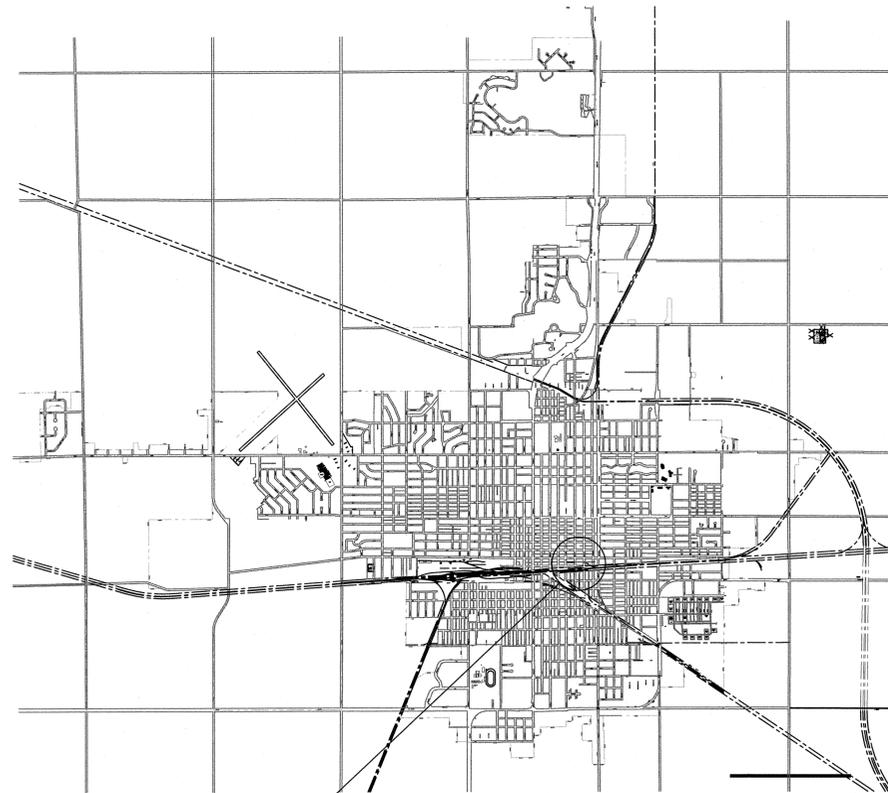


# ALLEY PROJECT - Between 1st & 2nd St., St. Joe Ave. to Kansas Ave.

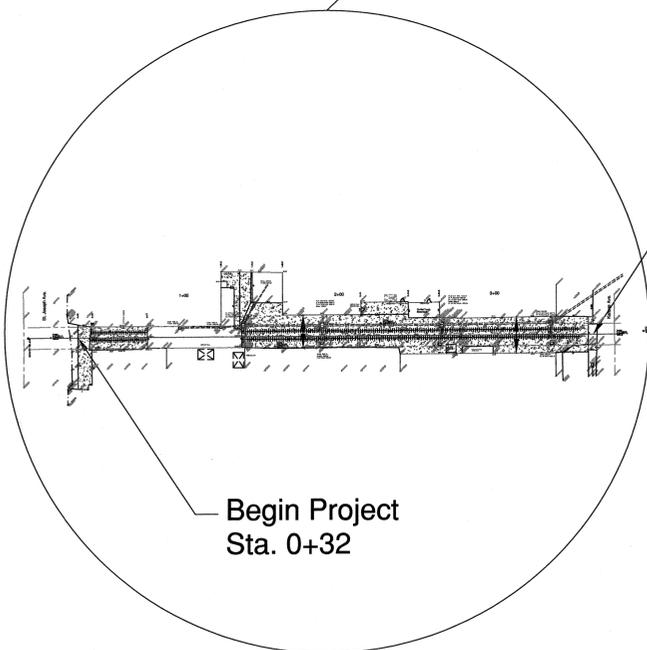
## AID - 2013 - 1

### INDEX OF SHEETS

SHEET NO. 1	COVER SHEET
SHEET NO. 2	TYPICAL SECTION & DETAIL SHEET
SHEET NO. 3-4	REMOVAL SHEETS
SHEET NO. 5-6	PLAN & PROFILE SHEETS
SHEET NO. 7	JOINT DETAIL
SHEET NO. 8-9	EXISTING ELECTRICAL CONDUIT PLAN
SHEET NO. 10-11	CROSS SECTION SHEETS



End Project  
Sta. 3+66



Begin Project  
Sta. 0+32

### LEGEND

•	Spot Elevation	□	Light
○ UP	Utility Pole	□	Telephone Box
◆	Control Point - Nail Set	◇ EJB	Electrical Junction Box
◆	Control Point - Temporary Wood Hub Set	— 1912 —	Contour Line
⊙	Deciduous Tree	---	Flowline
⊙	Coniferous Tree	---	Property Line
○	Manhole		
○ FH	Fire Hydrant		
W	Water Valve		
W	Gas Valve		

### NOTES:

The embankment and subgrade shall be adjusted to conform to the lines and grades on the plans in accordance with Section 205 and 302 of the 1997 Standard State Specifications and its supplements. The upper six (6) inches of the subgrade shall be scarified, mixed and recompact to the following compaction requirements:

Percent Density	Moisture Minimum	Requirements Maximum
95 Min.	Opt. -3%	Opt. +3%

Areas not meeting specified moisture density test requirements shall be removed and recompact at the Contractor's expense.

All subgrade compaction and water necessary for subgrade construction shall not be paid for directly but shall be considered subsidiary to the items of the contract.

Excavation, backfilling, and sawing control joints, keyway, tie bars, dowel pins, and rubberized joint sealant shall be considered subsidiary to the unit price per square yard of pavement.

### SUMMARY OF QUANTITIES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITIES	UNIT
1	Remove Pavement	738.8	S.Y.
2	Remove Existing Storm Sewer Inlets	7.0	Each
3	Remove Existing Storm Sewer Pipe	36.0	L.F.
4	Remove Existing Railroad Tracks & Ties	254.5	L.F.
5	Remove Unsuitable Material for Sub-base	250.0	C.Y.
6	Remove Existing Roof Drain	31.0	L.F.
7	Build 8" P.C.C. Pavement 47B - 3500	581.3	S.Y.
8	Build 8" P.C.C. Pavement 47B - High Early - 3500	157.0	S.Y.
9	Build Storm Sewer Inlet w/Frame & Grate	7.0	Each
10	Build 12" R.C.P. Storm Sewer Pipe Class III	18.0	L.F.
11	Build 8" D.I.P. Roof Drain	31.0	L.F.
12	Build Class C Flyash Stabilized Subgrade	35.0	Tons
13	Build Embankment for Subgrade	250.0	C.Y.
14	Adjust Manhole to Grade	1.0	Each
15	Adjust Valve Box to Grade	1.0	Each
16	Fabric Silt Fence, Low Porosity	140.0	L.F.
17	Traffic Control, Barricades and Maintenance thereof	1.0	Lump Sum

CALL BEFORE YOU DIG  
  
 DIGGERS  
 HOTLINE  
 OF NEBRASKA  
 1-800-331-5666

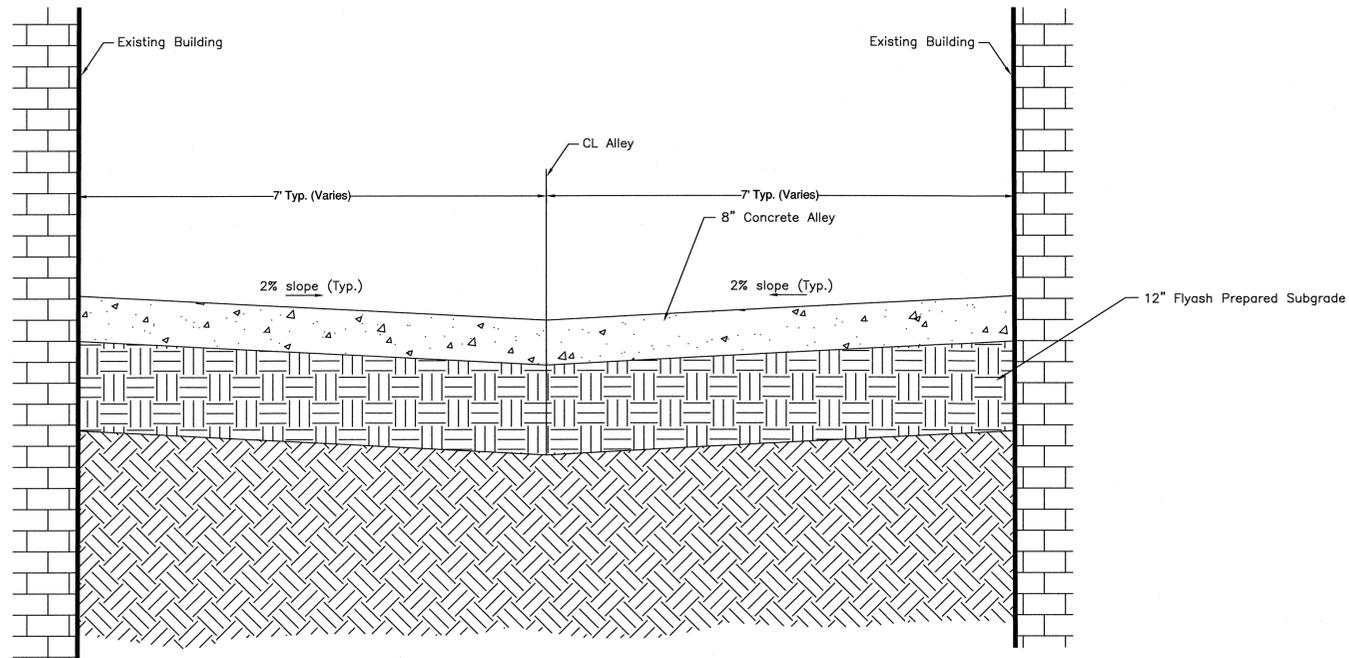


*David L. Wagner* 3/28/2016  
 Hastings City Engineer Date

*Ruth Seabrook* 3-31-2016  
 Utilities Director of Engineering Date

*Robert M. Pannone* 3/31/2016  
 Hastings City Surveyor Date

		
Project: ALLEY - Between 1st & 2nd Street/St. Joe to Kansas Ave.		
Proj. No. AID-2013-1		
Description: COVER SHEET		
Design By: R.G.D.	Date: 1/2016	Contractor:
Drawn By: B.B.	Approved: <i>[Signature]</i>	Sheet No. 1 of 11

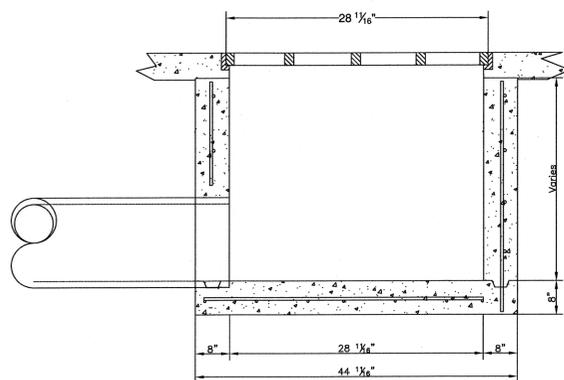


**CONCRETE ALLEY SECTION**

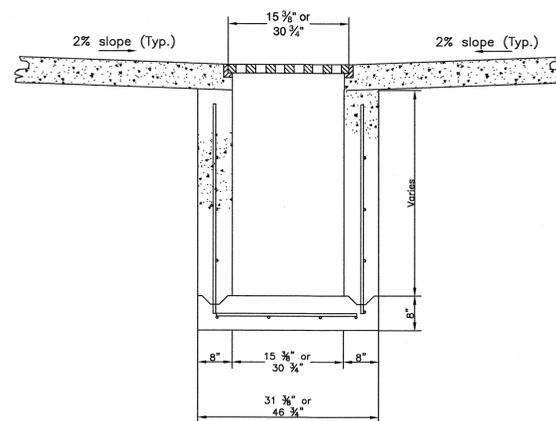
Scale: None

Vertical and Horizontal Reinforcing  
No. 4 Rebar @ 12" O.C.

Front View

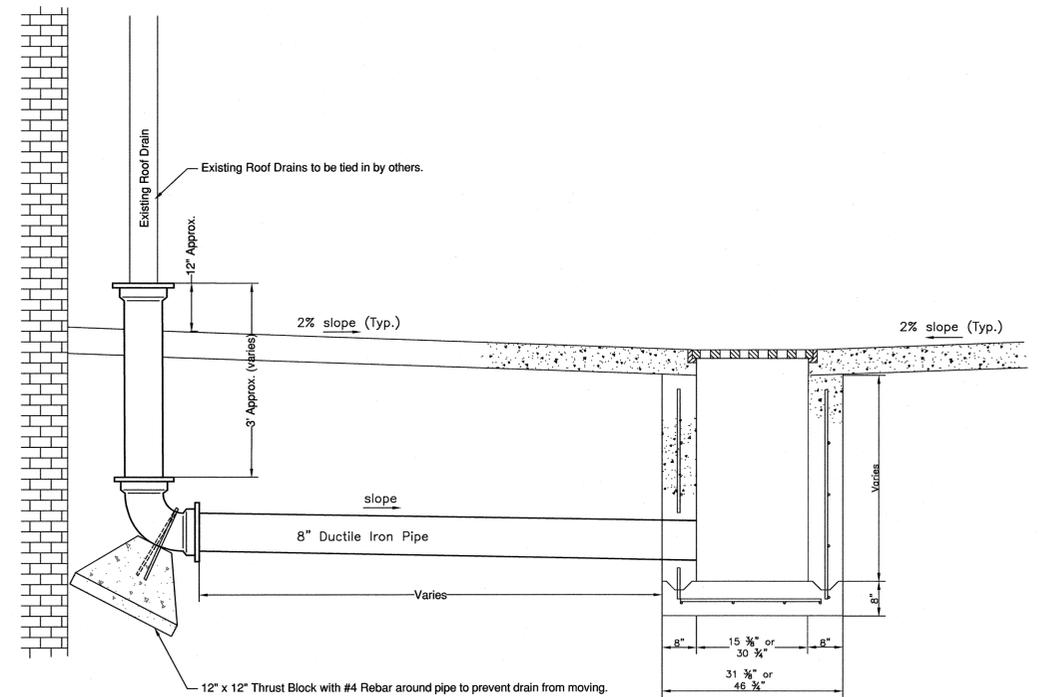


Side View



**DETAIL OF ALLEY INLET & FRAME AND GRATE**

Scale: None



**8" D.I.P Roof Drain Construction Detail**

Scale: None



**TYPICAL CROSS-SECTIONS & DETAILS**

Project: ALLEY = Between 1st & 2nd Street/St. Joe to Kansas Ave.			
Proj. No.: AID-2013-1			
Description: Typical Cross-Sections & Details			
Design By: R.G.D.	Date: 1/2016	Contractor:	
Drawn By: B.B.	Approved: <i>[Signature]</i>	Sheet No.: 2 of 11	

St. Joseph Ave.

Begin Project: Sta. 0+32

BOP = 0+00.00  
 277881.21  
 2068149.66

Control  
 N=277881.44  
 E=2068149.66

REMOVE PAVEMENT		
Station to Station	Side	Sq. Yds.
0+32 to 0+77	LT & RT	103.2
1+24 to 2+14	LT & RT	242.10
2+14 to 3+66	LT & RT	393.0

REMOVE STORM SEWER INLETS		
Station	Side	
1+38	7' LT	
1+89	5' RT	
1+89	7' LT	
2+66	7' LT	
2+66	6' RT	

REMOVE STORM SEWER PIPE			
Station to Station	Lin. Ft.	Side	
1+89	5.0	RT	
1+89	7.0	LT	
2+66	7.0	LT	
2+66	5.0	RT	

REMOVE EXISTING RAILROAD TRACKS & TIES			
Station to Station	Lin. Ft. (both rails included in 1 dist.)		
0+40 to 0+77	37.0		
1+37.5 to 3+00	162.5		

\* ONLY IF NEEDED - To be determined by Engineer

*REMOVE UNSUITABLE MATERIAL FOR SUB-BASE		
Station to Station	Cubic Yards	
0+32 to 3+66	250.0	

REMOVE EXISTING ROOF DRAIN		
Station	Side	Lin. Ft.
1+39	LT & RT	13.0
1+89	LT	7.0
2+65	LT	6.0
2+66	LT	5.0

BUILD FABRIC SILT FENCE- LOW POROSITY		
Station to Station	Side	L.F.
1+38	LT	20.0
1+89	LT	20.0
1+89	CL	20.0
2+66	LT	20.0
2+66	CL	20.0

- NOTE: 1. The Remove Storm Sewer Pipe Quantity shall cover all Types of pipe removal.  
 2. All Saw Cuts for Removal and Tie-in locations shall be subsidiary to it's removal item.  
 3. Contractor shall Salvage all Storm Sewer Inlet Frames and Grates. Frames and Grates to be re-installed during re-construction of inlets.  
 4. Fabric Silt Fence shall be installed and maintained around all inlets and inlet openings immediately after boxes have been removed and also after inlet walls are poured prior to installation of frames and grates.



**CITY OF HASTINGS, ENGINEERING DEPT.**

Project: ALLEY - Between 1st & 2nd, St. Joe to Kansas Ave.

Proj. No: AID-2013-1

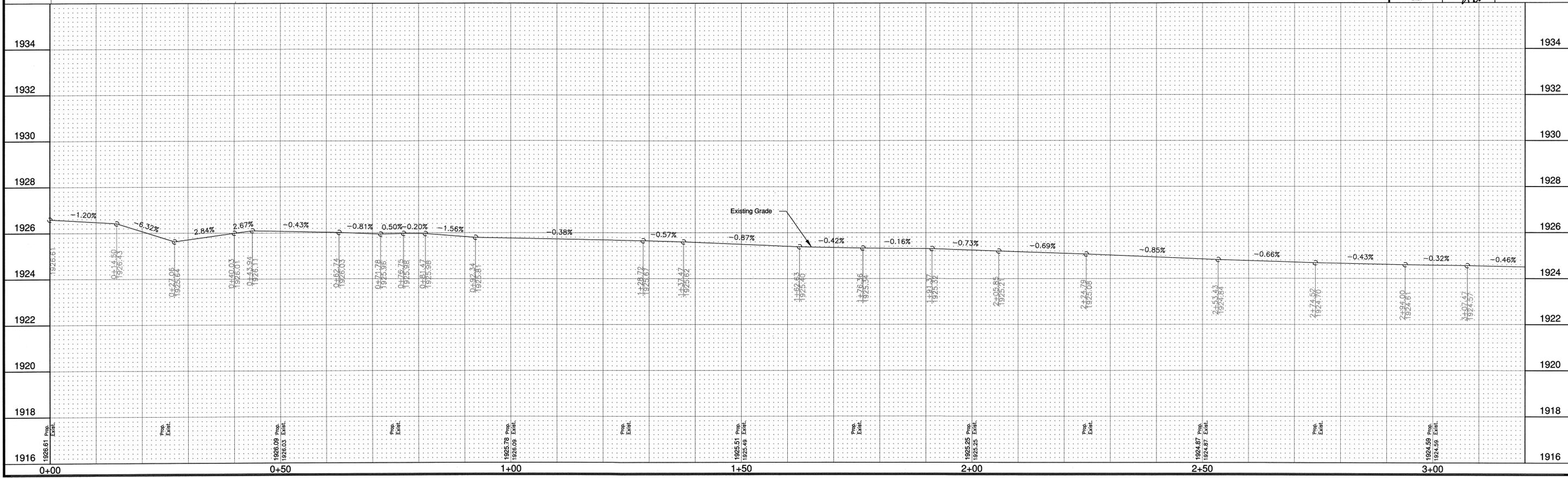
Description: Removal Plan

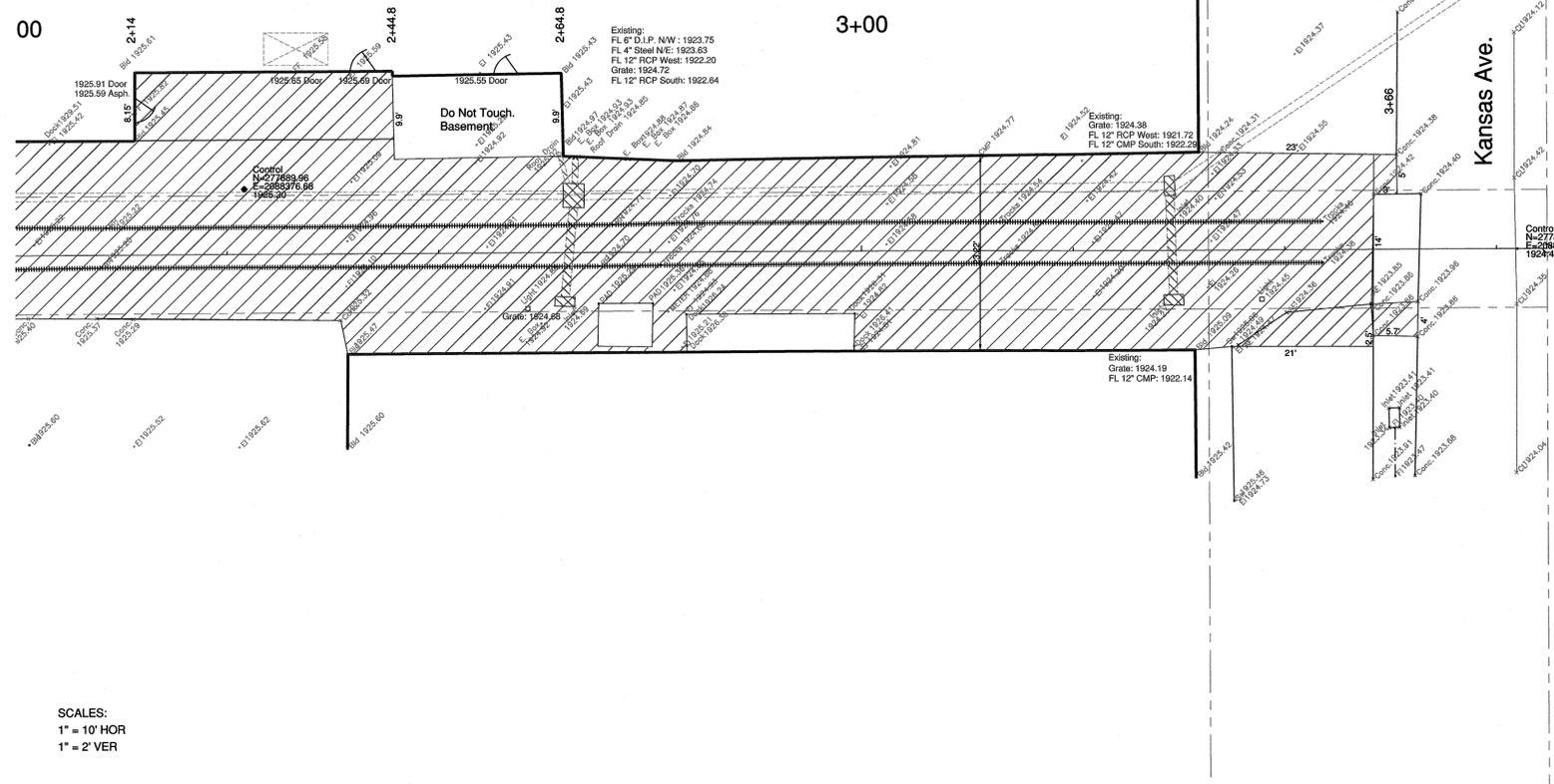
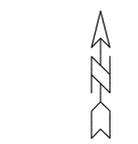
Design By: R.G.D. Date: 1/2016 Contractor: [Signature]

Drawn By: B.B. Approved By: [Signature] Dwn. No. 3 of 11

SCALES:  
 1" = 10' HOR  
 1" = 2' VER

T.B.M. = P.K. Nail in St. Joseph Ave.  
 Elev. = 1926.44





REMOVE PAVEMENT		
Station to Station	Side	Sq. Yds.
2+14 to 3+66	LT & RT	393.0

REMOVE STORM SEWER INLETS		
Station	Side	
3+36.5	7' LT	
3+36.5	6' RT	

REMOVE STORM SEWER PIPE		
Station to Station	Lin. Ft.	Side
3+36.5	7.0	LT
3+36.5	5.0	RT

REMOVE EXISTING RAILROAD TRACKS & TIES		
Station to Station	Lin. Ft. (both rails included in 1 dist.)	
3+00 to 3+55	55.0	

\* ONLY IF NEEDED - To be determined by Engineer

*REMOVE UNSUITABLE MATERIAL FOR SUB-BASE	
Station to Station	Cubic Yards
0+32 to 3+66	250.0

BUILD FABRIC SILT FENCE- LOW POROSITY		
Station to Station	Side	L.F.
3+36.5	LT	20.0
3+36.5	CL	20.0



- NOTE:
- The Remove Storm Sewer Pipe Quantity shall cover all Types of pipe removal.
  - All Saw Cuts for Removal and Tie-in locations shall be subsidiary to it's removal item.
  - Contractor shall Salvage all Storm Sewer Inlet Frames and Grates. Frames and Grates to be re-installed during re-construction of inlets.
  - Fabric Silt Fence shall be installed and maintained around all inlets and inlet openings immediately after boxes have been removed and also after inlet walls are poured prior to installation of frames and grates.



**CITY OF HASTINGS, ENGINEERING DEPT.**

Project: ALLEY - Between 1st & 2nd, St. Joe to Kansas Ave.

Proj. No. AID-2013-1

Description: Removal Plan

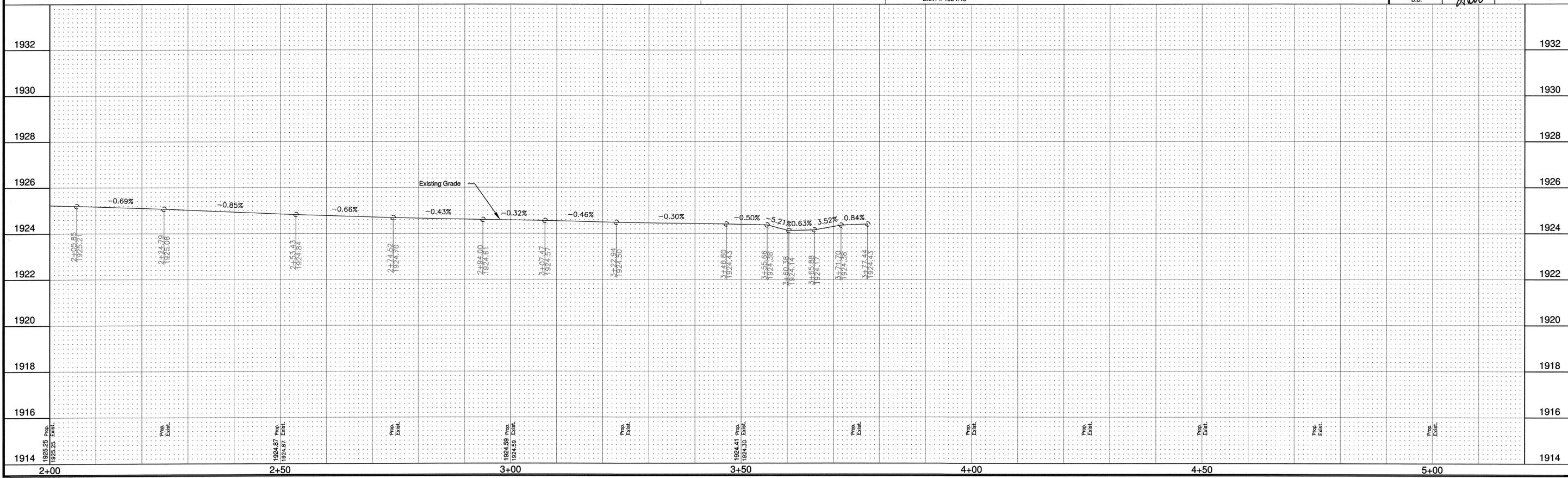
Design By: R.G.D. Date: 1/2016

Drawn By: B.B. Approved By: [Signature] Date: 3-28-2016

Contractor: [Blank] Im. No. 4 of 11

SCALES:  
1" = 10' HOR  
1" = 2' VER

T.B.M. = P.K. Nail in CL of Kansas Ave.  
Elev. = 1924.43



St. Joseph Ave.

Begin Project: Sta. 0+32

BOP = 0+00.00  
 TZ = 277881.21  
 = 2088149.66

SCALES:  
 1" = 10' HOR  
 1" = 2' VER

T.B.M. = P.K. Nail in St. Joseph Ave.  
 Elev. = 1926.44

- NOTES:
- Item Build 8" D.I.P. Roof Drain shall include all materials and labor needed to complete installation. Ex.= 90° elbows.
  - Class C Flyash shall be incorporated and uniformly mixed into the subgrade on this project at a depth of approx. one foot from bottom of pavement to help stabilize the subgrade.
  - Tar Paper or other approved items shall be placed around all pipes penetrating the concrete providing a bond breaker between the pipe and the concrete. A boxout is also acceptable.
  - Dock Area: Sta. 1+24 to approx. Sta. 1+76 Both Sides:  
 Staging of Dock Areas must be scheduled for routine deliveries during construction of this project.  
 Build Dock Area Sta. 1+24 to approx. Sta. 1+76 with 8" 47B High Early Concrete for opening to traffic in 2 days.  
 Dock area construction to be coordinated and phased with schedule of Dutton Lanson Company.  
 Keep at least 2 docks open at all times.

BUILD 8" P.C.C. PAVEMENT 47B		
Station to Station	Side	Sq. Yards
0+32 to 0+77	LT & RT	103.2
1+76 to 2+14	LT & RT	85.1

BUILD 8" P.C.C. PAVEMENT 47B HIGH EARLY		
Station to Station	Side	Sq. Yards
1+24 to 1+76	LT & RT	157.0

BUILD 8" D.I.P. ROOF DRAIN		
Station	Side	Lin. Ft.
1+39	RT	13.0
1+89	LT	7.0

BUILD 12" REINFORCED CONCRETE SEWER PIPE			
NO.	SLOPE	Lin. Ft.	DESCRIPTION
1	2.0%	8.0	Inlet #2 FL=1922.79 to Inlet #3 FL=1922.91

BUILD STORM SEWER INLET WITH SALVAGED FRAME & GRATE				
Inlet #	Station	T.S. Elev.	F.L. Elev.	Box Size
1	1+38 7"LT	25.40	23.54	30 3/4" x 28 11/16"
2	1+89 7"LT	22.68	20.12	30 3/4" x 28 11/16"
3	1+89 CL	22.40	19.88	15 3/8" x 28 11/16"

BUILD CLASS C FLYASH STABILIZED SUBGRADE		
Station to Station	Side	Tons
0+32 to 3+66	LT & RT	35.0

ADJUST MANHOLE TO GRADE		
Station	Side	Each
0+44	CL	1

\* If needed. To be determined by Engineer

BUILD EMBANKMENT for Subgrade		
Station to Station	Side	C.Y.
0+32 to 3+66	LT & RT	250.0



CITY OF HASTINGS, ENGINEERING DEPT.

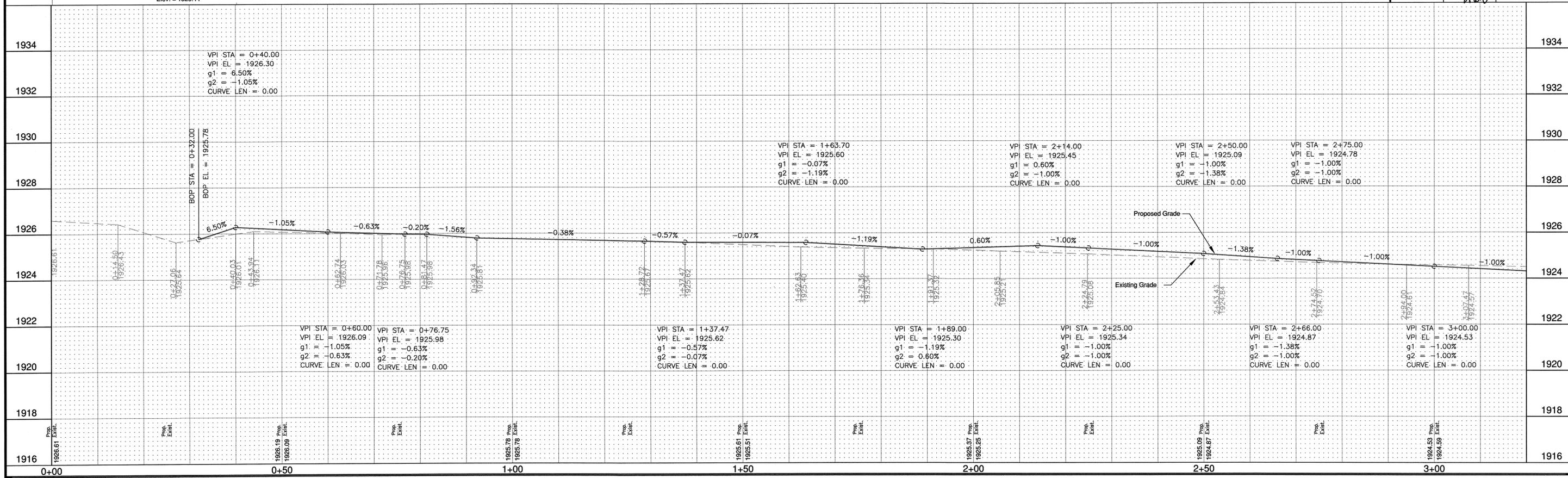
Project: ALLEY - Between 1st & 2nd, St. Joe to Kansas Ave.

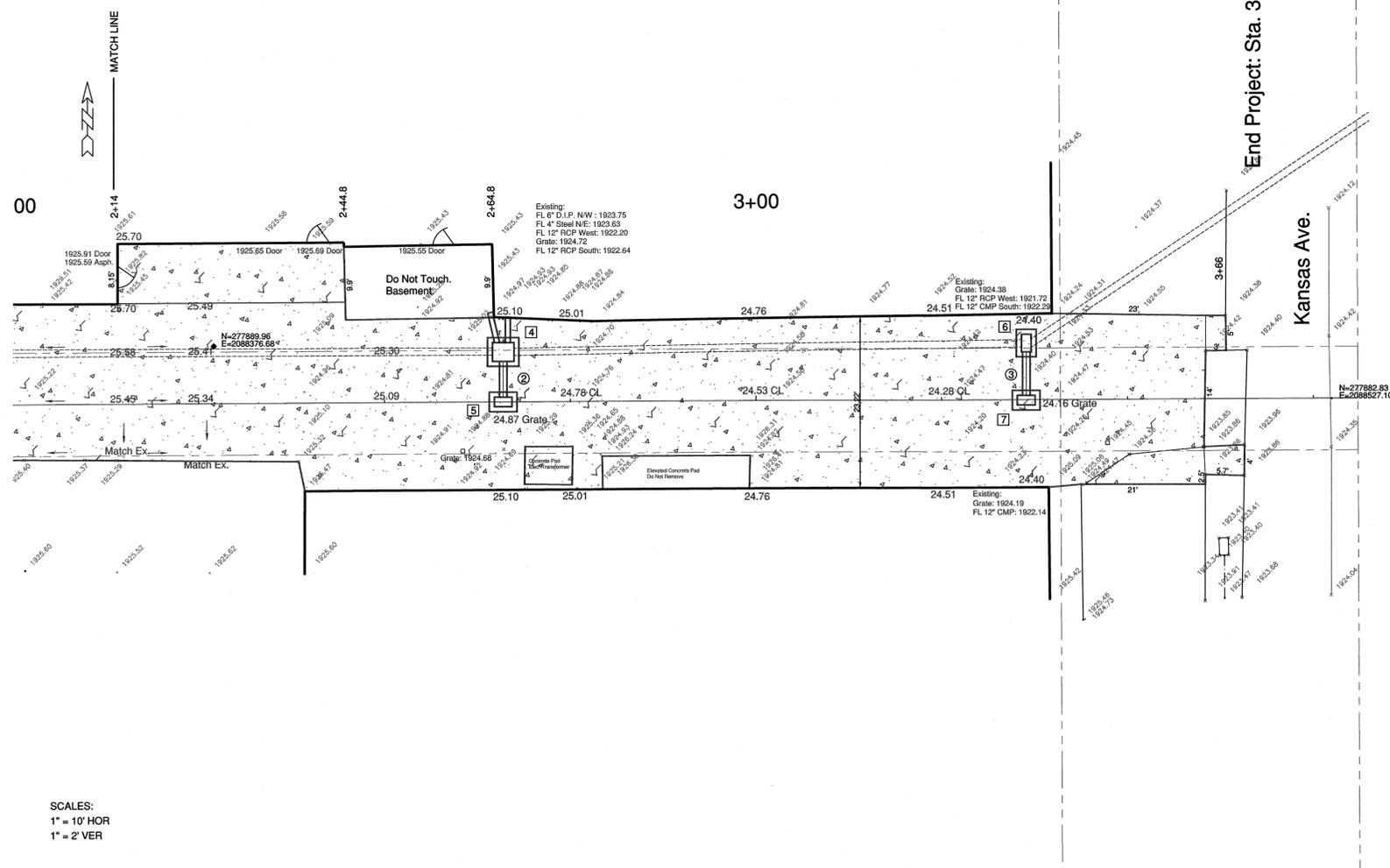
Proj. No.: AID-2013-1

Description: Construction Plan

Design By: R.G.D. Date: 1/2016 Contractor:

Drawn By: B.B. Approved By: [Signature] Dm. No.: 5 of 11





End Project: Sta. 3+66

SCALES:  
1" = 10' HOR  
1" = 2' VER

BUILD 8" P.C.C. PAVEMENT 47B		
Station to Station	Side	Sq. Yards
2+14 to 3+66	LT & RT	393.0

BUILD 8" D.I.P. ROOF DRAIN		
Station	Side	Lin. Ft.
2+65	LT	6.0
2+66	LT	5.0

BUILD 12" REINFORCED CONCRETE SEWER PIPE			
NO.	SLOPE	Lin. Ft.	DESCRIPTION
2	2.0%	6.0	Inlet #4 FL=1922.20 to Inlet #6 FL=1922.32
3	2.0%	6.0	Inlet #6 FL=1921.72 to Inlet #7 FL=1921.94

BUILD STORM SEWER INLET WITH SALVAGED FRAME & GRATE					
Inlet #	Station	T.S. Elev.	F.L. Elev.	Box Size	
4	2+66 7'LT	25.08	22.20	30 3/4" x 28 11/16"	
5	2+66 CL	24.87	22.32	15 3/8" x 28 11/16"	
6	3+36.5 7'LT	24.30	21.72	15 3/8" x 28 11/16"	
7	3+36.5 CL	24.16	21.84	15 3/8" x 28 11/16"	

BUILD CLASS C FLYASH STABILIZED SUBGRADE		
Station to Station	Side	Tons
0+32 to 3+66	LT & RT	35.0

\* If needed. To be determined by Engineer

* BUILD EMBANKMENT for Subgrade		
Station to Station	Side	C.Y.
0+32 to 3+66	LT & RT	250.0

- NOTES:
- Item Build 8" D.I.P. Roof Drain shall include all materials and labor needed to complete installation. Ex.= 90° elbows,
  - Class C Flyash shall be incorporated and uniformly mixed into the subgrade on this project at a depth of approx. one foot from bottom of pavement to help stabilize the subgrade.
  - Tar Paper or other approved items shall be placed around all pipes penetrating the concrete providing a bond breaker between the pipe and the concrete. A boxout is also acceptable.



**CITY OF HASTINGS, ENGINEERING DEPT.**

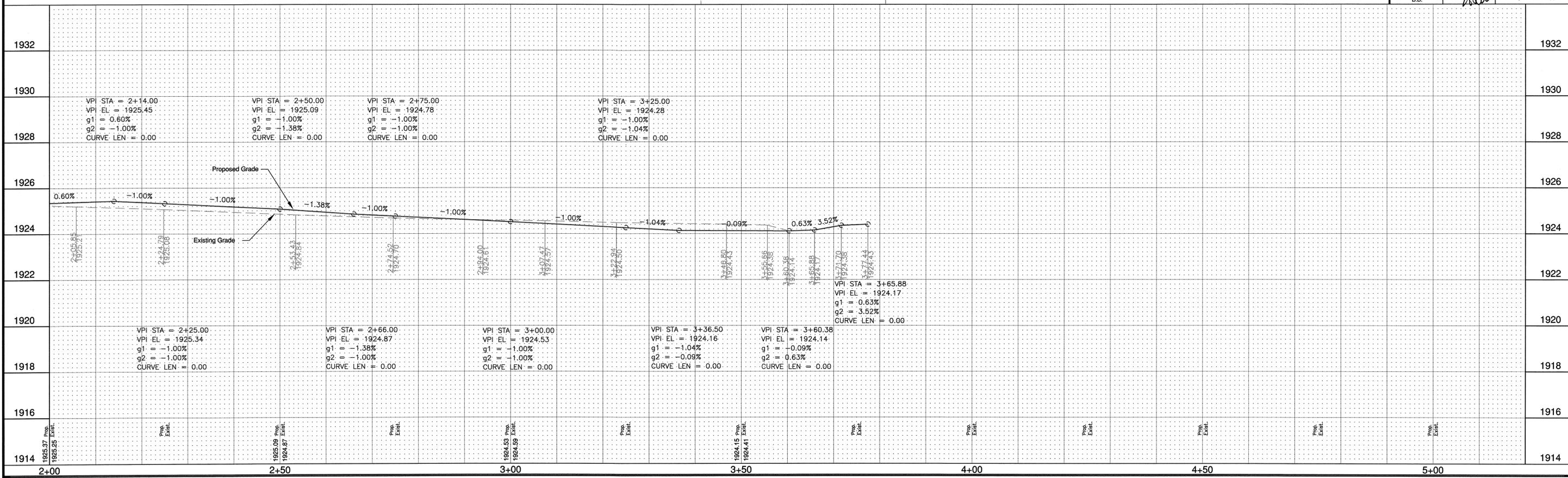
Project: ALLEY - Between 1st & 2nd, St. Joe to Kansas Ave.

Proj. No.: AID-2013-1

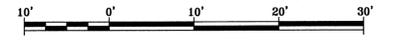
Description: Construction Plan

Design By: R.G.D. Date: 1/2016 Contractor:

Drawn By: B.B. Approved By: [Signature] In. No.: 6 of 11



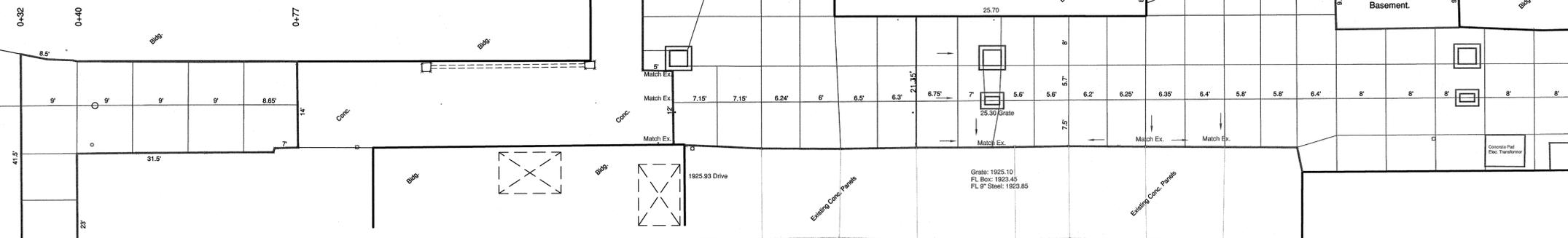
NORTH  
Scale: 1"=10'



St. Joseph Ave.

1+00

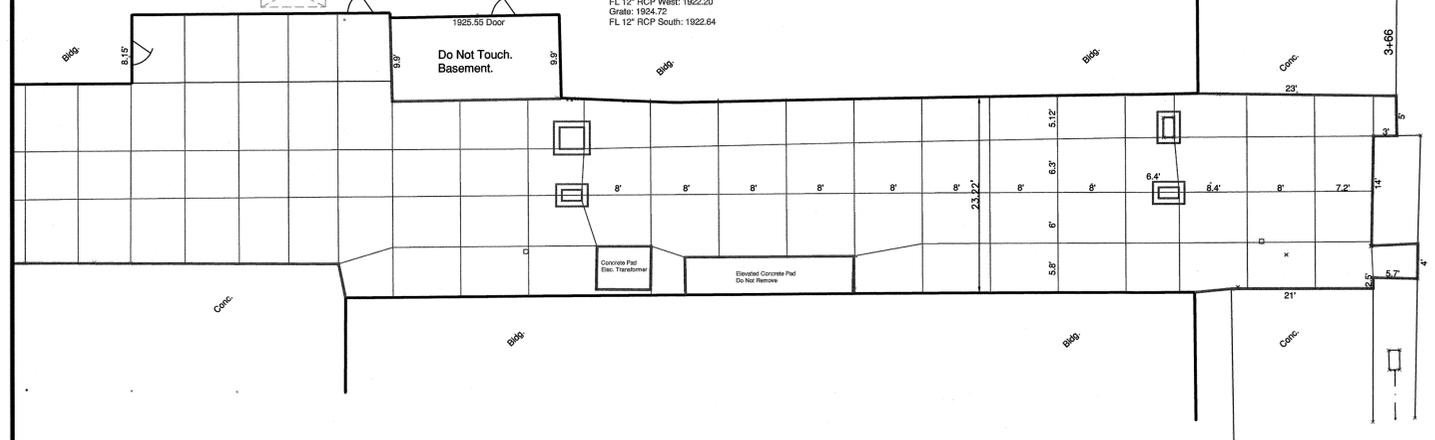
2+00



2+00

3+00

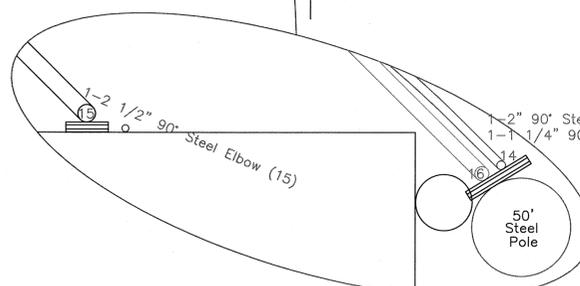
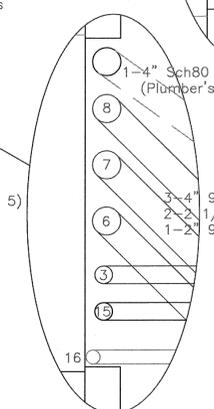
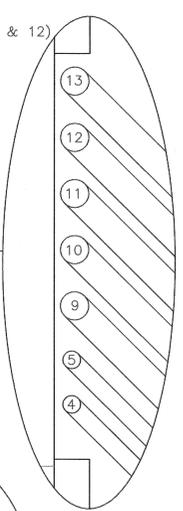
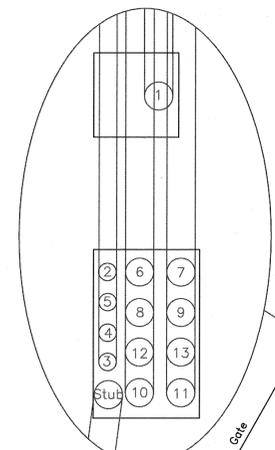
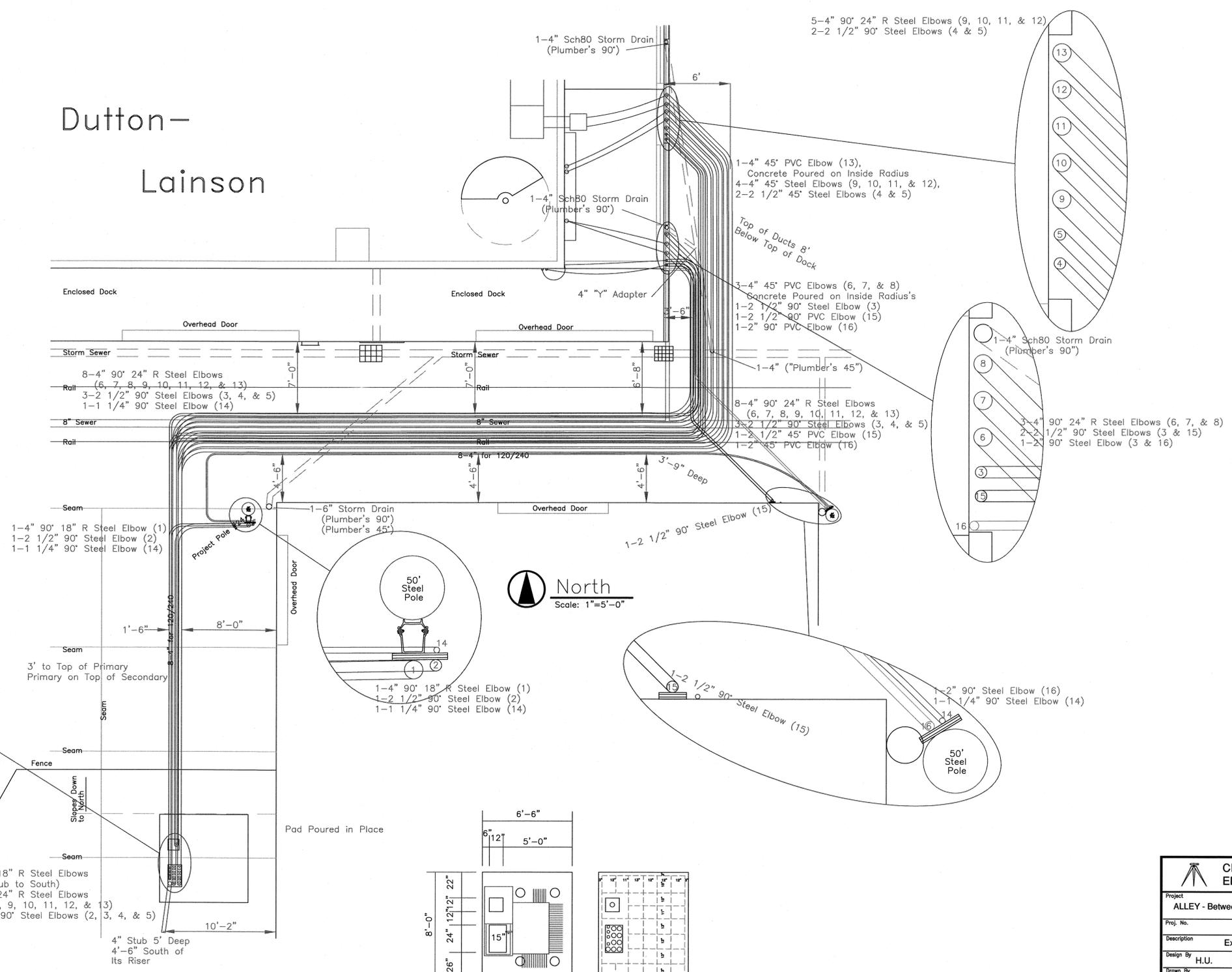
Kansas Ave.



CITY OF HASTINGS, ENGINEERING DEPT.			
Project	ALLEY - Between 1st & 2nd Street/St. Joe to Kansas Ave.		
Proj. No.	AID-2013-1		
Description	Joint Detail		
Design By	R.G.D.	Date	1/2016
Drawn By	B.B.	Approved By	<i>[Signature]</i>
Contractor		Drn. No.	7 of 11

# Dutton- Lainson

- Duct #1: 3-#2 15KV Aluminum Primary
- Duct #2: 2-#8 Copper (1-White, 1-Black)
- Duct #3: 4/0-4/0-2/0 600V URD Triplex
- Duct #4: Empty Spare
- Duct #5: Empty Spare
- Duct #6: Empty Spare
- Duct #7: 4-500MCM Copper
- Duct #8: 4-500MCM Copper
- Duct #9: Empty Spare
- Duct #10: 4-500MCM Copper
- Duct #11: 4-500MCM Copper
- Duct #12: 4-500MCM Copper
- Duct #13: 4-500MCM Copper
- Duct #14: 2-#8 Copper (1-White, 1-Black)
- Duct #15: 4/0-4/0-2/0 600V URD Triplex
- Duct #16: Empty for Phone



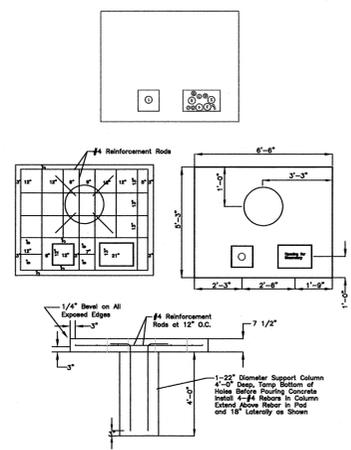
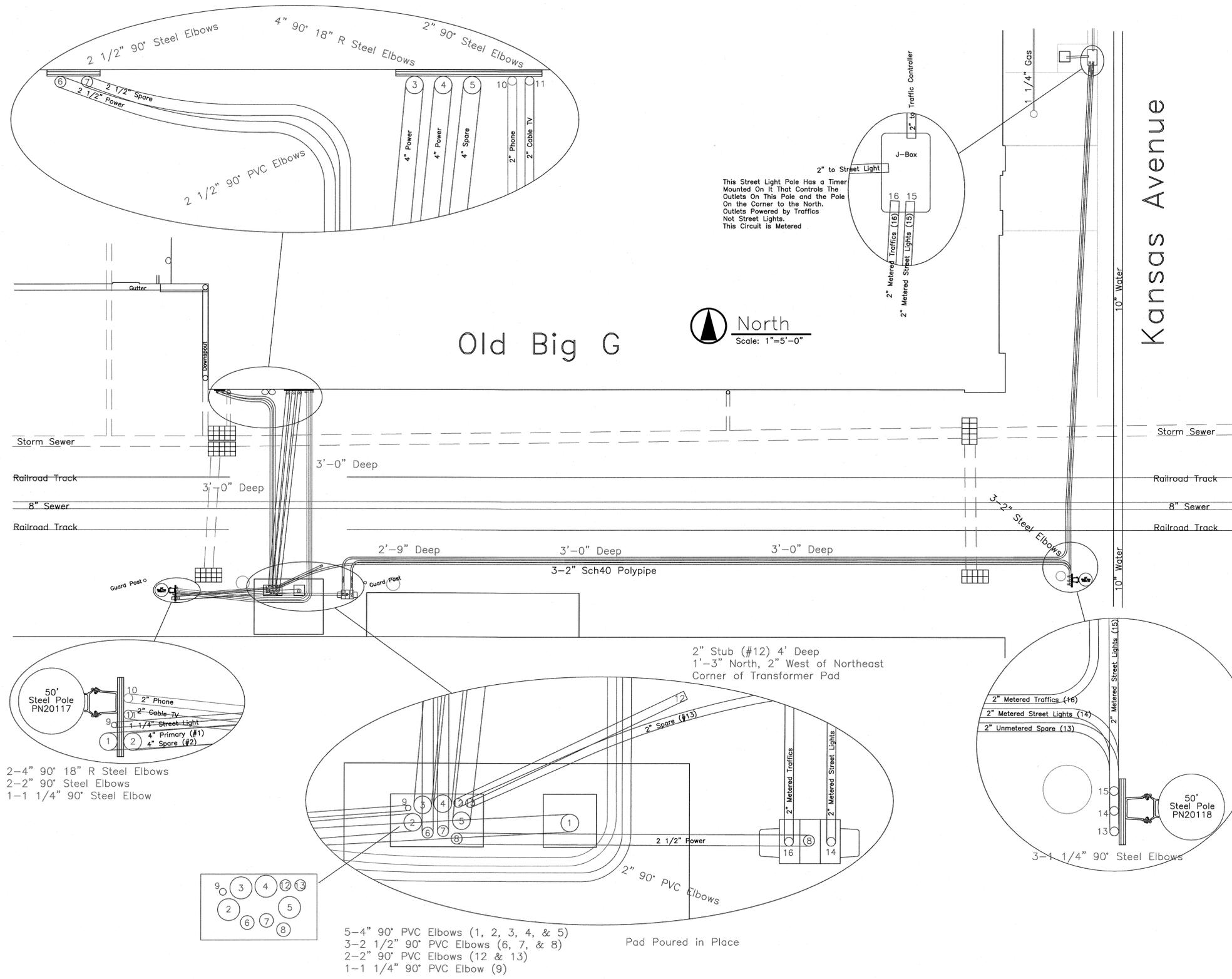
**Existing Electrical Conduit: For Information Only.**

<b>CITY OF HASTINGS, ENGINEERING DEPT.</b>	
Project: ALLEY - Between 1st & 2nd Street/St. Joe to Kansas Ave.	
Proj. No.: AID-2013-1	
Description: Existing Underground Electrical	
Design By: H.U.	Date: 1/2016
Drawn By: H.U.	Approved By: [Signature]
Contractor: [Blank] Dm. No.: 8 of 11	

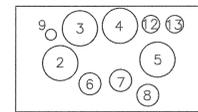
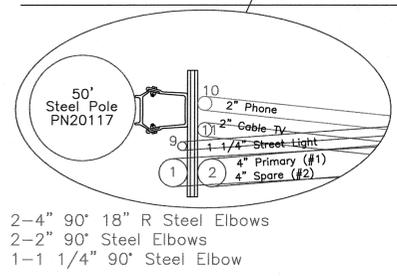
**HASTINGS UTILITIES**  
Hastings, Nebraska

**Conversion from 4.16KV to 13.8KV in the Alley Between 1st Street and 2nd Street, Burlington Avenue to Minnesota Avenue**

Network: Neighborhood/Cod/Electric/EOH/E-OH-381-10A	
Sup'l: Dan T. Waite	Sup'l: J. Yocom
W.O.No.: EL-78	Ckd: [Blank]
Drwn: T. Waite	Ret'mt No.: EL-79
Date: 10-12-07	App: [Blank]
No. E-OH-381 Sheet 10A of 16	



North  
Scale: 1"=5'-0"



5-4" 90° PVC Elbows (1, 2, 3, 4, & 5)  
3-2 1/2" 90° PVC Elbows (6, 7, & 8)  
2-2" 90° PVC Elbows (12 & 13)  
1-1 1/4" 90° PVC Elbow (9)

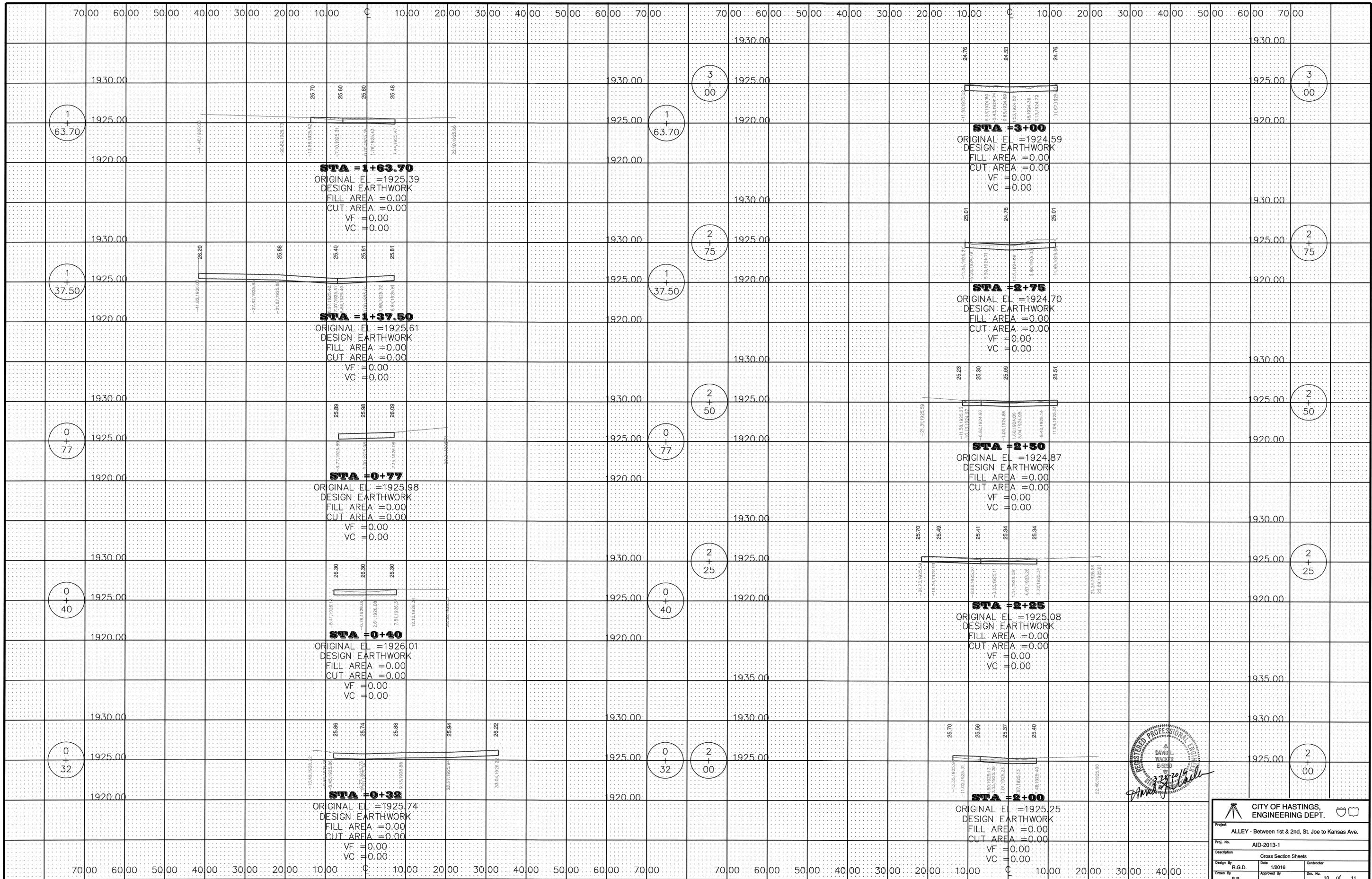
Pad Poured in Place

Existing Electrical Conduit: For Information Only.

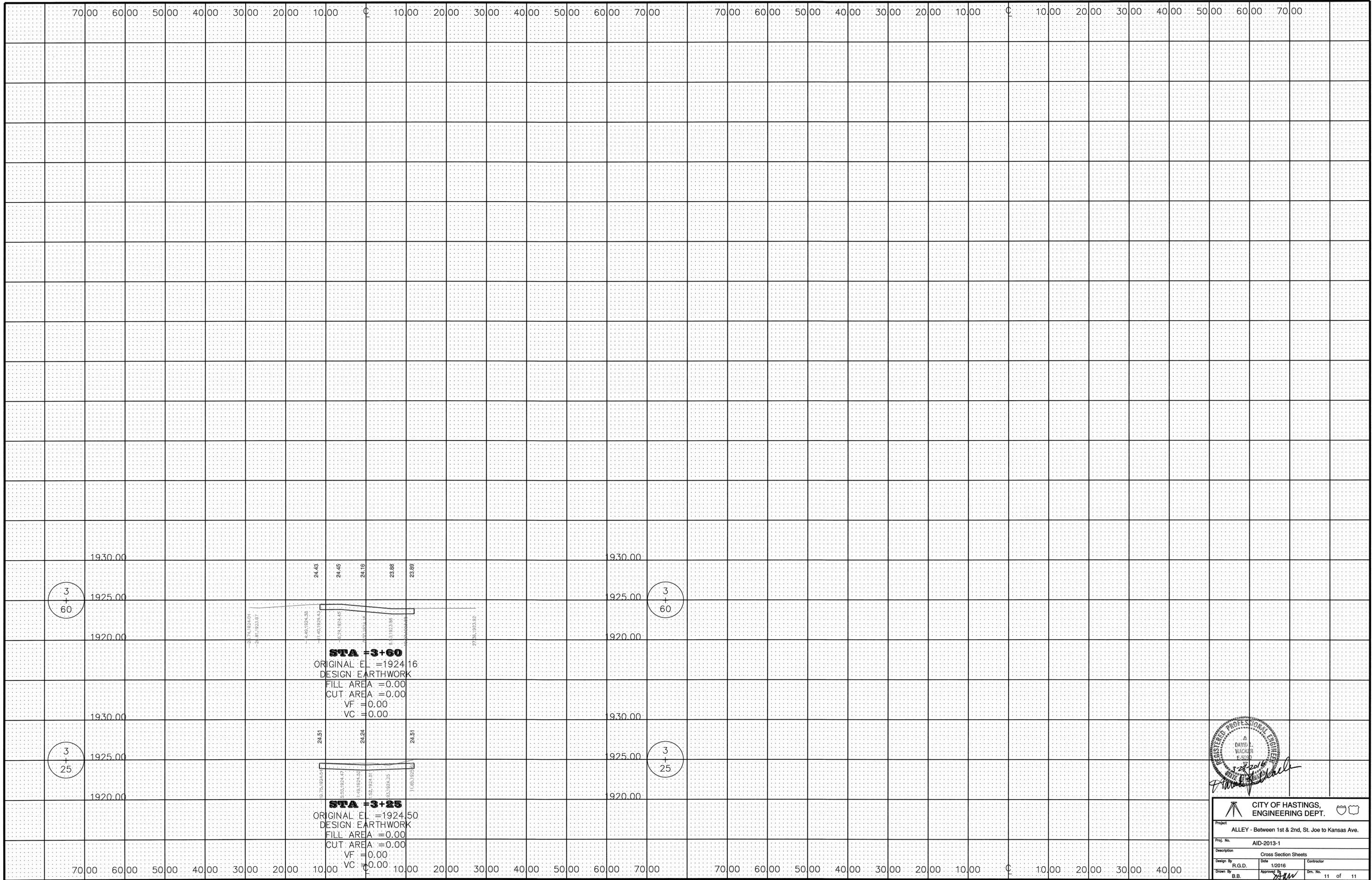
<b>CITY OF HASTINGS, ENGINEERING DEPT.</b>			
Project: ALLEY - Between 1st & 2nd Street/St. Joe to Kansas Ave.			
Proj. No. AID-2013-1			
Description: Existing Underground Electrical			
Design By	H.U.	Date	1/2016
Drawn By	H.U.	Approved By	9 of 11

**HASTINGS UTILITIES**  
 Hastings, Nebraska  
 Conversion from 4.16KV to 13.8KV in the Alley Between 1st Street and 2nd Street, Burlington Avenue to Minnesota Avenue

Network Neighborhood/Cad/Electric/EDH/E-0H-381-11A			
Drwn	T. Waite	Sup'l.	J. Yocom
W.O.No.	EL-78	Ckd	No.
Date	10-12-07	Ret'mt No.	EL-79
			E-OH-381
			Sheet 11A of 16

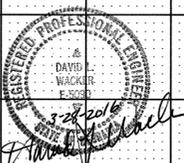


 <b>CITY OF HASTINGS, ENGINEERING DEPT.</b>		
Project: ALLEY - Between 1st & 2nd, St. Joe to Kansas Ave.		
Proj. No. AID-2013-1		
Description: Cross Section Sheets		
Design By: R.G.D.	Date: 1/2016	Contractor:
Drawn By: B.B.	Approved By:	Dim. No. 10 of 11

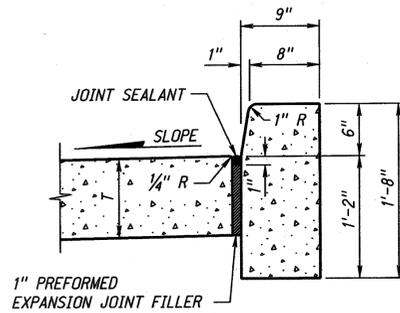


**STA = 3+60**  
 ORIGINAL E.L. = 1924.16  
 DESIGN EARTHWORK  
 FILL AREA = 0.00  
 CUT AREA = 0.00  
 VF = 0.00  
 VC = 0.00

**STA = 3+25**  
 ORIGINAL E.L. = 1924.50  
 DESIGN EARTHWORK  
 FILL AREA = 0.00  
 CUT AREA = 0.00  
 VF = 0.00  
 VC = 0.00

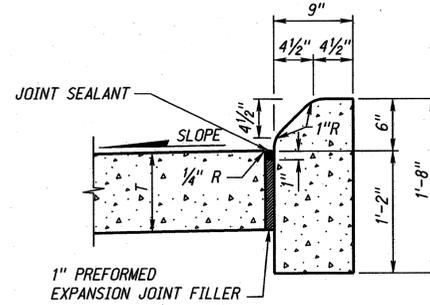


CITY OF HASTINGS, ENGINEERING DEPT.		
Project: ALLEY - Between 1st & 2nd, St. Joe to Kansas Ave.		
Proj. No. AID-2013-1		
Description: Cross Section Sheets		
Design By: R.G.D.	Date: 1/2016	Contractor:
Drawn By: B.B.	Approved By: <i>[Signature]</i>	Dm. No. 11 of 11



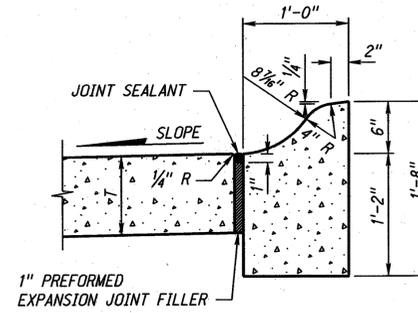
**CONCRETE BARRIER CURB \***

QUANTITIES  
 CONCRETE 4.55 CU. YDS./STA.  
 AREA 1.228 SQ. FT.



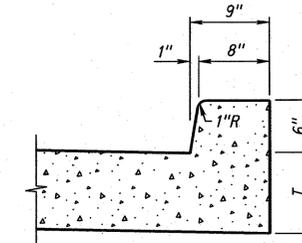
**CONCRETE MEDIAN CURB \***

QUANTITIES  
 CONCRETE 4.42 CU. YDS./STA.  
 AREA 1.192 SQ. FT.



**CONCRETE CURB, \*  
TYPE I**

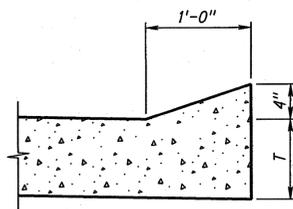
QUANTITIES  
 CONCRETE 5.22 CU. YDS./STA.  
 AREA 1.408 SQ. FT.



**INTEGRAL CONCRETE BARRIER CURB**

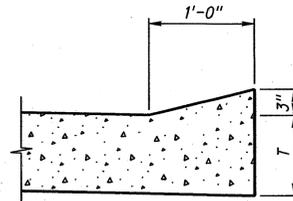
NOTE: MAY BE USED WHEN T IS LESS THAN 12"  
 QUANTITIES  
 CONCRETE 1.33 CU. YDS./STA.  
 AREA 0.359 SQ. FT.

NOTE: \* ONE INCH PREFORMED EXPANSION JOINT FILLER SHALL BE PLACED AT INTERVALS OF NOT MORE THAN 100 FT. THRU CONCRETE BARRIER CURB, CONCRETE MEDIAN CURB, AND CONCRETE CURB, TYPE I.



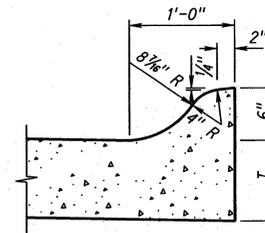
**INTEGRAL CONCRETE SLOPING CURB**

QUANTITIES  
 CONCRETE 0.62 CU. YDS./STA.  
 AREA 0.167 SQ. FT.



**INTEGRAL CONCRETE SLOPING CURB**

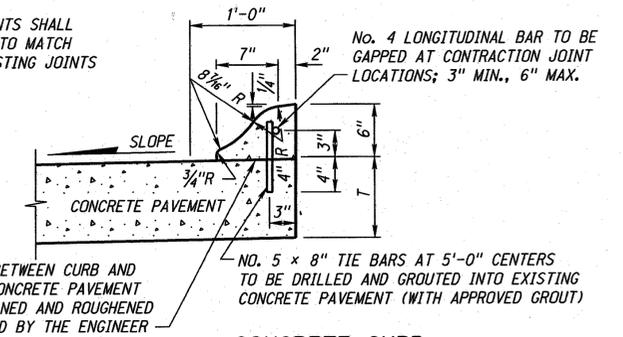
QUANTITIES  
 CONCRETE 0.46 CU. YDS./STA.  
 AREA 0.123 SQ. FT.



**INTEGRAL CONCRETE CURB**

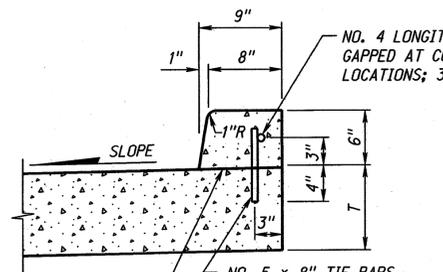
QUANTITIES  
 CONCRETE 0.89 CU. YDS./STA.  
 AREA 0.239 SQ. FT.

CONTRACTION JOINTS SHALL BE CONSTRUCTED TO MATCH LOCATION OF EXISTING JOINTS



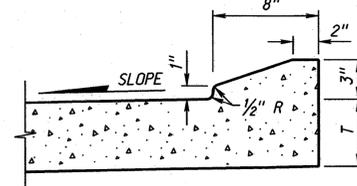
**CONCRETE CURB, \*  
TYPE II**

QUANTITIES  
 CONCRETE 0.87 CU. YDS./STA.  
 AREA 0.234 SQ. FT.



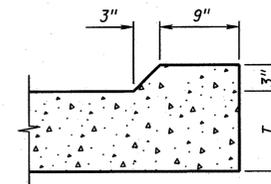
**CONCRETE BARRIER CURB ALTERNATE**

QUANTITIES  
 CONCRETE 1.33 CU. YDS./STA.  
 AREA 0.359 SQ. FT.



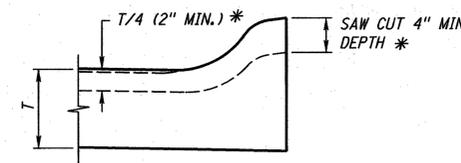
**INTEGRAL CONCRETE TRUCK APRON CURB**

QUANTITIES  
 CONCRETE 0.47 CU. YDS./STA.  
 AREA 0.127 SQ. FT.



**EROSION CONTROL CURB**

QUANTITIES  
 CONCRETE 0.81 CU. YDS./STA.  
 AREA 0.219 SQ. FT.



**CONTRACTION JOINT THRU CURB**

\* FOR NON-INTEGRAL CURB THE CONTRACTION JOINTS MAY BE MADE WITH A DOUBLE EDGER WHILE THE CONCRETE IS STILL PLASTIC.

NOTE: T = PAVEMENT THICKNESS

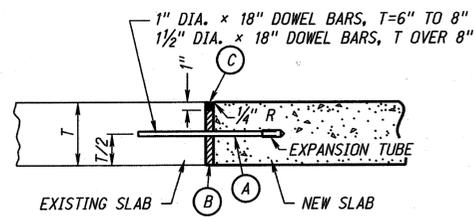
REV. NO.	DATE	DESCRIPTION OF REVISION
R11	JUL 15	ADDED TRUCK APRON CURB
R10	FEB 09	MULTIPLE REVISIONS
R9	MAR 05	MULTIPLE REVISIONS

NEBRASKA DEPARTMENT OF ROADS  
 STANDARD PLAN NO. 301-R11  
**PAVEMENT DETAILS**

ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM



DATE: 4/6/15  
 ORIGINAL: JANUARY 31, 1974  
 DATE



- (A) GREASE DOWEL BAR ON EXPANSION TUB SIDE
- (B) 1" PREFORMED EXPANSION JOINT FILLER
- (C) JOINT SEALANT

NOTES:

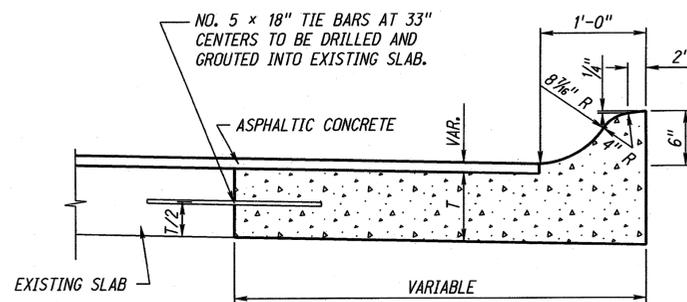
DOWEL BARS SHALL BE DRILLED TO A DEPTH OF 8" INTO EXISTING SLAB AND GROUTED.

DOWEL BARS SHALL BE PLACED AT 1'-0" CENTERS. THE OUTSIDE DOWEL BAR SHALL BE PLACED 6" FROM THE EDGE OF THE SLAB.

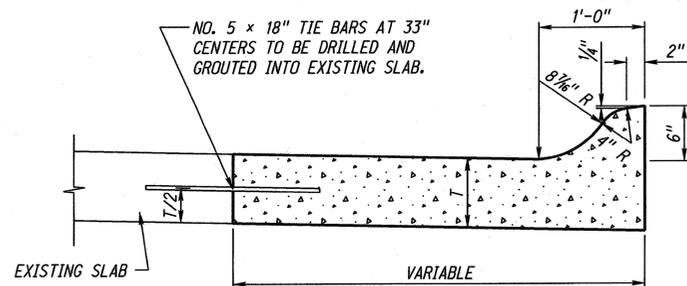
THIS JOINT SHALL BE CONSTRUCTED TRANSVERSE TO THE ROADWAY WHERE THE NEW CONCRETE ABUTS THE EXISTING CONCRETE.

DOWEL BARS SHALL BE PLACED PARALLEL TO THE ROADWAY & AND TO THE ROADBED.

EXPANSION JOINT (SUBSIDIARY)

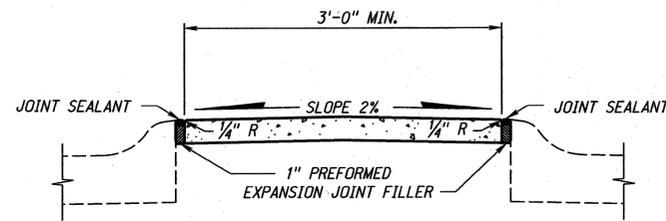


CONCRETE BASE COURSE W/INTEGRAL CURB



THE FOLLOWING NOTE IS TYPICAL FOR CONCRETE BASE COURSE W/INTEGRAL CURB AND CONCRETE PAVEMENT WIDENING: CONTRACTION AND EXPANSION JOINTS SHALL BE CONSTRUCTED TO MATCH LOCATIONS OF EXISTING JOINTS.

CONCRETE PAVEMENT WIDENING



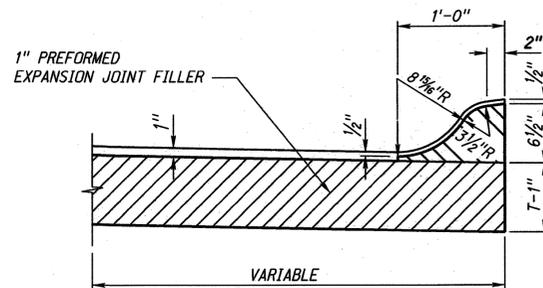
CONCRETE MEDIAN SURFACING

ONE INCH PREFORMED EXPANSION JOINT FILLER SHALL BE PLACED ACROSS THE FULL WIDTH OF THE MEDIAN SURFACING AT INTERVALS OF NOT MORE THAN 49'-0".

LONGITUDINAL JOINTS ONE INCH DEEP SHALL BE MADE IN ALL MEDIANS WHEN SURFACING WIDTH IS 16'-0" OR GREATER.

TRANSVERSE JOINTS ONE INCH DEEP SHALL BE MADE IN ALL MEDIANS AT INTERVALS OF NOT MORE THAN 8'-0".

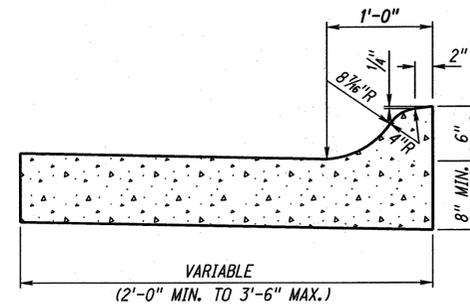
TRANSVERSE AND LONGITUDINAL JOINTS SHALL NOT BE FILLED.



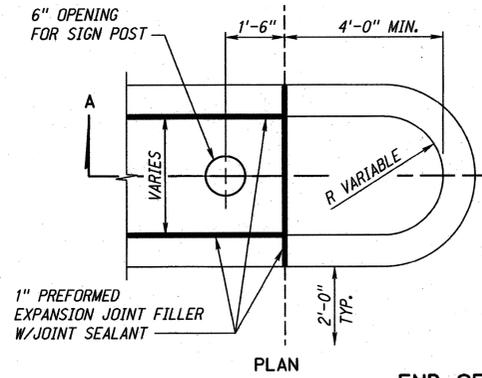
ONE INCH PREFORMED EXPANSION JOINT FILLER SHALL BE PLACED AT INTERSECTION RETURNS AND WHERE SHOWN ON THE PLANS. TRANSVERSE JOINTS SHALL BE PROVIDED EVERY 8'-0" OR WHERE SHOWN ON THE PLANS.

NOTE: RECESS THE EXPANSION JOINT FILLER 1/2" FROM THE TOP SURFACE OF THE CURB TYPE UNDER CONSTRUCTION

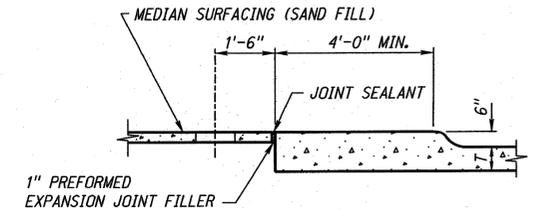
DETAIL FOR CUTTING EXPANSION JOINT FILLER



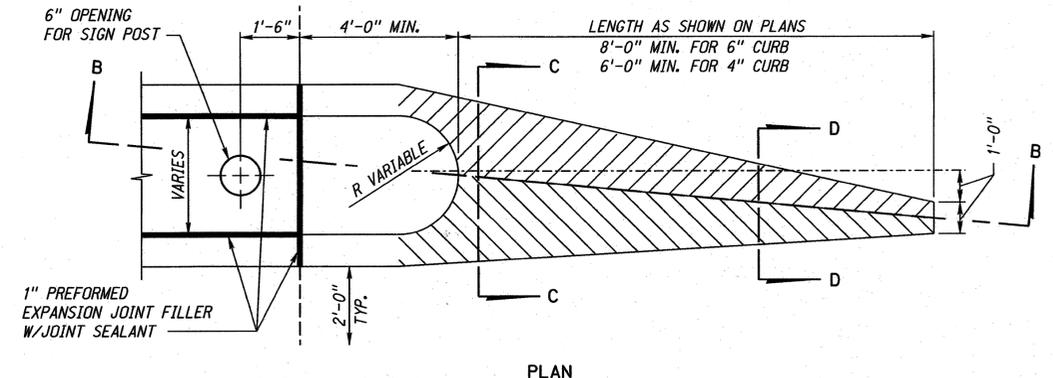
COMBINATION CONCRETE CURB & GUTTER



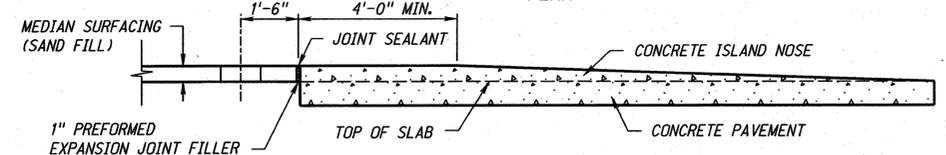
END OF MEDIAN ISLAND



SECTION A-A



PLAN



SECTION B-B



SECTION C-C



SECTION D-D

CONCRETE ISLAND NOSE

NOTE: EXISTING CONCRETE PAVEMENT IS TO BE REMOVED TO BUILD CONCRETE ISLAND NOSE.

NOTE: T = PAVEMENT THICKNESS

REV. NO.	DATE	DESCRIPTION OF REVISION
R11	JUL 15	ADDED TRUCK APRON CURB
R10	FEB 09	MULTIPLE REVISIONS
R9	MAR 05	MULTIPLE REVISIONS

NEBRASKA DEPARTMENT OF ROADS  
STANDARD PLAN NO. 301-R11  
PAVEMENT DETAILS

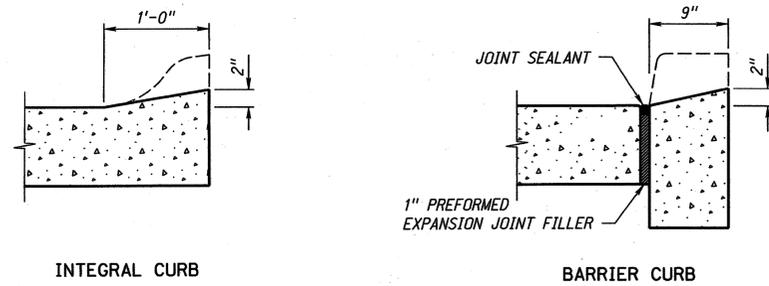
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM:



ACCEPTED BY: *Howard H. Schwartz*

DATE: 4/6/15

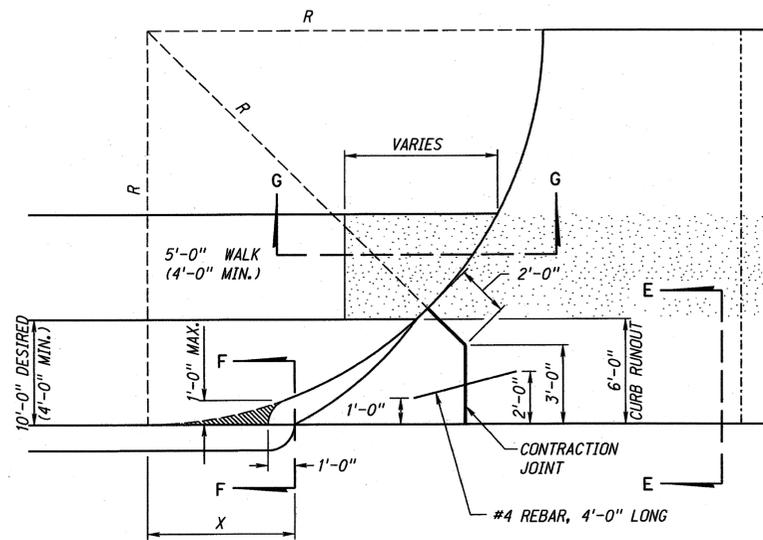
ORIGINAL: JANUARY 31, 1974  
DATE



INTEGRAL CURB

BARRIER CURB

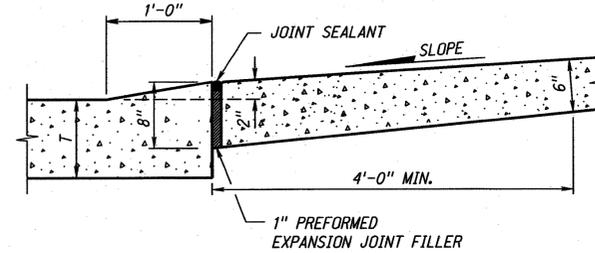
DETAILS OF CURB DROPS



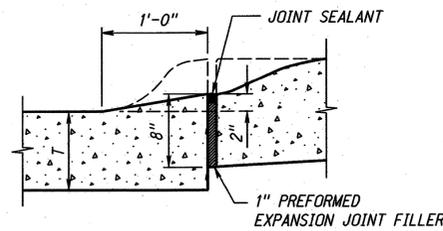
URBAN DRIVEWAY PLAN

R	X
5'-0"	3.00'
10'-0"	4.36'
15'-0"	5.38'
20'-0"	6.24'
25'-0"	7.00'
30'-0"	7.68'
35'-0"	8.31'
40'-0"	8.89'

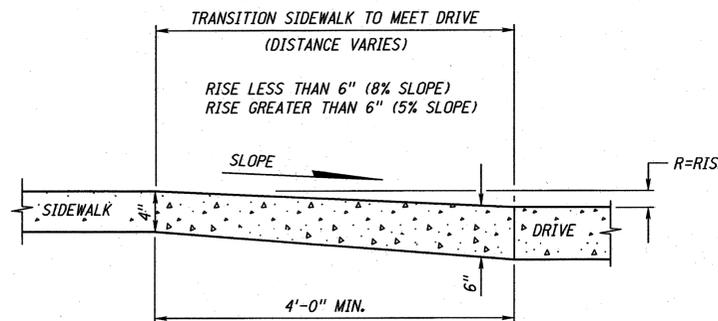
R = RADIUS  
X =  $\sqrt{(2R-1)}$   
(X & R IN FEET)



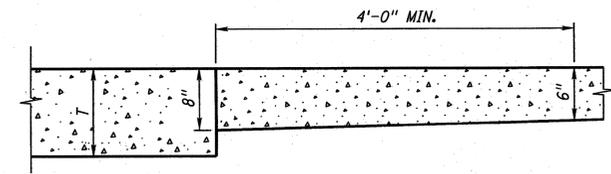
SECTION E-E



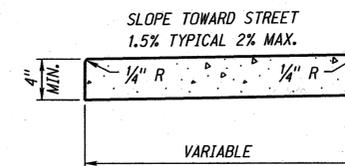
SECTION F-F



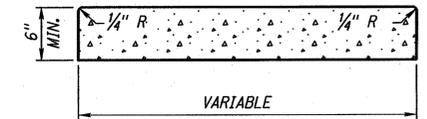
SECTION G-G



(RURAL DRIVEWAY)



SIDEWALK

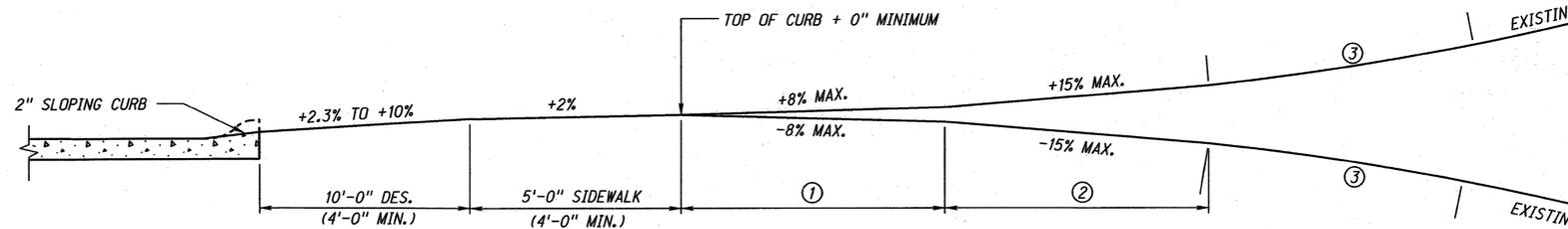


SIDEWALK AT DRIVEWAY

NOTE:

1" PREFORMED EXPANSION JOINT FILLER SHALL BE PLACED IN ALL SIDEWALKS OR CROSSWALKS AT INTERVALS OF NOT MORE THAN 50'-0", AND AT ALL POINTS WHERE SIDEWALKS OR CROSSWALKS ARE ADJACENT TO CURB. IF SIDEWALK OR CROSSWALK TO BE CONSTRUCTED IS LESS THAN 50'-0" IN LENGTH, ONE SUCH EXPANSION JOINT SHALL BE PLACED AS DIRECTED BY THE ENGINEER.

NOTE: T = PAVEMENT THICKNESS



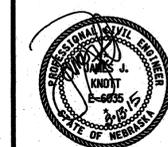
PROFILE URBAN DRIVEWAY WITH SIDEWALK  
(MAXIMUM PERCENT OF GRADE)

- ① 10'-0" MINIMUM IS REQUIRED WHEN THE EXISTING GRADE IS GREATER THAN ±8%
- ② 10'-0" MINIMUM IS REQUIRED WHEN THE EXISTING GRADE IS GREATER THAN ±15%
- ③ 10'-0" MINIMUM ROUNDING IS REQUIRED WHEN THE EXISTING GRADE IS GREATER THAN ±22%

REV. NO.	DATE	DESCRIPTION OF REVISION
R11	JUL 15	ADDED TRUCK APRON CURB
R10	FEB 09	MULTIPLE REVISIONS
R9	MAR 05	MULTIPLE REVISIONS

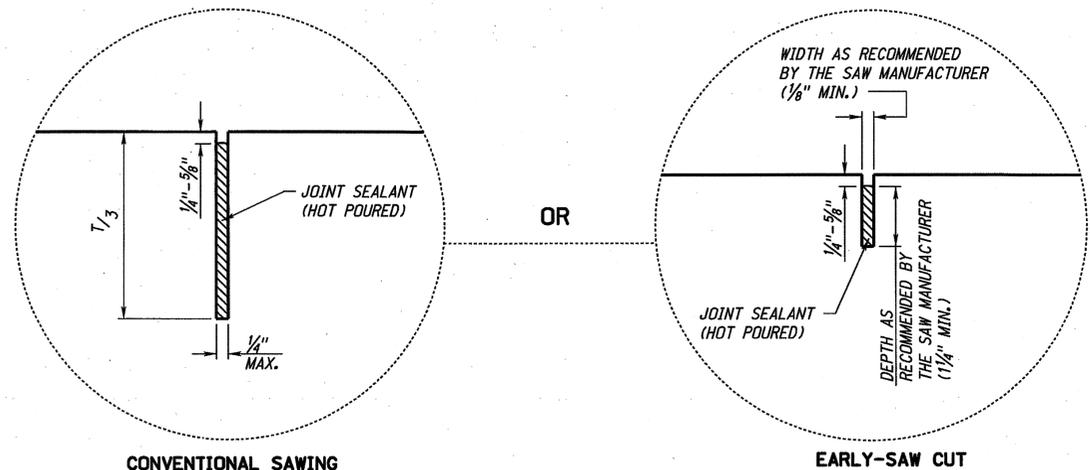
NEBRASKA DEPARTMENT OF ROADS  
STANDARD PLAN NO. 301-R11  
PAVEMENT DETAILS

ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM



ACCEPTED BY  
*Howard A. Schwartz*  
DATE: 4/6/15  
ORIGINAL:  
JANUARY 31, 1974  
DATE



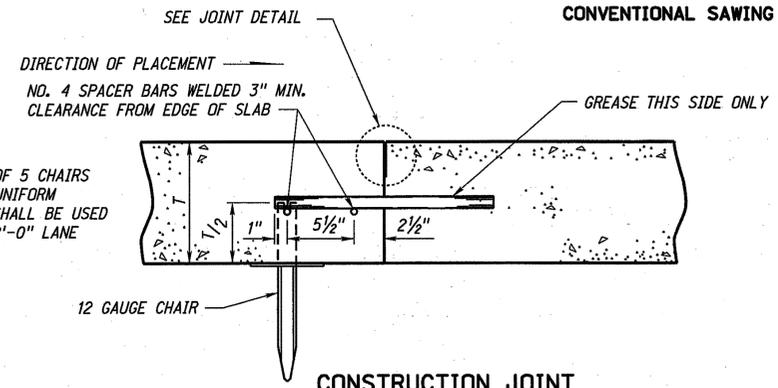


OR

CONVENTIONAL SAWING

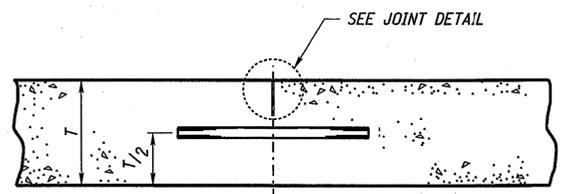
EARLY-SAW CUT

JOINT DETAIL

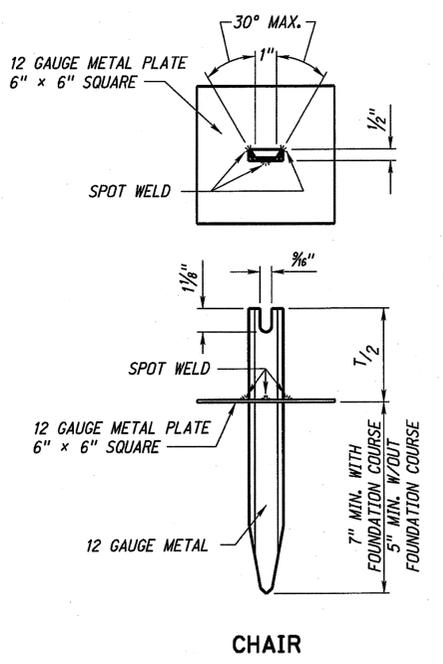


CONSTRUCTION JOINT

THE DOWEL BAR SPACING SHALL BE THE SAME AS SHOWN FOR THE EXPANSION JOINT. REFER TO BAR LOCATION TABLE AND THE DOWEL BAR HEIGHT AND DIAMETER TABLE ON SHEET 1 OF 4.

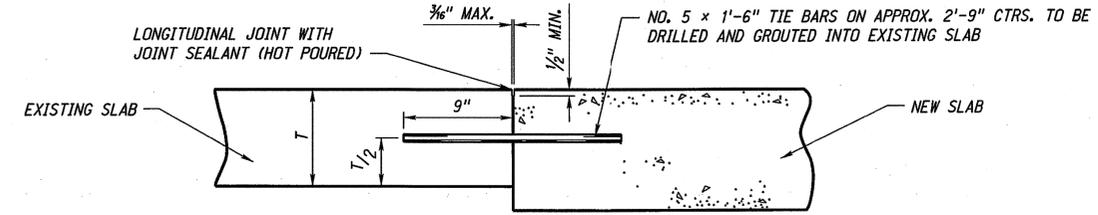


TIE BAR PIN



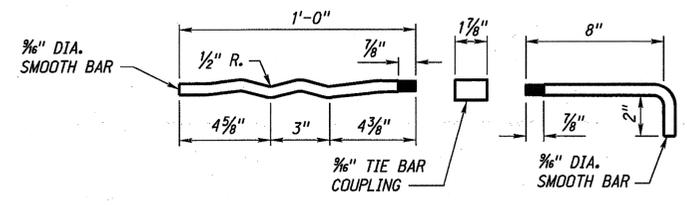
CHAIR

CONTRACTION JOINT

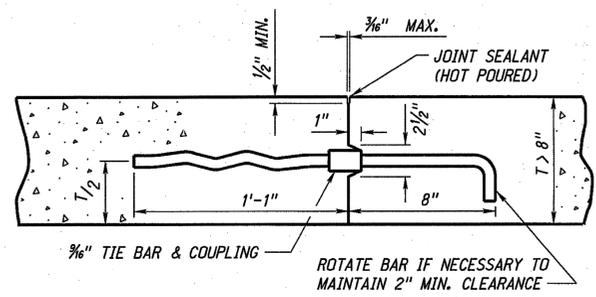


TIE BARS ARE TO BE INSTALLED WHERE NEW CONCRETE PAVEMENT IS PLACED ADJACENT TO EXISTING CONCRETE PAVEMENT

DETAILS OF TIE BAR

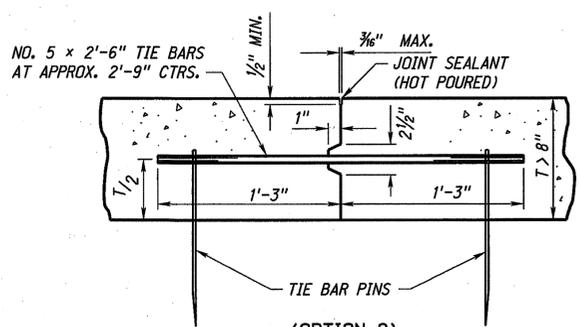


DETAILS OF "W" BAR



(OPTION 1)  
KEY TYPE

NO. 5 HOOK AND W-BARS AT APPROX. 2'-9" CTRS. OR 3/8" HOOK AND W-BARS AT APPROX. 2'-9" CTRS.

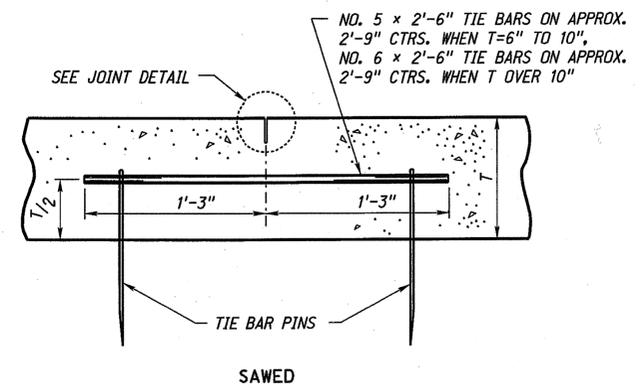


(OPTION 2)  
KEY TYPE

KEY TYPE JOINT SHALL BE USED ON ALL LONGITUDINAL CONSTRUCTION JOINTS WHEN THE ADJACENT LANE IS NOT PLACED AT THE SAME TIME

NOTE: NO TIE BARS SHALL BE CLOSER THAN 1'-3" TO A TRANSVERSE JOINT. ALL LONGITUDINAL JOINTS BETWEEN LANES AND BETWEEN LANES AND SHOULDERS MUST BE TIED. MEDIAN SHOULD NOT BE TIED.

LONGITUDINAL JOINTS



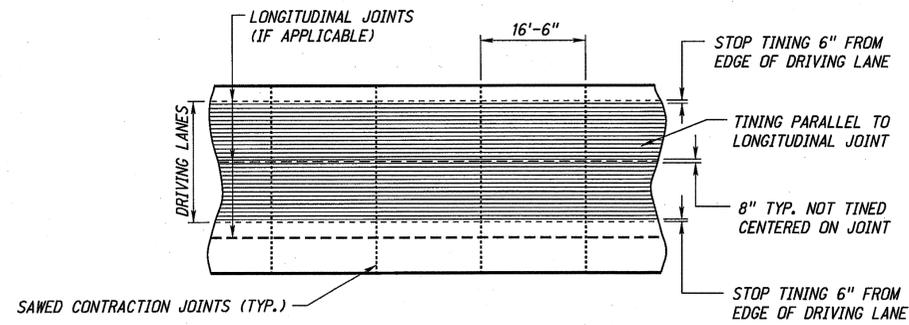
SAWED

WHEN TWO ADJACENT LANES ARE PLACED AT THE SAME TIME, THE LONGITUDINAL JOINT COMMON TO THE LANES SHALL BE SAWED

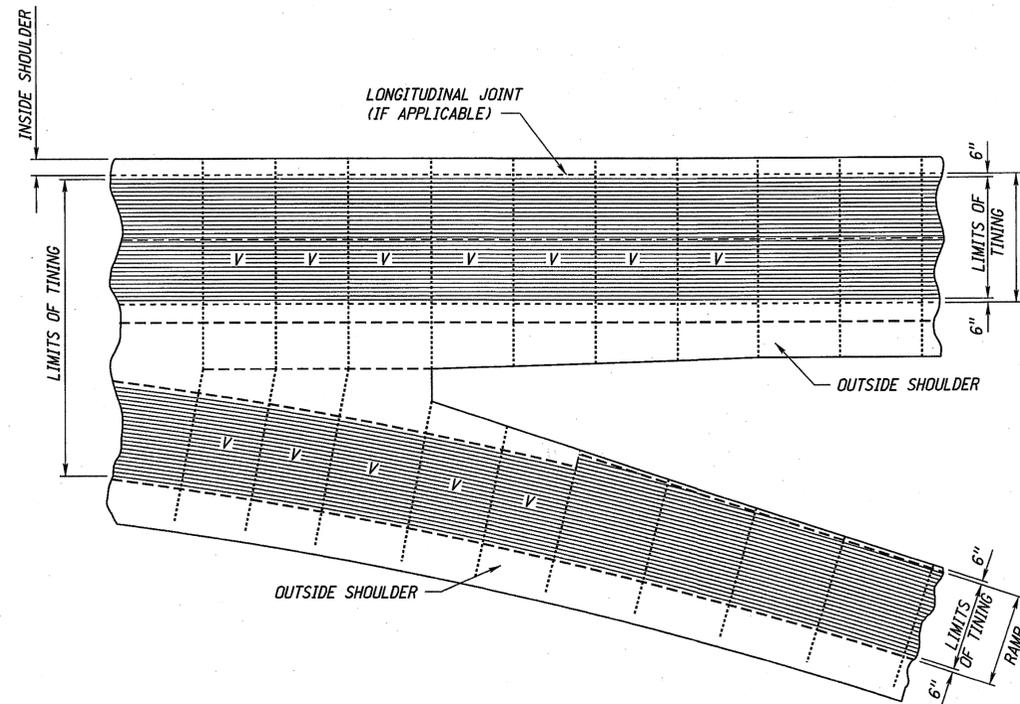
NOTE: T = PAVEMENT THICKNESS

DRDESIGN5 32900e09.dgn 16-FEB-2011 09:48 1001 SHEET 2 OF 4

R9	JUL 11	JOINT: EARLY SAW CUT
RB	OCT 10	CHANGED TITING INFORMATION
R7	MAR 05	MULTIPLE CHANGES
REV. NO.	DATE	DESCRIPTION OF REVISION
NEBRASKA DEPARTMENT OF ROADS STANDARD PLAN NO. 329-R9 <b>8 TO 16 INCH CONCRETE PAVEMENT</b>		
		FHWA APPROVED:  DATE: 8/20/11
ORIGINAL: OCTOBER 25, 1994 DATE		2 4



TINING WITH CONCRETE SHOULDER



TINING LIMITS GORE AREA

NOTES:

16'-6" TRANSVERSE JOINT SPACING IS THE STANDARD JOINT SPACING REGARDLESS OF THE PAVEMENT THICKNESS.

V VARIES FROM 10'-0" TO MAX. 16'-6".

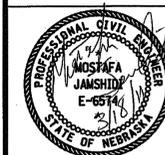
THE LONGITUDINAL JOINT BETWEEN THE SHOULDER AND THE 12'-0" DRIVING LANE IS NOT REQUIRED FOR SHOULDER WIDTHS OF 4'-0" OR LESS.

TRANSVERSE JOINTS FOR DOWELED CONCRETE PAVEMENT SHALL BE CONSTRUCTED PERPENDICULAR TO THE ROADWAY.

ALL CONCRETE SURFACES, NOT TINED, WILL REQUIRE TRANSVERSE BROOMING OR BURLAP DRAG. (NOT APPLICABLE TO SHOULDERS)

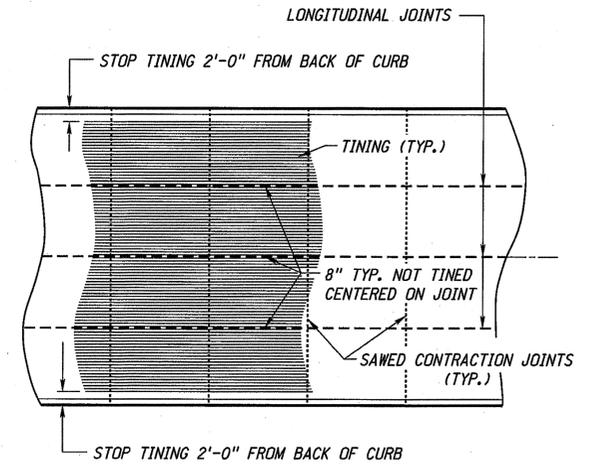
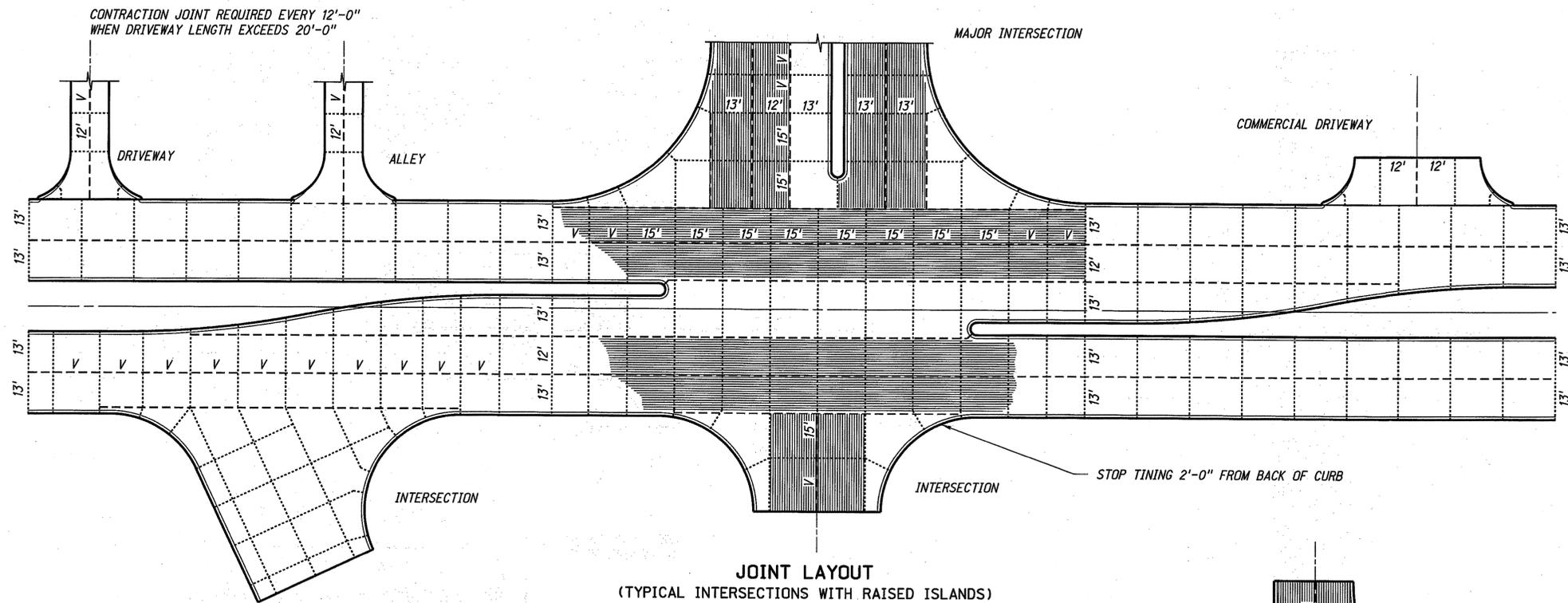
R9	JUL. 11	JOINT: EARLY SAW CUT
R8	OCT. 10	CHANGED TINING INFORMATION
R7	MAR. 05	MULTIPLE CHANGES
REV. NO.	DATE	DESCRIPTION OF REVISION

NEBRASKA DEPARTMENT OF ROADS  
STANDARD PLAN NO. 329-R9  
**8 TO 16 INCH  
CONCRETE PAVEMENT**



FHWA APPROVED:  
*Mustafa Janshida*  
DATE  
3/20/2011  
OCTOBER 25, 1994  
DATE

3  
4



**TINING LIMITS**

**LEGEND**

- ..... SAWED CONTRACTION JOINT
- LONGITUDINAL JOINT

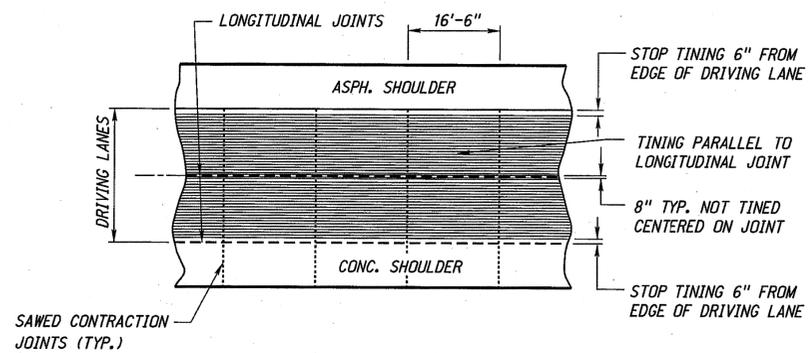
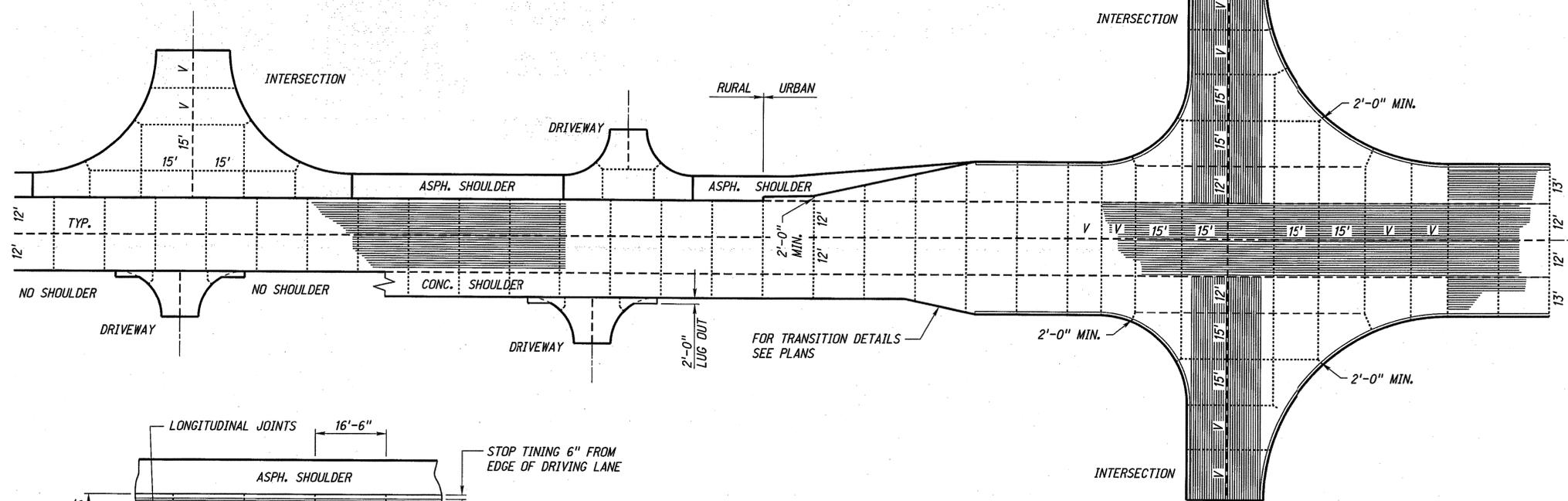
**NOTES:**

16'-6" TRANSVERSE JOINT SPACING IS THE STANDARD JOINT SPACING REGARDLESS OF THE PAVEMENT THICKNESS.

V VARIES FROM 10'-0" TO MAX. 16'-6".

VARIABLE SPACING IS USED AROUND INTERSECTIONS AND LARGE DRIVEWAYS WHICH IS TIED TO THE CONCRETE LANES OR SHOULDERS TO MATCH THE JOINTS.

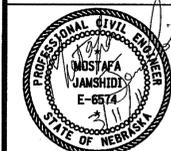
ALL CONCRETE SURFACES, NOT TINED, WILL REQUIRE TRANSVERSE BROOMING OR BURLAP DRAG. (NOT APPLICABLE TO SHOULDERS)



**RURAL TINING LIMITS WITH SURFACED SHOULDERS**

R9	JUL 11	JOINT: EARLY SAW CUT
R8	OCT. 10	CHANGED TINING INFORMATION
R7	MAR. 05	MULTIPLE CHANGES
REV. NO.	DATE	DESCRIPTION OF REVISION

NEBRASKA DEPARTMENT OF ROADS  
STANDARD PLAN NO. 329-R9  
**8 TO 16 INCH  
CONCRETE PAVEMENT**



FHWA APPROVED:  
*Mustafa Jamshidi*  
3/30/2011  
DATE  
ORIGINAL:  
OCTOBER 25, 1994  
DATE

**TABLE 1 - CONCRETE STANDARD INSTALLATIONS, SOILS AND MINIMUM COMPACTION REQUIREMENTS**

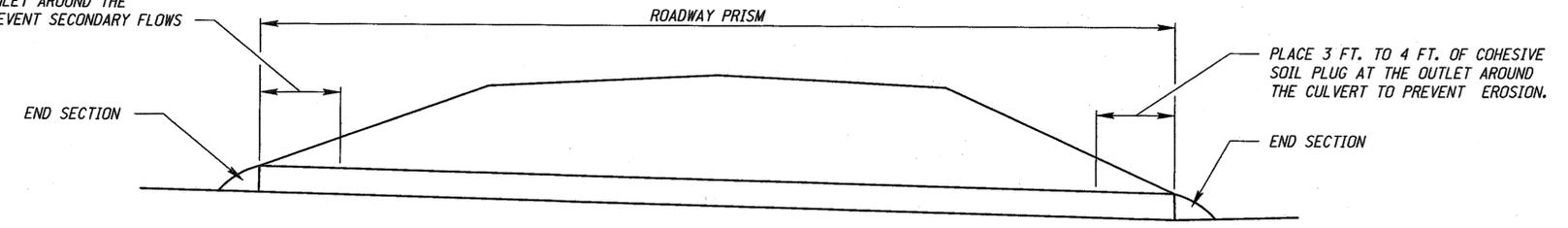
INSTALLATION TYPE	BEDDING THICKNESS	HAUNCH AND OUTER BEDDING	LOWER SIDE
TYPE 1	D <sub>0</sub> /24 MINIMUM, NOT LESS THAN 3" IF ROCK FOUNDATION, USE D <sub>0</sub> /12 MINIMUM, NOT LESS THAN 6".	95% SW	90% SW, 95% ML, 100% CL, OR NATURAL SOILS OF EQUAL FIRMNESS
TYPE 2		90% SW OR 95% ML	85% SW, 90% ML, 95% CL, OR NATURAL SOILS OF EQUAL FIRMNESS
*TYPE 3		85% SW, 90% ML, OR 95% CL	85% SW, 90% ML, 95% CL, OR NATURAL SOILS OF EQUAL FIRMNESS

**TABLE 1 NOTES:**

\*THE TYPE 3 INSTALLATION (SHADED) IN TABLE 4 IS THE NDOR MINIMUM STANDARD, USING EITHER A SHAPED TRENCH ACCORDING TO THE STANDARD SPECIFICATIONS, OR AT THE OPTION OF THE CONTRACTOR, THE BEDDING WITH COMPACTIONS AS SHOWN.

MAXIMUM FILL HEIGHTS FOR THE TYPE 1, 2, AND 3 INSTALLATIONS ARE SHOWN IN TABLE 4.

PLACE 3 FT. TO 4 FT. OF COHESIVE SOIL PLUG AT THE INLET AROUND THE CULVERT TO PREVENT SECONDARY FLOWS



**LIMITS OF BEDDING AND BACKFILL**

**EXCAVATION, BEDDING AND EMBANKMENT SEQUENCE:**

**TRENCH INSTALLATION:**

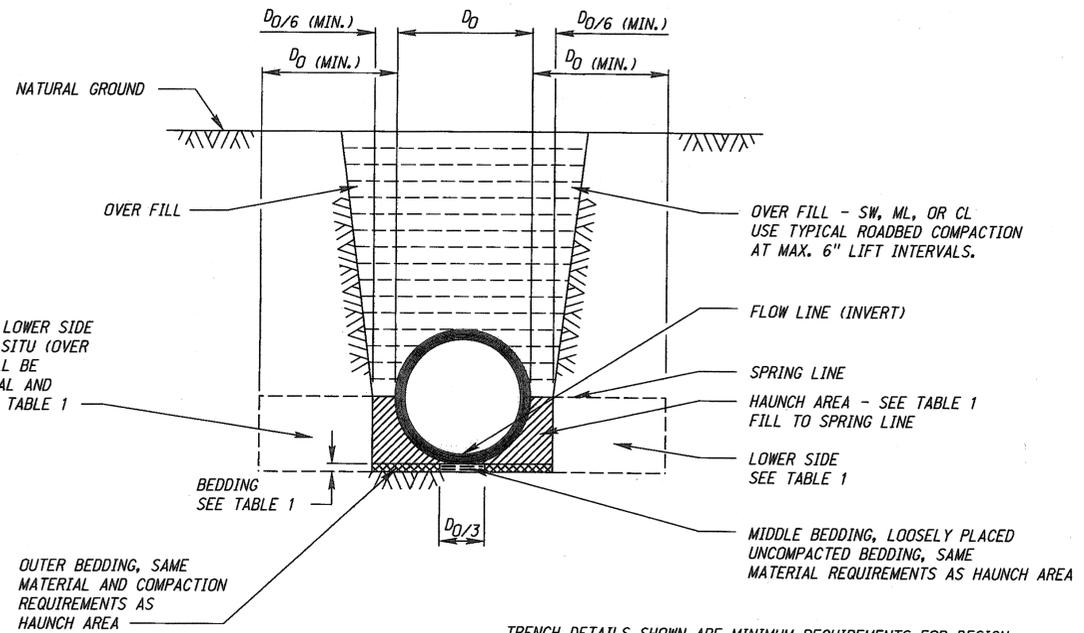
- (A) DETERMINE THE FLOW LINE AND TRENCH BOTTOM ELEVATIONS.
- (B) DETERMINE THE SHAPE OF TRENCH. DECIDE IF SHORING IS NEEDED. CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR THE SAFETY OF ALL WORKERS, EQUIPMENT AND MATERIALS IN THE TRENCH.
- (C) PLACE THE BEDDING MATERIAL (SEE CONCRETE - TABLE 1) LOOSELY.
- (D) PLACE PIPE ON THE BEDDING AND COMPACT OUTER BEDDING, (SEE TABLE 1).
- (E) PLACE AND COMPACT THE LOWER SIDE, HAUNCH AND OVERFILL MATERIAL AT 6 IN. INTERVALS.

**EMBANKMENT INSTALLATION:**

- (A) DETERMINE THE FLOW LINE AND SPRING LINE ELEVATION.
- (B) IF FLOW LINE IS ABOVE THE NATURAL GROUND, PLACE AN EMBANKMENT AT LEAST 300 WIDE WITH 3:1 FORESLOPES OR FLATTER AT SPRING LINE ELEVATION, COMPACTED AT ROADBED REQUIRED COMPACTION.
- (C) IF THE FLOW LINE IS BELOW THE NATURAL GROUND BUT THE SPRING LINE IS ABOVE THE NATURAL GROUND, PLACE THE EMBANKMENT SIMILAR TO THE ONE IN STEP B.
- (D) EXCAVATE TO PROPER ELEVATION.
- (E) PLACE BEDDING MATERIAL (SEE TABLE 1) LOOSELY.
- (F) PLACE THE PIPE ON THE BEDDING MATERIAL AND COMPACT OUTER BEDDING MATERIAL (SEE CONCRETE - TABLE 1).
- (G) PLACE AND COMPACT THE HAUNCH, LOWER SIDE AND OVERFILL MATERIAL AT 6 IN. INTERVALS.

**NOTES FOR TRENCH INSTALLATIONS:**

1. COMPACTION AND SOIL SYMBOLS, I.E. 95% SW, REFER TO SW SOIL MATERIAL WITH MINIMUM STANDARD PROCTOR COMPACTION OF 95%.
2. THE TRENCH TOP ELEVATION SHALL BE NO LOWER THAN 1 FT. BELOW THE BOTTOM OF THE PAVEMENT BASE MATERIAL.
3. SOIL IN BEDDING AND HAUNCH ZONES SHALL BE COMPACTED TO AT LEAST THE SAME COMPACTION AS SPECIFIED FOR THE MAJORITY OF SOIL IN THE BACKFILL ZONES.
4. THE TRENCH WIDTH SHALL BE WIDER THAN SHOWN IF REQUIRED FOR ADEQUATE SPACE TO ATTAIN THE SPECIFIED COMPACTION IN THE HAUNCH AND BEDDING ZONES.
5. FOR TRENCH WALLS THAT ARE WITHIN 10 DEGREES OF VERTICAL, THE COMPACTION OR FIRMNESS OF THE SOIL IN THE TRENCH WALLS AND LOWER SIDE ZONE NEED NOT TO BE CONSIDERED.
6. FOR TRENCH WALLS WITH GREATER THAN 10 DEGREE SLOPES THAT CONSIST OF EMBANKMENT, THE LOWER SIDE SHALL BE COMPACTED TO AT LEAST THE SAME COMPACTION AS SPECIFIED FOR THE SOIL IN THE BACKFILL ZONE.



THE SOIL IN THE LOWER SIDE ZONE, IF NOT IN SITU (OVER EXCAVATED), SHALL BE APPROVED MATERIAL AND COMPACTED. SEE TABLE 1

TRENCH DETAILS SHOWN ARE MINIMUM REQUIREMENTS FOR DESIGN AND CONSTRUCTION. PAYMENT FOR EXCAVATION IS BASED UPON THE GUIDELINES IN THE STANDARD SPECIFICATIONS.

TRENCHES SHALL BE EXCAVATED IN ACCORDANCE WITH APPROVED SAFETY PRACTICE.

**TYPICAL TRENCH INSTALLATION**

R1	OCT. 14	UP TO 60" PLASTIC ALLOWED IN ALL OF TABLE 1 - PLASTIC
REV. NO.	DATE	DESCRIPTION OF REVISION
NEBRASKA DEPARTMENT OF ROADS <b>STANDARD PLAN NO. 411-R1 BEDDING AND BACKFILL REQUIREMENTS FOR CONCRETE PIPE</b>		
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM:		 DATE: OCT 2014 ORIGINAL: JUNE 6, 2008 DATE:
1 4		

TABLE 3  
SOIL CLASSIFICATION FOR BEDDING & BACKFILL

ASTM SOIL GROUP SYMBOL D 2487	DESCRIPTION	PERCENTAGE PASSING SIEVE SIZES		
		1 1/2 IN.	NO. 4	NO. 200
SW	WELL GRADED SANDS AND GRAVELLY-SANDS: LITTLE OR NO FINES. NON PLASTIC	100%	> 50% OF "COURSE FRACTION"	< 5%
ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY-FINE-SANDS, SILTS WITH SLIGHT PLASTICITY		100%	> 50%
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELY-CLAYS, SANDY-CLAYS, SILTY-CLAYS, LEAN CLAYS			

NOTES FOR EMBANKMENT INSTALLATIONS:

1. COMPACTION AND SOIL SYMBOLS, I.E. 95% SW, REFER TO SW SOIL MATERIAL WITH A MINIMUM STANDARD PROCTOR COMPACTION OF 95%.
2. SOIL IN THE OUTER BEDDING, HAUNCH, AND LOWER SIDE ZONES, EXCEPT WITHIN THE  $D_0/3$  MIDDLE BEDDING, SHALL BE COMPACTED TO AT LEAST THE SAME COMPACTION AS THE MAJORITY OF THE SOIL IN THE OVERFILL ZONES.
3. SUBTRENCHES
  - 3.1 A SUBTRENCH IS DEFINED AS A TRENCH WITH ITS TOP AT AN ELEVATION LOWER THAN 1 FT. BELOW THE BOTTOM OF THE PAVEMENT BASE MATERIAL.
  - 3.2 THE MINIMUM WIDTH OF A SUBTRENCH SHALL BE  $1.33D_0$ , OR WIDER IF REQUIRED FOR ADEQUATE SPACE TO ATTAIN THE SPECIFIED COMPACTION IN THE HAUNCH AND BEDDING ZONES.
  - 3.3 FOR SUBTRENCHES WITH WALLS OF NATURAL SOIL, ANY PORTION OF THE LOWER SIDE ZONE IN THE SUBTRENCH WALL SHALL BE AT LEAST AS FIRM AS AN EQUIVALENT SOIL PLACED TO THE COMPACTION REQUIREMENTS SPECIFIED FOR THE LOWER SIDE ZONE, AND AS FIRM AS THE MAJORITY OF SOIL IN THE OVERFILL ZONE, OR SHALL BE REMOVED AND REPLACED WITH SOIL COMPACTED TO THE SPECIFIED LEVEL.

GENERAL NOTES:

WHEN IN-SITU LATERAL SOIL RESISTANCE IS NEGLIGIBLE, E.G. PEAT, MUCK, OR HIGHLY EXPANSIVE SOIL, EMBEDMENT SHALL BE PLACED AND COMPACTED AT THE DIRECTION OF THE ENGINEER.

TO PROTECT THE PIPE AND BACKFILL DURING CONSTRUCTION, PROVIDE A MINIMUM OF 36" OF COMPACTED FILL MATERIAL OVER THE TOP OF THE PIPE BEFORE ALLOWING ANY HEAVY EQUIPMENT TO TRAVERSE OVER THE PIPE. EXTREMELY HEAVY EQUIPMENT MAY REQUIRE LARGER COVER AS DETERMINED BY THE CONTRACTOR.

THE PIPE VOLUME SHOULD NOT BE SUBTRACTED FROM THE VOLUME OF EXCAVATION.

THESE DESIGN STANDARDS ARE MINIMUM. IF A MORE RESTRICTIVE DESIGN IS REQUIRED BY THE ENGINEER OR CULVERT MANUFACTURER, THEN THESE STANDARDS SHALL BE MODIFIED. CHANGES TO PAY ITEM QUANTITIES DUE TO UNFORESEEN SITE CONDITIONS SHALL BE CALCULATED AND INCORPORATED INTO THE CONTRACT THRU A CHANGE ORDER.

BOTH ENDS OF THE PIPE SHALL BE SEALED WITH COHESIVE SOIL (AROUND THE PIPE EXTENDING 3 FT. TO 4 FT. FROM EACH END) TO PROTECT AGAINST INFILTRATION AND EROSION.

BEDDING AND BACKFILL MATERIAL IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO THE LINEAR FEET OF CULVERT.

BEDDING AND BACKFILL MATERIAL SHALL MEET ASTM D 2487 (SOIL GROUPS AS SHOWN IN TABLE 3).

PERCENT COMPACTION SHALL BE DETERMINED IN ACCORDANCE WITH NDOR STANDARD TEST METHOD T 99.

TABLE 1 - CONCRETE STANDARD INSTALLATIONS, SOILS AND MINIMUM COMPACTION REQUIREMENTS

INSTALLATION TYPE	BEDDING THICKNESS	HAUNCH AND OUTER BEDDING	LOWER SIDE
TYPE 1	$D_0/24$ MINIMUM, NOT LESS THAN 3" IF ROCK FOUNDATION, USE $D_0/12$ MINIMUM, NOT LESS THAN 6".	95% SW	90% SW, 95% ML OR 100% CL
TYPE 2		90% SW OR 95% ML	85% SW, 90% ML OR 95% CL
*TYPE 3		85% SW, 90% ML, OR 95% CL	85% SW, 90% ML OR 95% CL

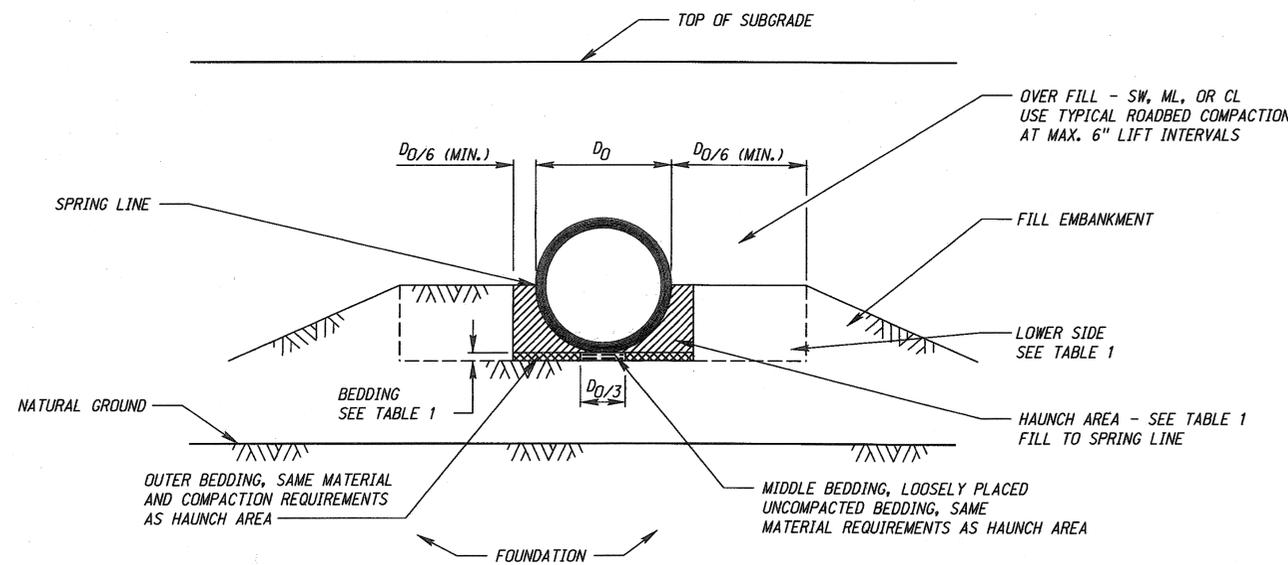
TABLE 1 NOTES:

\*THE TYPE 3 INSTALLATION (SHADED) IN TABLE 4 IS THE NDOR MINIMUM STANDARD, USING EITHER A SHAPED TRENCH ACCORDING TO THE STANDARD SPECIFICATIONS, OR AT THE OPTION OF THE CONTRACTOR, THE BEDDING WITH COMPACTIONS AS SHOWN.

MAXIMUM FILL HEIGHTS FOR THE TYPE 1, 2, AND 3 INSTALLATIONS ARE SHOWN IN TABLE 4.

TABLE 2 - CONCRETE PIPE DIMENSIONS

NOMINAL PIPE DIAMETER (INCHES)	STANDARD OUTSIDE PIPE DIAMETER, $D_0$ (SPAN)			
	ROUND PIPE	ARCH PIPE	H. ELLIP. PIPE	V. ELLIP. PIPE
15	19.5	22.5		
18	23	27	28.5	
21	26.5	31.5		
24	30	34.5	36.5	
27	33.5		41	
30	37	43.25	45.5	
36	44	51.75	54	38
42	51	60.13	63	44
48	58	68.5	71	49
54	65	76	80	55
60	72	85	89	61
66	79		97	67
72	86	102	106	73
78	93		114	79
84	100	118	123	85
90	107			
96	114			
102	121			
108	128			



TYPICAL EMBANKMENT INSTALLATION

R1	OCT. 14	UP TO 60" PLASTIC ALLOWED IN ALL OF TABLE 1 - PLASTIC
REV. NO.	DATE	DESCRIPTION OF REVISION
NEBRASKA DEPARTMENT OF ROADS STANDARD PLAN NO. 411-R1 <b>BEDDING AND BACKFILL REQUIREMENTS FOR CONCRETE PIPE</b>		
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM:		
		DATE OCT 2014 ORIGINAL: JUNE 6, 2008 DATE
2 4		

ROADWAY DESIGN DIVISION

Computer: DRDESIGN65

User: dor13017

Date: 16-JUN-2014 12:39

File: 41100e01.dgn  
Scale: 1:100

**TABLE 1 - CONCRETE STANDARD INSTALLATIONS, SOILS AND MINIMUM COMPACTION REQUIREMENTS**

INSTALLATION TYPE	BEDDING THICKNESS	HAUNCH AND OUTER BEDDING	LOWER SIDE
TYPE 1	D <sub>0</sub> /24 MINIMUM, NOT LESS THAN 3" IF ROCK FOUNDATION, USE D <sub>0</sub> /12 MINIMUM, NOT LESS THAN 6".	95% SW	90% SW, 95% ML OR 100% CL
TYPE 2		90% SW OR 95% ML	85% SW, 90% ML OR 95% CL
*TYPE 3		85% SW, 90% ML, OR 95% CL	85% SW, 90% ML OR 95% CL

**NOTES:**

\* THE TYPE 3 INSTALLATION (SHADED) IN TABLE 4 IS THE NDOR MINIMUM STANDARD, USING EITHER A SHAPED TRENCH ACCORDING TO THE STANDARD SPECIFICATIONS, OR AT THE OPTION OF THE CONTRACTOR, THE BEDDING WITH COMPACTIONS AS SHOWN.

MAXIMUM FILL HEIGHTS FOR THE TYPE 1, 2, AND 3 INSTALLATIONS ARE SHOWN IN TABLE 4.

INSTALLATION TYPE 2 AND TYPE 1 ARE IMPROVED METHODS IN ORDER TO SUPPORT HIGHER FILL HEIGHTS USING CLASS III, IV, AND V CIRCULAR CONCRETE PIPE. INSTALLATION TYPE 1 WILL PROVIDE THE BEST IN-SITU PERFORMANCE USING GREATER COMPACTION WITH GRANULAR BEDDING AND BACKFILL. THE CONTRACTOR WILL CHOOSE THE INSTALLATION TYPE AND CLASS OF PIPE. ACTUAL PROJECT FILL HEIGHTS MUST BE KNOWN IN ORDER TO USE TABLE 4.

ROUND EQUIVALENT, NON-CIRCULAR PIPE SUCH AS ARCH OR ELLIPTICAL PIPE, MAY BE SELECTED, PROVIDED SUCH PIPE ARE DESIGNED AND MANUFACTURED TO THE SAME D-LOADS AND ULTIMATE STRENGTHS (SEE TABLE 5) AS THE SELECTED CIRCULAR PIPE FROM THE FILL HEIGHT TABLE.

**TABLE 5 D-LOADS FOR CONCRETE PIPE**

PIPE CLASS	III	IV	V
D-LOAD TO PRODUCE A 0.01-IN. CRACK	1350	2000	3000
D-LOAD TO PRODUCE THE ULTIMATE LOAD	2000	3000	3750

**NOTES:**

LOAD ON PIPE IN POUNDS PER LINEAR FOOT = D-LOAD X INSIDE SPAN IN FEET  
D-LOAD = TEST LOAD EXPRESSED IN POUNDS-FORCE PER LINEAR FOOT PER FOOT OF DIAMETER

**TABLE 4 MAXIMUM FILL HEIGHTS (FEET) FOR STANDARD DESIGN (AASHTO M 170) ROUND CONCRETE PIPE**

PIPE SIZE (IN.)	INSTALLATION TYPE 3* (NDOR STANDARD)			INSTALLATION TYPE 2			INSTALLATION TYPE 1		
	CLASS III	CLASS IV	CLASS V	CLASS III	CLASS IV	CLASS V	CLASS III	CLASS IV	CLASS V
15	12	15	21	15	19	26	23	28	40
18	12	17	24	16	22	30	24	32	45
21	13	19	26	16	24	32	25	37	48
24	13	19	26	17	24	33	25	32	45
27	13	17	26	17	21	34	23	26	51
30	12	14	25	15	17	32	20	21	49
36	10	16	24	13	21	31	20	31	47
42	10	15	23	13	19	29	20	29	44
48	10	14	22	13	18	29	20	28	43
54	10	14		13	17		20	27	
60	9	14		12	18		19	28	
66	9	14		12	18		19	28	
72	9	14		12	18		19	28	
78	9			12			19		
84	9			12			19		
90	9			12			20		
96	9			12			19		
102	10			13			20		
108	10			14			22		

**TABLE 4 NOTES:**

AASHTO M 170 SPECIFICATIONS ARE MODIFIED AS FOLLOWS:

ONLY SINGLE INNER CAGE, CIRCULAR REINFORCING IS ALLOWED FOR CLASS III, 15", 18", 21", AND 24" ROUND RCP AS SHOWN:

PIPE SIZE (IN.)	CLASS	MINIMUM CIRCUMFERENTIAL REINFORCING (IN. <sup>2</sup> /FT. OF PIPE WALL)
15	III	0.08
18	III	0.10
21	III	0.12
24	III	0.14

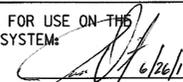
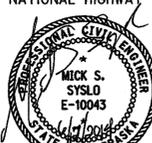
**APPLICABLE SPECIFICATIONS:**

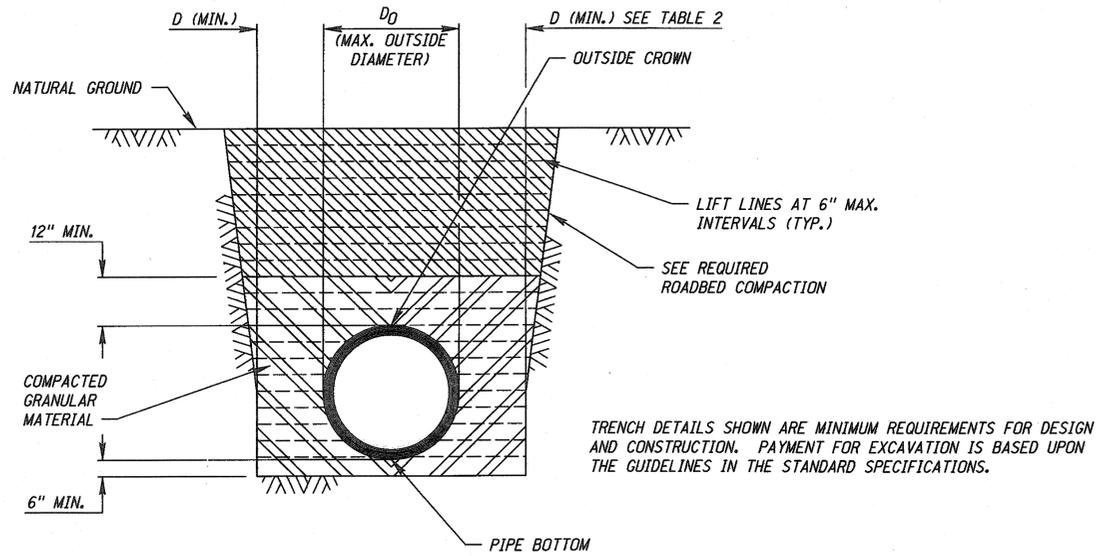
- AASHTO M 170---ROUND RCP
- AASHTO M 206---ARCH RCP
- AASHTO M 207---ELLIPTICAL RCP

**GENERAL NOTES:**

FILL HEIGHTS SHOWN IN TABLE 4 WERE DEVELOPED USING ASCE STANDARDS FOR DIRECT DESIGN OF BURIED PRECAST CONCRETE PIPE, MANUFACTURED IN ACCORDANCE WITH AASHTO M 170 SPECIFICATION REQUIREMENTS (SEE TABLE 4 FOOTNOTE FOR EXCEPTIONS). FILL HEIGHTS SHOWN APPLY ONLY TO ROUND PIPE (UNDER FULL FLOW CONDITIONS), USED UNDER RIGID AND FLEXIBLE PAVEMENT, WITH SOIL OVERFILL WEIGHING 120 POUNDS PER CUBIC FOOT. UNDER SPECIAL CIRCUMSTANCES (WHERE PAVEMENT IS NOT USED AND LIVE LOAD BECOMES CRITICAL, OR DIFFERENT SOIL DENSITY IS ENCOUNTERED, OR THE ONE FOOT MINIMUM CLEARANCE FROM THE BOTTOM OF THE PAVEMENT TO THE TOP OF THE PIPE CANNOT BE MAINTAINED) THESE FILL HEIGHTS MAY NEED TO BE MODIFIED. DEEPER FILL HEIGHTS MAY BE USED BY SUBMITTING A SPECIAL STANDARD INSTALLATION DIRECT DESIGN (SIDD) FOR NDOR APPROVAL.

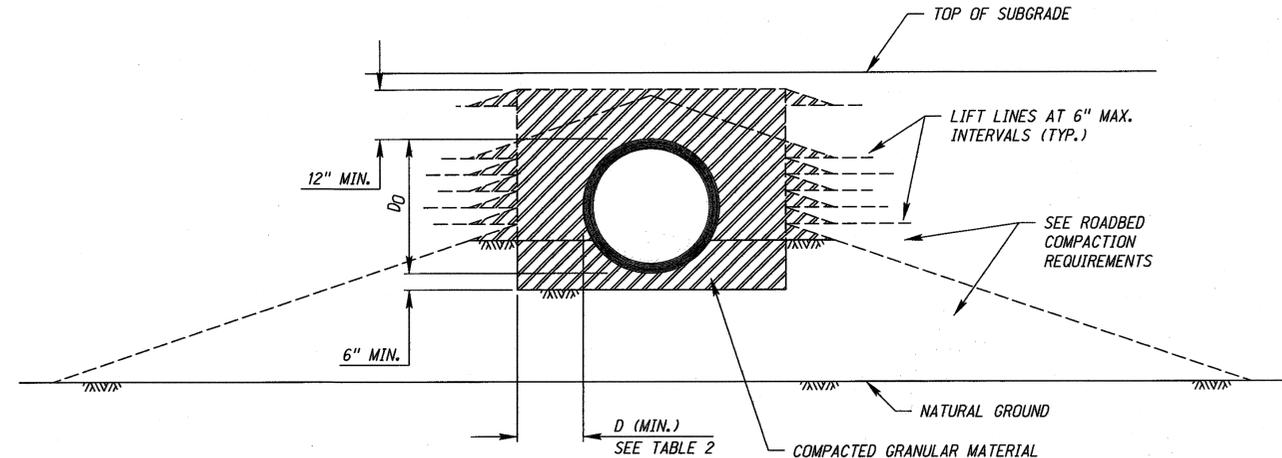
CONCRETE PIPE DESIGNS THAT ARE NOT SHOWN IN APPLICABLE AASHTO SPECIFICATIONS WILL BE CONSIDERED SPECIAL DESIGNS THAT MUST BE SUBMITTED TO NDOR FOR APPROVAL.

R1	OCT. 14	UP TO 60" PLASTIC ALLOWED IN ALL OF TABLE 1 - PLASTIC
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NEBRASKA DEPARTMENT OF ROADS STANDARD PLAN NO. 411-R1 <b>BEDDING AND BACKFILL REQUIREMENTS FOR CONCRETE PIPE</b>		
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM:		 DATE OCT 2014
		
ORIGINAL: JUNE 6, 2008 DATE		3 4



TRENCHES SHALL BE EXCAVATED IN ACCORDANCE WITH APPROVED SAFETY PRACTICE.

TYPICAL TRENCH INSTALLATION



TYPICAL EMBANKMENT INSTALLATION

TABLE 1 - PLASTIC SOIL CLASSIFICATION FOR GRANULAR FILL MATERIAL

SOIL GROUP SYMBOL D 2487	DESCRIPTION	% PASSING SIEVE SIZES		
		1/2 IN.	NO. 4	NO. 200
GW	WELL GRADED GRAVEL AND GRAVEL-SAND MIXTURES; LITTLE OR NO FINES.	100%	< 50% OF COARSE FRACTION	< 5%
GP	POORLY GRADED GRAVEL AND GRAVEL-SAND MIXTURES; LITTLE OR NO FINES.			
SW	WELL GRADED SAND AND GRAVEL-SANDS; LITTLE OR NO FINES.			
SP	POORLY GRADED SAND AND GRAVEL-SANDS; LITTLE OR NO FINES.	100%	> 50% OF COARSE FRACTION	5% TO 12%
E.G. GW-GC SP-SM	SAND AND GRAVELS WHICH ARE BORDER LINE BETWEEN CLEAN AND WITH FINES.		VARIES	
GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES.	100%	< 50% OF COARSE FRACTION	12% TO 50%
GC	CLAYEY-GRAVEL, GRAVEL-SAND-CLAY MIXTURES.			
SM	SILTY SANDS, SAND-SILT MIXTURES.		> 50% OF COARSE FRACTION	

TABLE 2 - PLASTIC MINIMUM D (INCHES)

NOMINAL PIPE DIAMETER (INCHES)	TRENCH INSTALLATION		EMBANKMENT INSTALLATION	
	METAL PIPE	PLASTIC PIPE	METAL PIPE	PLASTIC PIPE
15	11	11	15	15
18	12	12	18	18
24	13	13	24	24
30	15	15	24	24
36	17	17	24	24
42	24	24	24	24
48	24	24	24	24
54	24	24	24	24
60	24	24	24	24
66	24	24	24	24
72	24	24	24	24
78	24	24	24	24
84	24	24	24	24

NOTES:

INSTALLATIONS AS SHOWN ARE REQUIRED UNDER ALL SURFACED ROADWAYS. BEDDING AND BACKFILL FOR DRIVE PIPE OR OTHER PIPE OUTSIDE THE ROADWAY PRISM (OR BACK OF CURB-LINE FOR URBAN PROJECTS) MAY BE INSTALLED USING SUITABLE EXISTING SOIL, PLACED AND COMPACTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

WHERE IN-SITU LATERAL SOIL RESISTANCE IS NEGLIGIBLE E.G. PEAT, MUCK, OR HIGHLY EXPANSIVE SOIL, EMBEDMENT SHALL BE PLACED AND COMPACTED AT THE DIRECTION OF THE ENGINEER.

TO PROTECT THE PIPE AND BACKFILL DURING CONSTRUCTION, PROVIDE A MINIMUM OF 36" OF COMPACTED FILL MATERIAL OVER THE TOP OF THE PIPE BEFORE ALLOWING ANY HEAVY EQUIPMENT TO TRAVERSE OVER THE PIPE. EXTREMELY HEAVY EQUIPMENT MAY REQUIRE LARGER COVER AS DETERMINED BY THE CONTRACTOR.

PIPE VOLUME SHOULD NOT BE SUBTRACTED FROM THE VOLUME OF EXCAVATION.

THESE DESIGN STANDARDS ARE MINIMUM. IF A MORE RESTRICTIVE DESIGN IS REQUIRED BY THE ENGINEER OR THE CULVERT MANUFACTURER, THEN THESE STANDARDS SHALL BE MODIFIED. CHANGES TO PAY ITEM QUANTITIES DUE TO UNFORESEEN SITE CONDITIONS SHALL BE CALCULATED AND INCORPORATED INTO THE CONTRACT BY A CHANGE ORDER.

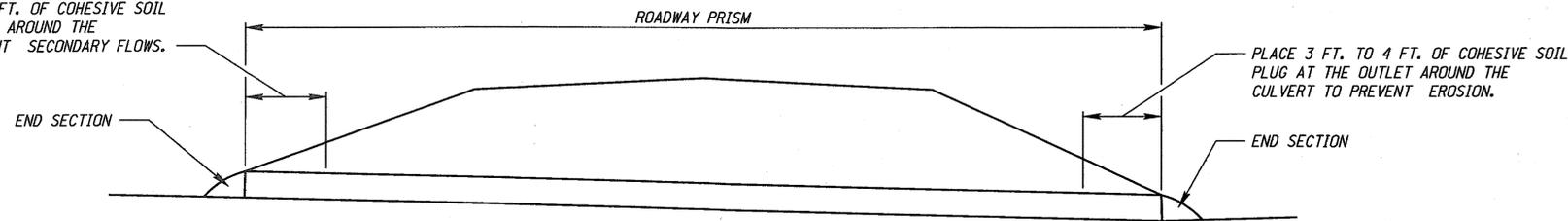
EXPOSED ENDS OF THE PIPE SHALL BE SEALED WITH COHESIVE SOIL (AROUND THE PIPE EXTENDING 3 FT. TO 4 FT. FROM EACH END) TO PROTECT AGAINST INFILTRATION AND EROSION.

GRANULAR FILL MATERIAL IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO THE LINEAR FEET OF CULVERT.

GRANULAR MATERIAL SHALL MEET ASTM D 2487 (SOIL GROUP AS SHOWN IN TABLE 1). MATERIAL SHALL BE COMPACTED TO AT LEAST 90% PROCTOR TEST DENSITY.

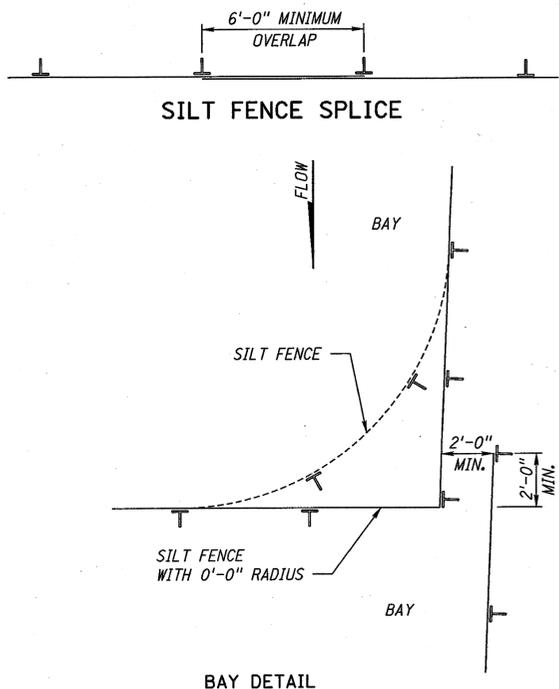
PERCENT COMPACTION SHALL BE DETERMINED IN ACCORDANCE WITH NDOR STANDARD TEST METHOD T 99.

PLACE 3 FT. TO 4 FT. OF COHESIVE SOIL PLUG AT THE INLET AROUND THE CULVERT TO PREVENT SECONDARY FLOWS.

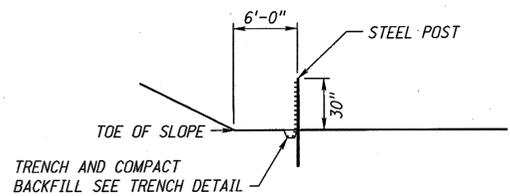


LIMITS OF BEDDING AND BACKFILL

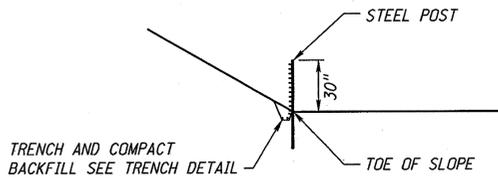
R1	OCT. 14	UP TO 60" PLASTIC ALLOWED IN ALL OF TABLE 1 - PLASTIC
REV. NO.	DATE	DESCRIPTION OF REVISION
NEBRASKA DEPARTMENT OF ROADS STANDARD PLAN NO. 411-R1 <b>BEDDING AND BACKFILL REQUIREMENTS FOR MCCMP, PCCMP, &amp; PLASTIC PIPE</b>		
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM:		
		DATE OCT 2014 ORIGINAL: JUNE 6, 2008 DATE
		4 4



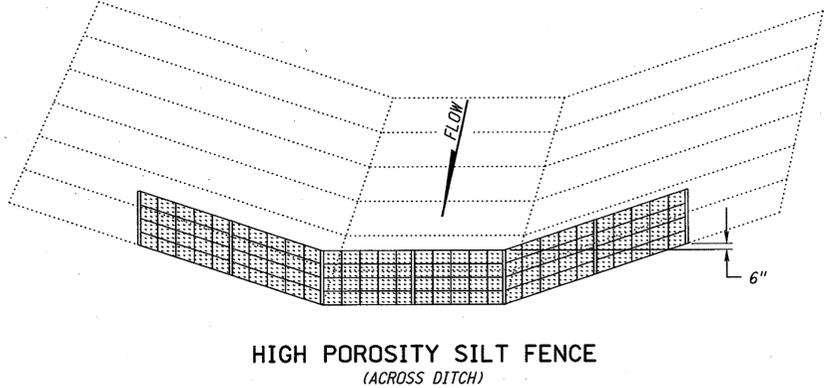
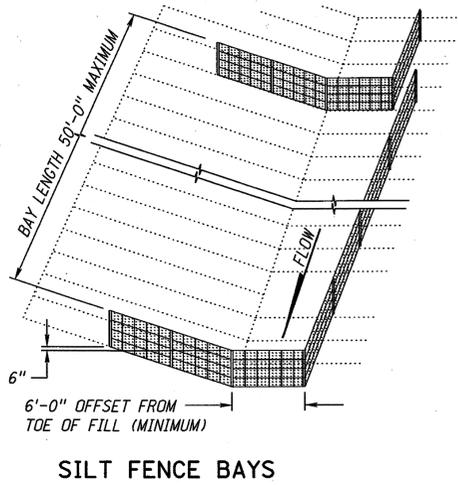
NOTE:  
SILT FENCE AT CORNERS SHALL HAVE A RADIUS OF 0'-0" MINIMUM TO 10'-0" MAXIMUM



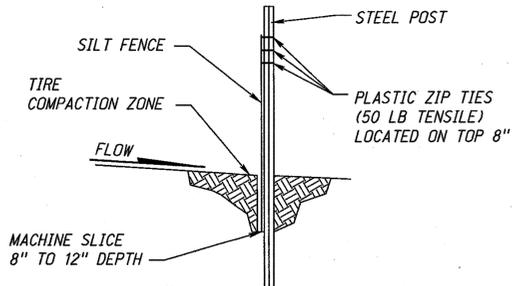
OPTION ONE (PREFERRED)  
**SILT FENCE**  
(6'-0" OFFSET FROM TOE OF FILL)



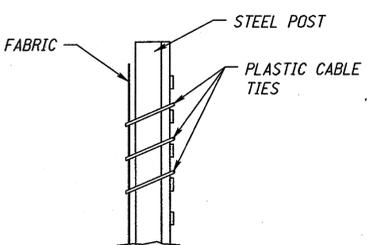
OPTION TWO (WITH LIMITED R.O.W.)  
**SILT FENCE**  
(AT TOE OF FILL)



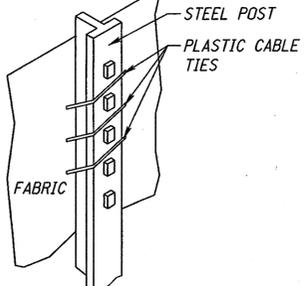
NOTE:  
POST SPACING 6'-0" MAXIMUM MULTIPLE BAYS MAY BE USED



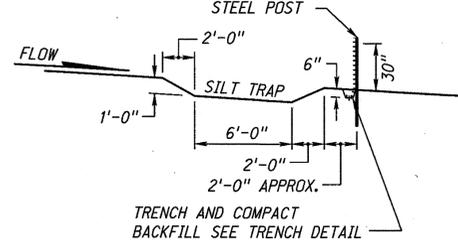
**SILT FENCE MACHINE SLICED**



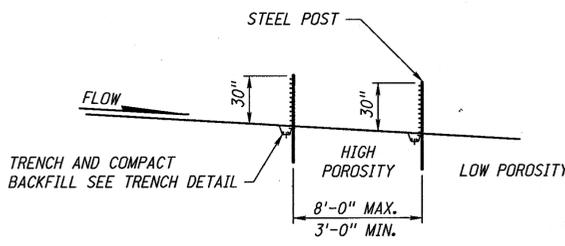
**PROFILE VIEW ATTACHMENT TO POST**



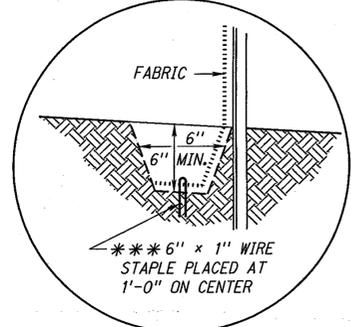
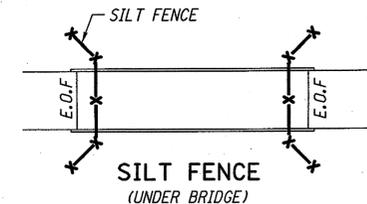
**BACK VIEW ATTACHMENT TO POST**



**HIGH POROSITY SILT FENCE WITH SILT TRAP**  
(ACROSS DITCH)



**SILT FENCE**  
(ACROSS DITCH)



**TRENCH DETAIL**

\*\*\* SILT FENCE MAY ALSO BE INSTALLED WITH A SILT FENCE PLOW. NO STAPLING IS REQUIRED WHEN THE SILT FENCE PLOW IS USED.

- NOTES:
- SILT FENCE SHOULD BE 30" ABOVE GRADE (MAY VARY)
  - SILT FENCE MINIMUM ROLL WIDTH:  
LOW POROSITY = 42"  
HIGH POROSITY = 42"  
LOW PROFILE = 36"  
COIR SILT FENCE = 36"
  - STEEL STUDDED "T" LINE POSTS 5'-6" LENGTH; 6'-0" MAXIMUM SPACING.
  - FOR EACH STEEL STUDDED "T" LINE POST, 3 PLASTIC CABLE TIES ARE REQUIRED.
  - 2" x 2" x 6'-0" NOMINAL WOOD STAKES SPACING, 6'-0" MAXIMUM ON CENTER DRIVEN UNTIL FIRM.

REV. NO.	DATE	DESCRIPTION OF REVISION
R1	APR 14	STEEL POST INSTALLATION

NEBRASKA DEPARTMENT OF ROADS  
STANDARD PLAN NO. 502-R1  
**SILT FENCE DETAILS**

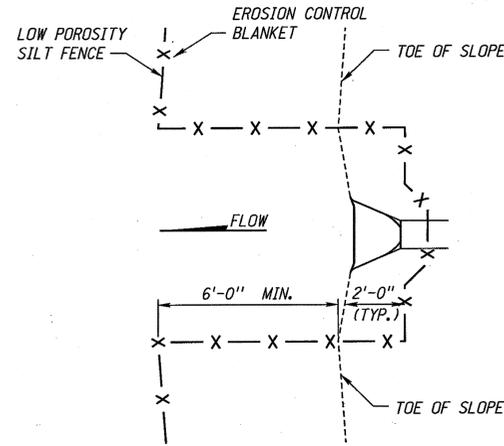
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM.

PROFESSIONAL CIVIL ENGINEER  
MICHAEL H. BOWEN  
E-6515  
STATE OF NEBRASKA

11/8/13  
DATE

ORIGINAL:  
DECEMBER 18, 2006  
DATE

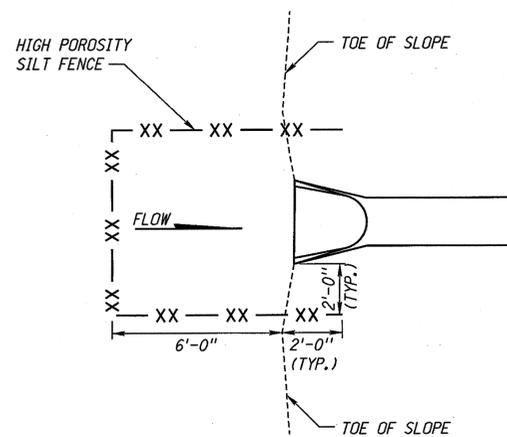
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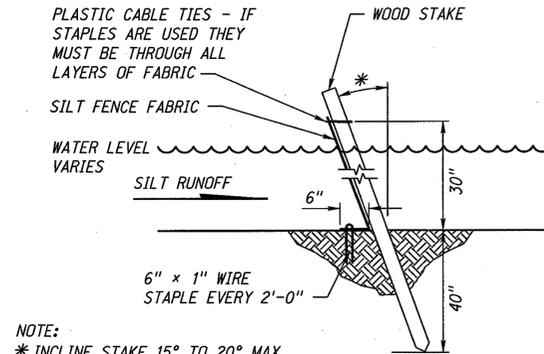
**SILT FENCE OUTLET PROTECTION**

**NOTES:**

1. SILT FENCE SHOULD BE BROUGHT FLUSH WITH WING WALLS ON BOX CULVERTS IF IT CAN NOT BE INSTALLED ABOVE THE BOX CULVERT.
2. IF APPLICABLE, SILT FENCE AROUND THE CULVERT SHOULD BE ADJUSTED TO ALLOW FOR THE INSTALLATION OF EROSION CONTROL AS SHOWN IN STANDARD PLAN 501.
3. SILT CHECKS MAY BE USED IN PLACE OF SILT FENCE ABOVE THE OPENING OF A CULVERT, AS SHOWN IN SPECIAL PLAN C.

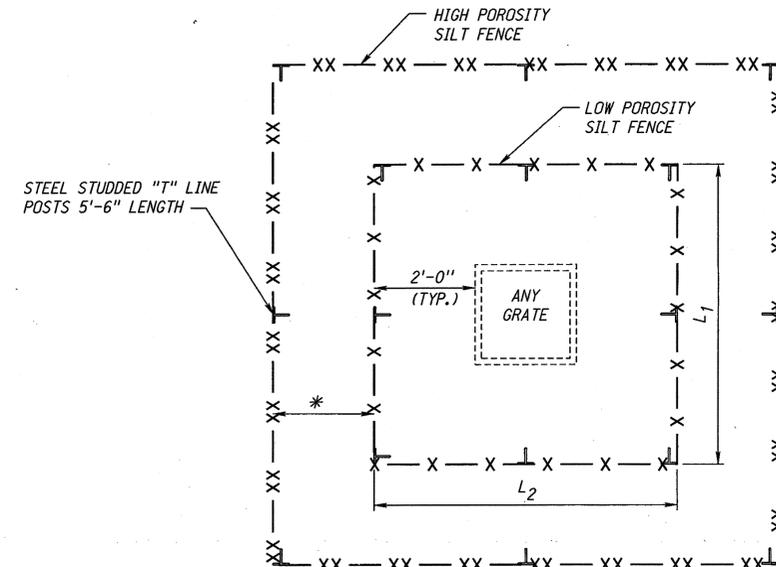


**SILT FENCE INLET PROTECTION**

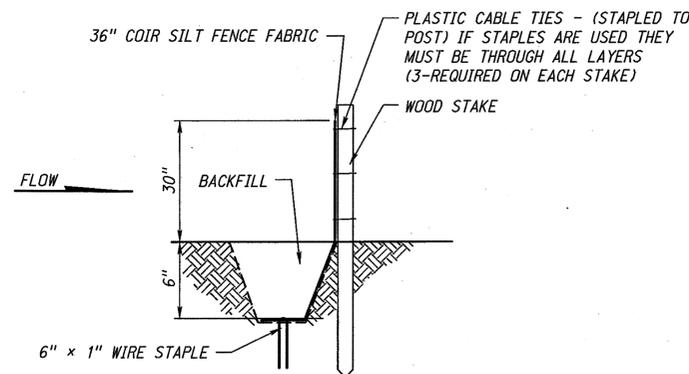


NOTE:  
\* INCLINE STAKE 15° TO 20° MAX. FROM VERTICAL, TOWARD FLOW.

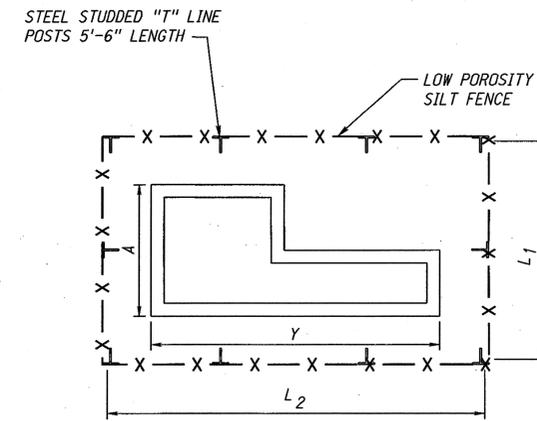
**SILT FENCE**  
(WET & BELOW WATER INSTALLATION)



**PLAN VIEW**  
**SILT FENCE FOR GRATE, AREA, MEDIAN INLETS OR JUNCTION BOXES**  
\* 3'-0" IF POSSIBLE (MAY VARY)



**COIR SILT FENCE - ON WOOD POSTS - DRY INSTALLATION**



**PLAN VIEW**  
**SILT FENCE CURB INLET**

REV. NO.	DATE	DESCRIPTION OF REVISION
R1	APR 14	STEEL POST INSTALLATION
NEBRASKA DEPARTMENT OF ROADS STANDARD PLAN NO. 502-R1 <b>SILT FENCE DETAILS</b>		
ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM:		 DATE: 11/10/13 ORIGINAL: DECEMBER 18, 2006 DATE:
2 2		

**CHANNELIZATION DEVICES**

THE FUNCTION OF CHANNELIZATION DEVICES IS TO WARN ROAD USERS OF CONDITIONS CREATED BY WORK ACTIVITIES IN OR NEAR THE TRAVELED WAY, TO PROTECT WORKERS IN THE TEMPORARY TRAFFIC CONTROL ZONE, AND TO GUIDE DRIVERS AND PEDESTRIANS SAFELY. CHANNELIZING DEVICES INCLUDE BUT ARE NOT LIMITED TO CONES, TUBULAR POSTS, VERTICAL PANELS, DRUMS, BARRICADES, TRAFFIC LANE DIVIDERS, TEMPORARY RAISED ISLANDS, AND BARRIERS.

DEVICES USED FOR CHANNELIZATION SHOULD PROVIDE FOR SMOOTH AND GRADUAL TRAFFIC MOVEMENT FROM ONE LANE TO ANOTHER, ONTO A BYPASS OR DETOUR, OR TO REDUCE THE WIDTH OF THE TRAVELED WAY. THEY MAY ALSO BE USED TO SEPARATE TRAFFIC FROM THE WORK SPACE, PAVEMENT DROP-OFFS, PEDESTRIAN PATHS, OR OPPOSING DIRECTIONS OF TRAFFIC.

CHANNELIZING DEVICES SHALL MEET THE CRASHWORTHY PERFORMANCE CRITERIA CONTAINED IN THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 350 OR MANUAL FOR ASSESSING SAFETY HARDWARE (MASH). THEY SHOULD BE CONSTRUCTED AND BALLASTED TO PERFORM IN A PREDICTABLE MANNER WHEN INADVERTENTLY STRUCK BY A VEHICLE. IF STRUCK, THE DEVICE SHOULD YIELD OR BREAK AWAY, FRAGMENTS OR OTHER DEBRIS FROM THE DEVICE SHOULD NOT PENETRATE THE PASSENGER COMPARTMENT OF THE VEHICLE OR BE A POTENTIAL HAZARD TO WORKERS OR PEDESTRIANS IN THE IMMEDIATE AREA.

SPACING OF CHANNELIZING DEVICES SHOULD NOT EXCEED A DISTANCE IN FEET EQUAL TO THE SPEED WHEN USED FOR THE TAPER CHANNELIZATION, AND A DISTANCE IN FEET OF TWICE THE SPEED WHEN USED FOR TANGENT CHANNELIZATION.

SPACING OF CHANNELIZATION DEVICES		
SPEED (MPH)	SPACING OF DEVICES (FEET)	
	TAPER	TANGENT
5	25	50
35	35	70
45	45	90
55	55	110
60	60	120
65	65	130
75	75	150

WARNING LIGHTS MAY BE ADDED TO CHANNELIZING DEVICES IN AREAS WITH FREQUENT FOG, SNOW, OR SEVERE ROADWAY CURVATURE, OR WHERE VISUAL DISTRACTIONS ARE PRESENT, EXCEPT FOR THE SEQUENTIAL FLASHING WARNING LIGHTS, WARNING LIGHTS PLACED ON CHANNELIZING DEVICES USED IN A SERIES TO CHANNELIZE ROAD USERS SHALL BE STEADY-BURN.

THE RETROREFLECTIVE MATERIAL USED ON CHANNELIZING DEVICES SHALL HAVE A SMOOTH, SEALED OUTER SURFACE, MEETING THE REQUIREMENTS OF THE ASTM SPECIFICATION D4956, FOR TYPE IV SHEETING OR TYPE V REBOUNDABLE SHEETING (OR GREATER).

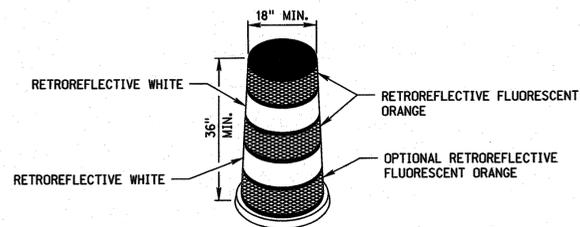
COEFFICIENT OF RETROREFLECTION (CD/LUX/M <sup>2</sup> )			
WHITE	ORANGE	RED	YELLOW
250	100	45	170

THE AMERICAN TRAFFIC SAFETY SERVICES ASSOCIATION (ATSSA) "QUALITY GUIDELINES FOR WORK ZONE TRAFFIC CONTROL DEVICES" SHALL BE USED AS A VISUAL GUIDE FOR DETERMINING IF A TRAFFIC CONTROL DEVICE/OR SIGN IS ACCEPTABLE, MARGINAL OR UNACCEPTABLE.

THE NAME AND TELEPHONE NUMBER OF THE AGENCY, CONTRACTOR, OR SUPPLIER MAY BE SHOWN ON THE CHANNELIZING DEVICE BACK OR SUPPORT, BUT NOT ON THE DEVICE FACE. THE LETTERS AND NUMBERS SHALL BE A NON-REFLECTIVE COLOR AND NOT OVER 15 SQUARE INCHES IN TOTAL AREA.

PARTICULAR ATTENTION SHOULD BE GIVEN TO MAINTAINING THE CHANNELIZING DEVICES TO KEEP THEM CLEAN, VISIBLE, AND PROPERLY POSITIONED. DEVICES SHALL BE REPLACED THAT ARE DAMAGED AND/OR HAVE LOST A SIGNIFICANT AMOUNT OF THEIR RETROREFLECTIVITY AND EFFECTIVENESS.

**REFLECTORIZED PLASTIC DRUMS**



**DESIGN**

REFLECTORIZED PLASTIC DRUMS USED FOR TRAFFIC WARNING OR CHANNELIZATION SHALL BE CONSTRUCTED OF LIGHTWEIGHT, FLEXIBLE, AND DEFORMABLE MATERIALS AND BE A MINIMUM OF 36 INCHES IN HEIGHT AND HAVE A MINIMUM WIDTH OF AT LEAST 18 INCHES, REGARDLESS OF ORIENTATION. THE PREDOMINANT COLOR OF THE DRUM SHALL BE ORANGE. METAL DRUMS SHALL NOT BE USED. THE MARKINGS ON DRUMS SHALL BE HORIZONTAL, SHALL BE CIRCUMFERENTIAL, AND SHALL DISPLAY FOUR 6 INCH WIDE BANDS OF RETROREFLECTIVE SHEETING, ALTERNATING FLUORESCENT ORANGE-WHITE-FLUORESCENT ORANGE-WHITE. DRUMS SHALL HAVE CLOSED TOPS THAT WILL NOT ALLOW COLLECTION OF CONSTRUCTION OR OTHER DEBRIS.

**APPLICATION**

DRUMS ARE MOST COMMONLY USED TO CHANNELIZE OR DELINEATE TRAFFIC FLOW BUT MAY ALSO BE USED INDIVIDUALLY OR IN GROUPS TO MARK SPECIFIC LOCATIONS. DRUMS ARE HIGHLY VISIBLE AND HAVE GOOD TARGET VALUE; THEY GIVE THE APPEARANCE OF BEING FORMIDABLE OBSTACLES AND, THEREFORE, COMMAND THE RESPECT OF ROAD USERS.

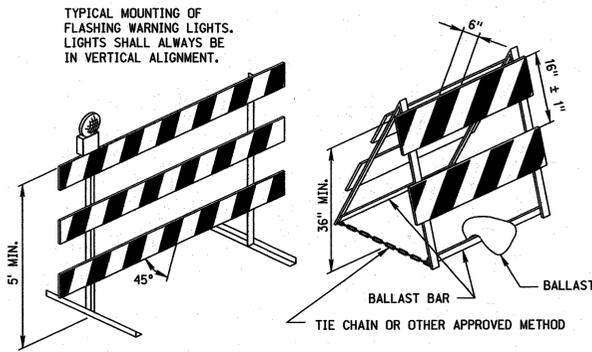
BALLAST SHALL NOT BE PLACED ON TOP OF THE DRUM. DRUMS SHOULD NOT BE WEIGHTED WITH SAND, WATER, OR ANY MATERIAL.

**BARRICADES**

BARRICADE TYPE	TYPE II	TYPE III
WIDTH OF RAIL*	8 INCHES MIN. - 12 INCHES MAX.	8 INCHES MIN. - 12 INCHES MAX.
LENGTH OF RAIL	36 INCHES	8 FEET**
WIDTH OF STRIPES	6 INCHES	6 INCHES
HEIGHT	36 INCHES	5 FEET
REFLECTIVE SHEETING	TYPE IV	TYPE IV
NUMBER OF REFLECTORIZED RAIL FACES	4 (TWO EACH DIRECTION)	6 (THREE EACH DIRECTION)

\*NOMINAL DIMENSIONS ARE PERMISSIBLE WHEN CONSTRUCTED FROM LUMBER.  
\*\*WHEN LATERAL SPACE IS LIMITED, SOME TYPE III BARRICADES WITH A 4 FOOT LENGTH OF RAIL, MAY BE ALLOWED WHEN APPROVED BY THE ENGINEER.

**TYPE III BARRICADE**      **TYPE II BARRICADE**



BALLAST SHALL NOT BE PLACED OVER ANY REFLECTIVE DEVICE

**DESIGN**

A BARRICADE IS A PORTABLE OR FIXED DEVICE HAVING TWO OR THREE RAILS WITH APPROPRIATE MARKINGS. IT IS USED TO CONTROL ROAD USERS BY CLOSING, RESTRICTING, OR DELINEATING ALL OR A PORTION OF THE RIGHT-OF-WAY.

BARRICADES SHALL BE ONE OF TWO TYPES; TYPE II OR TYPE III.

STRIPES ON BARRICADE RAILS SHALL BE ALTERNATING ORANGE AND WHITE RETROREFLECTIVE STRIPES SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION ROAD USERS ARE TO PASS. THE STRIPES SHALL BE 6 INCHES WIDE. THE MINIMUM RAIL LENGTH FOR A TYPE II BARRICADE IS 36 INCHES.

WHERE BARRICADES EXTEND ENTIRELY ACROSS A ROADWAY, THE STRIPES SHOULD SLOPE DOWNWARD IN THE DIRECTION TOWARD WHICH ROAD USERS MUST TURN. WHERE BOTH RIGHT AND LEFT TURNS ARE PROVIDED, THE STRIPES MAY SLOPE DOWNWARD IN BOTH DIRECTIONS FROM THE CENTER OF THE BARRICADE OR BARRICADES. WHERE NO TURNS ARE INTENDED, THE STRIPES SHOULD SLOPE DOWNWARD TOWARD THE CENTER OF THE BARRICADE OR BARRICADES.

BARRICADE RAILS SHOULD BE SUPPORTED IN A MANNER THAT WILL ALLOW THEM TO BE SEEN BY THE ROAD USER, AND IN A MANNER THAT PROVIDES A STABLE SUPPORT THAT IS NOT EASILY BLOWN OVER OR DISPLACED.

ON HIGH-SPEED ROADWAYS OR IN OTHER SITUATIONS WHERE BARRICADES MAY BE SUSCEPTIBLE TO OVERTURNING IN THE WIND, SANDBAGS SHOULD BE USED FOR BALLASTING. SANDBAGS MAY BE PLACED ON LOWER PARTS OF THE FRAME OR STAYS TO PROVIDE THE REQUIRED BALLAST BUT SHALL NOT BE PLACED ON TOP OF ANY STRIPED RAIL. BARRICADES SHALL NOT BE BALLASTED BY HEAVY OBJECTS SUCH AS ROCKS OR CHUNKS OF CONCRETE.

THE BARRICADE OWNERS NAME, NOT TO EXCEED 15 SQUARE INCHES SHALL BE SHOWN ON THE BARRICADE BACK OR SUPPORT BUT NOT ON ITS FACE.

\*\* WHEN LATERAL SPACE IS LIMITED, SOME TYPE III BARRICADES WITH A 4 FOOT LENGTH OF RAIL, MAY BE ALLOWED WHEN APPROVED BY THE ENGINEER.

**APPLICATION**

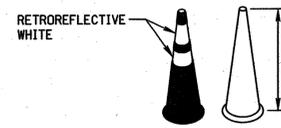
TYPE II BARRICADES ARE INTENDED FOR USE IN SITUATIONS WHERE TRAFFIC IS MAINTAINED THROUGH THE TEMPORARY TRAFFIC CONTROL ZONE. THEY MAY BE USED INDIVIDUALLY OR IN GROUPS TO MARK A SPECIFIC CONDITION, OR THEY MAY BE USED IN A SERIES FOR CHANNELIZING TRAFFIC ON THE INTERSTATE, FREEWAY AND EXPRESSWAY SYSTEM, TYPE II BARRICADES SHALL NOT BE USED FOR CHANNELIZATION.

TYPE III BARRICADES USED AT A ROAD CLOSURE MAY EXTEND COMPLETELY ACROSS A ROADWAY FROM CURB TO CURB. WHERE PROVISION IS MADE FOR ACCESS OF AUTHORIZED EQUIPMENT AND VEHICLES, THE RESPONSIBILITY FOR THE TYPE III BARRICADES SHOULD BE ASSIGNED TO A PERSON WHO SHALL PROVIDE PROPER CLOSURE AT THE END OF EACH WORK DAY.

WHEN A HIGHWAY IS LEGALLY CLOSED BUT ACCESS MUST STILL BE ALLOWED FOR LOCAL TRAFFIC, THE TYPE III BARRICADES MAY NOT BE EXTENDED COMPLETELY ACROSS A ROADWAY. A SIGN WITH THE APPROPRIATE LEGEND CONCERNING PERMISSIBLE USE BY LOCAL TRAFFIC SHALL BE MOUNTED.

NORMALLY PERMANENT SIGNS MOUNTED ON BARRICADES SHALL BE ERECTED ABOVE THE BARRICADE. THE SIGNS "ROAD CLOSED" OR "ROAD WORK AHEAD", FOR EXAMPLE CAN EFFECTIVELY BE MOUNTED ABOVE THE BARRICADE THAT CLOSURES THE ROADWAY. TYPE III BARRICADES SHALL BE SUPPLEMENTED WITH A LIGHTING DEVICE UNLESS SPECIFICALLY OMITTED BY THE ENGINEER. DETOUR ARROW AND LARGE WARNING ARROW SIGNS SHOULD BE PLACED ON THE FACE OF BARRICADE.

**CONES**



**DESIGN**

CONES SHALL BE PREDOMINANTLY ORANGE, FLOURESCENT RED-ORANGE, OR FLOURESCENT YELLOW/ORANGE, NOT LESS THAN 28 INCHES IN HEIGHT, AND SHALL BE MADE OF A MATERIAL THAT CAN BE STRUCK WITHOUT DAMAGING VEHICLES ON IMPACT. CONES WHEN ALLOWED ON THE INTERSTATE, FREEWAY OR EXPRESSWAY SYSTEM SHALL BE A MINIMUM OF 36 INCHES IN HEIGHT.

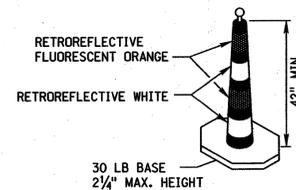
FOR NIGHTTIME USE, CONES SHALL BE RETROREFLECTIVE OR EQUIPPED WITH LIGHTING DEVICES FOR MAXIMUM VISIBILITY. RETROREFLECTION OF 28 INCH OR 36 INCH CONES SHALL BE PROVIDED BY A WHITE BAND 6 INCHES WIDE, NO MORE THAN 4 INCHES FROM THE TOP OF THE CONE, AND AN ADDITIONAL 4 INCH WIDE WHITE BAND A MINIMUM OF 2 INCHES BELOW THE 6 INCH BAND.

**APPLICATION**

TRAFFIC CONES ARE USED TO CHANNELIZE TRAFFIC, DIVIDE OPPOSING TRAFFIC LANES, DIVIDE TRAFFIC LANES WHEN TWO OR MORE LANES ARE KEPT OPEN IN THE SAME DIRECTION, AND DELINEATE SHORT-DURATION MAINTENANCE AND UTILITY WORK. CONES SHALL NOT BE USED FOR LANE CLOSURE TAPERS OR SHIFTS, CONES SMALLER THAN 42 INCHES SHALL NOT BE USED AT NIGHT ON RURAL HIGHWAYS, UNLESS SHOWN ON THE PLANS OR AS APPROVED OR DIRECTED BY THE ENGINEER.

STEPS SHOULD BE TAKEN TO ENSURE THAT CONES WILL NOT BE BLOWN OVER OR DISPLACED BY WIND OR MOVING TRAFFIC. CONES CAN BE DOUBLED UP TO INCREASE THEIR WEIGHT. SOME CONES ARE CONSTRUCTED WITH BASES THAT CAN BE FILLED WITH BALLAST. OTHERS HAVE SPECIAL WEIGHTED BASES, OR WEIGHTS SUCH AS SANDBAG RINGS THAT CAN BE DROPPED OVER THE CONES AND ONTO THE BASE TO PROVIDE ADDED STABILITY. BALLAST, HOWEVER, SHOULD NOT PRESENT A HAZARD IF THE CONES ARE INADVERTENTLY STRUCK.

**42 INCH CONES**



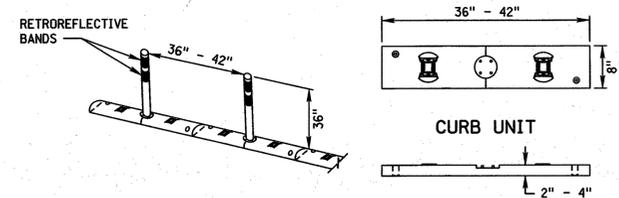
**DESIGN**

42 INCH CONES SHALL INCLUDE A 30 POUND RUBBER BASE AND DISPLAY FOUR 6 INCH WIDE BANDS OF RETROREFLECTIVE SHEETING, ALTERNATING FLUORESCENT ORANGE-WHITE-FLUORESCENT ORANGE-WHITE.

**APPLICATION**

WHEN APPROVED BY THE ENGINEER OR SHOWN IN THE PLANS, 42 INCH REFLECTIVE CONES MAY BE USED IN LIEU OF TYPE II BARRICADES OR REFLECTORIZED DRUMS. 42 INCH CONES SHALL NOT BE USED FOR LANE-CLOSURE TAPERS OR SHIFTS. IF A RECTANGULAR BASE IS USED, THE LONG SIDE OF THE BASE SHOULD BE ORIENTED PARALLEL TO THE DIRECTION OF TRAFFIC.

**TUBULAR POST AND CURB SYSTEM**



**DESIGN**

TUBULAR POSTS USED IN THE SYSTEM SHALL BE 36 INCHES HIGH AND A MINIMUM OF 2 INCHES WIDE WHEN FACING TRAFFIC. THE TUBULAR POST AND CURB SYSTEM SHALL BE MADE OF A MATERIAL THAT CAN BE STRUCK WITHOUT DAMAGING IMPACTING VEHICLES. THE COLOR SHALL BE AS SHOWN IN THE PLANS.

THE TUBULAR POSTS SHALL BE RETROREFLECTIVE. RETROREFLECTION OF TUBULAR POSTS SHALL BE PROVIDED BY TWO 3-INCH WIDE RETROREFLECTIVE BANDS PLACED A MAXIMUM OF 2 INCHES FROM THE TOP WITH A MAXIMUM OF 6 INCHES BETWEEN THE BANDS. EACH CURB SECTION SHALL CONTAIN ONE RETROREFLECTIVE MARKER FACING EACH DIRECTION OF TRAFFIC. THE COLOR OF THE RETROREFLECTIVE BANDS AND MARKERS SHALL MATCH THE POST/CURB COLOR.

THE CURB SECTIONS SHALL BE CONFIGURED TO ALLOW FOR DRAINAGE FROM THE PAVEMENT SURFACE.

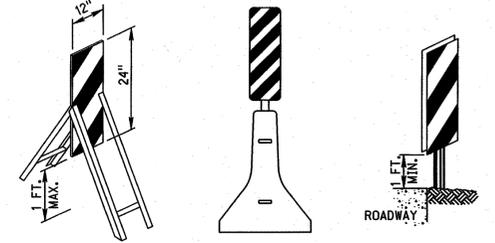
**APPLICATION**

TUBULAR POST AND CURB SYSTEMS MAY BE USED TO DIVIDE OPPOSING LANES OF TRAFFIC OR TO DIVIDE TRAFFIC LANES WHEN TWO OR MORE LANES ARE KEPT OPEN IN THE SAME DIRECTION.

FASTENING THE CURBS TO THE PAVEMENT WITH ANCHOR BOLTS OR OTHER SUITABLE METHODS AS DIRECTED BY THE MANUFACTURER IS REQUIRED TO MINIMIZE THE CHANCE OF BEING MOVED BY TRAFFIC.

TUBULAR POST AND CURB SYSTEMS SHALL BE INSTALLED IN THE LOCATIONS SHOWN IN THE PLANS OR DIRECTED BY THE ENGINEER.

**VERTICAL PANELS**



**DESIGN**

RETROREFLECTIVE MATERIAL ON VERTICAL PANELS SHALL BE 12 INCHES WIDE AND AT LEAST 24 INCHES HIGH. THEY SHALL HAVE ALTERNATING ORANGE AND WHITE STRIPES, WHERE THE HEIGHT OF THE RETROREFLECTIVE MATERIAL ON THE VERTICAL PANEL IS MORE THAN 36 INCHES, A PANEL STRIPE WIDTH OF 6 INCHES SHALL BE USED. WHERE THE HEIGHT OF THE RETROREFLECTIVE MATERIAL ON THE VERTICAL PANEL IS 36 INCHES OR LESS, A PANEL STRIPE WIDTH OF 4 INCHES SHALL BE USED. IF USED FOR TWO-WAY TRAFFIC, BACK-TO-BACK PANELS SHALL BE USED.

MARKINGS FOR VERTICAL PANELS SHALL BE ALTERNATING ORANGE AND WHITE RETROREFLECTORIZED STRIPES SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION TRAFFIC IS TO PASS.

POST MOUNTED VERTICAL PANELS SHALL BE MOUNTED WITH THE BOTTOM A MINIMUM OF 1 FOOT ABOVE THE ROADWAY. VERTICAL PANELS ON A TEMPORARY STAND SHALL BE MOUNTED WITH THE BOTTOM A MAXIMUM OF 1 FOOT ABOVE THE ROADWAY.

**APPLICATION**

WHERE SPACE IS LIMITED VERTICAL PANELS MAY BE USED TO CHANNEL TRAFFIC, DIVIDE OPPOSING LANES OF TRAFFIC, DIVIDE TRAFFIC LANES OR REPLACE BARRICADES. WHEN APPROVED BY THE ENGINEER, VERTICAL PANELS MAY BE POST-MOUNTED ALONG THE SIDE OF THE ROADWAY.

**TUBULAR POSTS**



**DESIGN**

TUBULAR POSTS SHALL BE PREDOMINANTLY ORANGE, NOT LESS THAN 28 INCHES HIGH, BE A MINIMUM OF 2 INCHES WIDE WHEN FACING TRAFFIC, AND MADE OF A MATERIAL THAT CAN BE STRUCK WITHOUT DAMAGING IMPACTING VEHICLES.

TUBULAR POSTS SHALL BE RETROREFLECTIVE. RETROREFLECTION OF TUBULAR POSTS SHALL BE PROVIDED BY TWO 3 INCHES WIDE WHITE BANDS PLACED A MAXIMUM OF 2 INCHES FROM THE TOP, WITH A MAXIMUM OF 6 INCHES BETWEEN THE BANDS. THE BASE SHALL NOT BE WIDER THAN 12 INCHES OR HIGHER THAN 2 INCHES.

**APPLICATION**

TUBULAR POSTS HAVE LESS VISIBLE AREA THAN OTHER DEVICES AND SHOULD BE USED ONLY WHERE SPACE RESTRICTIONS DO NOT ALLOW FOR THE USE OF OTHER MORE VISIBLE DEVICES. THEY MAY BE USED EFFECTIVELY TO DIVIDE OPPOSING LANES OF TRAFFIC OR TO DIVIDE TRAFFIC LANES WHEN TWO OR MORE LANES ARE KEPT OPEN IN THE SAME DIRECTION.

STEPS SHOULD BE TAKEN TO ASSURE THAT TUBULAR POSTS WILL NOT BE BLOWN OVER OR DISPLACED BY TRAFFIC BY EITHER AFFIXING THEM TO THE PAVEMENT WITH ANCHOR BOLTS OR ADHESIVE, IF A NONCYLINDRICAL DEVICE IS USED, IT SHALL BE ATTACHED TO THE PAVEMENT TO ENSURE THAT THE WIDTH FACING TRAFFIC MEETS THE MINIMUM REQUIREMENTS.

TUBULAR POSTS SHOULD NOT BE USED FOR PEDESTRIAN CHANNELIZATION OR A PEDESTRIAN BARRIERS IN TEMPORARY TRAFFIC CONTROL ZONES ON OR ALONG SIDEWALKS.

REV. NO.	DATE	DESCRIPTION OF REVISION
R6	JUN 14	2009 MUTCD UPDATE
R5	OCT 98	REVISE CHANNELIZATION DEVICES, TAPER
R4	JAN 95	REWRITE

NEBRASKA DEPARTMENT OF ROADS  
STANDARD PLAN NO. 920-R6  
**TRAFFIC CONTROL  
CONSTRUCTION AND MAINTENANCE**

ACCEPTED BY FHWA FOR USE ON THE NATIONAL HIGHWAY SYSTEM

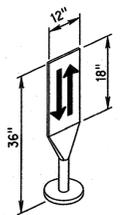
DANIEL J. WADDE  
E-6289  
STATE OF NEBRASKA

JUNE 2014  
DATE

ORIGINAL:  
OCTOBER 1998  
DATE

1  
3

**OPPOSING TRAFFIC LANE DIVIDERS**



**DESIGN**

OPPOSING TRAFFIC LANE DIVIDERS SHALL BE A TWO SIDED UPRIGHT RETROREFLECTORIZED ORANGE PANEL, WITH A WIDTH OF 12 INCHES AND A HEIGHT OF 18 INCHES. THE TOP OF THE PANEL SHALL BE 36 INCHES ABOVE THE PAVEMENT. THE SYMBOL ON EACH SIDE SHALL BE TWO OPPOSING BLACK ARROWS. THE LANE DIVIDER SHALL BE MADE OF LIGHTWEIGHT MATERIAL THAT WILL YIELD UPON IMPACT BY A VEHICLE. THE LANE DIVIDER BASE SHALL NOT BE WIDER THAN 12 INCHES OR HIGHER THAN 4 INCHES. THE BASE SHALL BE ATTACHED TO THE EXISTING SURFACE BY EPOXY OR OTHER SUITABLE ADHESIVE, TO ENSURE THAT THE PANEL REMAINS FACING TRAFFIC.

**APPLICATION**

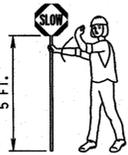
OPPOSING TRAFFIC LANE DIVIDERS ARE DELINEATION DEVICES USED AS CENTER LANE DIVIDERS TO SEPARATE OPPOSING TRAFFIC ON A TWO-LANE, TWO-WAY OPERATION.

**FLAGGERS**

**REQUIRED METHOD**



TO STOP TRAFFIC



TRAFFIC PROCEED



TO ALERT AND SLOW TRAFFIC

**EMERGENCY USE ONLY**



**FLAGGER PADDLE**

THE STOP/SLOW PADDLE SHALL HAVE AN OCTAGONAL SHAPE ON A RIGID HANDLE. STOP/SLOW PADDLES SHALL BE AT LEAST 18 INCHES WIDE WITH LETTERS AT LEAST 6 INCHES HIGH. IF THE STOP/SLOW PADDLE IS PLACED ON A RIGID STAFF, THE MINIMUM LENGTH OF THE STAFF, MEASURED FROM THE BOTTOM OF THE SIGN TO THE END OF THIS STAFF THAT RESTS ON THE GROUND, SHOULD BE 5 FEET. THE STOP/SLOW PADDLE SHOULD BE THE PRIMARY AND PREFERRED HAND-SIGNALING DEVICE BECAUSE THE STOP/SLOW PADDLE GIVES ROAD USERS MORE POSITIVE GUIDANCE THAN RED FLAGS. USE OF FLAGS SHOULD BE LIMITED TO EMERGENCY SITUATIONS.

**FLAGGERS**

A FLAGGER MUST BE DRESSED FOR SAFETY. IN ADDITION TO THE REQUIREMENTS OF THE "WORKER VISIBILITY" SECTION LISTED BELOW, FLAGGERS SHALL WEAR:

1. AN ORANGE OR YELLOW/GREEN CAP OR HARD HAT.
2. A SHIRT WITH SLEEVES, PANTS AND SHOES (TANK TOPS, SHORTS OR SANDALS SHALL NOT BE WORN).

FLAGGERS SHALL BE INSTRUCTED IN THE PROPER LOCATION, DUTIES AND PROCEDURES FOR FLAGGING AS OUTLINED IN THE CURRENT MUTCD AND THE DEPARTMENT OF ROADS FLAGGER'S HANDBOOK. AS REQUIRED BY THE DEPARTMENT OF ROADS, THE FLAGGER SHALL BE CERTIFIED, AND HAVE IN THEIR POSSESSION, A VALID FLAGGER CERTIFICATION CARD.

**WORKER VISIBILITY**

ALL WORKERS WITHIN THE RIGHT-OF-WAY WHO ARE EXPOSED EITHER TO TRAFFIC (VEHICLES USING THE HIGHWAY FOR PURPOSES OF TRAVEL) OR TO CONSTRUCTION EQUIPMENT WITHIN THE WORK AREA SHALL WEAR HIGH-VISIBILITY SAFETY APPAREL. HIGH-VISIBILITY SAFETY APPAREL IS DEFINED TO MEAN PERSONAL PROTECTIVE SAFETY CLOTHING THAT:

1. IS INTENDED TO PROVIDE CONSPICUITY DURING BOTH DAYTIME AND NIGHTTIME USAGE, AND
2. MEETS THE PERFORMANCE CLASS 2 OR CLASS 3 REQUIREMENTS OF THE ANSI/ISEA 107-2004 PUBLICATION ENTITLED "AMERICAN NATIONAL STANDARDS FOR HIGH-VISIBILITY SAFETY APPAREL AND HEADWEAR"

**LIGHTING DEVICES**

**FUNCTION**

CONSTRUCTION AND MAINTENANCE ACTIVITIES OFTEN CREATE CONDITIONS ON OR NEAR THE TRAVELED WAY THAT ARE PARTICULARLY HAZARDOUS AT NIGHT. IT IS OFTEN DESIRABLE AND NECESSARY TO SUPPLEMENT THE REFLECTORIZED SIGNS, BARRIERS, AND CHANNELIZING DEVICES WITH LIGHTING DEVICES. STROBE TYPE LIGHTS ARE NOT PERMITTED.

**BARRICADE WARNING LIGHTS DESIGN (BATTERY OPERATED)**

TYPE "A" LOW INTENSITY FLASHING WARNING LIGHTS ARE MOST COMMONLY MOUNTED ON BARRICADES, OR WITH SIGNS AND ARE INTENDED TO WARN THE DRIVER THAT THEY ARE PROCEEDING IN A HAZARDOUS AREA. THESE LIGHTS SHALL NOT BE USED FOR DELINEATION, AS A SERIES OF FLASHING LIGHTS IN A ROW WOULD TEND TO OBSCURE THE DESIRED PATH.

TYPE "A" HIGH INTENSITY FLASHING WARNING LIGHTS ARE NORMALLY MOUNTED ON THE TYPE III BARRICADE THAT ACCOMPANIES THE ADVANCE WARNING SIGNS.

TYPE "C" STEADY BURN LIGHTS AS USED HEREIN, SHALL MEAN A SERIES OF LOW WATTAGE YELLOW ELECTRIC LIGHTS, WHERE LIGHTS ARE NEEDED TO DELINEATE OR MARK THE TRAVELED WAY THROUGH AND AROUND OBSTRUCTIONS IN A CONSTRUCTION MAINTENANCE AREA, THE DELINEATION SHALL BE ACCOMPLISHED BY USE OF STEADY BURNING LIGHTS. WHEN USED TO SUPPLEMENT CHANNELIZATION, THE MAXIMUM SPACING FOR WARNING LIGHTS SHOULD BE IDENTICAL TO THE CHANNELIZING DEVICE SPACING REQUIREMENTS. WHEN USED TO DELINEATE A CURVE, TYPE "C" WARNING LIGHTS SHOULD ONLY BE USED ON DEVICES ON THE OUTSIDE OF THE CURVE, AND NOT ON THE INSIDE OF THE CURVE.

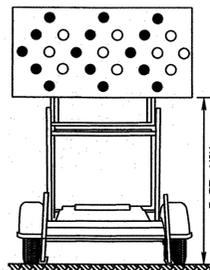
**FLASHING ARROW PANEL (DISPLAY)**

AN ARROW PANEL IS A SIGN WITH A MATRIX OF ELEMENTS, CAPABLE OF EITHER FLASHING OR SEQUENTIAL DISPLAYS. THIS SIGN SHALL PROVIDE ADDITIONAL WARNING AND DIRECTIONAL INFORMATION TO ASSIST IN MERGING AND CONTROLLING ROAD USERS THROUGH OR AROUND A TEMPORARY TRAFFIC CONTROL ZONE. AN ARROW PANEL SHOULD BE USED IN COMBINATION WITH APPROPRIATE SIGNS, CHANNELIZING DEVICES OR OTHER TRAFFIC CONTROL DEVICES.

**DESIGN**

ARROW PANELS SHALL MEET THE SIZE AND SPECIFICATIONS OF THE MUTCD FOR TYPE "C" ARROW DISPLAYS.

FLASHING ARROW PANEL SHALL BE RECTANGULAR, OF SOLID APPEARANCE AND FINISHED IN NON-REFLECTIVE BLACK. THE PANEL SHALL BE MOUNTED ON A VEHICLE, TRAILER OR OTHER SUITABLE SUPPORT. MINIMUM MOUNTING HEIGHT MEASURED VERTICALLY FROM THE BOTTOM OF THE PANEL TO THE ROADWAY BELOW IT OR TO THE ELEVATION OF THE NEAR EDGE OF THE ROADWAY, SHALL BE 7 FEET EXCEPT ON VEHICLE-MOUNTED PANELS, WHICH SHOULD BE AS HIGH AS PRACTICAL.



THE FOLLOWING SELECTIONS SHALL BE PROVIDED ON THE ARROW PANEL	
OPERATING MODE	PANEL DISPLAY
FLASHING ARROW	RIGHT SHOWN; LEFT OPPOSITE
SEQUENTIAL ARROW	RIGHT SHOWN; LEFT OPPOSITE
SEQUENTIAL CHEVRON	RIGHT SHOWN; LEFT OPPOSITE
FLASHING DOUBLE ARROW	
FLASHING OR ALTERNATING CAUTION	OR  OR 

THE ARROW PANEL SHALL HAVE A MINIMUM SIZE OF 96 INCHES WIDE AND 48 INCHES HIGH. THE MINIMUM LEGIBILITY DISTANCE SHALL BE 1 MILE. THE PANEL SHALL CONTAIN 25 LAMP ELEMENTS. ARROW PANEL ELEMENTS SHALL BE CAPABLE OF A MINIMUM 50 PERCENT DIMMING, AUTOMATICALLY WHEN AMBIENT LIGHT FALLS BELOW 50 LUX.

THE MINIMUM ELEMENT "ON TIME" SHALL BE 50 PERCENT FOR THE FLASHING MODE AND EQUAL INTERVALS OF 25 PERCENT FOR EACH SEQUENTIAL CHEVRON PHASE. THE FLASHING RATE SHALL BE NO FEWER THAN 25 NOR MORE THAN 40 FLASHES PER MINUTE.

**APPLICATION**

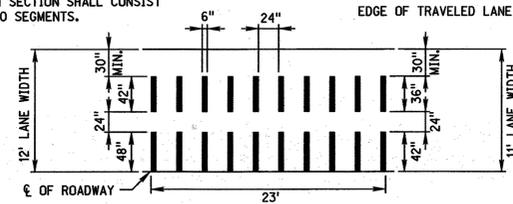
A FLASHING ARROW OR SEQUENTIAL CHEVRON MODE SHALL ONLY BE USED FOR STATIONARY OR MOVING LANE CLOSURES.

FOR SHOULDER WORK BLOCKING THE SHOULDER, FOR ROADSIDE WORK NEAR THE SHOULDER, OR FOR TEMPORARILY CLOSING ONE LANE ON A TWO-LANE, TWO-WAY ROADWAY, AN ARROW PANEL SHALL BE USED ONLY IN THE CAUTION MODE.

AN ARROW DISPLAY MODE SHALL NOT BE USED ON A TWO-LANE TWO-WAY ROADWAY FOR TEMPORARY ONE-LANE OPERATION OR LANE SHIFTS. AN ARROW DISPLAY SHALL NOT BE USED TO LATERALLY SHIFT TRAFFIC.

**TEMPORARY RUMBLE STRIPS**

EACH SECTION SHALL CONSIST OF 10 SEGMENTS.



**DESIGN**

TEMPORARY RUMBLE STRIPS MAY BE MADE OF ASPHALT PAVING MATERIAL, EPOXY AND AGGREGATE OR OTHER SUITABLE MATERIAL WHICH WILL MAINTAIN A DESIRABLE RUMBLE EFFECT. THE TEMPORARY RUMBLE STRIP SHOULD HAVE AN INSTALLED HEIGHT OF 3/8". PREFORMED RUMBLE STRIPS MAY BE USED PROVIDED THEY HAVE A MINIMUM 1/2" HEIGHT.

**TRAFFIC SIGNALS**

TRAFFIC SIGNALS MAY BE ALLOWED AT CERTAIN EQUIPMENT CROSSINGS WHERE THE VOLUME OF FILL MATERIAL AND THE NUMBER OF EQUIPMENT CROSSINGS PER HOUR IS HIGH. TRAFFIC SIGNALS MAY BE ALLOWED AT CERTAIN BRIDGE CONSTRUCTION SITES WHERE A COMBINATION OF ONE-WAY TRAFFIC AND HIGH TRAFFIC VOLUMES WOULD BE BEST SERVED WITH THIS TYPE OF TRAFFIC CONTROL.

ALL TRAFFIC SIGNAL REQUESTS AND METHOD OF INSTALLATION ON THE STATE HIGHWAY SYSTEM SHALL BE IN COMPLIANCE WITH THE MUTCD AND MUST BE APPROVED BY THE STATE TRAFFIC ENGINEER.

IF, AFTER THE SIGNAL ASSEMBLIES ARE ERECTED AND THE ROAD IS OPEN TO PUBLIC TRAVEL, THE SIGNAL SYSTEM IS NOT PUT IMMEDIATELY INTO OPERATION, THE SIGNAL FACES SHALL BE COVERED WITH BURLAP OR OTHER OPAQUE MATERIAL SUBJECT TO THE APPROVAL OF THE ENGINEER, INOPERATIVE SIGNALS ON ROADS OPEN TO THE PUBLIC SHALL ALWAYS BE COVERED. TILTING THE SIGNALS UPWARD IS NOT AN ACCEPTABLE ALTERNATIVE TO COVERING THE HEADS.

**FLOODLIGHTS**

WHEN NIGHTTIME WORK IS REQUIRED, FLOODLIGHTS SHALL BE USED TO ILLUMINATE FLAGGER STATIONS. FLOODLIGHTS SHOULD BE USED TO ILLUMINATE EQUIPMENT CROSSINGS, AND OTHER AREAS WHERE EXISTING LIGHT IS NOT ADEQUATE FOR THE WORK TO BE PERFORMED SAFELY.

IN NO CASE SHALL FLOODLIGHTING BE PERMITTED TO CREATE A DISABLING GLARE FOR DRIVERS. THE ADEQUACY OF THE FLOODLIGHT PLACEMENT AND ELIMINATION OF POTENTIAL GLARE SHOULD BE CHECKED BY DRIVING THROUGH THE PROJECT.

**PAVEMENT MARKING**

IT IS INTENDED TO THE EXTENT POSSIBLE, THAT MOTORISTS BE PROVIDED MARKINGS WITHIN A WORK AREA COMPARABLE TO THE MARKINGS NORMALLY MAINTAINED ALONG ADJACENT ROADWAYS, PARTICULARLY AT EITHER END OF THE WORK AREA.

ALL MARKINGS AND DEVICES USED TO DELINEATE VEHICLE AND PEDESTRIAN PATHS SHALL BE CAREFULLY REVIEWED DURING DAYTIME AND NIGHTTIME PERIODS TO AVOID INADVERTENTLY LEADING DRIVERS OR PEDESTRIANS FROM THE INTENDED PATH.

PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED UNLESS OTHERWISE APPROVED BY THE ENGINEER.

**TAPERS**

TAPERS ARE CREATED USING A SERIES OF CHANNELIZING DEVICES OR PAVEMENT MARKINGS TO MOVE TRAFFIC OUT OF OR INTO ITS NORMAL PATH.

**MERGING TAPER**

A MERGING TAPER REQUIRES THE LONGEST DISTANCE BECAUSE DRIVERS ARE REQUIRED TO MERGE INTO COMMON ROAD SPACE. THE TAPER SHOULD BE LONG ENOUGH TO ENABLE MERGING DRIVERS TO HAVE ADEQUATE ADVANCE WARNING AND SUFFICIENT LENGTH TO ADJUST THEIR SPEEDS AND MERGE INTO A SINGLE LANE BEFORE THE DOWNSTREAM END OF THE TRANSITION.

**SHIFTING TAPER**

A SHIFTING TAPER IS USED WHEN MERGING IS NOT REQUIRED, BUT A LATERAL SHIFT IS NEEDED. APPROXIMATELY ONE-HALF "L" HAS BEEN FOUND TO BE ADEQUATE. WHERE MORE SPACE IS AVAILABLE, IT MAY BE BENEFICIAL TO USE LONGER TAPERS. GUIDANCE FOR CHANGES IN ALIGNMENT MAY ALSO BE ACCOMPLISHED BY USING HORIZONTAL CURVES DESIGNED FOR NORMAL HIGHWAY SPEEDS.

**SHOULDER TAPERS**

A SHOULDER TAPER MAY BE BENEFICIAL ON HIGH-SPEED ROADWAYS WHERE SHOULDERS ARE PART OF THE ACTIVITY AREA AND ARE CLOSED, OR WHEN IMPROVED SHOULDERS MIGHT BE MISTAKEN AS A DRIVING LANE IN THESE INSTANCES, THE SAME TYPE, BUT ABBREVIATED, CLOSURE PROCEDURES USED ON A NORMAL PORTION OF THE ROADWAY CAN BE USED. IF USED, SHOULDER TAPERS APPROACHING THE ACTIVITY AREA SHOULD HAVE A LENGTH OF ABOUT ONE-THIRD "L".

**DOWNSTREAM TAPERS**

THE DOWNSTREAM TAPER MAY BE USEFUL IN TERMINATION AREAS TO PROVIDE A VISUAL CUE TO THE DRIVER THAT ACCESS IS AVAILABLE TO THE ORIGINAL LANE OR PATH THAT WAS CLOSED. WHEN USED, IT SHOULD HAVE A MINIMUM LENGTH OF ABOUT 100 FEET PER LANE, WITH DEVICES SPACED ABOUT 20 FEET APART.

**ONE LANE, TWO WAY TAPER**

THE ONE-LANE, TWO-WAY TAPER IS USED IN ADVANCE OF AN ACTIVITY AREA THAT OCCUPIES PART OF A TWO-WAY ROADWAY IN SUCH A WAY THAT A PORTION OF THE ROAD IS USED ALTERNATELY BY TRAFFIC IN EACH DIRECTION. A SHORT TAPER HAVING A MINIMUM LENGTH OF 50 FEET AND A MAXIMUM LENGTH OF 100 FEET WITH CHANNELIZING DEVICES AT APPROXIMATELY 20 FOOT SPACINGS SHOULD BE USED TO GUIDE TRAFFIC INTO THE ONE-LANE-SECTION AND A DOWNSTREAM TAPER WITH A LENGTH OF APPROXIMATELY 100 FEET SHOULD BE USED TO GUIDE TRAFFIC BACK INTO THEIR ORIGINAL LANE.

TYPE OF TAPER	TAPER LENGTH (FEET)
MERGING TAPER	L MINIMUM
SHIFTING TAPER	1/2 L MINIMUM
SHOULDER TAPER	1/3 L MINIMUM
TWO-WAY TAPER	100 FEET MAXIMUM

SPEED	FORMULA
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR GREATER	$L = WS$

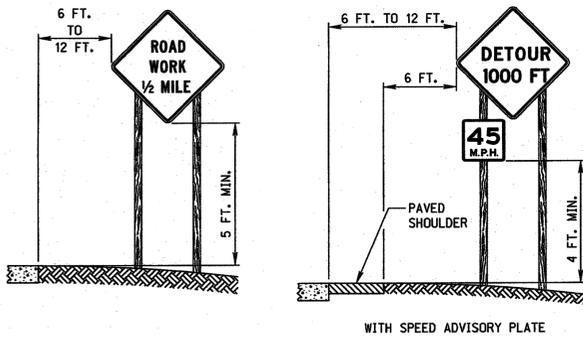
L = TAPER LENGTH IN FEET  
W = WIDTH OF OFFSET IN FEET  
S = POSTED SPEED LIMIT PRIOR TO WORK IN MPH

SPEED (MPH)	LANE WIDTH			
	10 FT.	11 FT.	12 FT.	12 FT.
25	105	115	125	
30	150	165	180	
35	205	225	245	
40	270	295	320	
45	450	495	540	
50	500	550	600	
55	550	605	660	
60	600	660	720	
65	650	715	780	
75	750	825	900	

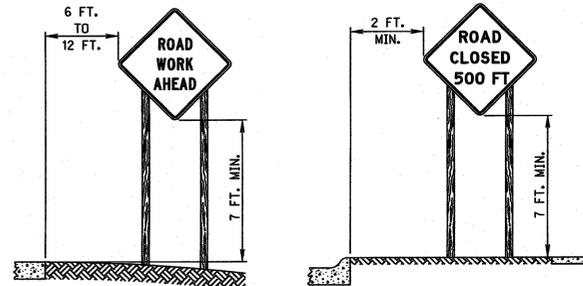
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### ROADSIDE SIGNS

#### HEIGHT AND LATERAL LOCATION OF SIGNS RURAL AREA



#### URBAN AREA



#### TYPICAL FIRST SIGN AT CONSTRUCTION SITE

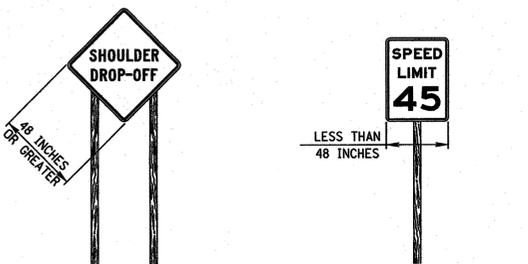


WITH TYPE "A" FLASHING WARNING LIGHT MOUNTED ABOVE TYPE III BARRICADE

#### PORTABLE AND TEMPORARY MOUNTING



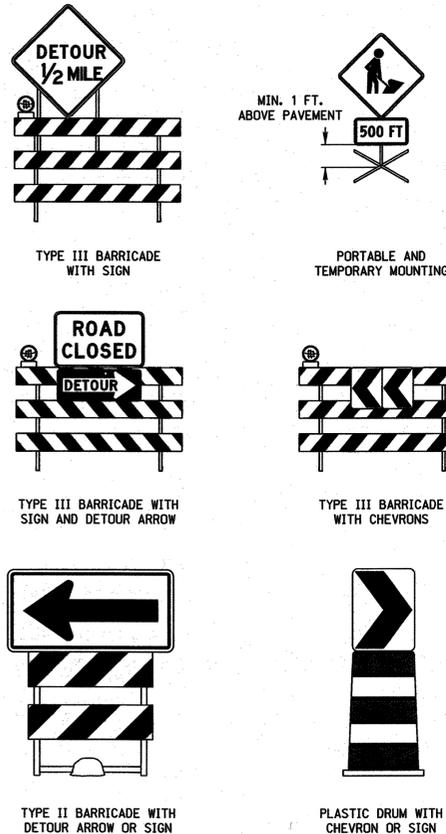
#### TYPICAL SIGN MOUNTINGS POST MOUNTED



SIGNS 48 INCHES OR WIDER REQUIRE TWO POSTS

SIGN WIDTHS LESS THAN 48 INCHES MAY BE MOUNTED WITH ONE POST

#### TYPICAL SIGN MOUNTINGS OTHER THAN POST MOUNTED



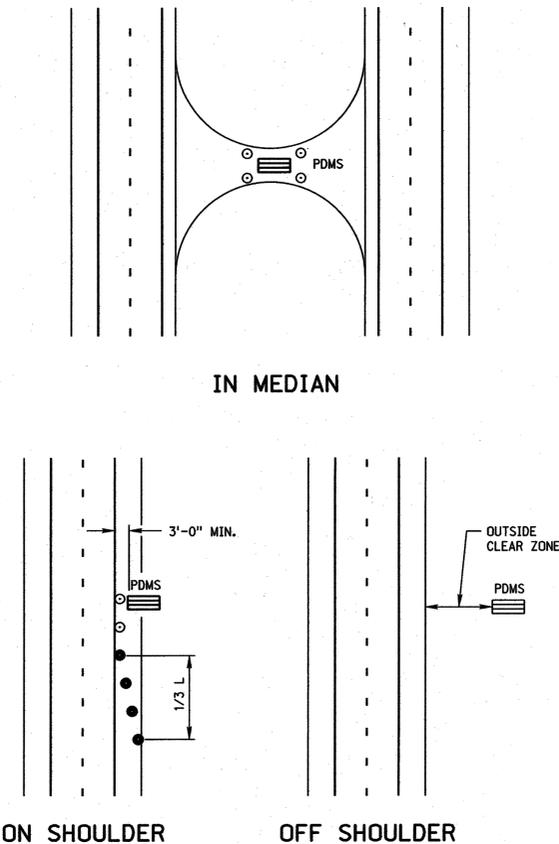
#### TEMPORARY SIGN SUPPORTS

ALL "TEMPORARY SIGN" SUPPORTS (BASES) SHALL BE NCHRP 350 OR MASH (TL-3) APPROVED.

"TEMPORARY SIGNS" ARE ALL TEMPORARILY MOUNTED WORK ZONE SIGNS THAT ARE NOT POST MOUNTED IN THE GROUND AT THE TYPICAL 5 FOOT MOUNTING HEIGHT. TEMPORARY SIGNS ARE CONSIDERED NCHRP 350 OR MASH CATEGORY 2 DEVICES AND ARE MOUNTED ON TEMPORARY SIGN STANDS. TEMPORARY SIGNS SHALL BE MOUNTED A MINIMUM OF 1 FOOT ABOVE THE GROUND, UNLESS OTHERWISE REQUIRED TO BE MOUNTED AT A HIGHER HEIGHT.

TEMPORARY SIGNS AND THEIR SUPPORTS SHALL NOT BE IN PLACE LONGER THAN 3 DAYS. ANY SIGN THAT IS TO BE IN PLACE LONGER THAN 3 DAYS SHALL BE POST MOUNTED OR MOUNTED TO A DRUM, BARRICADE, OR BARRIER, AS REQUIRED BY THE PLANS OR SPECIFICATIONS.

#### PORTABLE DYNAMIC MESSAGE SIGN DELINEATION



#### PORTABLE DYNAMIC MESSAGE SIGNS (PDMS)

THE PLACEMENT OF PDMS SHOULD BE IN THE FOLLOWING ORDER:

WHENEVER POSSIBLE, PDMS SHOULD BE PLACED OFF OF ANY USABLE PORTION OF THE ROADWAY ON THE RIGHT SIDE OF THE ROADWAY. WHEN PLACED OUTSIDE THE CLEAR ZONE OR BEHIND GUARDRAIL OR CONCRETE PROTECTION BARRIERS, DELINEATION IS NOT REQUIRED.

- WHERE FIELD CONDITIONS DO NOT ALLOW FOR THIS PLACEMENT, THE SIGNS MAY BE LOCATED ON THE OUTSIDE SHOULDER OF THE ROADWAY OR WITHIN THE MEDIAN.
- A MINIMUM CLEARANCE OF 3 FEET MEASURED HORIZONTALLY FROM THE EDGE OF THE SIGN TO THE EDGE OF THE TRAVELED WAY IS RECOMMENDED.
  - THE PDMS SHOULD HAVE A MINIMUM MOUNTED HEIGHT OF 7 FEET ON FREEWAYS, EXPRESSWAYS AND IN URBAN AREAS.
  - ALL OTHER RURAL APPLICATIONS SHOULD HAVE A MINIMUM HEIGHT OF 5 FEET.

THESE HEIGHTS ARE MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE ELEVATION OF THE NEAR EDGE OF THE PAVEMENT.

REFLECTORIZED PLASTIC DRUMS SHOULD BE USED TO DELINEATE EACH SIGN USING A 1/3 L TAPER. THESE DRUMS SHOULD BE POSITIONED ON THE UPSTREAM END OF THE SIGN TO FORM A TAPER LEADING UP TO THE TRAFFIC SIDE OF THE SIGN. FOR A SIGN LOCATED IN THE MEDIAN, THE SIGN SHOULD BE DELINEATED WITH A 42 INCH CONE ON ALL FOUR CORNERS.

WHEN DEPLOYED, THE SIGN SHALL BE SIGHTED AND ALIGNED WITH APPROACHING TRAFFIC TO ENSURE VISIBILITY OF THE MESSAGE. IF MULTIPLE SIGNS ARE USED, THE SIGNS SHOULD BE LOCATED ON THE SAME SIDE OF THE ROAD AND SEPARATED ACCORDING TO PROPER SIGN SPACING.

WHEN PRACTICAL, PDMS SHOULD NOT BE USED TO REPLACE STATIC SIGNS FOR LONG TERM USAGE (OVER 10 DAYS).

WHEN PDMS ARE TO BE DEPLOYED FOR LONG PERIODS, SUCH AS INCIDENT MANAGEMENT ROLES, CONCRETE PADS WITH APPROPRIATE TIE DOWNS SHOULD BE CONSTRUCTED FOR THEIR PLACEMENT.

PDMS NOT ACTIVELY BEING USED IN A CONSTRUCTION OR INCIDENT MANAGEMENT ROLE SHOULD BE REMOVED.

REFER TO NDOR "DMS GUIDELINES" FOR PROPER PDMS MESSAGE INFORMATION.

#### NOTES

- ALL TRAFFIC CONTROL DEVICES SHALL MEET THE APPLICABLE STANDARDS AND SPECIFICATIONS PRESCRIBED IN PART 6 OF THE LATEST ADOPTED EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, (MUTCD)" AND THE STATE OF NEBRASKA SUPPLEMENT TO THE MUTCD. ALL TRAFFIC CONTROL DEVICES SHALL BE CRASHWORTHY AND QUALIFY AS SUCH ACCORDING TO THE TESTING AND ACCEPTANCE GUIDELINES OF THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 350 OR MANUAL FOR ASSESSING SAFETY HARDWARE (MASH).
- TRAFFIC CONTROL PLANS AND DEVICES SHOULD FOLLOW THE PRINCIPLES SET FORTH, BUT MAY DEVIATE FROM THE TYPICAL DRAWINGS TO ALLOW FOR CONDITIONS AND REQUIREMENTS OF THE PROJECT.
- TRAFFIC CONTROL DEVICES SHALL BE INSTALLED SO AS NOT TO OBSTRUCT THE VIEW OF OTHER TRAFFIC CONTROL DEVICES.
- THE ENGINEER SHALL HAVE THE AUTHORITY TO REQUIRE THE USE, AND APPROVE THE LOCATION OF ANY OF THE DEVICES SHOWN IN THESE PLANS.

#### WORK ZONE SPEED LIMIT NOTES

- WORK ZONE SPEED LIMITS SHALL NOT BE INSTALLED WITHOUT A SPEED ZONE AUTHORIZATION COMPLETED BY THE DEPARTMENT.
- REDUCED SPEED LIMITS SHOULD BE USED ONLY IN THE SPECIFIC PORTION OF THE WORK ZONE WHERE CONDITIONS OR RESTRICTIVE FEATURES ARE PRESENT. HOWEVER, FREQUENT CHANGES IN THE SPEED LIMIT SHOULD BE AVOIDED. THE REDUCTION OF SPEED SHOULD BE DESIGNED SO VEHICLES CAN SAFELY TRAVEL THROUGH THE WORK ZONE WITH A SPEED LIMIT REDUCTION OF NO MORE THAN 10 MPH UNLESS OTHERWISE NOTED IN THE PLANS.
- WORK ZONE SPEED LIMITS SHOWN ARE TYPICAL APPLICATIONS ONLY AND ARE NOT TO BE ASSUMED AS THE SPEED LIMITS REQUIRED FOR THE WORK.
- EXISTING SPEED LIMIT SIGNS SHALL BE REMOVED OR COVERED WHEN A REDUCED WORK ZONE SPEED LIMIT IS IN EFFECT IN THE SAME AREA.
- WORK ZONE SPEED LIMIT SIGNS SHALL BE INSTALLED EVERY MILE THROUGH THE WORK AREA WHEN SPEED ZONE IS REDUCED.
- A SPEED LIMIT SIGN ENDING THE REDUCED SPEED ZONE SHALL BE INSTALLED AT THE END OF EACH ZONE.
- DOUBLE FINES AND REDUCED SPEED ZONE SIGNING ARE NOT REQUIRED FOR SHORT-DURATION WORK LESS THAN 12 HOURS.

#### TAPER FORMULA

$$L = S \times W \text{ FOR SPEEDS OF 45 MPH OR MORE.}$$

$$L = \frac{WS^2}{60} \text{ FOR SPEEDS OF 40 MPH OR LESS.}$$

WHERE:

L = MINIMUM LENGTH OF TAPER.

S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK.

W = WIDTH OF OFFSET (LANE WIDTH).

#### LEGEND

- TYPE III BARRICADE
- REFLECTORIZED PLASTIC DRUM
- REFLECTORIZED PLASTIC DRUM OR 42" CONE
- PORTABLE DYNAMIC MESSAGE SIGN

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