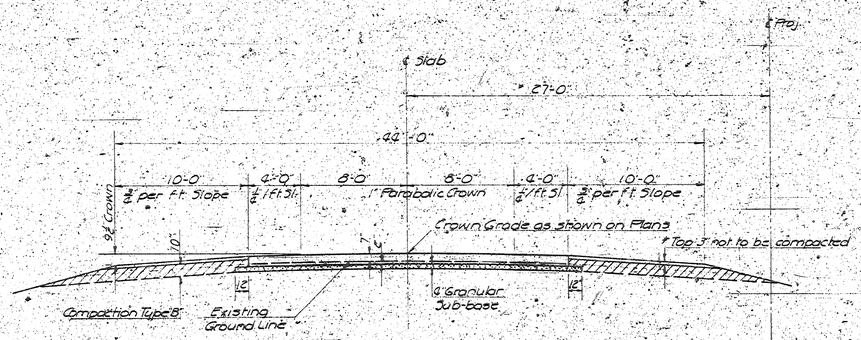
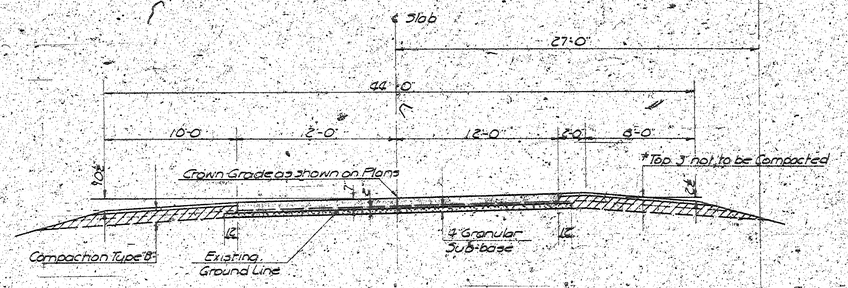
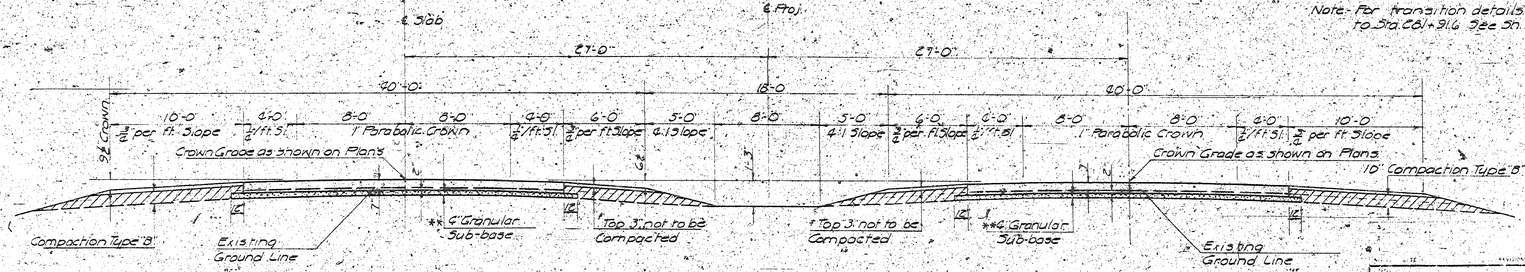


SINGLE SLAB SECTION



SUPERELEVATED SECTION



DUAL SLAB SECTION

* Varies from 0' at Sta. 17+71.5 to 27' at Sta. 29+40.

* The top 3" of shoulder material is to be obtained from shallow pits so that suitable seedbed material is secured for seeding.

Note: The material excavated by paving contractor is to be used for pavement curing and shouldering.

Note: For transition details Sta. 270+80 to Sta. 281+91.6 See Sh. No. 5.

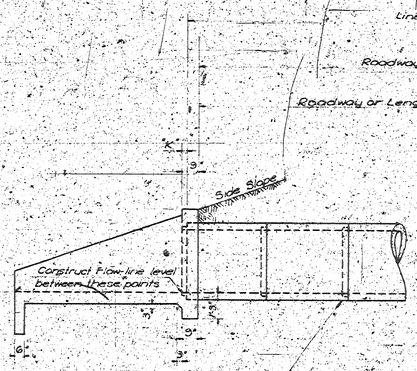
** Note: Granular sub-base not required from Sta. 331+00 to Sta. 399+33.0.

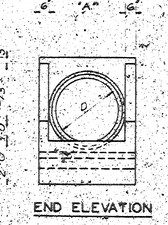
STATE HIGHWAY COMMISSION OF KANSAS

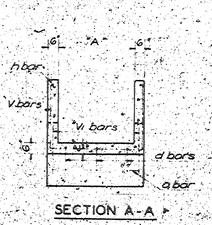
TYPICAL SECTIONS

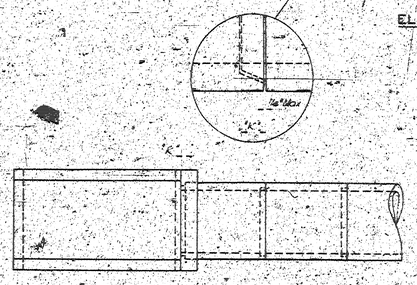
SHEET NO. | OF. | SCALE 1"=10' | APP'D | TRACED W.L.A.
DESIGNED | DETAILED W.L.A. | QUANTITIES | CHK'D
DESIGN CK. | DETAIL CK. | QUAN. CK. | FINAL CK.

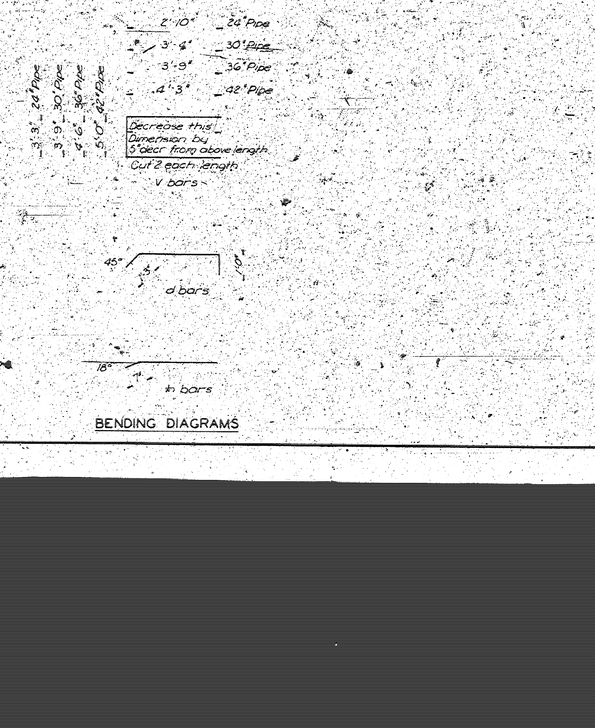
PUB. ROAD DIV. NO.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	KANSAS		195		











LIST OF BARS, DIMENSIONS AND QUANTITIES

TWO HEADWALLS FOR 24" PIPE							
Letter	A	B	D	K	T		
Dimension	1'-6"	5'-3"	2'-0"	3"	3"		
Bar	a	d	h	V	Vo	Vi	
Number	18	4	4	6	8	4	
Length	3'-3"	6'-11"	5'-11"	#	4'-0"	2'-0"	
Class A Concrete					2.4	Cu Yds	
Reinforcing Steel					120	Lbs	

TWO HEADWALLS FOR 30" PIPE							
Letter	A	B	D	K	T		
Dimension	3'-0"	6'-3"	2'-6"	3½"	3½"		
Bar	a	d	h	V	Vo	Vi	
Number	14	4	4	8	8	4	
Length	3'-3"	8'-5"	7'-6"	#	4'-6"	2'-0"	
Class A Concrete					3.4	Cu Yds	
Reinforcing Steel					160	Lbs.	

TWO HEADWALLS FOR 36" PIPE							
Letter	A	B	D	K	T		
Dimension	3'-9"	8'-3"	3'-0"	3½"	4"		
Bar	a	d	h	V	Vo	Vi	
Number	14	6	6	10	8	4	
Length	3'-6"	9'-11"	9'-2"	#	5'-0"	2'-0"	
Class A Concrete					4.6	Cu Yds	
Reinforcing Steel					210	Lbs	

TWO HEADWALLS FOR 42" PIPE							
Letter	A	B	D	K	T		
Dimension	4'-3"	9'-9"	3'-6"	3¾"	4½"		
Bar	a	d	h	V	Vo	Vi	
Number	14	6	8	12	8	4	
Length	5'-0"	11'-5"	10'-8"	#	5'-6"	2'-0"	
Class A Concrete					5.8	Cu Yds	
Reinforcing Steel					250	Lbs	

† See Bending Diagram for these values

PIPE CULVERT SUMMARY

Station	Size	Crown Grade Elev.	Flow Line Lt.	Flow Line Rt.	Horizontal Roadway Lt.	Horizontal Roadway Rt.	Degree of Rotation	Length along Pipe Lt.	Length along Pipe Rt.	No. of ¢ Ft Sections	Lineal ft of Pipe	Class III Excav. Cu Yds	Class A Concrete Cu Yds	Reinf. Steel Lbs

GENERAL NOTES

LOADING H20-44 AASHO Specifications, 1949 Edition
UNIT STRESSES: f'c = 3000 psi, fc = 1000 psi, fs = 20,000 psi
Class A Concrete shall be used thruout. Bevel all exposed edges with a ¾" triangular molding.
No deflections shall be made for pipe openings.
All reinforcing shall be billet steel, intermediate grade. All dimensions are to center-line of bars unless otherwise noted.

NOTE: ALL REINFORCING BARS ARE ½" ϕ.

NO	DATE	REVISIONS	BY	APP'D
1	6-28-50	Revised Roadway & Length	J.H.B.	E.A.R.

STATE HIGHWAY COMMISSION OF KANSAS

CONCRETE HEADWALLS FOR PIPE CULVERTS

STD. NO. 300.1

SHEET NO.	OF	SCALE	APPROVED
DESIGNED J.H.B.	DETAILED J.H.B.	QUANTITIES J.H.B.	TRACED J.P.
DESIGN CK. J.M.L.	DETAIL CK. J.M.L.	QUAN. CK. J.M.L.	TRACE CK. J.H.B.

Fed. Road Dist. No.	State	Proj. No.	Fiscal Year	Sheet No.	Total Sheets
5	Kansas				

Section

LISTS OF BARS AND DIMENSIONS

2'x 2' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	2'-0"	1'-2"	1'-2"	0'-9"	0'-9"

3'x 2' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"

3'x 3' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	3'-0"	1'-2"	1'-2"	0'-9"	0'-9"

4'x 2' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"

4'x 3' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"

4'x 4' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	4'-0"	1'-2"	1'-2"	0'-9"	0'-9"

5'x 2' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"

5'x 3' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"

5'x 4' CULVERTS

H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
0'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
1'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
2'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
3'-6"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"
4'-0"	5'-0"	1'-2"	1'-2"	0'-9"	0'-9"

5'x 5' CULVERTS

Letter	B	D	H	S	Bar a	Bar b	Bar Spacing c	Bar Spacing d
Dimension	2'-0"	1'-2"	0'-6" to 4'-0"	5'-0"				
Bar	a	b	c	d				
No.	2	2	2	2				
Size	# 5	# 5	# 5	# 5				
Length	4'-8"	7'-0"	2'-0" to 5'-6"	5'-8"				

(7'-6" (H = 4')
6'-6" (H = 3')
5'-6" (H = 2')

d bars

Increase this dimension by 6" increments from length shown above. Cut 2 bars each length.

2'-6" (H = 5')
2'-0" (H = 4')
1'-6" (H = 3')
1'-0" (H = 2')

* See Culvert Summary for these values.

a bar = (S + 2Tw + 8d - 3")
v bar = (H + Ts + Tf - 8d - 3")

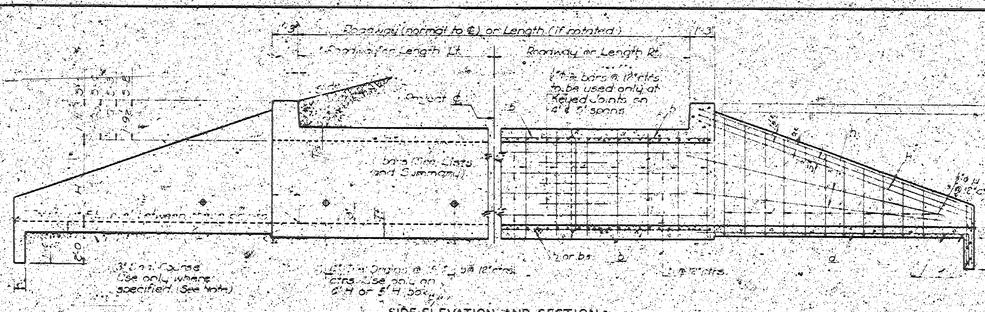
Hooked a & v bars

u bars
12'-6" (H = 5')
12'-0" (H = 4')
11'-6" (H = 3')
11'-0" (H = 2')

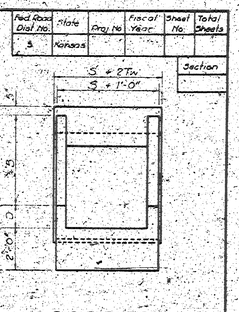
Use hooked a bars only on 4' & 5' spans and when specified in design table.
Use hooked v bars only on 3' & 5' spans and under design fills of 10'-0" or over.

b bars

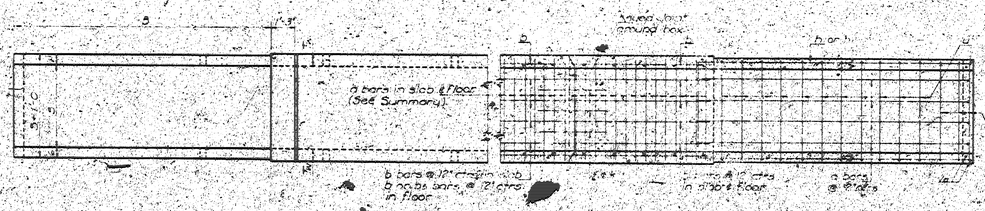
BENDING DIAGRAMS



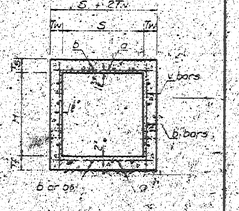
SIDE ELEVATION AND SECTION



END ELEVATION



PLAN AND SECTION



SECTION THRU BOX

NOTE - Class "A" concrete shall be used thruout. Bevel all exposed edges with a ¾" triangular mouldings.

Seal Course, consisting of 3" of Class "A" concrete, shall be constructed only where specified on the Plans or by the Engineer. No reinforcing shall be placed until the Seal Course has gained sufficient strength to permit working upon it without injury. Payment for additional quantities, resulting from including Seal Course as a change in the original Plans, shall be made at the unit price bid for the various items involved.

Coarse aggregate shall be deposited behind each weephole, to occupy a space extending 15" in all directions from the weephole. This work shall not be paid for directly, but shall be considered a part of the excavation.

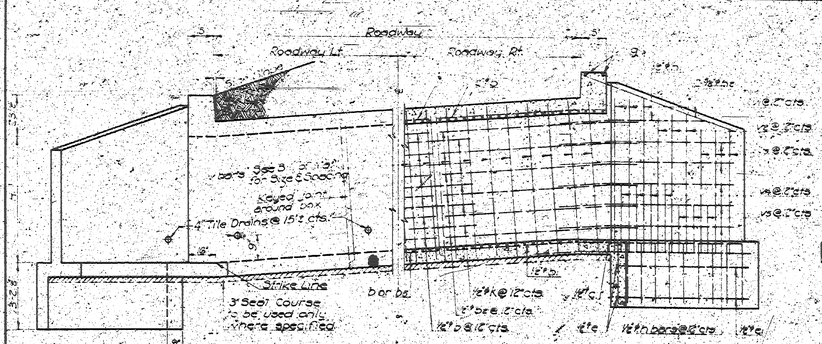
Keyed joints shall be provided as shown on all 4' and 5' span culverts which are 45' or more in box length. They shall be spaced so as to divide the box in to sections of equal length. The number of joints shall be as follows: 45' to 59'- 1 joint; 60' to 79'- 2 joints; 80' to 99'- 3 joints; 100' to 119'- 4 joints; 120' to 139'- 5 joints; etc.

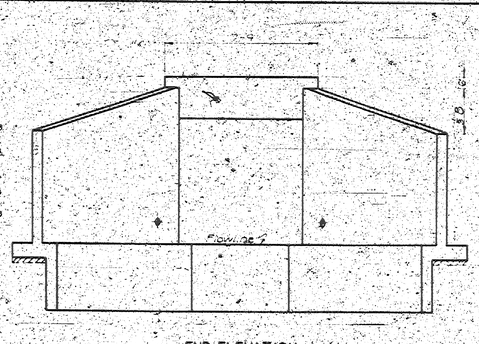
CULVERT SUMMARY

Station	Skew	Crown Elev.	Flow Line	Ratio H/S	Ratio H/S	Ratio H/S	Ratio H/S	Ratio H/S	Cond. Class	Steel Class	No. Barrels	Fill Ht. Above Barrel	Tw	Ts	a bars No.	a bars Size	a bars Spacing	b bars No.	b bars Size	b bars Spacing	b1 bars No.	b1 bars Size	b1 bars Spacing	Degree of Curvature

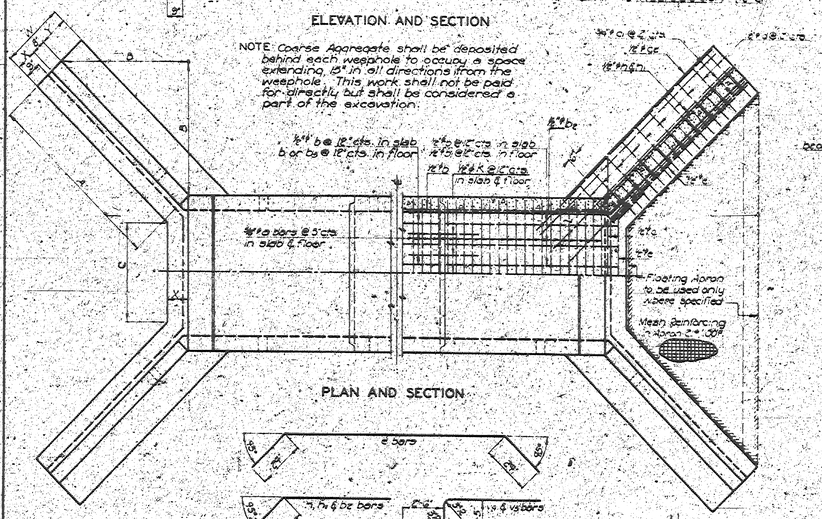
Fed. Road Dist. No.	State	Fed. Aid Proj. No.	Fiscal Year	Sheet No.	Total Sheets
5	Kansas	-			-

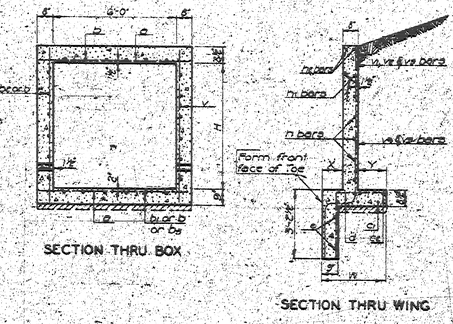
Sec.

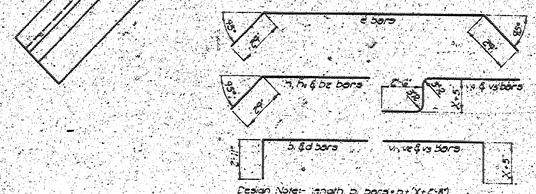


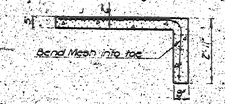


NOTE: Coarse Aggregate shall be deposited behind each weephole to occupy a space extending, 12" in all directions from the weephole. This work shall not be paid for directly, but shall be considered a part of the excavation.









NOTE: Keyed joints to be provided as shown on all culverts of 95' or more in box length and to be so spaced as to divide the box into sections of equal length. The number of joints to be used shall be as follows:-

45' to 59', 1 joint
60' to 79', 2 joints
80' to 99', 3 joints
100' to 119', 4 joints
120' to 139', 5 joints

Maximum height of fill for this design = 13'-0"

* "Roadway" = Horizontal distance.
\# "Length" = Distance along box

LIST OF CULVERTS

Station	Size	# Length Lt. of ℄	# Length Rt. of ℄	# Roadway Lt. of ℄	# Roadway Rt. of ℄	Flowline Elevations Lt.	Flowline Elevations Rt.	Crown Grade Elevation	No. of Joints	Section Length

BILL OF MATERIAL

	6'x6'	6'x9'	6'x5'	6'x5'	6'x6'	6'x6'
Wall Conc. (Cu. Yds.)						
Wall Steel (Lbs.)						
Apron Conc. (Cu. Yds.)						
Apron Steel (Lbs.)						
Letter						
Dimension A		6'-0"				
B		9'-0"				
C		14'-9"				
E		16'-0"				
W		12'-6"				
X		0'-10"				
Y		0'-10"				
Bar Spacing						
Concrete per Ft. of Box	3.3333 C.Y.					
Bar No.						
Size						
Length Ft.						
Total Class A Concrete, Cu. Yds.						
Total Reinforcing Steel, Lbs.						
Standard Box						
Box + Seal						
Box + Apron						
Box + Seal + Apron						

NOTE: Class A Concrete to be used thruout. Bevel all exposed edges with a ¾" triangular molding.

Seal Course consisting of 3" of Class A Concrete to be constructed only where specified on the Plans or by the Engineer. No reinforcing shall be placed until Seal Course has gained sufficient strength to permit working upon it without injury.

Floating Apron to be constructed only between downstream wings in locations subject to scour where specified on the Plans or by the Engineer.

Payment for additional quantities resulting from including Seal Course and Apron, as changes in original Plans, shall be made at unit price bid for various items involved.

Wire reinforcing mesh shall be of the electrically welded square mesh type and shall be composed of No. 10 gauge steel wire spaced at 6" centers each way.

NO.	DATE	REVISIONS	BY	APP'D
3	3-49	Revise Max. fill height (WRD)	WAB	GDM
2	8-46	X'' bars deleted	WRD	L.H.V.
1	6-46	Notations & Tables (W.R.D.)	WAB	L.H.V.

STATE HIGHWAY COMMISSION OF KANSAS

CONCRETE

BOX CULVERT

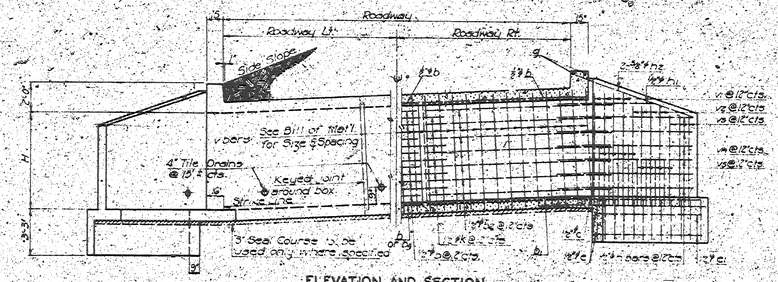
6 FT. SPAN

STD. NO. 312 SCALE 1"=1'

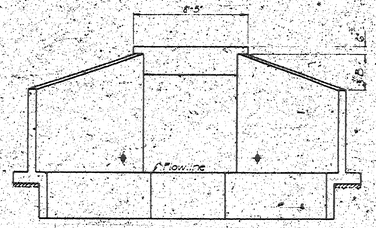
DESIGNED BY L.H.V. DATE 5-30-31 DETAILED BY B.G.S. TRACED BY W.D.S.

CHECKED BY G.L.R. APPROVED BY _____ DATE _____

Fed. Aid Proj. No.	State	Fed. Aid Proj. No.	Fiscal Year	Sheet No.	Total Sheets
.5	Kansas				
				Sec.	

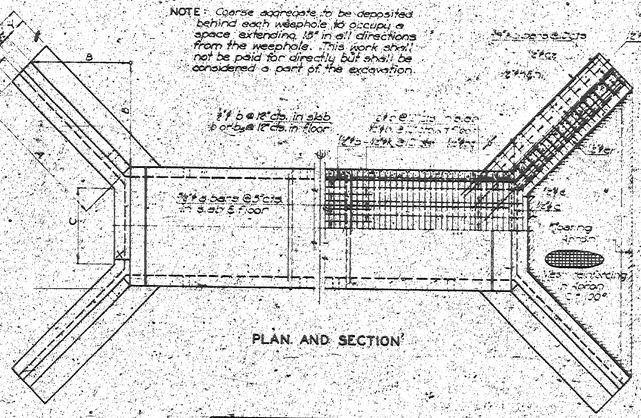


ELEVATION AND SECTION

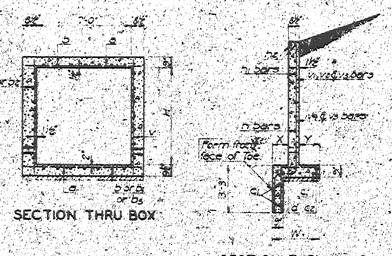


END ELEVATION

NOTE: Coarse aggregate to be deposited behind each weephole to occupy a space extending 18" in all directions from the weephole. This work shall not be paid for directly but shall be considered a part of the excavation.

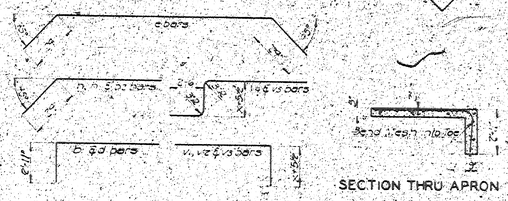


PLAN AND SECTION



SECTION THRU BOX

SECTION THRU WING



SECTION THRU APRON

NOTE: Keyed joints to be installed as shown on all culverts of 45° or more in box length and to be so spaced as to divide the box into sections of equal length. The number of joints to be used shall be as follows:

45' to 59' - 1 joint
60' to 79' - 2 joints
80' to 99' - 3 joints
100' to 119' - 4 joints
120' to 139' - 5 joints

Max. mum height for any one box, design - 7'-0"

Design Note: Length of X = 2'-6" or 3'-2"

#"Roadway" = Horizontal distance.
#"Length" = Distance along box.

BENDING DIAGRAMS

LIST OF CULVERTS

Station	Size	# Length Lt of ℄	# Length Rt of ℄	# Roadway Lt of ℄	# Roadway Rt of ℄	Flowline Elevations Lt	Flowline Elevations Rt	Crown Grade Elevations	No. of Joints	Section Length

BILL OF MATERIAL

7'X

Wall Conc. Cu Yds	Wall Steel Lbs	Wall Seal Cu Yds	Apron Conc. Cu Yds	Apron Steel Lbs	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
0.578 C.Y.	69	0.49 C.Y.	2.5 C.Y.	371	3 percent	3'-0"	2'-6"	3'-7"	6'-0"	3'-7"	0'-9"	1'-0"	#5 @ 12"

Concrete per ft of Box - 3.960 C.Y. — Seal per ft of Box - 0.490 Cu Yds

Bar	a	b	b_1	b_2	K	c	c_1	c_2	d	e	f	g	n	n_2	v	v_1	v_2	w
No.	8	8	8	8	8	8	8	8	8	8	8	8	10	8	8	8	8	8
Size	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	8'-2"				3'-0"	2'-9"	3'-0"	4'-10"	1'-9"	8'-2"	10'-0"		9'-4"	6'-3"	1'-3"	1'-9"	6'-6"	8'-9"

Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron

Total Class A Concrete, Cu Yds
Total Reinforcing Steel, Lbs

8'X

Wall Conc. Cu Yds	Wall Steel Lbs	Wall Seal Cu Yds	Apron Conc. Cu Yds	Apron Steel Lbs	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
0.578 C.Y.	69	0.49 C.Y.	2.5 C.Y.	371	3 percent	3'-0"	2'-6"	3'-7"	6'-0"	3'-7"	0'-9"	1'-0"	#5 @ 12"

Concrete per ft of Box - 3.960 C.Y. — Seal per ft of Box - 0.490 Cu Yds

Bar	a	b	b_1	b_2	K	c	c_1	c_2	d	e	f	g	n	n_2	v	v_1	v_2	w
No.	8	8	8	8	8	8	8	8	8	8	8	8	10	8	8	8	8	8
Size	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	8'-2"				3'-0"	2'-9"	3'-0"	4'-10"	1'-9"	8'-2"	10'-0"		9'-4"	6'-3"	1'-3"	1'-9"	6'-6"	8'-9"

Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron

Total Class A Concrete, Cu Yds
Total Reinforcing Steel, Lbs

9'X

Wall Conc. Cu Yds	Wall Steel Lbs	Wall Seal Cu Yds	Apron Conc. Cu Yds	Apron Steel Lbs	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
0.578 C.Y.	69	0.49 C.Y.	2.5 C.Y.	371	3 percent	3'-0"	2'-6"	3'-7"	6'-0"	3'-7"	0'-9"	1'-0"	#5 @ 12"

Concrete per ft of Box - 3.960 C.Y. — Seal per ft of Box - 0.490 Cu Yds

Bar	a	b	b_1	b_2	K	c	c_1	c_2	d	e	f	g	n	n_2	v	v_1	v_2	w
No.	8	8	8	8	8	8	8	8	8	8	8	8	10	8	8	8	8	8
Size	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	8'-2"				3'-0"	2'-9"	3'-0"	4'-10"	1'-9"	8'-2"	10'-0"		9'-4"	6'-3"	1'-3"	1'-9"	6'-6"	8'-9"

Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron

Total Class A Concrete, Cu Yds
Total Reinforcing Steel, Lbs

10'X

Wall Conc. Cu Yds	Wall Steel Lbs	Wall Seal Cu Yds	Apron Conc. Cu Yds	Apron Steel Lbs	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
0.578 C.Y.	69	0.49 C.Y.	2.5 C.Y.	371	3 percent	3'-0"	2'-6"	3'-7"	6'-0"	3'-7"	0'-9"	1'-0"	#5 @ 12"

Concrete per ft of Box - 3.960 C.Y. — Seal per ft of Box - 0.490 Cu Yds

Bar	a	b	b_1	b_2	K	c	c_1	c_2	d	e	f	g	n	n_2	v	v_1	v_2	w
No.	8	8	8	8	8	8	8	8	8	8	8	8	10	8	8	8	8	8
Size	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	8'-2"				3'-0"	2'-9"	3'-0"	4'-10"	1'-9"	8'-2"	10'-0"		9'-4"	6'-3"	1'-3"	1'-9"	6'-6"	8'-9"

Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron

Total Class A Concrete, Cu Yds
Total Reinforcing Steel, Lbs

NOTE: Class A Concrete to be used thruout Box. All exposed edges with a ¾" triangular molding.

Seal Courses consisting of 3" of Class A Concrete to be constructed only where specified on the Plans or by the Engineer. No reinforcing shall be placed until Seal Course has gained sufficient strength to permit working upon it without injury.

Floating Apron to be constructed only between downstream wings in locations subject to scour where specified on the Plans or by the Engineer.

Payment for additional quantities resulting from including Seal Course and Apron, as changes in original Plans, shall be made at unit price bid for various items involved.

Wire reinforcing mesh shall be of the electrically welded, square mesh type and shall be composed of No. 0 gauge steel wire spaced at 6" centers each way.

NO	DATE	REVISIONS	BY	APP'D
3				
2	4-46	#4 bars deleted	WRD	LHV
1	2-44	Notations & Tables (W.R.D.)	WRD	LHV

STATE HIGHWAY COMMISSION OF KANSAS

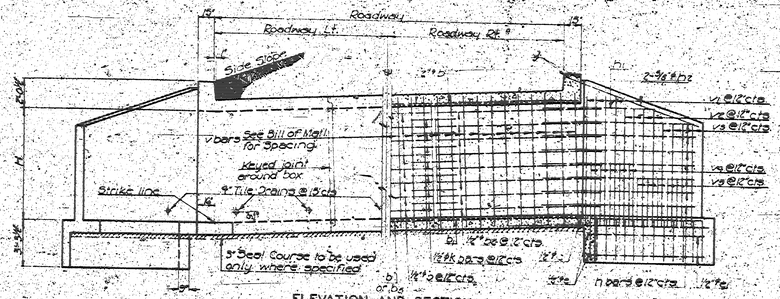
CONCRETE
BOX CULVERT
7 FT. SPAN

STD. NO. 314 — SCALE 1/2" = 1'

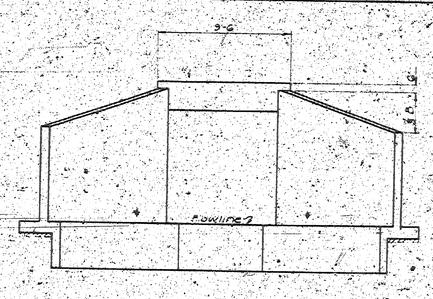
DESIGNED BY TWO DATE 8-31 DETAILED BY R.O.S. TRACED BY W.D.S.
CHECKED BY G.L.E. APPROVED BY _____ DATE _____

Fed. Road Dist. No.	State	Fed. Aid Proj. No.	Fiscal Year	Sheet No.	Total Sheets
5	Kansas				

Sec.

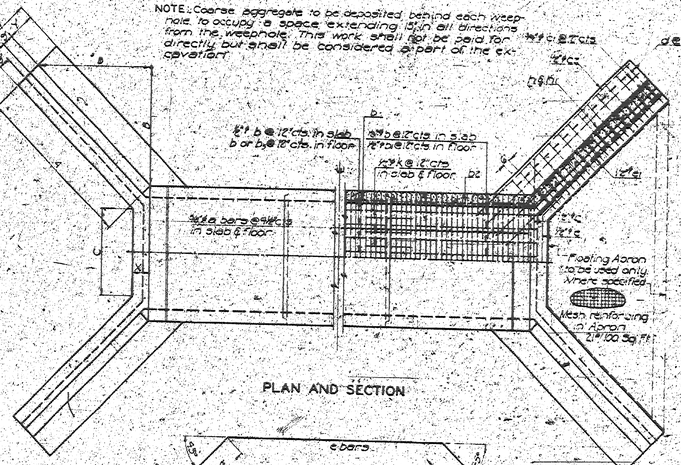


ELEVATION AND SECTION



END ELEVATION

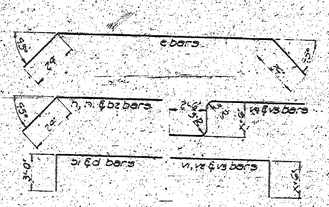
NOTE: Coarse aggregate to be deposited behind each weep hole to occupy a space extending 15" in all directions from the weephole. This work shall not be paid for directly but shall be considered as part of the excavation.



PLAN AND SECTION

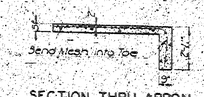
SECTION THRU BOX

SECTION THRU WING



Design Note: Length b1 = b + X + 2'-9"
b2 = b + 2'-4"

BENDING DIAGRAMS



SECTION THRU APRON

" Roadway " = Horizontal distance.
" Length " = Distance along box.

LIST OF CULVERTS

Station	Size	# Length		# Roadway		Flowline Elevations		Crown Grade Elevations	No. of Joints	Section Length
		Lt. of ℄	Rt. of ℄	Lt. of ℄	Rt. of ℄	Lt.	Rt.			

NOTE: Keyed joint is to be provided as shown on all culverts of 45 ft. or more in box length and to be so spaced as to divide the box into sections of equal length. The number of joints to be used shall be as follows:

45 to 59', 1 joint
60 to 79', 2 joints
80 to 99', 3 joints
100 to 119', 4 joints
120' to 139', 5 joints

Maximum height fill this design - 5'-0"

BILL OF MATERIAL

Item	Conc. Vol.	Item	Steel Lbs.	Item	Seal Cu. Yds.	Item	Apron Conc. Cu. Yds.	Item	Apron Steel Lbs.	Item	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing	V
Bar	a	b	b1	b2	k	c	c1	c2	d	e	e1	g	n	n1	n2	v	v1	v2		
No.																				
Size																				
Length																				

Total Class A Concrete, Cu Yds — Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron
Total Reinforcing Steel, Lbs

BUS — 6 — 6'x6'x

Item	Conc.	Item	Steel	Item	Wall Cu. Yds.	Item	Seal Cu. Yds.	Item	Apron Conc. Cu. Yds.	Item	Apron Steel Lbs.	Item	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing	V
Bar	a	b	b1	b2	k	c	c1	c2	d	e	e1	g	n	n1	n2	v	v1	v2	v3	v4
No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Size	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6
Length	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"

Total Class A Concrete, Cu Yds — Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron
Total Reinforcing Steel, Lbs

BUS — 7 — 8'x7'x

Item	Conc.	Item	Steel	Item	Wall Cu. Yds.	Item	Seal Cu. Yds.	Item	Apron Conc. Cu. Yds.	Item	Apron Steel Lbs.	Item	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing	V
Bar	a	b	b1	b2	k	c	c1	c2	d	e	e1	g	n	n1	n2	v	v1	v2	v3	v4
No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Size	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6
Length	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"	8'-3"

Total Class A Concrete, Cu Yds — Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron
Total Reinforcing Steel, Lbs

BUS — 8 — 8'x8'x

Item	Conc.	Item	Steel	Item	Wall Cu. Yds.	Item	Seal Cu. Yds.	Item	Apron Conc. Cu. Yds.	Item	Apron Steel Lbs.	Item	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing	V
Bar	a	b	b1	b2	k	c	c1	c2	d	e	e1	g	n	n1	n2	v	v1	v2	v3	v4
No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Size	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6
Length	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"	9'-9"

Total Class A Concrete, Cu Yds — Standard Box — Box + Seal — Box + Apron — Box + Seal + Apron
Total Reinforcing Steel, Lbs

NOTE: Class A Concrete to be used throughout. Bevel all exposed edges with a ¾" triangular molding.

Seal Course consisting of 3" of Class A Concrete to be constructed only where specified on the Plans or by the Engineer. No reinforcing shall be placed until Seal Course has gained sufficient strength to permit working upon it without injury.

"Floating Apron" to be constructed only between downstream wings in locations subject to scour where specified on the Plans or by the Engineer.

Payment for additional quantities resulting from including Seal Course and Apron, as changes in original Plans, shall be made at unit price bid for various items involved.

Wire reinforcing mesh shall be of the electrically welded, square mesh type and shall be composed of No. 10 gauge steel wire spaced at 6" centers each way.

NO.	DATE	REVISIONS	BY	APP'D
3				
2	4-46	½" Bars deleted	W.R.D.	L.H.V.
1	4-44	Notations & Tables (W.R.D.)	W.A.S.	L.H.V.

STATE HIGHWAY COMMISSION OF KANSAS

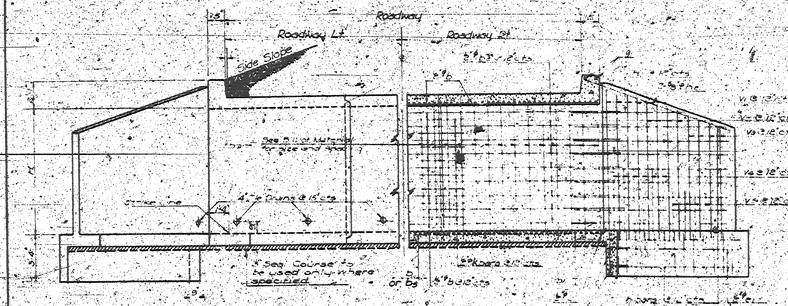
CONCRETE
BOX CULVERT
8 FT. SPAN

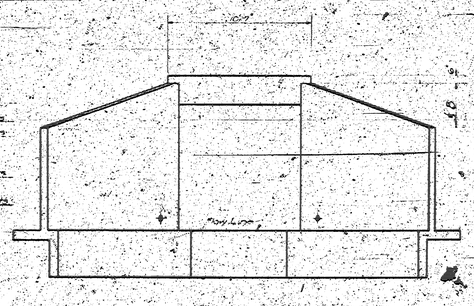
STD. NO. 315 — SCALE ½" = 1"

DESIGNED BY T.H.O. DATE 8-31 DETAILED BY E.D.F. TRACED BY H.O.S.
CHECKED BY G.L.F. APPROVED BY _____ DATE _____

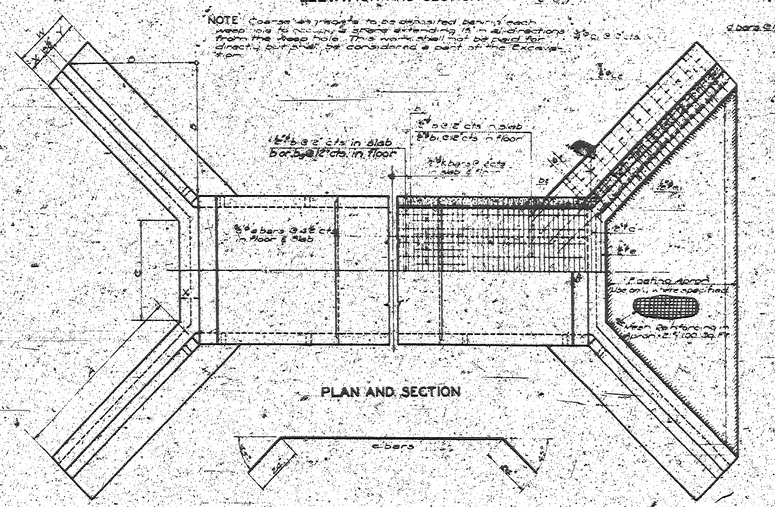
Fed. Road Dist. No.	State	& Proj. No.	Fiscal Year	Sheet No.	Total Sheets
5	Kansas				

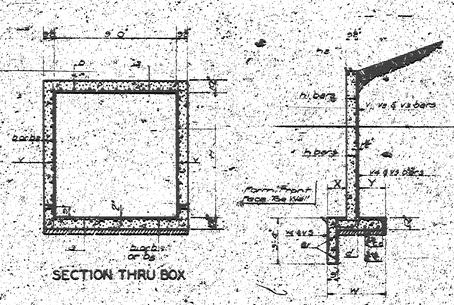
Section

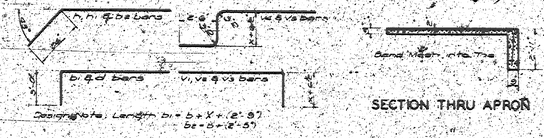




NOTE: Coarse with ready to be eliminated by removing weep hole by making a sharp extending 1/4 in diameters from the weep hole. This work shall not be paid for directly but shall be considered a part of the Excavation.







BENDING DIAGRAMS

* "Roadway" = Horizontal distance.
\# "Length" = Distance along box.

LIST OF CULVERTS

Station	Size	# Length Lt of ℄	Rt of ℄	* Roadway Lt of ℄	Rt of ℄	Flow Line Elevations	Crown Grade Elevations	No. of Joints	Section Length

NOTE: Keyed joints to be provided as shown on all culverts of 45° or more skew and to be so spaced as to divide the box into sections of equal length.
The number of joints to be used shall be as follows:
45° to 59° 1 Joint 60 to 89 3 Joints
60 to 74 2 Joints 90 to 119 4 Joints
75 to 89 3 Joints 120 to 135 5 Joints
Maximum height of fill for this design = 3'-0"

BILL OF MATERIAL

Mark	Total Conc. (Cu. Yds.)	Total Steel (Lbs.)	Apron Conc. (Cu. Yds.)	Apron Steel (Lbs.)	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
9'0"	11	3.3	4.7			0'-3"	1'-3"	1'-3"	2'-10"	3'-0"	1'-0"	1'-6"	
Concrete per foot of Box	1.0801 Cu. Yds.												Steel per foot of Box 330 Lbs.
Bar	a	b	b1	b2	K	c	c1	d	e	f	g	h	h1	h2	V	V1	V2	V3	V4	V5
No.		18	18	36		10	10	2	2	2	2	2	2	2	18	18	18	18	18	18
Size	#6	#5	#5	#5		#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	10'-6"	3'-7"	2'-5"	1'-4"		2'-3"	2'-0"	4'-11"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	11'-0"	10'-3"	9'-6"	8'-9"	8'-0"	7'-3"
Total Class 'A' Concrete	Cu. Yds.																			
Total Reinforcing Steel	Lbs.																			

Standard Box | Box + Seal | Box + Apron | Box + Seal + Apron

Mark	Total Conc. (Cu. Yds.)	Total Steel (Lbs.)	Apron Conc. (Cu. Yds.)	Apron Steel (Lbs.)	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
9'0"	11	3.5	4.7			0'-3"	1'-3"	1'-3"	2'-10"	3'-0"	1'-0"	1'-6"	
Concrete per foot of Box	1.0801 Cu. Yds.												Steel per foot of Box 330 Lbs.
Bar	a	b	b1	b2	K	c	c1	d	e	f	g	h	h1	h2	V	V1	V2	V3	V4	V5
No.		18	18	36		10	10	2	2	2	2	2	2	2	18	18	18	18	18	18
Size	#6	#5	#5	#5		#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	10'-6"	3'-7"	2'-5"	1'-4"		2'-3"	2'-0"	4'-11"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	11'-0"	10'-3"	9'-6"	8'-9"	8'-0"	7'-3"
Total Class 'A' Concrete	Cu. Yds.																			
Total Reinforcing Steel	Lbs.																			

Standard Box | Box + Seal | Box + Apron | Box + Seal + Apron

Mark	Total Conc. (Cu. Yds.)	Total Steel (Lbs.)	Apron Conc. (Cu. Yds.)	Apron Steel (Lbs.)	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
9'0"	11	3.5	4.7			0'-3"	1'-3"	1'-3"	2'-10"	3'-0"	1'-0"	1'-6"	
Concrete per foot of Box	1.0801 Cu. Yds.												Steel per foot of Box 330 Lbs.
Bar	a	b	b1	b2	K	c	c1	d	e	f	g	h	h1	h2	V	V1	V2	V3	V4	V5
No.		18	18	36		10	10	2	2	2	2	2	2	2	18	18	18	18	18	18
Size	#6	#5	#5	#5		#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	10'-6"	3'-7"	2'-5"	1'-4"		2'-3"	2'-0"	4'-11"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	11'-0"	10'-3"	9'-6"	8'-9"	8'-0"	7'-3"
Total Class 'A' Concrete	Cu. Yds.																			
Total Reinforcing Steel	Lbs.																			

Standard Box | Box + Seal | Box + Apron | Box + Seal + Apron

Mark	Total Conc. (Cu. Yds.)	Total Steel (Lbs.)	Apron Conc. (Cu. Yds.)	Apron Steel (Lbs.)	Letter Dimension	A	B	C	H	W	X	Y	Bar Spacing
9'0"	11	3.5	4.7			0'-3"	1'-3"	1'-3"	2'-10"	3'-0"	1'-0"	1'-6"	
Concrete per foot of Box	1.0801 Cu. Yds.												Steel per foot of Box 330 Lbs.
Bar	a	b	b1	b2	K	c	c1	d	e	f	g	h	h1	h2	V	V1	V2	V3	V4	V5
No.		18	18	36		10	10	2	2	2	2	2	2	2	18	18	18	18	18	18
Size	#6	#5	#5	#5		#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Length	10'-6"	3'-7"	2'-5"	1'-4"		2'-3"	2'-0"	4'-11"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	11'-0"	10'-3"	9'-6"	8'-9"	8'-0"	7'-3"
Total Class 'A' Concrete	Cu. Yds.																			
Total Reinforcing Steel	Lbs.																			

Standard Box | Box + Seal | Box + Apron | Box + Seal + Apron

NOTE: Class 'A' Concrete to be used throughout. Bevel all exposed edges with a ¾" triangular molding.
Seal courses consisting of 3" of Class 'A' Concrete to be constructed only where specified on the Plans or by the Engineer. No reinforcing shall be placed until Seal Course has gained sufficient strength to carry working loads without injury.
Roadway Apron to be constructed only between downstream wings in location outside of normal limits indicated on the Plans or by the Engineer. Payment for additional quantities resulting from making Culvert and Apron, as changes in original plans, shall be made at unit price bid for various items involved.
Wire reinforcing mesh shall be of the electrically welded square mesh type and shall be composed of No. 10 gauge steel wire spaced at 6" centers each way.

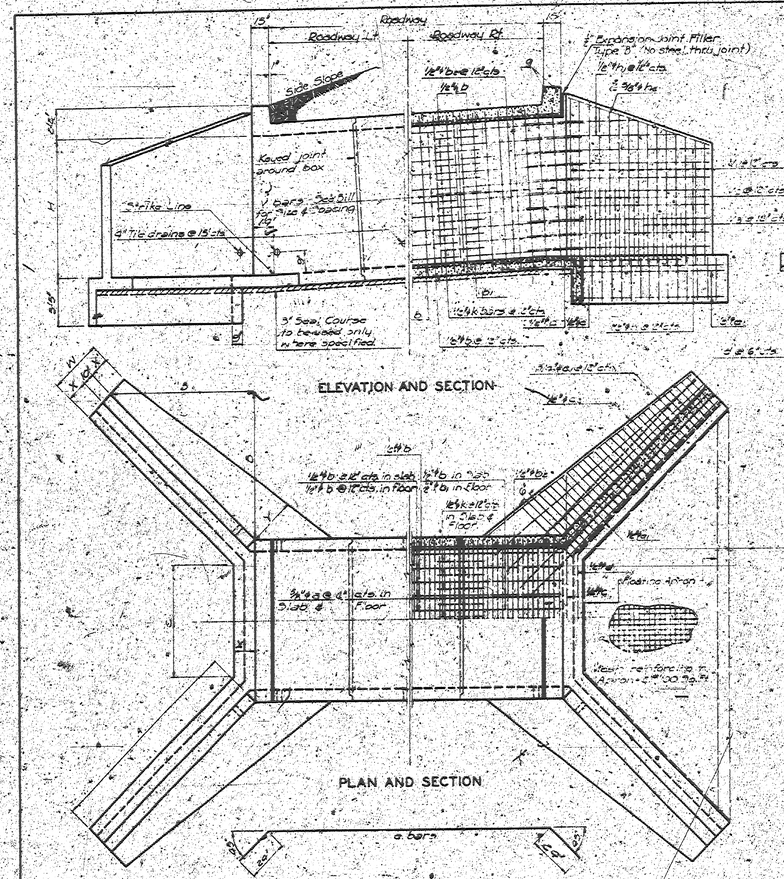
NO.	DATE	REVISIONS	BY	APP'D
3	6-46	¾" ø bars deleted	W.R.D.	L.H.V.
2	5-41	Notations & Tables (W.R.D.)	W.A.S.	L.H.V.
1				

STATE HIGHWAY COMMISSION OF KANSAS

CONCRETE
BOX CULVERT
9 FT. SPAN

STD. NO. 316 SCALE: ½" = 1'

DESIGNED BY ... DATE ... DETAILED BY C.F.B. TRACED BY G.T.S.
CHECKED BY C.T. APPROVED BY ... DATE ...



Design note: Length b1 = b + X + 2'10"
Length b2 = b + 2'5"

* "Roadway" = Horizontal distance
# "Length" = Distance along box.

LIST OF CULVERTS

Station	Size	# Length	# Roadway		Floorline Elevation		Crown Grade Elevation	Number of Joints	Section Length
		Lt of ℄ Roads	Lt. ℄	Rt. ℄	Lt. ℄	Rt. ℄			

BILL OF MATERIAL

Bar Mark	Size	No.	Length	Weight

Section

Job No.	Sheet No.	Proj. No.	Year	Sheets No.	Total Sheets
5					

| IOU5 | 0x | | | | | | | | |