AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	19

REVISIONS		

GENERAL NOTES

GRADE 60 REINFORCING STEEL IS REQUIRED.

THE FOLLOWING TABLE GIVES THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS:

BAR SIZE	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH FOR CLASS B CONCRETE	1'-3"	1'-6"	1'-10"	2'-2"	2'-10"	3'-7"	4'-7"	5'-7"

NB = North Bound
SB = South Bound

DIMENSIONS CONTAINED IN THESE PLANS HAVE BEEN CALCULATED FROM THE FOLLOWING AS CONSTRUCTED PLANS:

STR. NO. L-18-M & W PROJ. NO. UI 002-3(11)
STR. NO. L-18-CD PROJ. NO I 25-1(64)97
STR. NO. L-18-AV PROJ. NO. I 002-3(20)
STR. NO. K-18-AJ PROJ. NO. I 007-3(22)
STR. NO. K-18-AX & AY PROJ. NO. I 002-3(22)
STR. NO. K-18-CK PROJ. NO. I 25-1(16)99
STR. NO. K-18-CN & CO PROJ. NO. I 25-1(17)99
STR. NO. K-18-EN PROJ. NO. EHS I 25-1(70)100
STR. NO. K-18-J PROJ. NO. BF 001-4(94)

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

INDEX OF DRAWINGS

DWG. NO. B 1 GENERAL INFORMATION – SUMMARY OF QUANTITIES
DWG. NO. B 2 TYPICAL CURB DETAIL\ BRIDGE RAIL REMOVAL DETAIL\ TABLE OF POST DIMENSIONS
DWG. NO. B 3 BRIDGE EXPANSION DEVICE DETAIL (0-2 INCH)
DWG. NO. B 4 BRIDGE RAIL TYPE 10R
DWG. NO. B 5 BRIDGE RAIL TYPE 10R
DWG. NO. B 6 BRIDGE RAIL TYPE 10R
DWG. NO. B 7 GENERAL LAYOUT (L-18-M & W)
DWG. NO. B 8 GENERAL LAYOUT (L-18-CD)
DWG. NO. B 9 GENERAL LAYOUT (L-18-AV)
DWG. NO. B 10 GENERAL LAYOUT (K-18-AJ)
DWG. NO. B 11 GENERAL LAYOUT (K-18-CK)
DWG. NO. B 12 GENERAL LAYOUT (K-18-CK)
DWG. NO. B 13 GENERAL LAYOUT (K-18-CK)
DWG. NO. B 14 GENERAL LAYOUT (K-18-CN & CO)
DWG. NO. B 15 GENERAL LAYOUT (K-18-CN)
DWG. NO. B 16 BRIDGE RAIL TYPE 10R (K-18-AX & AY)
DWG. NO. B 17 BRIDGE RAIL TYPE 10R (K-18-AX & AY)
DWG. NO. B 18 BRIDGE RAIL TYPE 10R (K-18-AX & AY)
DWG. NO. B 19 GENERAL LAYOUT (K-18-AX & AY)
DWG. NO. B 20 BRIDGE RAIL TYPE 10R (K-18-EN)
DWG. NO. B 21 GENERAL LAYOUT (K-18-EN)

SUMMARY OF QUANTITIES

	ITEM NO.	DESCRIPTION	UNIT	L-18-M (NB)	L-18-W (SB)	L-18-CD	L-18-AV	K-18-AJ	K-18-AX (NB)	K-18-AY (SB)	*K-18-CK	K-18-CN (NB)	K-18-CO (SB)	K-18-EN	K-18-J	TOTAL
(2)	202	REMOVAL OF ASPHALT MAT (PLANING) (SPECIAL)	SQ YD	477	477	0	0	2977.8	800	1066.7	4267.5	520	520	1303.6	1190.2	13,599.8
(1)	202	REMOVAL OF BRIDGE RAILING	LIN FT	251	289	455	416	683	479	479		311	311	345	402	4,421
(2)	403	HOT BITUMINOUS PAVEMENT (GRADING SP) (4) (ASPHALT) (109)	TON	52.5	52.5	103.6	136.6	327.6	88	117.3	469.4	57.2	57.2	143.4	130.9	1,736.2
(2)	411	EMULSIFIED ASPHALT (SLOW-SETTING)	GAL	24	24	47	62	149	40	53	213	26	26	65	60	789
	618	BRIDGE EXPANSION DEVICE (0-2 INCH)	LIN FT	102	102	98		162			342				106	902
	601	CONCRETE (PATCHING)	CU YD	2	2	2	2	3	2	2		2	2	2	2	23
	606	BRIDGE RAIL TYPE 10R	LIN FT	253	253	518	420	696.3	485	485		320	320	345.6	420	4,516.9
(3)	613	2" ELECTRICAL CONDUIT	LIN FT	187	165	492	237	724	272	272		182	182		472	3,166

* – THE EXISTING BRIDGE RAIL WAS REPLACED WITH BRIDGE RAIL TYPE 10R ON PROJECT ACIM P200-034.

(1) Existing Rail shall become the property of the Contractor.

(2) FOR INFORMATION ONLY. Quantities are carried to roadway surfacing tabulation.

(3) Contractor shall furnish adequate hangers, nuts, expansion sleeves and any other hardware required for hanging conduit. The cost shall be included in the pay item "613 – 2" Electrical Conduit". Conduit shall be a galvanized rigid steel conduit. Wiring shall be a seperate pay item and paid for under pay item "613 – Wiring" Lump Sum.

Lighting shall be kept operational at all times, except for periods when temporary or permanent connections are being made.

DESIGN DATA

CURRENT AASHTO SPECIFICATIONS: FIFTEENTH EDITION

DESIGN METHOD: SERVICE LOAD DESIGN

REINFORCED CONCRETE:

CONCRETE CLASS D : f'c = 4,500 psi f'c = 1,800 psi n = 8

EXISTING CONCRETE : f'c = 3,000 psi f'c = 1,200 psi n = 10

EXISTING REINFORCING STEEL : fy = 40,000 psi fs = 2,000 psi

BRIDGE DESCRIPTION

STR. L-18-M & W : 3-SPAN CONCRETE ON ROLLED I-BEAM CONTINUOUS BRIDGE

STR. L-18-CD (OVERPASS) : 2-SPAN WELDED GIRDER CONTINUOUS & COMPOSITE BRIDGE

STR. L-18-AV (OVERPASS) : 4-SPAN CONCRETE SLAB & GIRDER CONTINUOUS (POURED IN PLACE)

STR. K-18-AJ : 2-SPAN STEEL DECK GIRDER CONTINUOUS WITH FLOOR BEAM SYSTEM BRIDGE

STR. K-18-AX & AY : 4-SPAN CONCRETE ON ROLLED I-BEAM CONTINUOUS BRIDGE

STR. K-18-CK : 3-SPAN CONCRETE PRESTRESSED GIRDER (PRECAST) BRIDGE (EXISTING BRIDGE RAIL = TYPE 10R)

STR. K-18-CN & CO : 4-SPAN CONCRETE SLAB & GIRDER CONTINUOUS (POURED IN PLACE) BRIDGE

STR. K-18-EN : 3-SPAN CONCRETE BOX GIRDER CONTINUOUS BRIDGE

STR. K-18-J (OVERPASS) : 4-SPAN CONCRETE SLAB & GIRDER (POURED IN PLACE) BRIDGE

BRIDGE RAIL TYPE 10R BOTH SIDES

CROSS REFERENCE DRAWING NUMBER

SECTION OR DETAIL IDENTIFICATION

COLORADO DEPARTMENT OF TRANSPORTATION	
GENERAL INFORMATION SUMMARY OF QUANTITIES	
Milepost 94.769 to Milepost 99.950	Structure Numbers
	L-18-M & W
	L-18-CD, L-18-AV, K-18-AJ
	K-18-AX & AY, K-18-CK
Designer: S. Wilson	K-18-CN & CO
Detailer: Dan Hunt	K-18-EN, K-18-J
Drawing Number B1 of 21 Drawings	

Revision Dates (Preliminary Stage Only)

Quantities: INITIAL DATE; Quantities By; Checked By; DATE
Detailed By; Checked By; DATE
Designed By; Checked By; INITIAL DATE

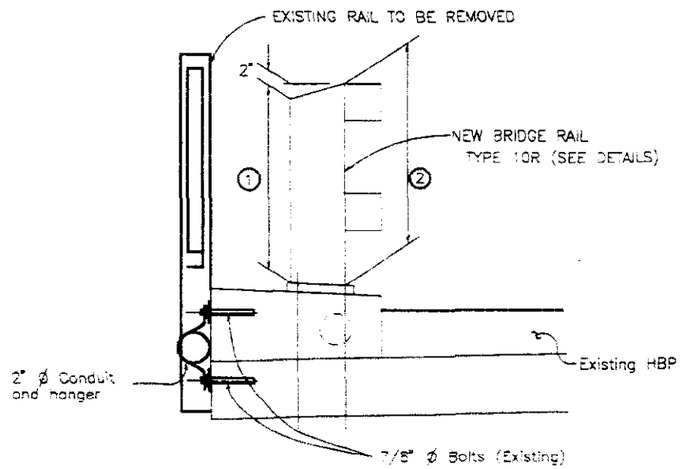
PLANS.DWG

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	20

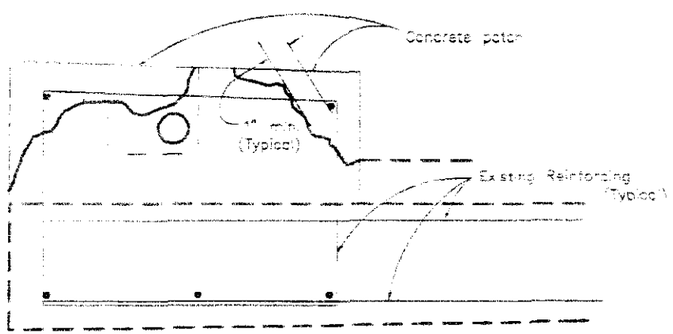
REVISIONS

BRIDGE RAIL REMOVAL DETAIL



1) Removed rail is to be disposed of in accordance with the Revision of 202, Removal of Painted Steel Bridge Rail.
2) Bolts are to remain in place to attach conduit.
3) Edge of deck shall be protected with temporary barrier or new Bridge Rail prior to removing existing railing.
4) Existing electrical conduit exists for each structure see deck layouts for locations. Circuits are live and circuit breakers MUST be tripped prior to drilling anchor bolt holes.
5) See Drawing Number B8 for construction rail removal details and Drawing Number B21 for K-18-CN rail removal details.

TYPICAL CURB REPAIR DETAIL



1) Spalled and deteriorated concrete shall be removed to sound concrete.
2) If reinforcing steel is exposed, concrete shall be removed to 1" minimum below the reinforcing steel to provide adequate bond for the concrete patch material.
3) Concrete and reinforcing shall be sandblasted to remove loose particles and rust that could inhibit bond with new concrete.
4) Curb shall be patched with an approved high strength, quick setting concrete patch material. It is estimated that 23 cu. yds. of concrete for patching curbs will be required.
5) Removals, sandblasting and patching shall be included in the pay item 601 Concrete (Patching), cu. yd.
6) Damaged reinforcement shall be repaired or replaced by the contractor.

Table of Post Dimensions

Structure	Mile Post	Post Dimension 1	Post Dimension 2
L-18-M	95.901 (NB)	2'-0 7/8"	2'-3"
L-18-W	95.902 (SB)	2'-0 7/8"	2'-3"
L-18-CD	96.673	2'-1 1/8"	2'-3 1/8"
L-18-AV	97.477	1'-10 7/8"	2'-1"
K-18-AJ	97.585	1'-10 7/8"	2'-1"
K-18-AX	97.691 (NB)	1'-10 7/8"	2'-1"
K-18-AY	97.692 (SB)	1'-10 7/8"	2'-1"
K-18-CN	98.545 (NB)	1'-10 7/8"	2'-1"
K-18-CO	98.546 (SB)	1'-10 7/8"	2'-1"
K-18-EN	99.334	2'-2 1/8"	2'-4 1/8"
K-18-J	99.95	2'-0 7/8"	2'-3"

COLORADO DEPARTMENT OF TRANSPORTATION

	Structure Numbers
TYP CURB REPAIR DETAIL	L-18-M,L-18-W
BRIDGE RAIL REMOVAL DETAIL	L-18-CD,L-18-AV
TABLE OF POST DIMENSIONS	K-18-AJ,K-18-AX
Designer: S. Wilson	K-18-AY,K-18-CK
Detailer: Dan Hunt	K-18-CN,K-18-CO
Drawing Number B2 of 21 Drawings	K-18-EN,K-18-J

Quantities		
	INITIAL	DATE
Quantities By		
Checked By		

Detail		
	INITIAL	DATE
Detailed By		
Checked By		

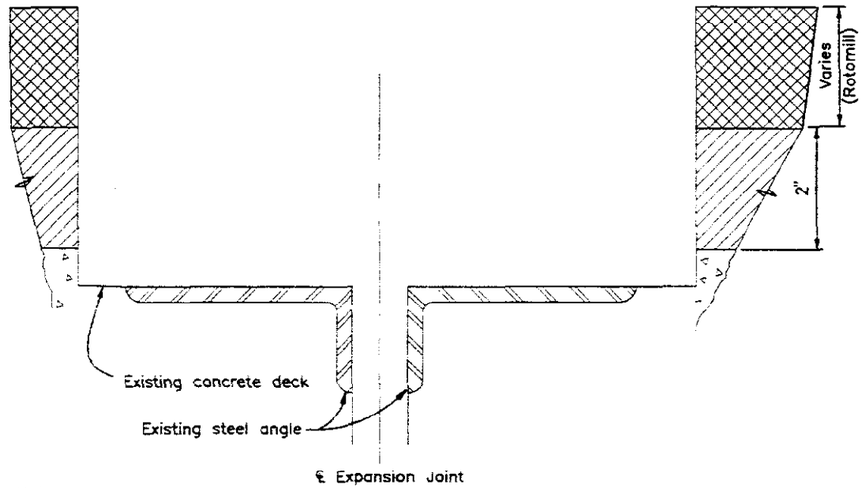
Design		
	INITIAL	DATE
Designed By		
Checked By		

PLAN16.DWG

Revision Dates (Preliminary Stage Only)

AS CONSTRUCTED				FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
NO REVISIONS	REVISED	VOID		VII	COLORADO	IM 025-1-41	21

REVISIONS



Note:
Remove existing finger plates and existing asphalt.

Existing sliding plates may be left in place.

Leave existing concrete embeded steel angles in place.

Removal of finger plates, joint preparation and cleaning shall be included in the cost of Item 518 - Bridge Expansion Device (0-2 Inch) and will not be paid for separately.

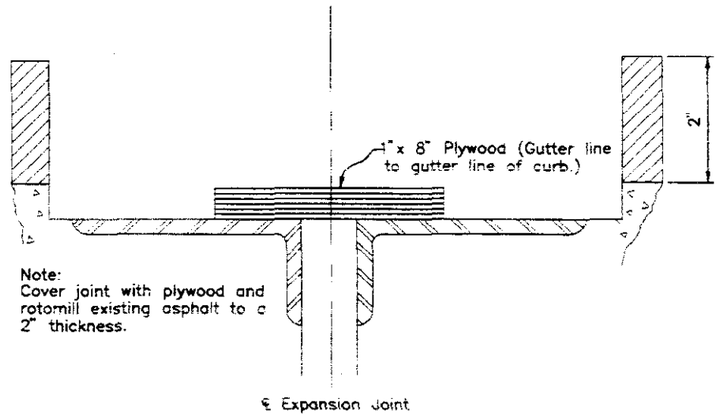
Asphalt to be removed

Existing asphalt to stay in place

Newly placed asphalt

STEP 1

Section thru slab



STEP 2

NOTES:

The expansion joint system shall include all labor and materials to install the expansion joint according to the manufacturer's directions and according to these plans.

The backer rod shall be secured and sealed according to the Manufacturer's directions.

The cover plate shall be the size and type recommended by the Manufacturer and installed in accordance with the Manufacturer's directions.

The joint bonding agent shall be the type recommended by the Manufacturer for the joint system being installed. It shall be applied according to the Manufacturer's recommendations.

All surfaces in joint opening shall be cleaned according to the Manufacturer's directions.

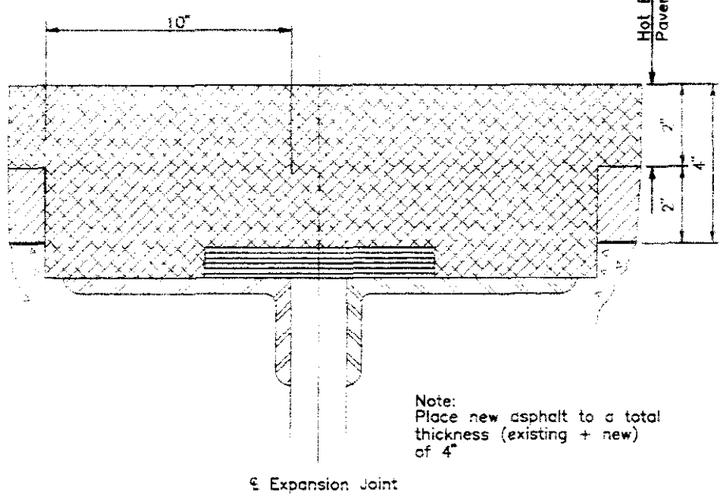
The joints shall be installed and compacted according to the Manufacturer's procedures.

The finished joint, after compacting, shall be flush with the top of the adjacent asphalt surface.

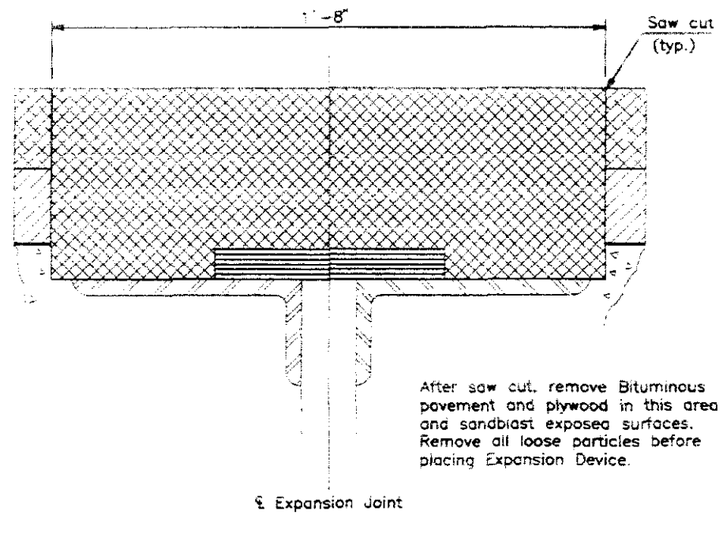
A representative of the Manufacturer shall be on site prior to installing the expansion joints and shall approve the methods and materials before work commences.

ACCEPTABLE ALTERNATIVES:

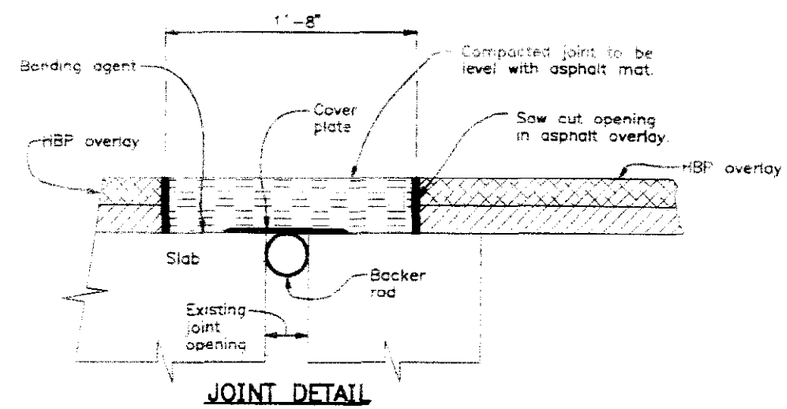
KOCH B J S SYSTEM
LINEAR DYNAMICS THORMA-JOINT
WATSON BOWMAN ACME EXPANDEX



STEP 3



STEP 4



JOINT DETAIL

COLORADO DEPARTMENT OF TRANSPORTATION

BRIDGE EXPANSION DEVICE DETAIL (0-2 INCH)

Designer: S. Wilson	Structure Numbers	L-18-M, L-18-W, L-18-CC, K-18-AU, K-18-CK	
Detailer: Don Hunt			
Drawing Number B3 of 21 Drawings			

Revision Dates (Preliminary Stage Only)							
6-86	4-90	6-92	11-92	8-94			

Quantities:	INITIAL	DATE
	JFF	1/96
Quantities By		
Checked By		

DATE	
1/96	

Detailed By	DATE
Checked By	3/96

Design:	INITIAL
	JFF

Designed By	
Checked By	

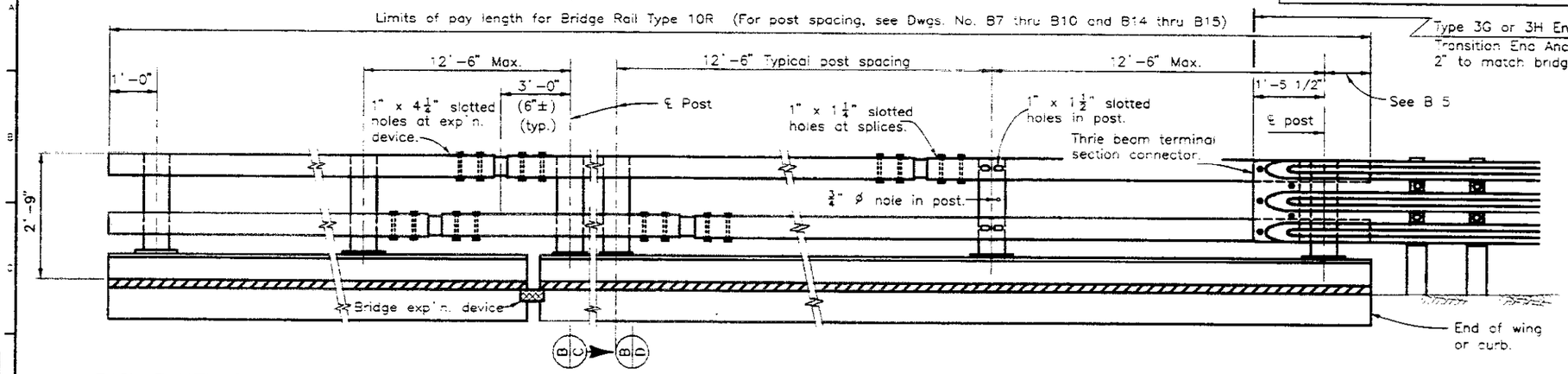
EXP_DET2.DG

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	22

REVISIONS		

B-606-10R



RAIL PANEL ON WING TERMINAL SECTION

(See Roadway plans for ends not attached to Guard Rail.)

RAIL PANEL AT EXPANSION DEVICE

ELEVATION – BRIDGE RAIL

RAIL PANEL ON WING TRANSITION SECTION

(See roadway plans for ends requiring attachment to guard rail.)

NOTES:

All tubes shall be fabricated from ASTM A-500 Grade B.
All posts shall be fabricated from ASTM A-36 steel.

The above material and all anchor bolts and miscellaneous bolts, nuts, and washers shall be galvanized after fabrication in accordance with Section 509. Concrete, reinforcing steel, and structural steel elements shall conform to the requirements of Sections 601, 602 and 509, respectively.

The tubes shall be shop bent or fabricated to fit horizontal curve when radius is less than 1,500 feet.

Tubes shall be continuous over not less than two posts.

The centerline of the posts at the bridge expansion device shall be a minimum of 3'-0" from the centerline of the bridge expansion device, measured along the centerline of posts except at abutments, location shall be shown.

All bolts that have lock washers shall be tightened to snug only.

Posts shall be perpendicular to the grade of the deck.

One or more 12'-6" post spacings may be reduced in order to maintain dimensions from the end of the wings and expansion joints.

Optional drain hole for galvanizing may be drilled, punched, or slipped leaving smooth surfaces and transitions. No flame cutting or air carbon arc gouging is allowed.

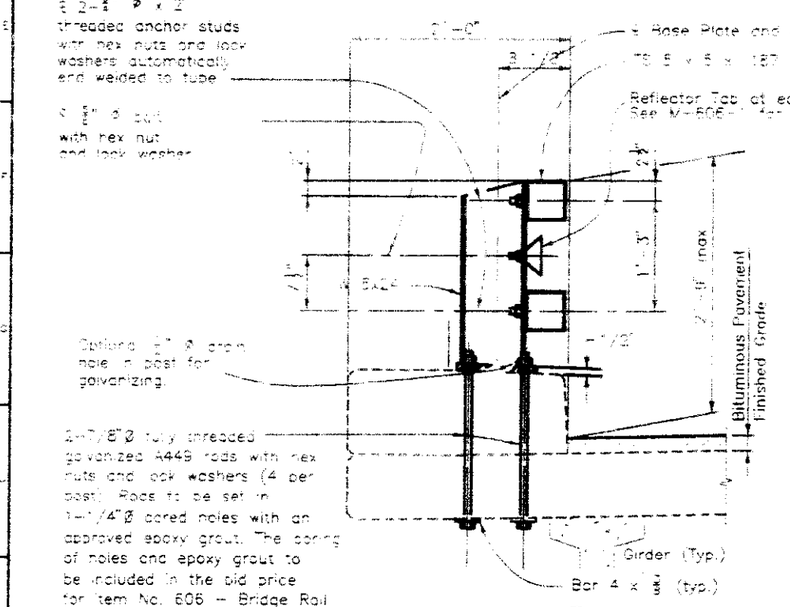
Posts, base plates, backing plates, anchor bolts, miscellaneous bolts, nuts, washers, tubes, tube expansion devices, tube splices, end plates, cored holes, grout, and reflector tabs shall be included in Item 606 – Bridge Rail Type 10R.

Prior to fabrication of this item, two sets of shop drawings which comply with the requirements of Section 105, shall be submitted to the Department for information only. One set shall be sent to the Colorado Department of Transportation, Staff Materials Branch Inspection Unit, 4340 E. Louisiana Avenue, Denver, Colorado 80222. One set shall be sent to the Engineer. The shop drawings will not be approved or returned.

Structural Steel:
AASHTO M-183(ASTM A-36) f_y=36,000 psi
Cold formed ASTM A-500 Grade B f_y=46,000 psi

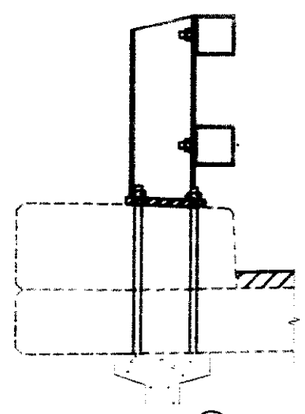
For additional details see next rail sheets.

For post dimensions, see B2.



SECTION B/C

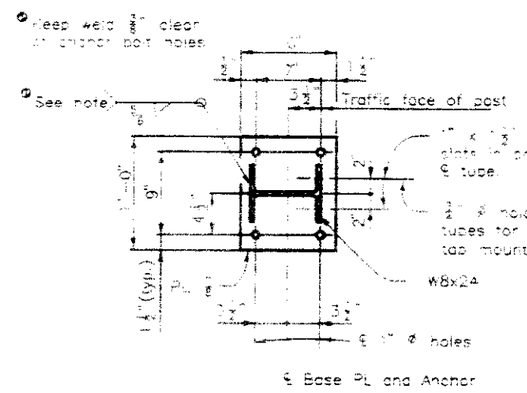
When girders are offset from railing.



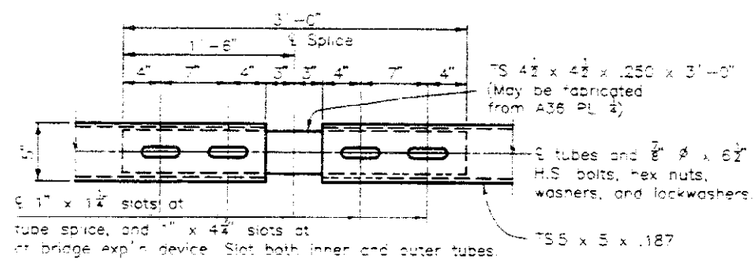
SECTION B/C

At Abutments or where girders are aligned with railing.

2-7/8" Ø fully threaded galvanized A449 rods with hex nut and lock washer (4 per post). Rods to be set in 1-1/4" Ø x 1'-5" cored holes with an approved epoxy grout.



PLAN – POST DETAIL



Stagger top and bottom splices into different post spacings except at expansion joint, place at opposite ends of same post space. (Range of motion = 1'-0" at bridge expansion device.)

PLAN – TUBE SPLICE

INFORMATION ONLY

Description	Unit	Per Lin Ft
Structural Steel (Galvanized)	Lb.	33.1

Note: the Contractor shall field verify the curb and slab thickness prior to fabricating the threaded rods to assure proper length.

COLORADO DEPARTMENT OF TRANSPORTATION	
BRIDGE RAIL TYPE 10R	Structure Numbers
	L-18-M,L-18-W
	L-18-CD,L-18-AV
Designer: S. Wilson	K-18-AJ
	K-18-CN,K-18-CO
Detailer: Don Hunt	K-18-J
Drawing Number B4 of 21 Drawings	

Revision Dates (Preliminary Stage Only)							
8-90	11-90	11-91	03-92	8-94			

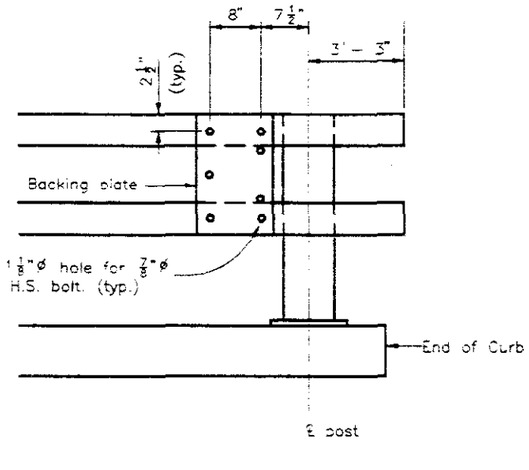
Quantities INITIAL DATE | Quantities By | Checked By | DATE
Detailed By | Checked By
Designed By | Checked By
Design: JMT/JH | JAH

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	23

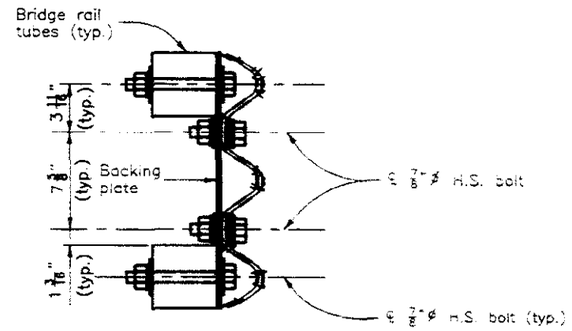
B-606-10A

REVISIONS	

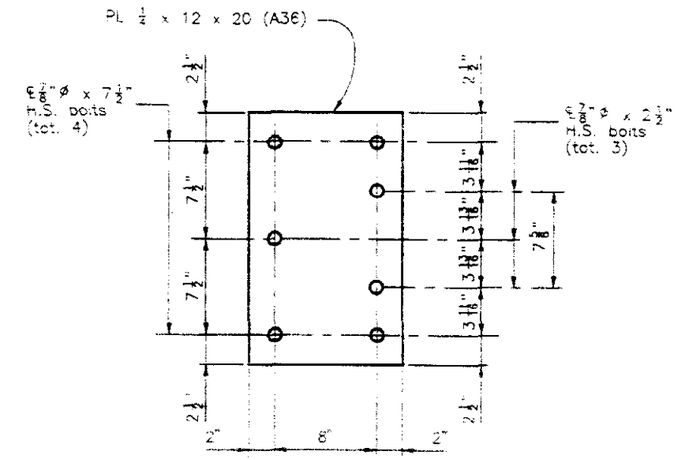


RAIL TUBE DETAILS

Thrie beam not shown.

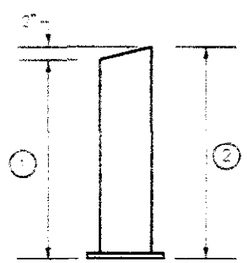


SECTION THRU BACKING PLATE



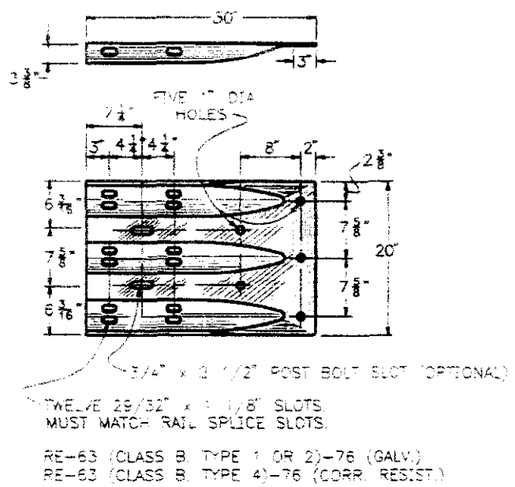
BACKING PLATE

Holes are 1 1/8"Ø for 7/8"Ø H.S. bolts with hex nuts, 2 PL washers, and 1 lock washer.



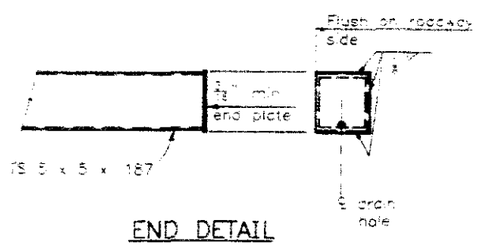
See Table of Post Dimensions for dimensions ① & ②

POST DIMENSIONS



RE-63 (CLASS B, TYPE 1 OR 2)-76 (GALV.)
RE-63 (CLASS B, TYPE 4)-76 (CORR. RESIST.)

THRIE BEAM
TERMINAL SECTION (CONNECTOR)



END DETAIL

COLORADO DEPARTMENT OF TRANSPORTATION	
BRIDGE RAIL TYPE 10R DETAILS	Structure Numbers
	L-18-M,L-18-W
	L-18-CD,L-18-AV
	K-18-AJ
Designed: S. Wilson	K-18-CN,K-18-CQ
Detailed: Don Hunt	K-18-EN,K-18-J
Drawing Number B5 of 21 Drawings	

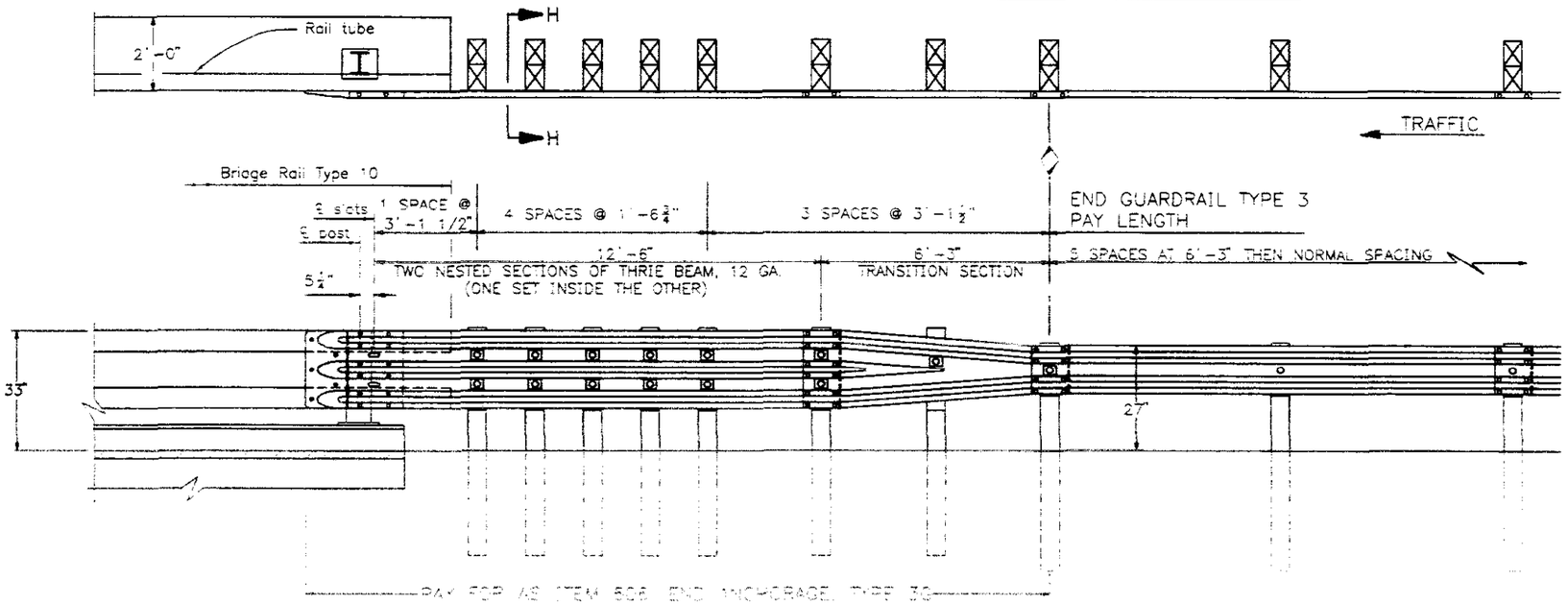
Revision Dates	(Preliminary Stage Only)					
03-92						

Quantities	INITIAL	DATE
Quantities By		
Checked By		
DATE		

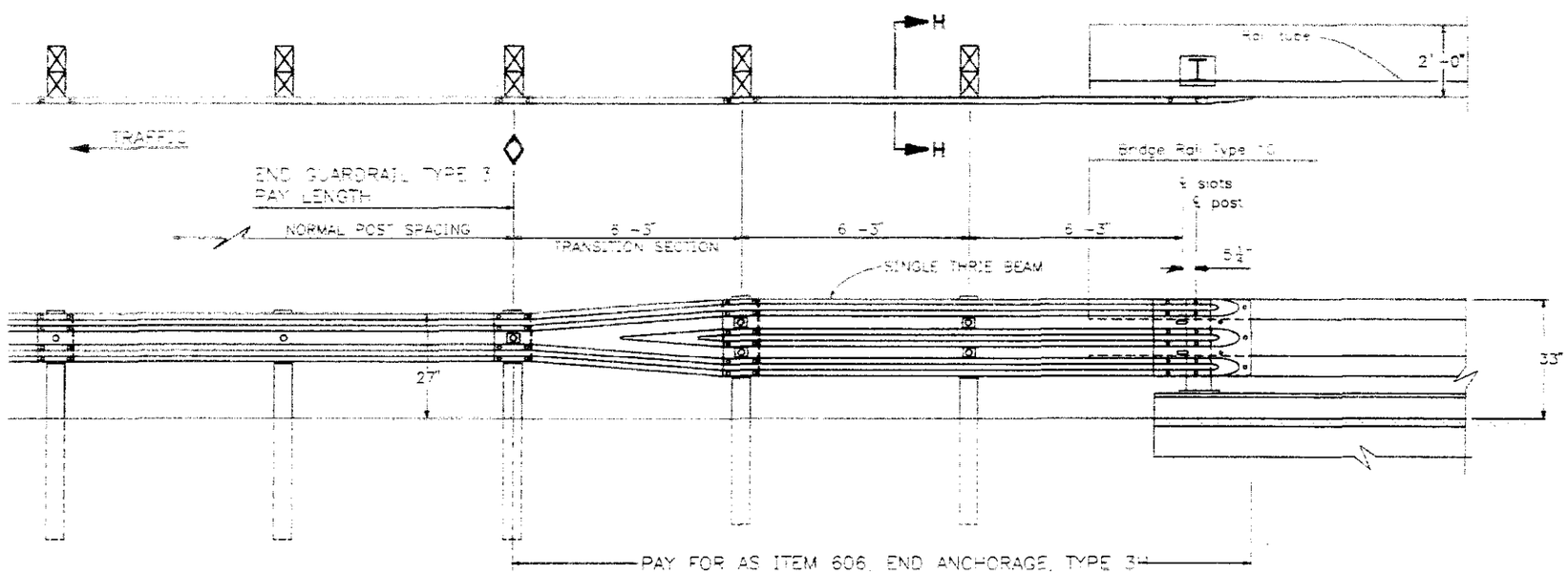
Detailed By	INITIAL	DATE
Checked By		

Designed By	INITIAL	DATE
Checked By		

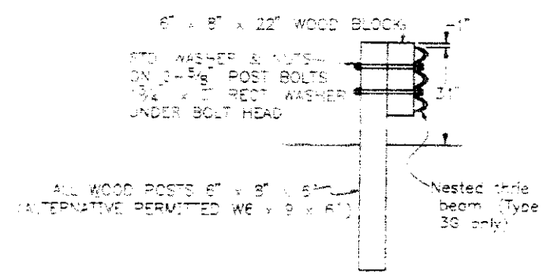
REVISIONS	AS CONSTRUCTED	FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
	NO REVISIONS / REVISED / VOID	VIII	COLORADO	IM 0251-141	24



TYPE 3G END ANCHORAGE



TYPE 3H END ANCHORAGE



SECTION H-H

BACKUP PLATE NOT REQUIRED AT GUARDRAIL POSTS ON TYPE 3G AND 3H.

NOTES

TYPE 3G END ANCHORAGE IS FOR USE AT BOTH ENDS OF BRIDGES ON TWO-WAY ROADS AND AT THE APPROACH END OF BRIDGES ON ONE-WAY ROADS.

TYPE 3H END ANCHORAGE IS FOR USE AT THE TRAILING END OF BRIDGES ON ONE-WAY ROADS.

⊡ THIS SHOWS RECTANGULAR WASHER IS REQUIRED UNDER POST BOLT HEAD.

COLORADO DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL TYPE 10R

Structure Numbers

L-18-M,L-18-W
L-18-CD,L-18-AV
K-18-AJ
K-18-CN,K-18-CO
K-18-J

Designer: S. Wilson
Detailer: Dan Hunt

Drawing Number B6 of 21 Drawings

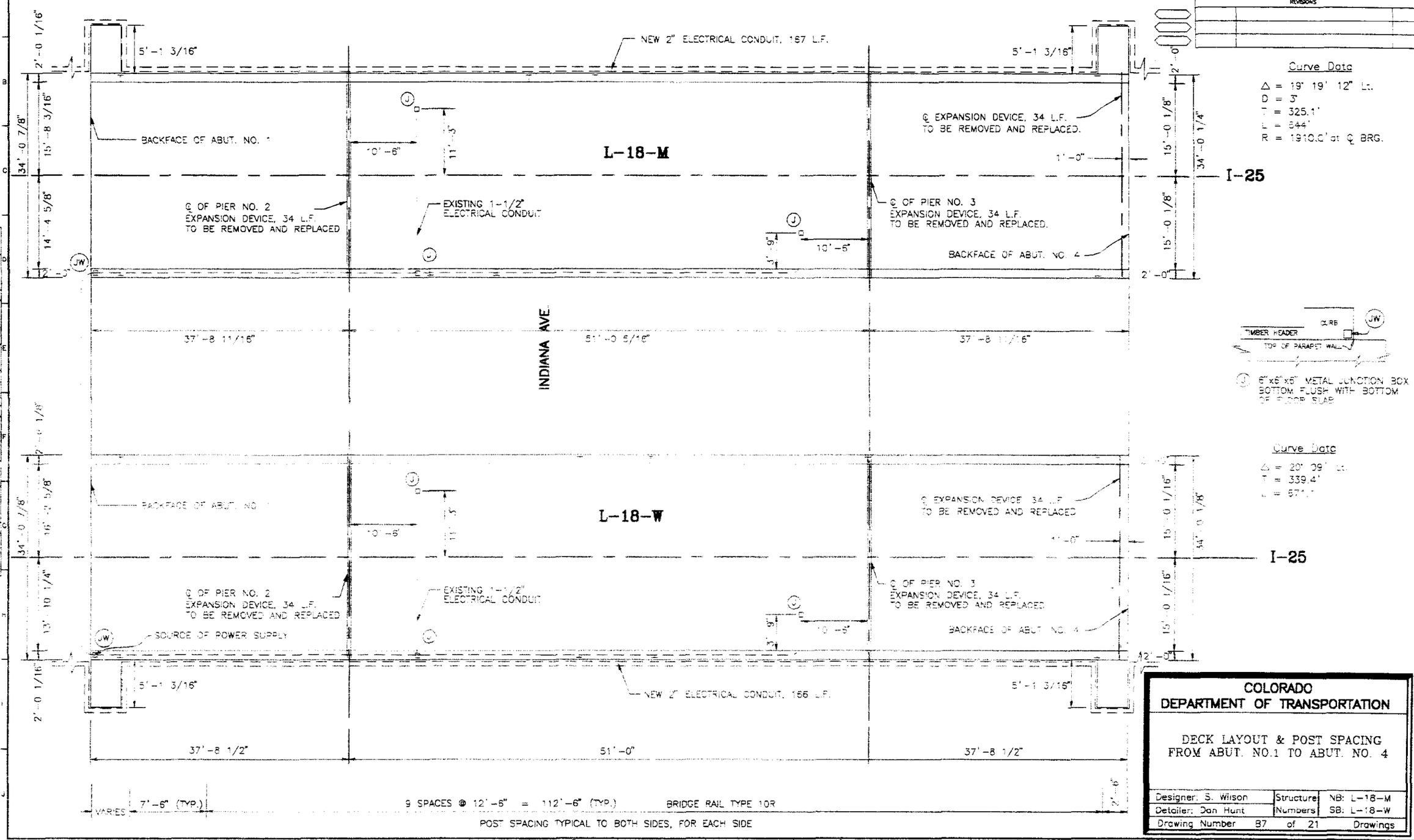
Revision Dates (Preliminary Stage Only)
03-92 09-92

Quantities: INITIAL DATE
Quantities By
Checked By
Design: INITIAL DATE
Designed By
Checked By

AS CONSTRUCTED			
NO REVISIONS	REVISED	VOID	

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VII	COLORADO	IM 0251-141	25

REVISIONS



Curve Data

Δ = 19° 19' 12" Lt.
D = 3°
T = 325.1'
L = 644'
R = 1910.0' at ℄ BRG.

Curve Data

Δ = 20° 09' Lt.
T = 339.4'
L = 671.1'

COLORADO DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 4

Designer: S. Wilson	Structure Numbers	NB: L-18-M
Detailer: Dan Hunt		SB: L-18-W
Drawing Number B7 of 21 Drawings		

Revision Dates (Preliminary Stage Only)

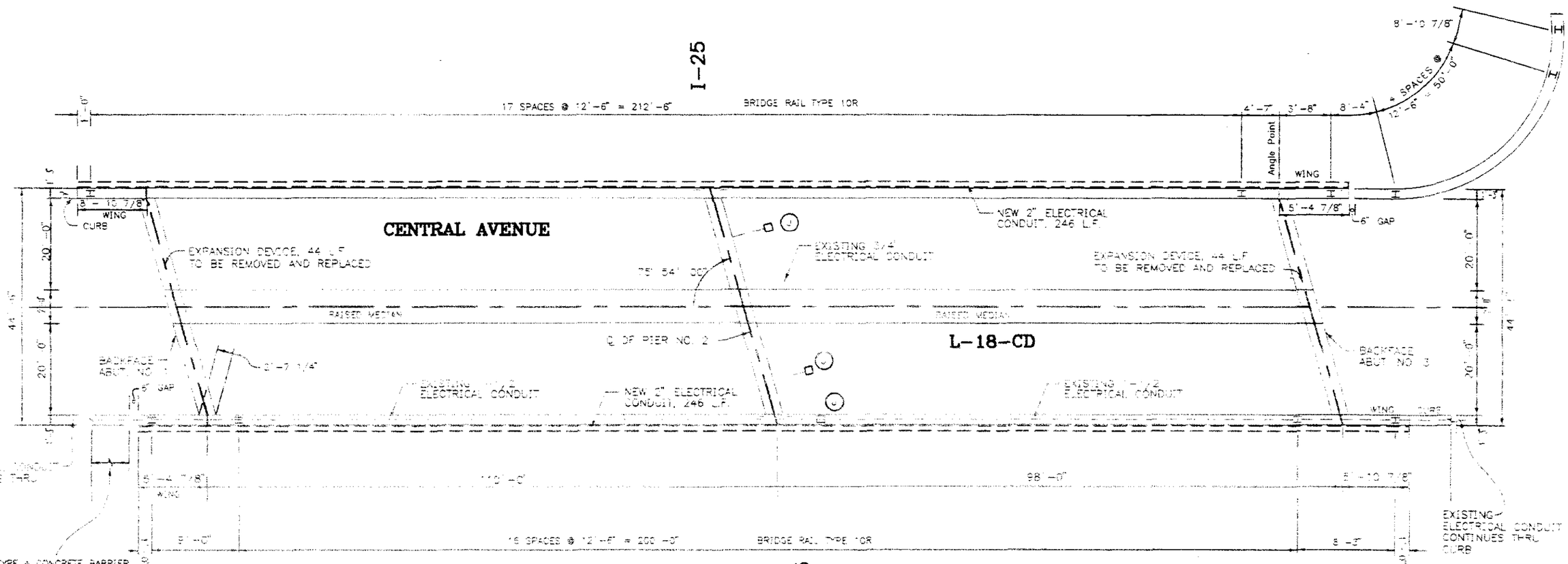
Design: Designed By / Checked By / INITIAL / DATE
Detail: Detailed By / Checked By / INITIAL / DATE
Quantities: Quantities By / Checked By / INITIAL / DATE

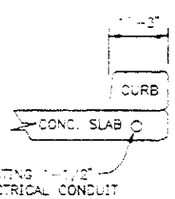
L787W.DWG

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

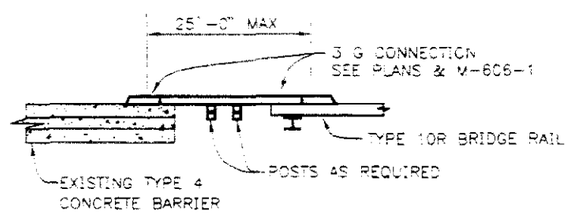
FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	26

REVISIONS		



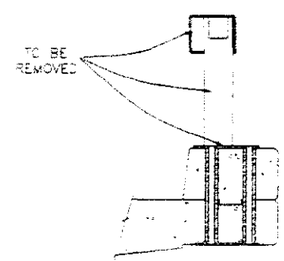


(J) = 6"x6"x4" JUNCTION BOX FLUSH WITH THE BOTTOM OF SLAB.



CONNECTION DETAIL TYPE 10R TO TYPE 4

N.T.S.



BRIDGE RAIL REMOVAL DETAIL

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 3

Designed: S. Wilson	Structure Number	L-18-CD OVERPASS
Detailed: Don Hunt		
Drawing Number 88 of 21		Drawings

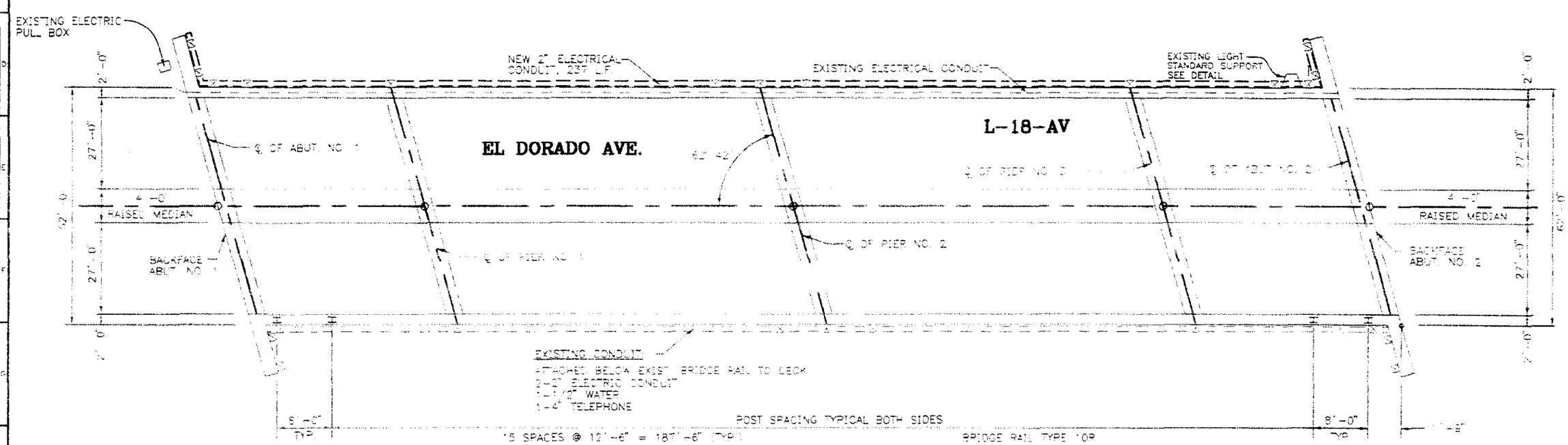
(Revision Dates) (Preliminary Stage Only)

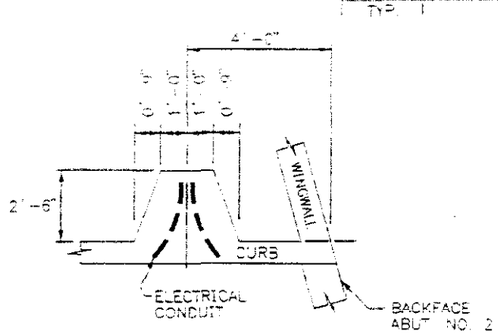
Quantities	INITIAL	DATE
Quantities By		
Checked By		
Detailed By		
Checked By		
Designed By		
Checked By		

L-18-CD DWG.

AS CONSTRUCTED			FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
NO REVISIONS	REVISED	VOID	VIII	COLORADO	IM 0251-141	27

REVISIONS		





PLAN VIEW

EXISTING LIGHT STANDARD SUPPORT DETAIL

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING
FROM ABUT. NO.1 TO ABUT. NO. 2

Designer: S. Wilson	Structure Number	L-18-AV OVERPASS
Detailer: Dan Hunt		
Drawing Number B9 of 21 Drawings		

Revision Dates (Preliminary Stage Only)

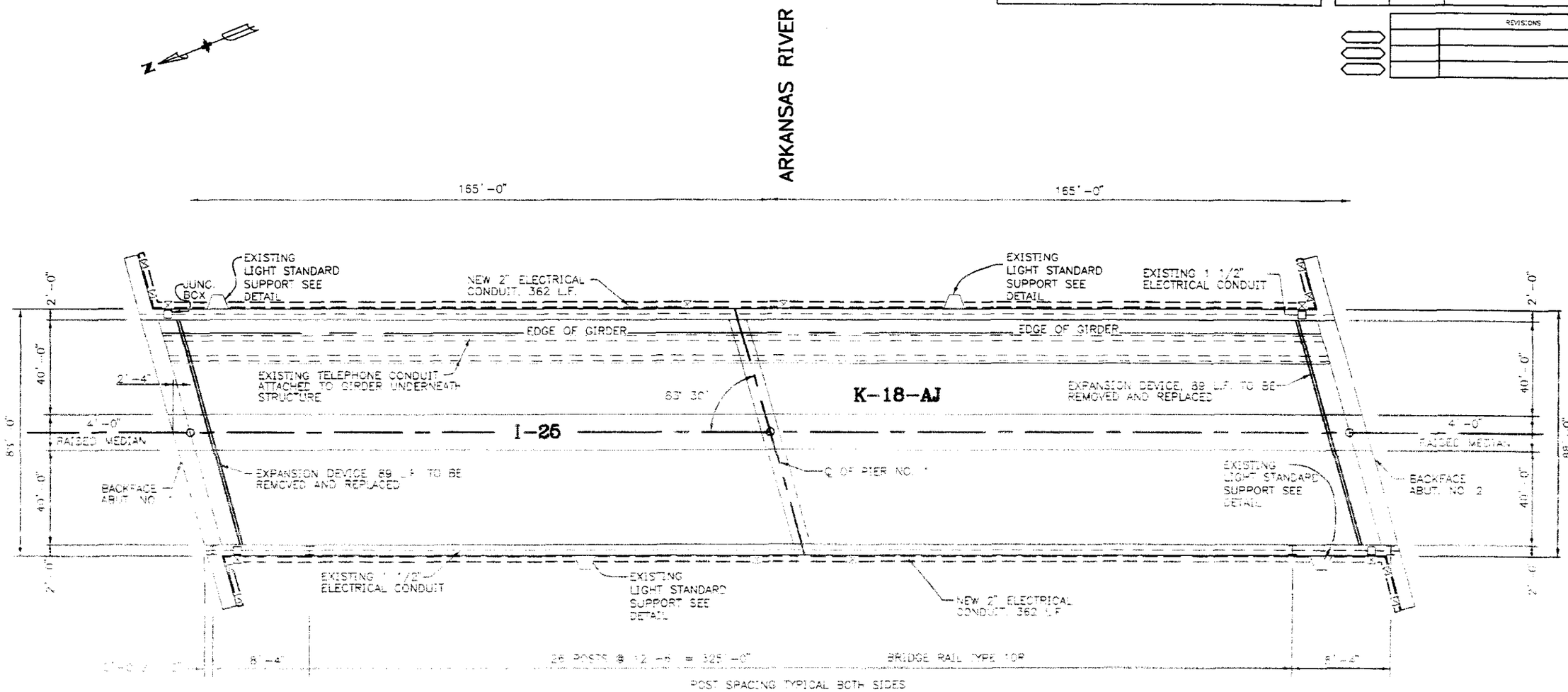
Quantities: INITIAL DATE
Quantities By: Checked By: DATE
Detailed By: Checked By:
Designed By: INITIAL DATE
Designed By: Checked By:

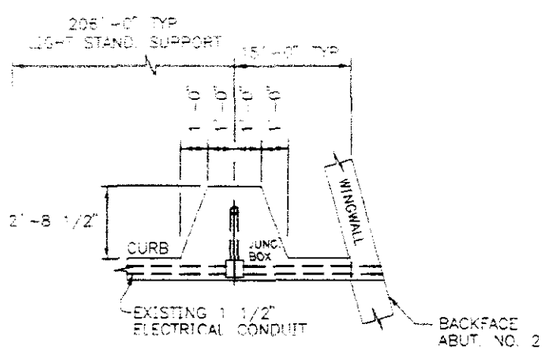
L 18 AV.DWG

AS CONSTRUCTED							
NO REVISIONS		REVISED		VOID			

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	28

REVISIONS





PLAN VIEW

EXISTING LIGHT STANDARD SUPPORT DETAIL

Quantities			
INITIAL	DATE	Quantities By	Checked By
INITIAL	DATE	Quantities By	Checked By
INITIAL	DATE	Detailed By	Checked By
Designed By	Checked By		

COLORADO DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 2

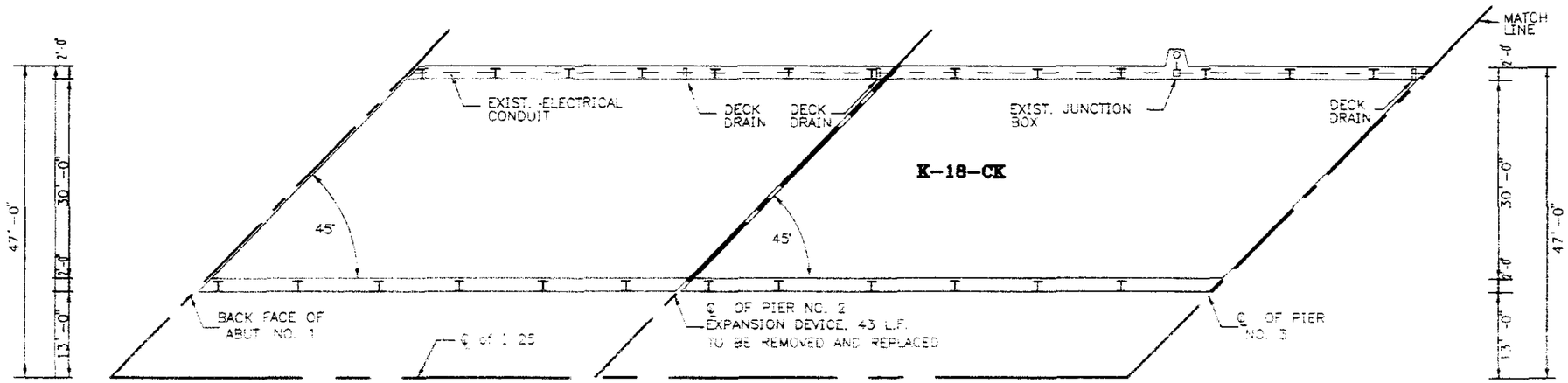
Designer: S. Wilson	Structure Number	K-18-AJ
Detailer: Dan Hunt		
Drawing Number B10 of 21		Drawings

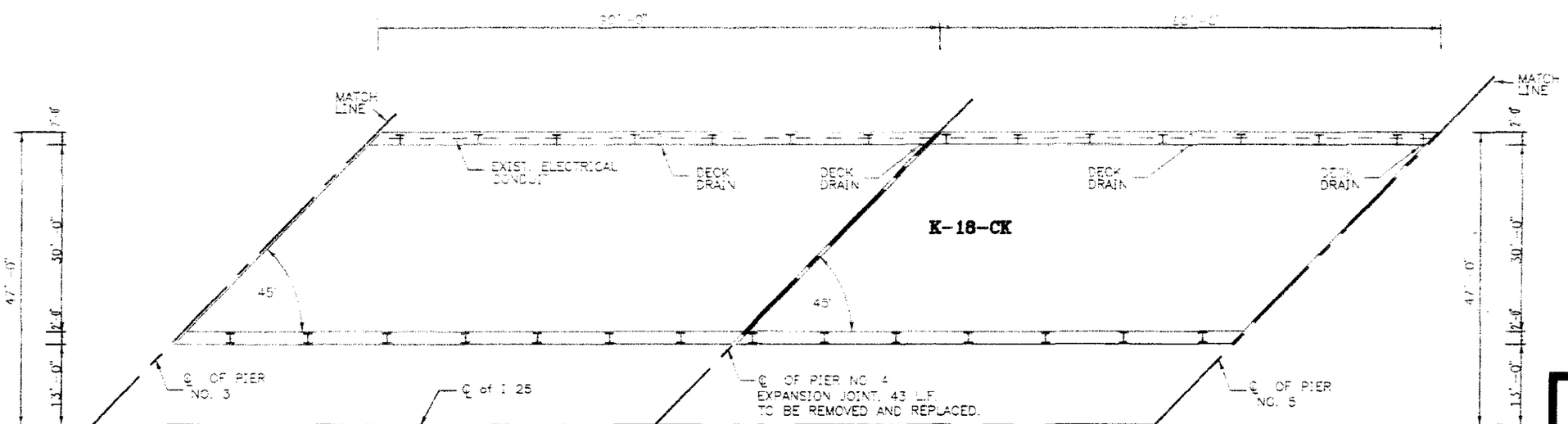
Revision Dates (Preliminary Stage Only)

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VI	COLORADO	IM 0251-141	29

REVISIONS		





Quantities		
	INITIAL	DATE
Quantities By		
Checked By		

Detailed By		
Checked By		

Designed By		
Checked By		

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO. 1 TO PEIR NO. 5

Designer: S. Wilson	Structure Number	NB. K-18-CK
Detailer: Don Hunt		
Drawing Number B11 of 21		Drawings

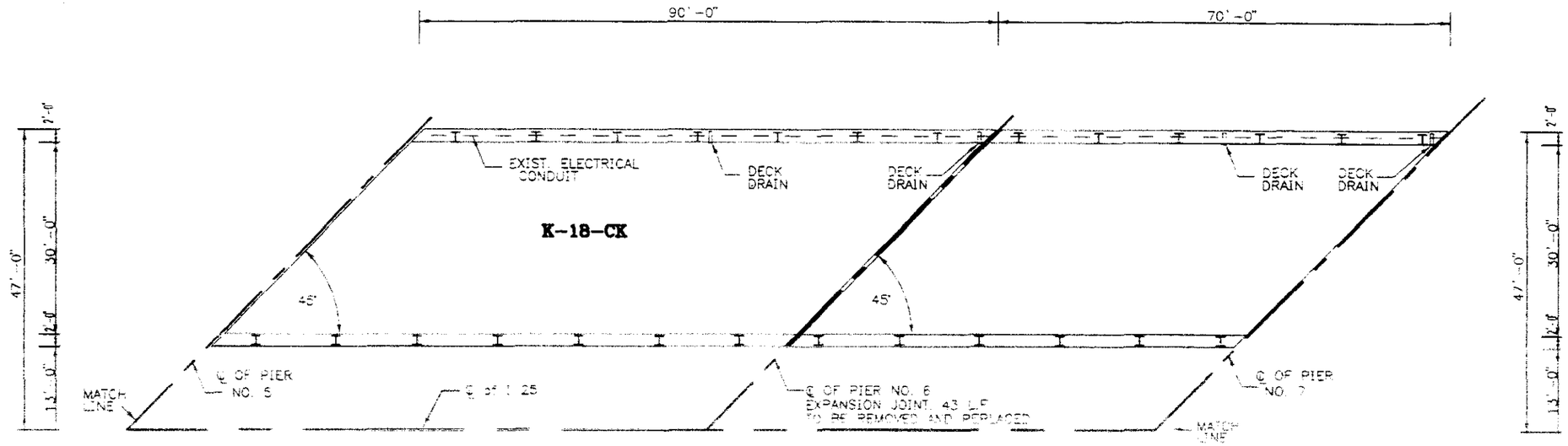
Revision Dates (Preliminary Stage Only)

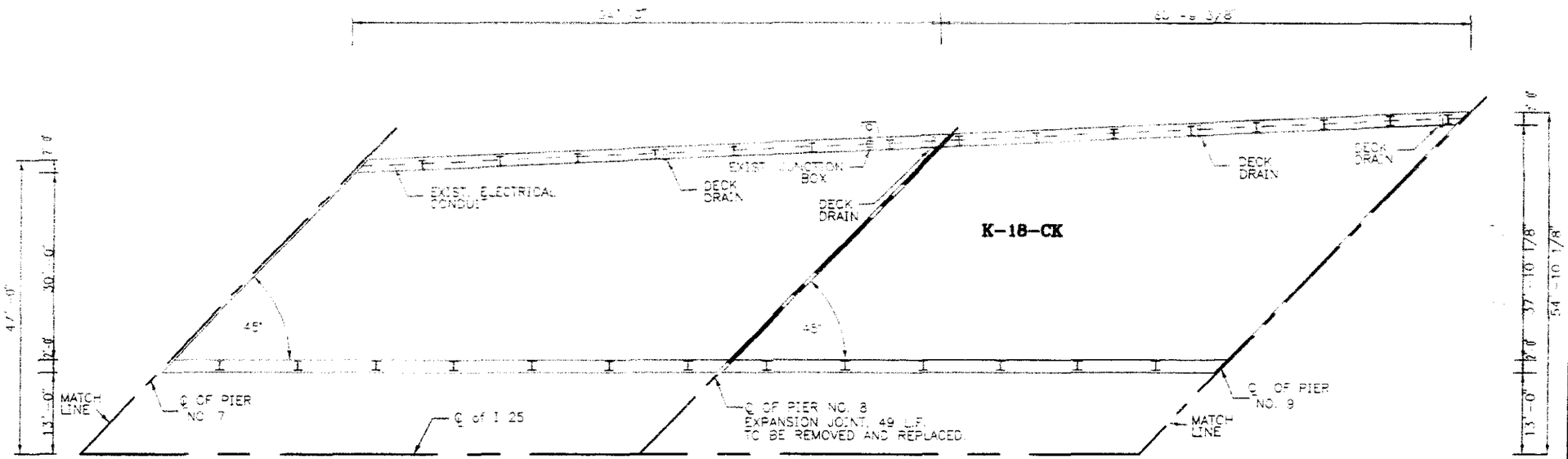
K 18 CK1.DWG

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	30

REVISIONS		





Quantities			
Quantities By	INITIAL	DATE	
Checked By			

Design			
Detailed By	INITIAL	DATE	
Checked By			

Design			
Designed By	INITIAL	DATE	
Checked By			

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM PIER NO. 5 TO PEIR NO. 9

Designer: S. Nelson	Structure Number	NB: K-18-CK
Detailer: Don Hunt		
Drawing Number B12 of 21 Drawings		

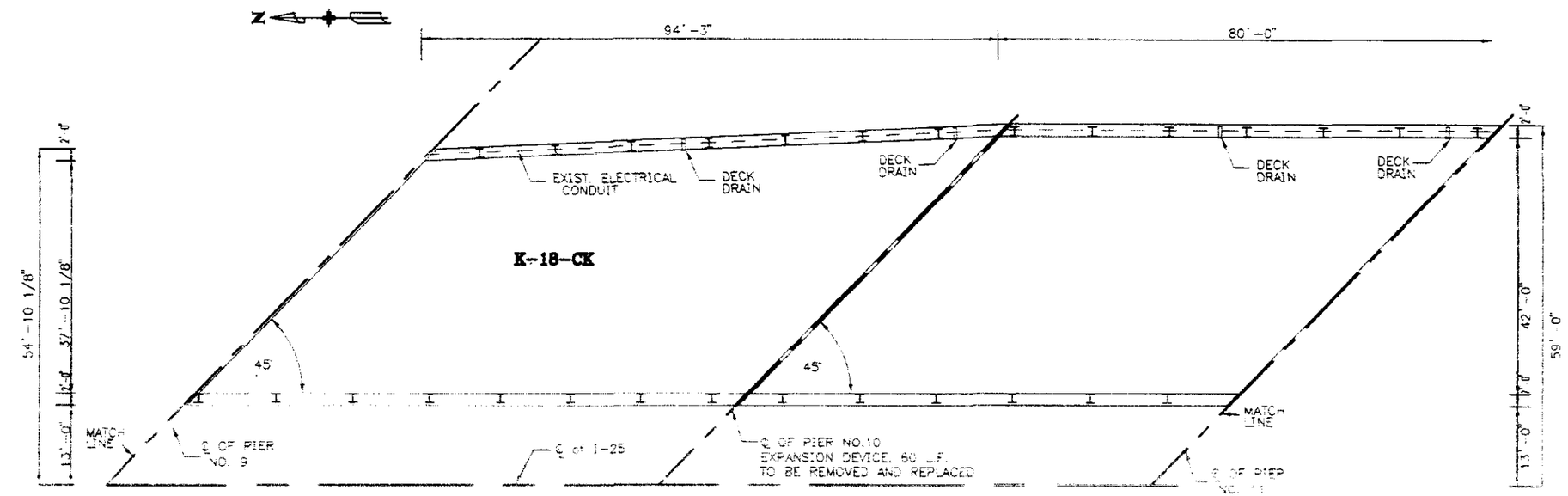
Revision Dates (Preliminary Stage Only)

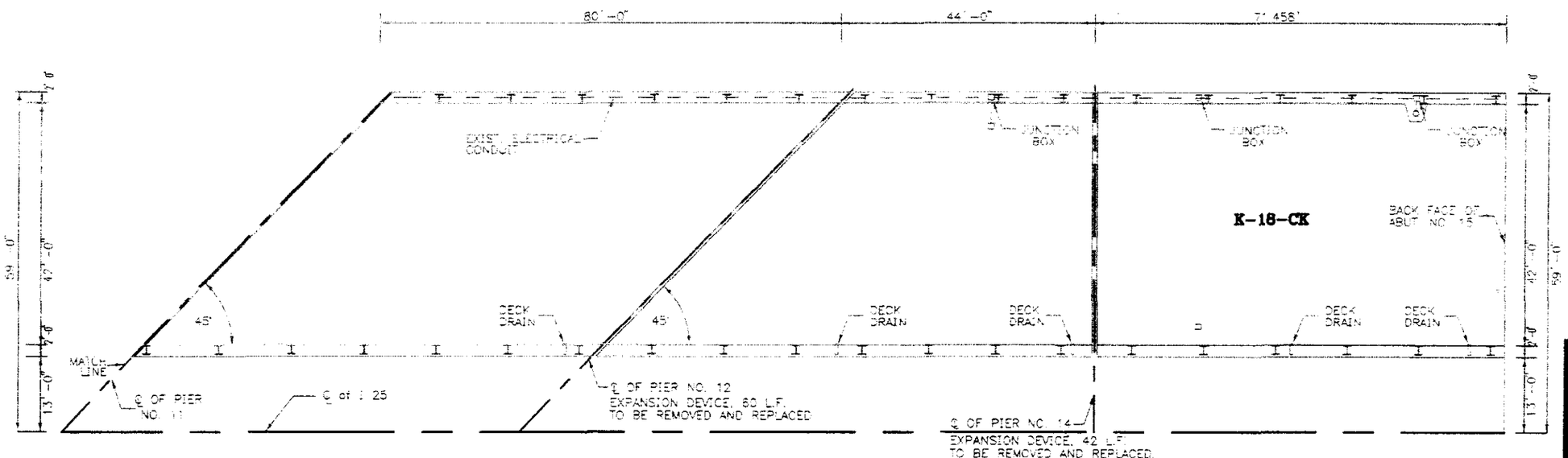
K-18-CK2.DWG

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	31

REVISIONS		





Quantities	INITIAL	DATE
Quantities By		
Checked By		
Detailed By		
Checked By		
Designed By		
Checked By		

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM PIER NO. 9 TO ABUT NO. 15

Designer S. Wilson	Structure Number	NB: K-18-CK
Detailer Don Hunt		
Drawing Number B13 of 21		Drawings

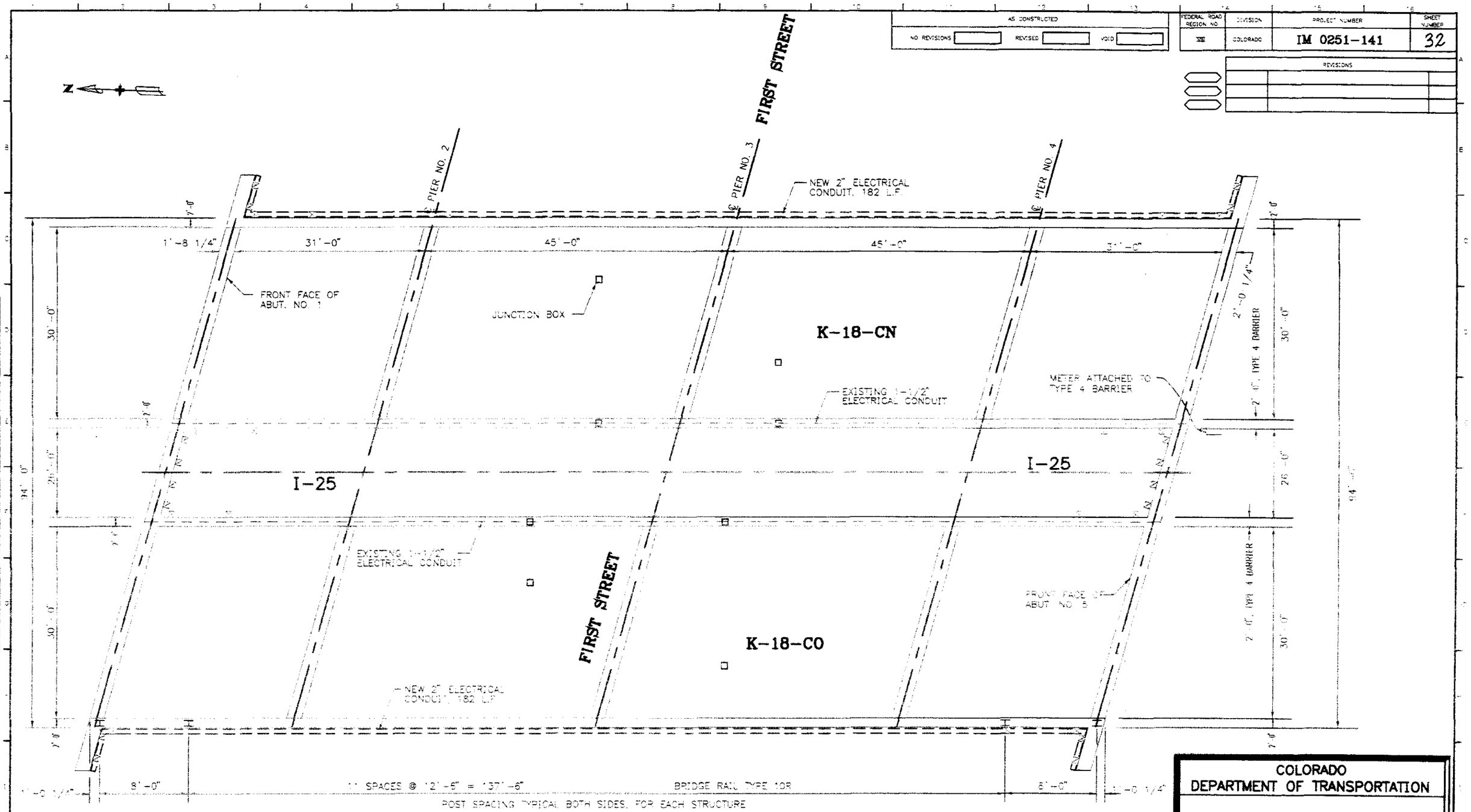
Revision Dates (Preliminary Stage Only)

K 18 CK3.DGN

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	32

REVISIONS		



Quantities		
Quantities By	INITIAL	DATE
Checked By		

Detailed		
Detailed By	INITIAL	DATE
Checked By		

Designed		
Designed By	INITIAL	DATE
Checked By		

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 5

Designer: S. Wilson	Structure Number	K-18-CN
Detailer: Dan Hunt		K-18-CO
Drawing Number B14 of 21		Drawings

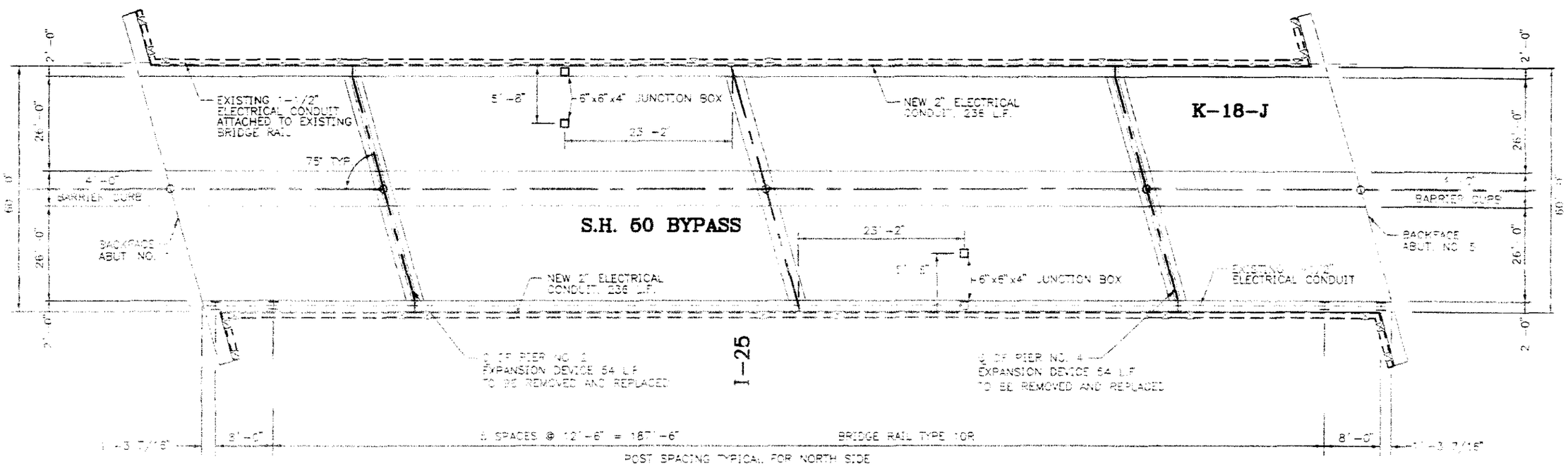
Revision Dates "Preliminary Stage Only"

K 18 CNO.DWG

AS CONSTRUCTED						
NO REVISIONS		REVISED		VOID		

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	33

REVISIONS		



Quantities	INITIAL	DATE
Quantities By		
Checked By		

Details	INITIAL	
Details By		
Checked By		

Designs	INITIAL	
Designed By		
Checked By		

K-18.DWG

COLORADO
DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 5

Designer: S. Wilson	Structure Number	K-18-J OVERPASS
Detailer: Don Hunt		
Drawing Number B15 of 21		Drawings

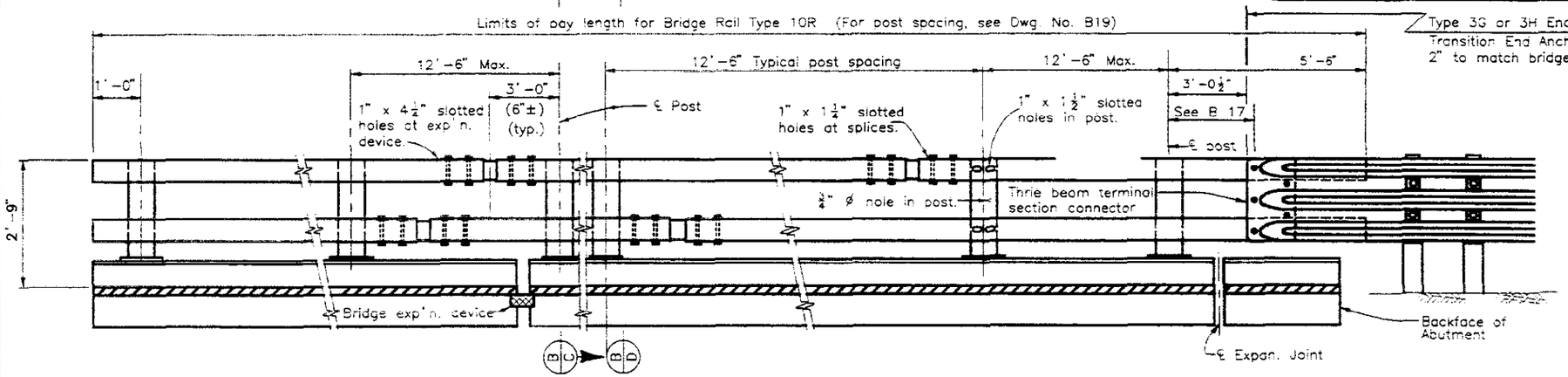
Revision Dates (Preliminary Stage Only)

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	34

REVISIONS

B-606-10R



RAIL PANEL ON WING TERMINAL SECTION

(See Roadway plans for ends not attached to Guard Rail.)

RAIL PANEL AT EXPANSION DEVICE

ELEVATION – BRIDGE RAIL

RAIL PANEL ON WING TRANSITION SECTION

(See roadway plans for ends requiring attachment to guard rail.)

NOTES:

All tubes shall be fabricated from ASTM A-500 Grade B.
All posts shall be fabricated from ASTM A-36 steel.

The above material and all anchor bolts and miscellaneous bolts, nuts, and washers shall be galvanized after fabrication in accordance with Section 509. Concrete, reinforcing steel, and structural steel elements shall conform to the requirements of Sections 601, 602 and 509, respectively.

The tubes shall be shop bent or fabricated to fit horizontal curve when radius is less than 1,500 feet.

Tubes shall be continuous over not less than two posts.

The centerline of the posts at the bridge expansion device shall be a minimum of 3'-0" from the centerline of the bridge expansion device, measured along the centerline of posts except at abutments, location shall be shown.

All bolts that have lock washers shall be tightened to snug only.

Posts shall be perpendicular to the grade of the deck.

One or more 12'-6" post spacings may be reduced in order to maintain dimensions from the end of the wings and expansion joints.

Optional drain hole for galvanizing may be drilled, punched, or dripped leaving smooth surfaces and transitions. No flame cutting or air carbon arc gouging is allowed.

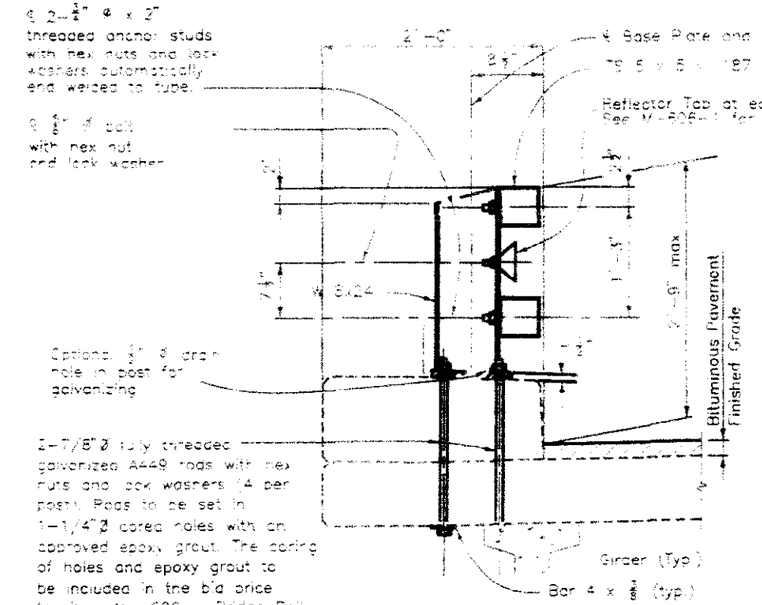
Posts, base plates, backing plates, anchor bolts, miscellaneous bolts, nuts, washers, tubes, tube expansion devices, tube splices, end plates, bored holes, grout, and reflector tabs shall be included in Item 606 – Bridge Rail Type 10R.

For fabrication of this item, two sets of shop drawings which comply with the requirements of Section 105, shall be submitted to the Department for information only. One set shall be sent to the Colorado Department of Transportation, Staff Materials Branch Inspection Unit, 4340 E. Louisiana Avenue, Denver, Colorado 80222. One set shall be sent to the Engineer. The shop drawings will not be approved or returned.

Structural Steel:
AASHTO M-183(ASTM A-36) f_y=36,000 psi
Cold formed ASTM A-500 Grade B f_y=46,000 psi

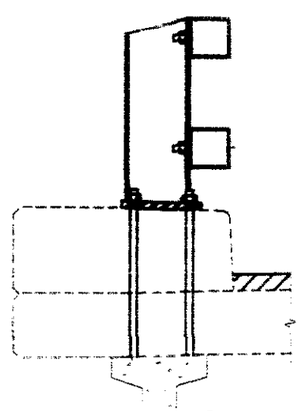
For expansion details see next roll sheets.

For post dimensions, see B17.



SECTION (B/C)

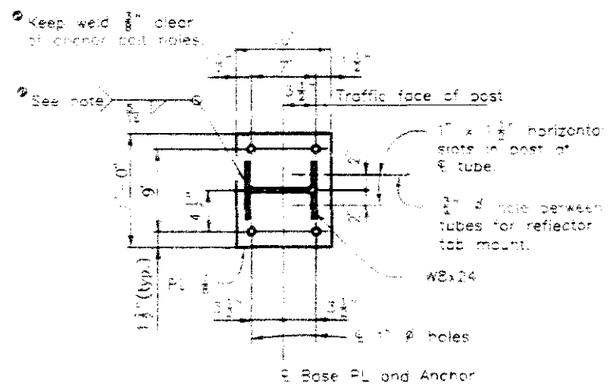
When girders are offset from railing.



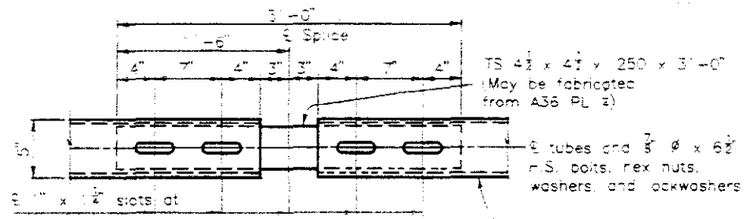
SECTION (B/D)

Where girders are aligned with railing.

2-7/8" ø fully threaded galvanized A449 rods with hex nut and lock washer (4 per post). Rods to be set in 1-1/4" ø x 1'-5" cored holes with an approved epoxy grout.



PLAN – POST DETAIL



tube splice, and 1" x 4½" slots at at bridge exp'n device. Slot both inner and outer tubes.

Stagger top and bottom splices into different post spacings except at expansion joint; place at opposite ends of same post space. (Range of motion = 1'-0" at bridge expansion device.)

PLAN – TUBE SPLICE

INFORMATION ONLY

Description	Unit	Per Lin. Ft.
Structural Steel (Galvanized)	LB	33.1

COLORADO DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL TYPE 10R

	Structure Numbers
Designer: S. Wilson	K-18-AX
Detailer: Don Hunt	K-18-AY
Drawing Number B16 of 21 Drawings	

Revision Dates					(Preliminary Stage Only)
8-90	11-90	11-91	03-92	8-94	

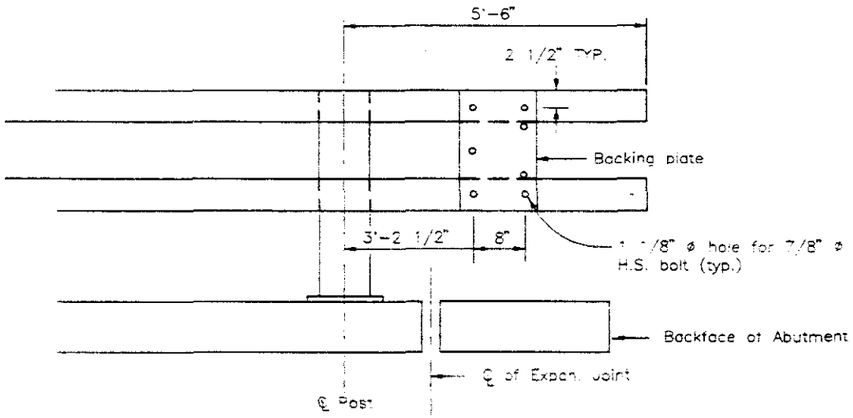
Quantities			
DATE	INITIAL	Quantities By	Checked By

Design			
DATE	INITIAL	Detailed By	Checked By
		Designed By	Checked By

AS CONSTRUCTED				FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
NO REVISIONS	REVISED	VOID		VIII	COLORADO	IM 0251-141	35

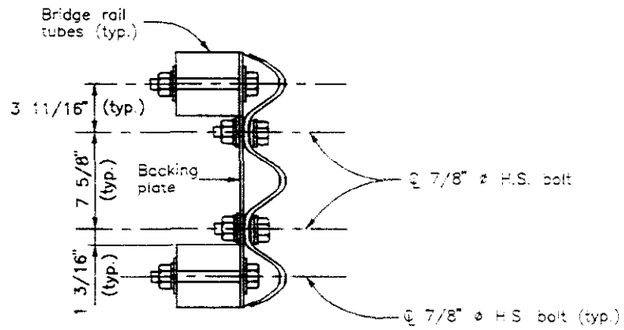
B-606-10A

REVISIONS		

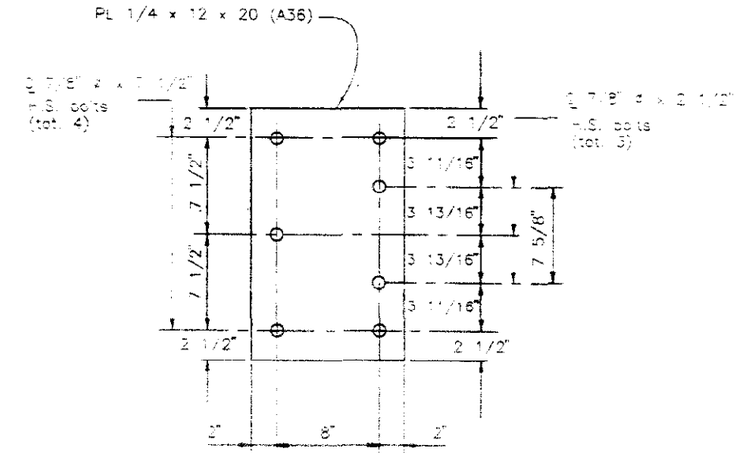


RAIL TUBE DETAILS

Thrie beam not shown

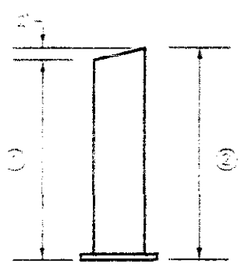


SECTION THRU BACKING PLATE



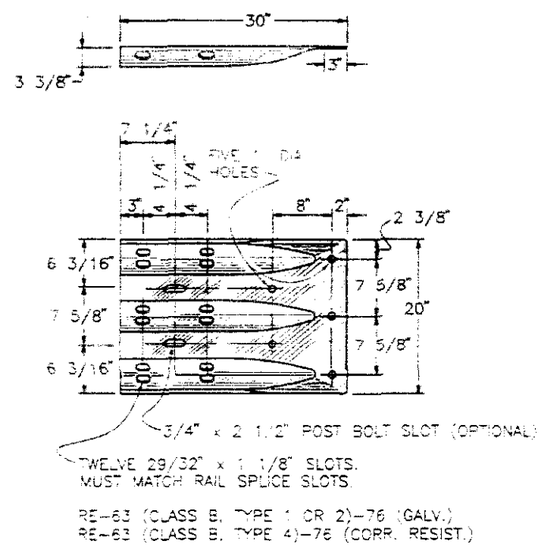
BACKING PLATE

Holes are 1 1/8" ø for 7/8" ø H.S. bolts with hex nuts, 2 PL washers and 1 lock washer



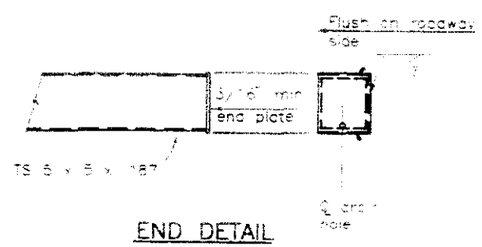
Structure	①	②
K-18-AX	1'-10 7/8"	2'-1"
K-18-AY	1'-10 7/8"	2'-1"

POST DIMENSIONS



RE-63 (CLASS B, TYPE 1 OR 2)-76 (GALV.)
RE-63 (CLASS B, TYPE 4)-76 (CORR. RESIST.)

THRIE BEAM
TERMINAL SECTION (CONNECTOR)



END DETAIL

COLORADO DEPARTMENT OF TRANSPORTATION

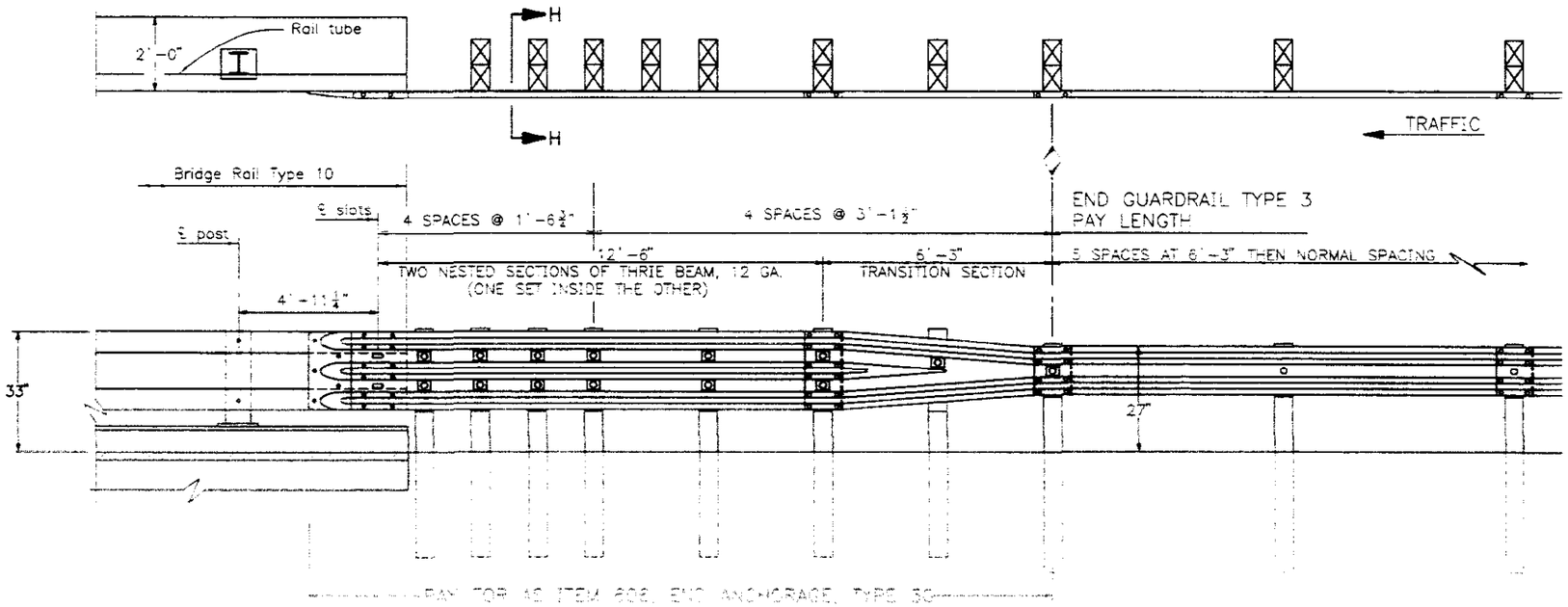
BRIDGE RAIL TYPE 10R DETAILS

	Structure Numbers
Designer: S. Wilson	K-18-AX
Detailer: Don Hunt	K-18-AY
Drawing Number B17 of 21 Drawings	

Revision Dates (Preliminary Stage Only)						
03-92						

Quantities	INITIAL	DATE
Quantities By		
Checked By		
DATE		
Detailed By		
Checked By		
DATE		
Designed By		
Checked By		

REVISIONS	AS CONSTRUCTED	FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
	NO REVISIONS / REVISED / VOID	VIII	COLORADO	IM 0251-141	36



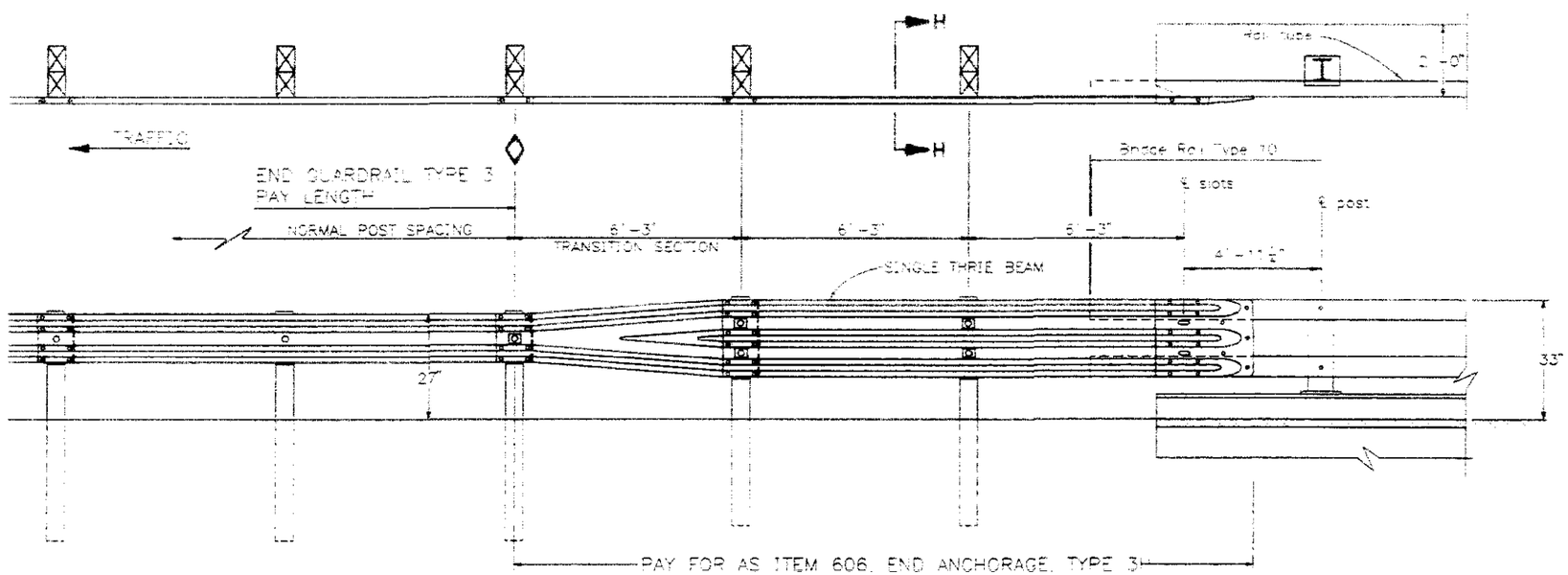
TYPE 3G END ANCHORAGE

NOTES

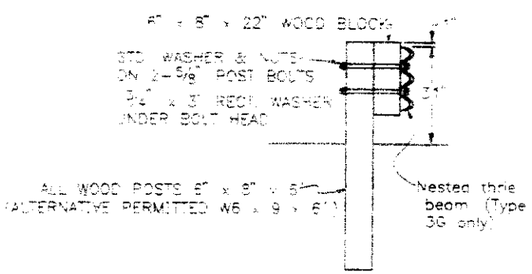
TYPE 3G END ANCHORAGE IS FOR USE AT BOTH ENDS OF BRIDGES ON TWO-WAY ROADS AND AT THE APPROACH END OF BRIDGES ON ONE-WAY ROADS.

TYPE 3H END ANCHORAGE IS FOR USE AT THE TRAILING END OF BRIDGES ON ONE-WAY ROADS.

⊠ THIS SHOWS RECTANGULAR WASHER IS REQUIRED UNDER POST BOLT HEAD.



TYPE 3H END ANCHORAGE



SECTION H-H

BACKUP PLATE NOT REQUIRED AT GUARDRAIL POSTS ON TYPE 3G AND 3H.

COLORADO DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL TYPE 10R

	Structure Numbers
Designer: S. Wilson	K-18-AX
Detailer: Dan Hunt	K-18-AY
Drawing Number B18 of 21	Drawings

Revision Dates	(Preliminary Stage Only)
03-92 09-92	

Quantities		
INITIAL	DATE	
Quantities By		
Checked By		
DATE		

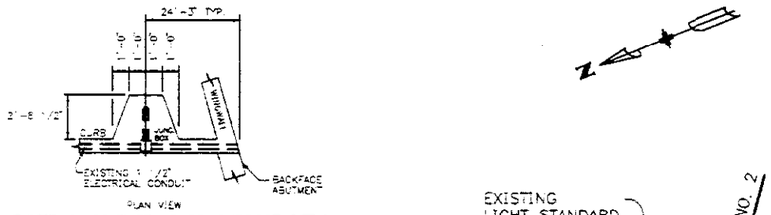
Design		
INITIAL	DATE	
Designed By		
Checked By		
Detailed By		
Checked By		

PLAN19o.DWG

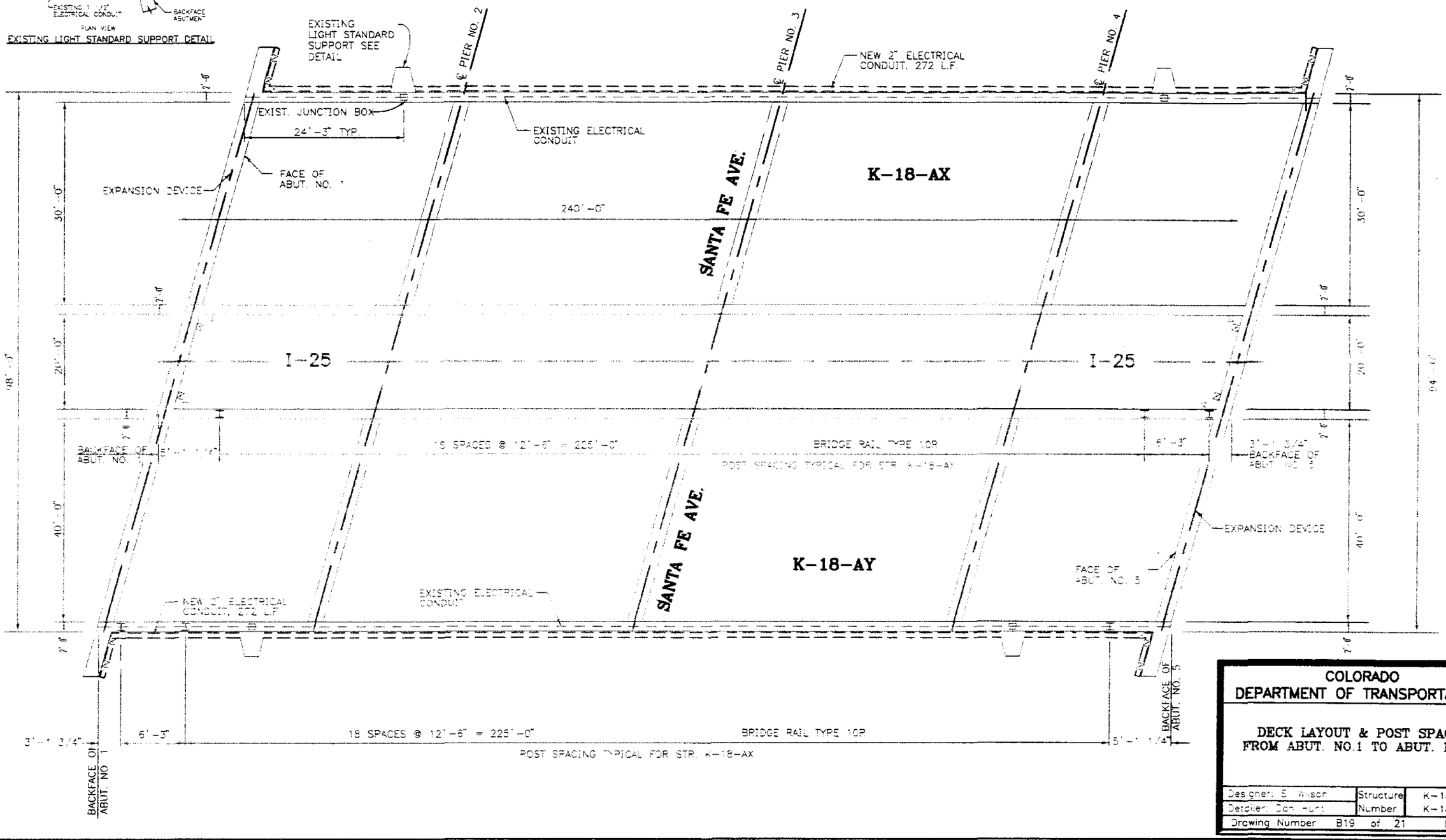
AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
XVIII	COLORADO	IM 0251-141	37

REVISIONS		



EXISTING LIGHT STANDARD SUPPORT DETAIL



Quantities		
	INITIAL	DATE
Quantities By		
Checked By		

Design		
	INITIAL	DATE
Detailed By		
Checked By		

Design		
	INITIAL	DATE
Designed By		
Checked By		

K 18 AXY.DWG.

COLORADO DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 5

Designer: S. Wilson	Structure Number	K-18-AX
Detailer: Don Hunt		K-18-AY
Drawing Number B19 of 21		Drawings

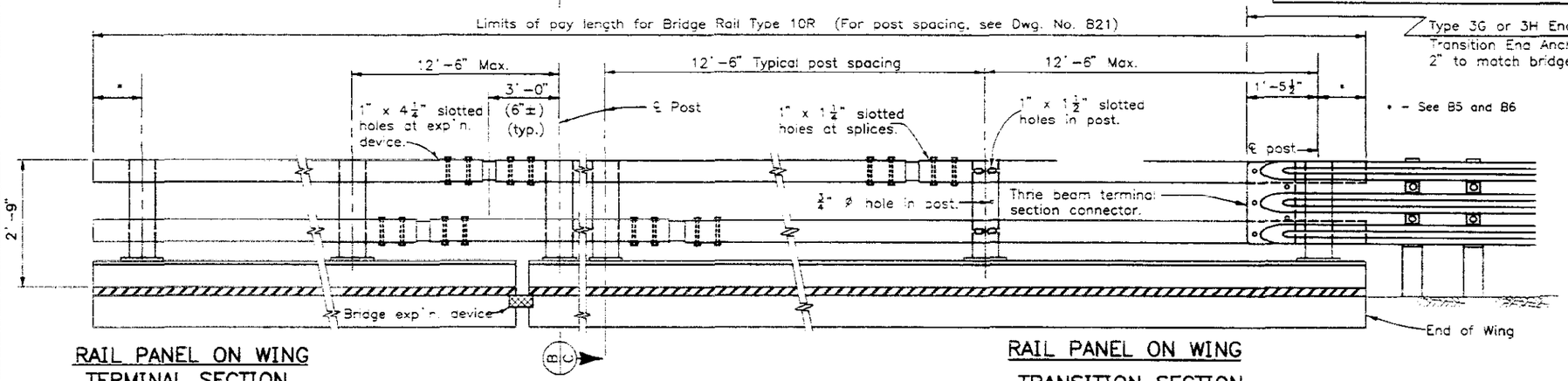
Revision Dates (Preliminary Stage Only)

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	38

REVISIONS

B-606-10R



RAIL PANEL ON WING TERMINAL SECTION

(See Roadway plans for ends not attached to Guard Rail.)

RAIL PANEL AT EXPANSION DEVICE ELEVATION – BRIDGE RAIL

RAIL PANEL ON WING TRANSITION SECTION

(See roadway plans for ends requiring attachment to guard rail.)

NOTES:

All tubes shall be fabricated from ASTM A-500 Grade B.
All posts shall be fabricated from ASTM A-36 steel.

The above material and all anchor bolts and miscellaneous bolts, nuts, and washers shall be galvanized after fabrication in accordance with Section 509. Concrete, reinforcing steel, and structural steel elements shall conform to the requirements of Sections 601, 602 and 505, respectively.

The tubes shall be shop bent or fabricated to fit horizontal curve when radius is less than 1,500 feet.

Tubes shall be continuous over not less than two posts

The centerline of the posts at the bridge expansion device shall be a minimum of 3'-0" from the centerline of the bridge expansion device, measured along the centerline of posts except at abutments, location shall be shown.

All bolts that have lock washers shall be tightened to snug only

Posts shall be perpendicular to the grade of the deck.

One or more 12'-6" post spacings may be reduced in order to maintain dimensions from the end of the wings and expansion joints.

Optional drain hole for galvanizing may be drilled, punched, or clipped leaving smooth surfaces and transitions. No flame cutting or air carbon arc gouging is allowed.

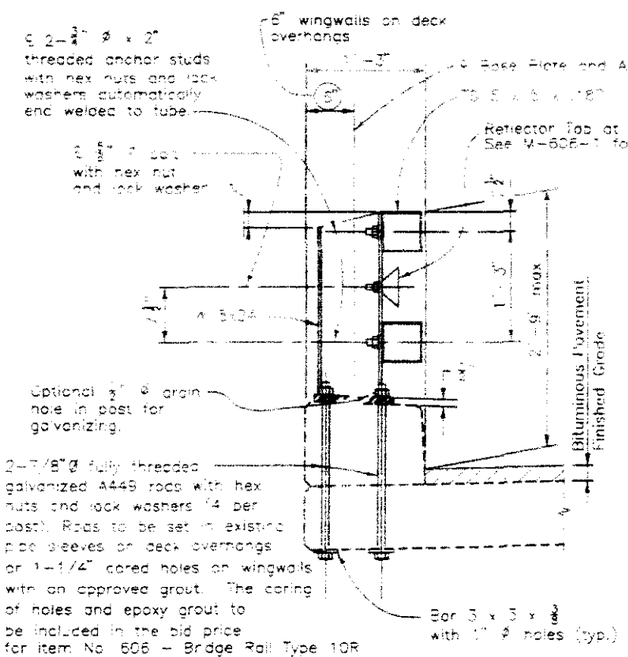
Tubes, base plates, backing plates, anchor bolts, miscellaneous bolts, nuts, washers, tubes, tube expansion devices, tube splices, end plates, cored holes, grout, and reflector tabs shall be included in item 606 - Bridge Rail Type 10R

Prior to fabrication of this item, two sets of shop drawings which comply with the requirements of Section 105, shall be submitted to the Department for information only. One set shall be sent to the Colorado Department of Transportation, Staff Materials Branch, Inspection Unit, 4340 E. Louisiana Avenue, Denver, Colorado 80222. One set shall be sent to the Engineer. The shop drawings will not be approved or returned.

Structural Steel:
AASHTO M-183(ASTM A-36) F_y=36,000 psi
Cold formed ASTM A-500 Grade B F_y=46,000 psi

For additional details see next rail sheets

For posts dimensions, see B2

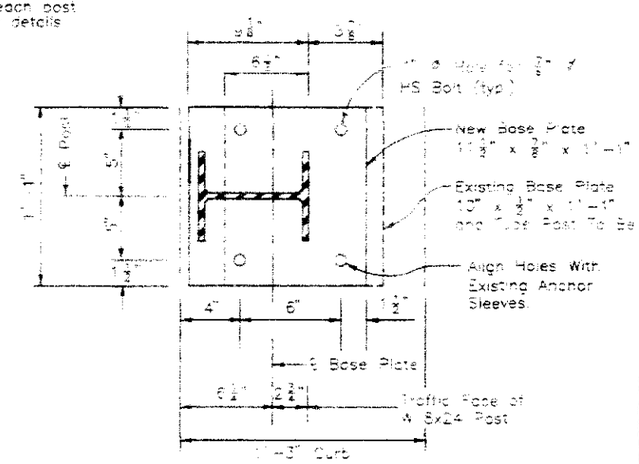


Note: The Contractor shall field verify the curb and slab thickness prior to fabricating rods to assure proper length

SECTION B/C

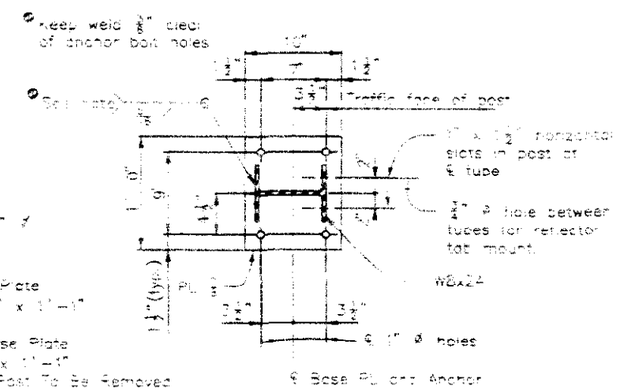
Deck Overhang

See B5 and B6



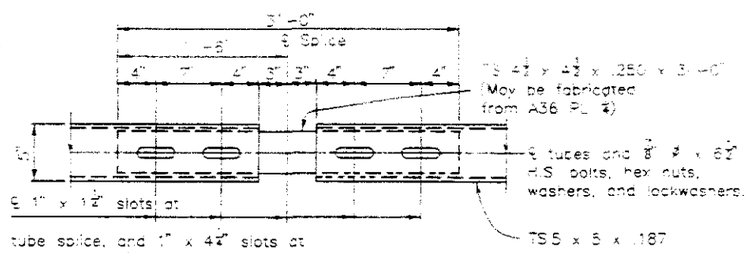
Post and Base Plate at Deck Overhangs

34 REQUIRED



PLAN – POST DETAIL AT WINGWALLS

8 REQUIRED



Stagger top and bottom splices into different post spacings except at expansion joint, place at opposite ends of same post space. (Range of motion = 1"-0" at bridge expansion device.)

PLAN – TUBE SPLICE

INFORMATION ONLY

Description	Unit	Per Unit
Structural Steel (Galvanized)	LB.	33.1

COLORADO DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL TYPE 10R

Structure Numbers: K-18-EN

Designed: S. Wilson
Detailed: Don Hunt
Drawing Number B20 of 21 Drawings

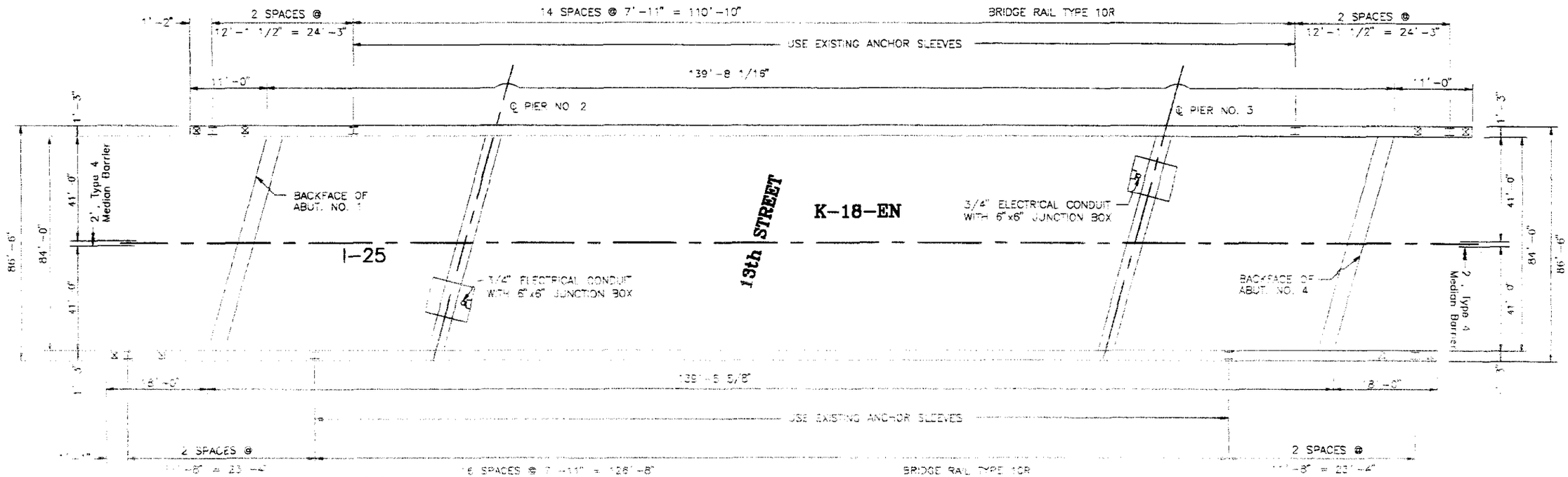
Revision Dates (Preliminary Stage Only)							
8-90	11-90	11-91	03-92	8-94			

Quantities Initial Date
Quantities By
Checked By
Design Initial Date
Designed By
Checked By
Detailed By
Checked By

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NUMBER	SHEET NUMBER
VIII	COLORADO	IM 0251-141	39

REVISIONS



CURVE DATA

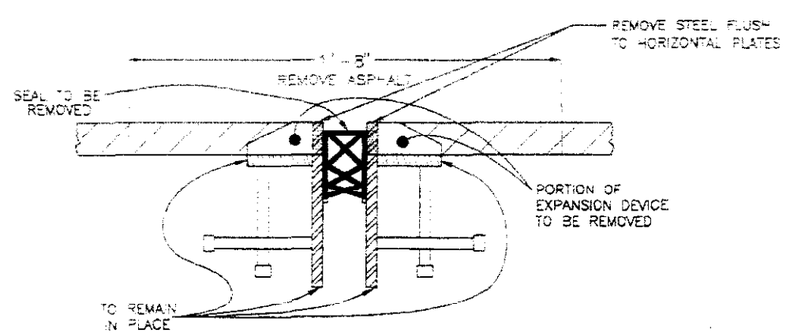
Δ = 24° 0' 0"
Ts = 562.2'
Ls = 150'
Ds = 1° 52' 30"
Δc = 20° 15'
Dc = 2° 30'
Tc = 409.3'
Lc = 810'
Rc = 2291.8'

NOTE:

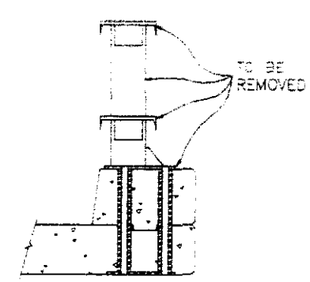
3/4" ELECTRICAL CONDUIT IS LOCATED IN THE COLUMNS AS SHOWN FOR PIER NO. 2 AND 3.

NEW ELECTRICAL CONDUIT WILL NOT BE REQUIRED.

USE EXISTING ANCHOR LOCATIONS EXCEPT AS SHOWN



REMOVAL OF EXPANSION JOINT DETAIL



BRIDGE RAIL REMOVAL DETAIL

COLORADO DEPARTMENT OF TRANSPORTATION

DECK LAYOUT & POST SPACING FROM ABUT. NO.1 TO ABUT. NO. 4

Designer: S. Wilson	Structure Number	K-18-EN
Detailer: Don Hunt		
Drawing Number B21 of 21		Drawings

Revision Dates (Preliminary Stage Only)

Quantities			
INITIAL	DATE		
Quantities By		Checked By	

Detail			
INITIAL	DATE		
Detailed By		Checked By	

Design			
INITIAL	DATE		
Designed By		Checked By	

K787N.DWG