)	8	MO.	$3100	$ 24,800
	TIMBER DECKING	1	LS	$3400	3,400
	SHIPPING TRUSSES (BOTH WAYS)	2	EA	$1400	2,800
	ERECTION COSTS				
	1 - 10 MAN CREW	3	DAYS	$2000	6,000
	LAUNCHING EQUIPMENT	1	LS	$1050	1,050
	1 MFR. TECHNICIAN (TRAVEL, PIER DIEM, ETC)	1	L.S.	$1000	1,000
	MISC	1	L.S.	$1000	1,000
	FOUNDATIONS, 5'X5' TIMBER				
	CRIBBED PADS (2 @ EA. END)				
	MAT'L: 2 LAYERS 8'Ø R.R. TIES	4	EA	$300	$ 1,200
	LABOR: (4 MAN CREW @ 4HRS EA)	16	MAN HRS	$20	320
	DISASSEMBLE & REPACK FOR SHIPPING				
	1-10 MAN CREW	3	DAYS	$2000	$ 6000
	LAUNCHING RAMP	1	LS	$1050	$ 1050
					$48,620
	TOTAL THIS PAGE				

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project I-17 BRIDGES / ACDC no. 85003

client ADOT design sal date 5/85

subject TEMPORARY BRIDGE @ AZ. CANAL checked date

CONSTRUCTION COST ESTIMATE

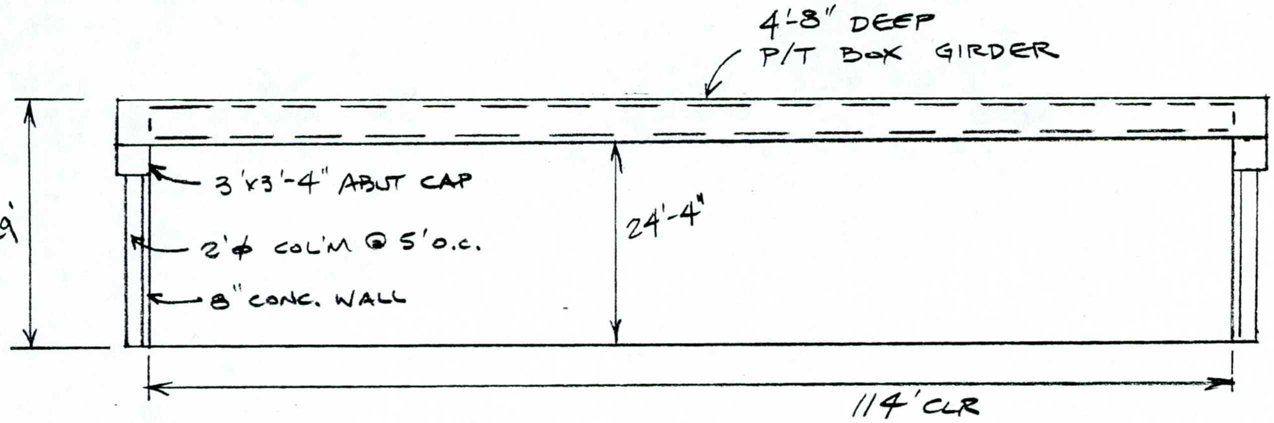
NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
	PRECAST / PRESTRESSED BOXES				
	REMOVAL				
	SAW CUT (12" DEEP) – 6 (CUTS) x 80'	480	LF	$8.40	$4030
	REMOVE TENSION RODS (TWO MEN @ 4 HRS)	8	HRS	$20	$160
	BUSH HAMMER GROUT @ SHEAR KEYS	640	LF	$2	$1280
	PICK UP & MOVE GIRDERS				
	TWO CRANES (INCL. MISC) – 2 DAYS	4	CRANE DAYS	$1750	$7000
				SUB	$12470
	ERECTION				
	DRILLED SHAFTS (2(3x28))	168	LF	$42	$7060
	PIER CAPS (9 SF x 30') $\frac{2}{27}$ = 20	20	CY	$260	$5200
	ERECT. GIRDERS IN PLACE	5	EA	$1000	$5000
	APPROACH SLABS & RETAINING STRUCTURES	2	EA	$5000	$10000
				SUB	$27260
	REMOVAL				
	SAW CUT (12" DEEP) – 4 CUTS x 80'	320	LF	$8.40	$2,690
	REMOVE TENSION RODS	8	HRS	$20	160
	HAUL GIRDERS OFF SITE	1	LS	$5000	5000
	DEMOLISH ABUTMENT CAPS & WINGWALLS AS REQ'D & HAUL AWAY	2	EA	$1500	$3000
				SUB	$10,850
	TOTAL THIS PAGE				$50,580

project I-17 / ACDC BRIDGES no. 85003

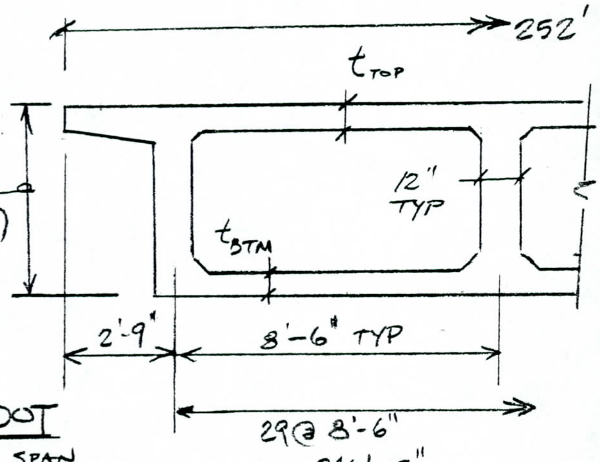
client ADOT design sal date 5/85

subject SUPERSTRUCTURE FRAMING SCHEMES checked ______ date ______

SCHEME I (ONE SPAN w/ POST TENSIONED BOX GIRDER)



(REF: P/T BOX GIRDER MANUAL by PTI)



APPROX. DEPTH REQ'D

$0.040(114') = 4.56'$ say 4'-8" $(D/L = .041)$

TOP SLAB THICKNESS

$t_{MIN\ TOP} = \frac{1}{16}(8.5 - 1.)12 = 5.6\text{ IN} < 6"$ ℄ GOV'S

USE $8\frac{1}{2}$" per ADOT for 7'-6" SPAN

BTM SLAB THICKNESS

$t_{MIN} = \frac{1}{16}(8.5 - 1.) = 5.6\text{ IN} \Rightarrow$ USE $5\frac{3}{4}$"

PRE-STRESSING STEEL REQ'D

$D/L = 0.041$ & $f'_c = 4500$ PSI

APPROX P/T REQ'D $= .85 \times 3.4 = 2.9\ \#/FT^2$

& $2.9 \times 252' = 731\ \#/\text{LIN FT.}$

project: I-17 / ACDC BRIDGES — no. 85003
client: ADOT — design: [illegible] — date: 5/85
subject: SUPERSTRUCTURE FRAMING SCHEMES — checked: — date:

SCHEME I (CONT.)

@ ABUTMENT

DL/GIRDER:

$\frac{1}{2}(114') \; 402 \text{ SF} \times 150 / 29 = 118{,}520^{\#}$

LL/GIRDER (REF. SCHEME II)

$Q = \frac{8.5}{7.} = 1.21$

LANE: $62480^{\#}$/LANE $\Rightarrow R_{LL} = \frac{1.21}{2}(62.5) = 37.8^{K}$

TRUCK: $66100^{\#}$/LANE $\Rightarrow R_{LL} = \frac{1.21}{2}(66.1) = 40.0K$

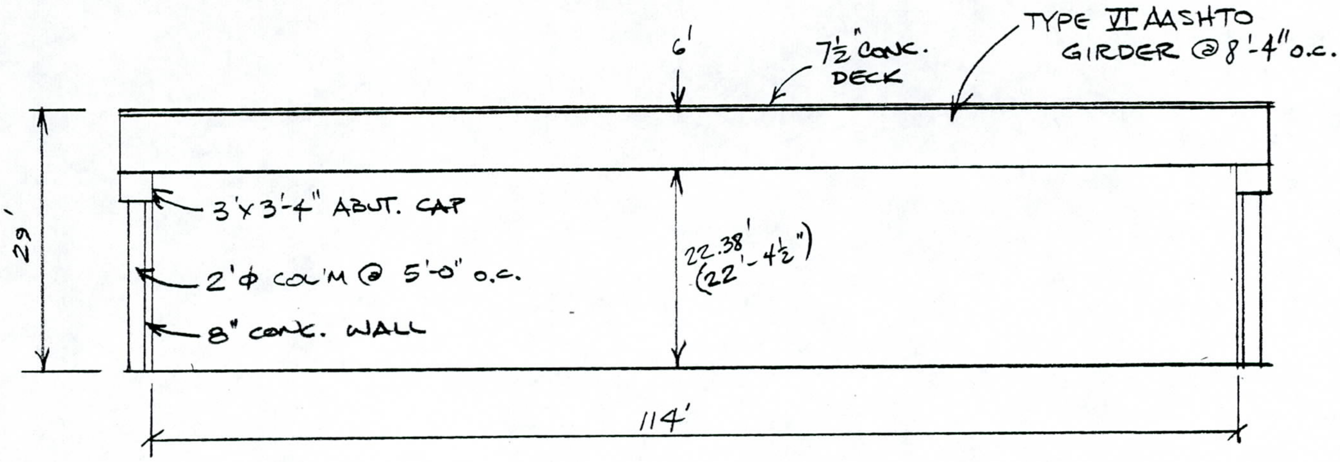
IMPACT / GIRDER

$R_I = .209\,(40.0) = 8.4^{K}$

$\therefore R_{TOTAL(ABUT)} = 119 + 40 + 8 = 167$ K / GIRDER consulting engineers

project I-17 / ACDC BRIDGES no. 85003
client ADOT design cal date 5/85
subject SUPERSTRUCTURE FRAMING SCHEMES checked ______ date ______

SCHEME TWO (ONE SPAN w/ TYPE VI AASHTO GIRDERS)



@ABUTMENT

DL/GIRDER

DECK $\frac{1}{2}(114')\,94\,psf\,(7') = 37{,}500^{\#}$

GIRDERS $\frac{114}{2}(1130\,plf) = 64420^{\#}$

$101{,}920^{\#}$

LL/GIRDER

LANE : $\frac{114}{2}(640) + 26000 = 62480^{\#}/LANE \Rightarrow R_{LL} = \frac{1.27}{2}(62.5) = 39.7^K$

TRUCK : $\approx 32000\left(1 + \frac{100}{114}\right) + 8000\left(\frac{86}{114}\right) = 66100^{\#}/LANE \Rightarrow R_{LL} = \frac{1.27}{2}(66.1) = 42.0\,K$ ← GOV'S

IMPACT /GIRDER

$R_I = \frac{50}{(114 + 125)}(42.0) = .209(42.0) = 8.79\,K$

$\therefore R_{TOTAL}(ABUT) = 101.9 + 42.0 + 8.8 = 152.7^K/GIRDER$

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client: ADOT design: [initials] date: 5/85
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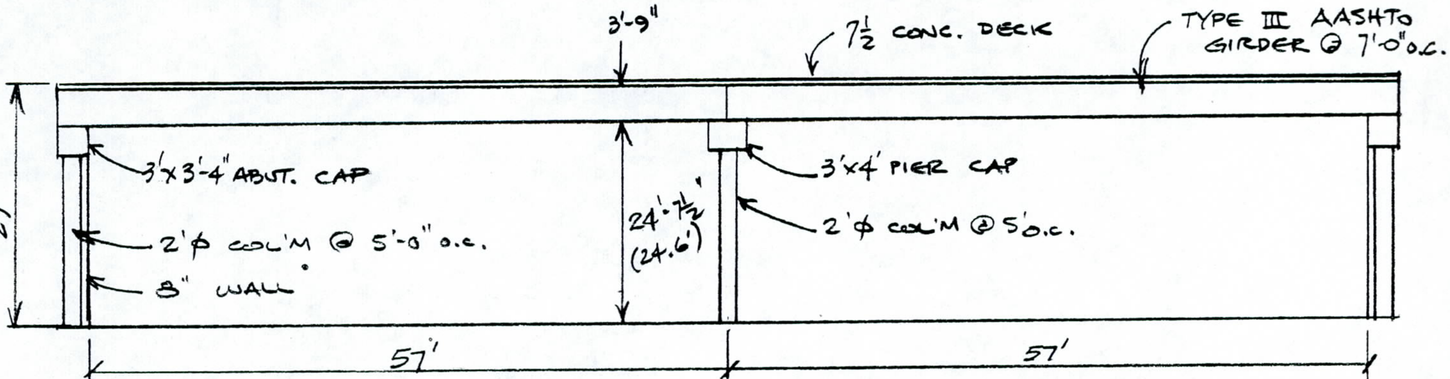
SCHEME III (TWO SPAN w/ TYPE III AASHTO GIRDERS)



@ ABUTMENT

DL/GIRDER

DECK	.375 × 57' × 94 psf × 7'	= 14060#
GIRDERS	$\frac{57'}{2}$ × 583 plf	= 16620#
		30680#

LL/GIRDER $(Q = \frac{7.0}{5.5} = 1.27)$

$R_{LL} = 57.6\left(\frac{1.27}{2}\right) + 16\left(3 - \frac{10}{7} - 1.27\right)$

$= 36.6 + 4.8 = 41.4K$

IMPACT/GIRDER

$R_I = .275(41.4) = 11.4K$

$R_T(\text{ABUT}) = 30.7 + 41.4 + 11.4 = 83.5K$/GIRDER

@ CENTERLINE PIER

DL/GIRDER

DECK	$\frac{1.25}{.375}(14,060)$	= 64,440#
GIRD'S		= 16,620#
		81,060#

LL/GIRDER

$R_{LL} = 71.6\left(\frac{1.27}{2}\right) + 4.8 = 50.3K$

IMPACT/GIRDER

$R_I = .209 \times 50.3 = 10.5K$

$R_{TOTAL}(\text{PIER}) = 81.1 + 50.3 + 10.5$

$= 141.9K$/GIRDER

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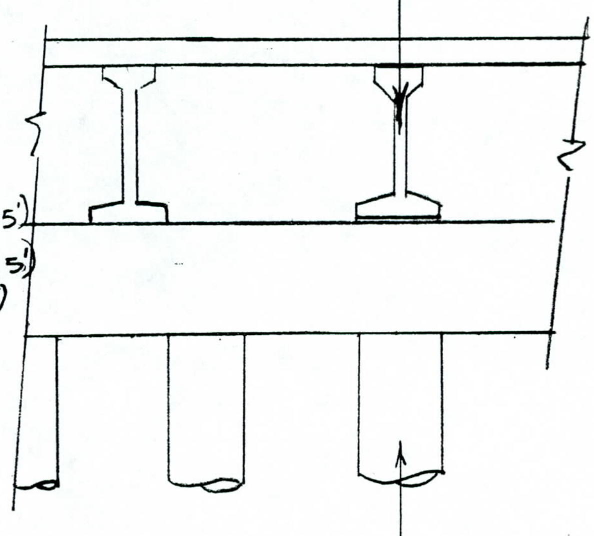
SCHEME THREE (CONT.)



@ ABUTMENT

P_{MAX} = { = 83.5K R_{MAX}
+ 7.5K CAP (3'x3.3'x150x5')
+ 4.2K DIAPH (3.75'x1.5'x150x5')
+ 8.2K COL'M (471plf x 17.3')

103.4K

@ PIER = { =141.9 = R_{MAX}
+ 9.0 CAP
5.6 DIAPH
8.2 COL'M

164.7K

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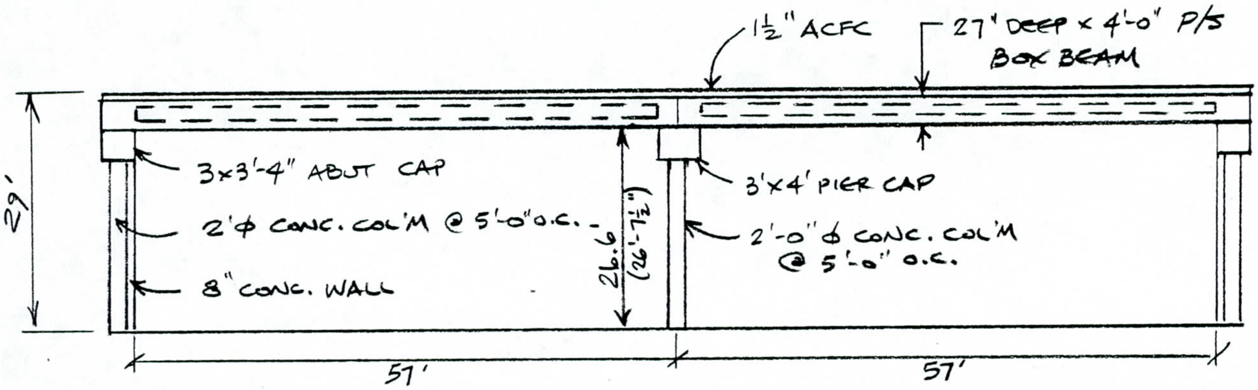
SCHEME FOUR (TWO SPAN W/ PRE STRESSED CONC. BOX GIRDERS)



@ABUTMENT

DL/GIRDER

DECK : 19 PSF × 4' × $\frac{57}{2}$ = 2170#

GIRDER : 722 × $\frac{57}{2}$ = 20580#

22750#

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client: ADOT — design: [illegible] — date: 5/85
subject: SUPERSTRUCTURE FRAMING SCHEMES — checked: — date:

CONSTRUCTION COST ESTIMATE

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
	SCHEME I				
	CONC. BOX GIRDER ⇒ 402 x 114 (4500 psi)	1,697	CY	$285	$483,650
	POST TENSIONING STEEL	83,220	LBS.	$1.50	124,830
	MILD REINF. STEEL	309,200	LBS.	$0.40	123,680
	CONC. CAPS, ABUT (3500 psi)	195	CY	$260	50,700
	STEEL REINF. @ CAPS ⇒	57,000	LBS	$0.40	22,800
	DRILLED SHAFTS 2[(24.4+16)51]	4,120	LF	$42	173,070
					$978,730
					($34.07/SF)
	SCHEME II				
	CONCRETE DECK (7 1/2") 4500 PSI	665	CY	$285	$189,530
	STEEL REINF @ DECK	192,000	LBS	$0.40	$76,800
	AASHTO GIRDERS, TYPE VI, 31 @ 114'	3,534	LF	$135	$477,090
	CONCRETE CAPS, ABUT	195	CY	$260	50,700
	STEEL REINF. @ CAPS ⇒ 300#/CY x 195	57,000	LBS	$0.40	$22,800
	DRILLED SHAFTS 2[(22.4+16)51]	3,920	LF	$42	$164,640
					$981,560
					($34.17/SF)
	TOTAL THIS PAGE				

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project I-17/ACDC BRIDGE no. 85003

client ADOT design sal date 5/85

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CONSTRUCTION COST ESTIMATE

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
	SCHEME III				
	CONCRETE DECK (7½") 4500 PSI	665	CY	$285	$189,530
	STEEL REINF. @ DECK	192,000	LBS	$0.40	$76,800
	AASHTO GIRDERS, TYPE III, 37@114'	4,220	LF	$95	$400,900
	CONCRETE CAPS, ABUT. & CTR. PIER	300	CY	$260	$78,000
	STEEL REINF. @ CAPS ⇒ 300#/CY × 300	90,000	LBS.	$0.40	$36,000
	DRILLED SHAFTS [2(24.6+10)+(24.6+17)]51	5,650	LF	$42	$237,300
	FINISH EXPOSED CTR. PIER COL'S (51×24.6)	1,260	LF	$8	10,080
					$1,028,610
					($35.80/SF)
	SCHEME IV				
	A.C.F.C. (1½") × 28730 SF = 3591 CF	270	TON	$30	$8,100
	PRESTRESSED BOX GIRDERS	7182	LF	$85	$610,470
	CONC. CAPS, ABUT & CTR PIER	300	CY	$260	$78,000
	STEEL REINF @ CAPS	90,000	LBS	$0.40	$36,000
	DRILLED SHAFTS [2(26.6+10)+(26.6+17)]51	5,960	LF	$42	$250,320
	FINISH EXPOSED CTR. PIER COL'S (51×26.6)	1,360	LF	$8	$10,880
					$993,770
					($34.59/SF)
	TOTAL THIS PAGE				