CHEROKEE NATION

PLANS FOR

HULBERT COMMUNITY CENTER

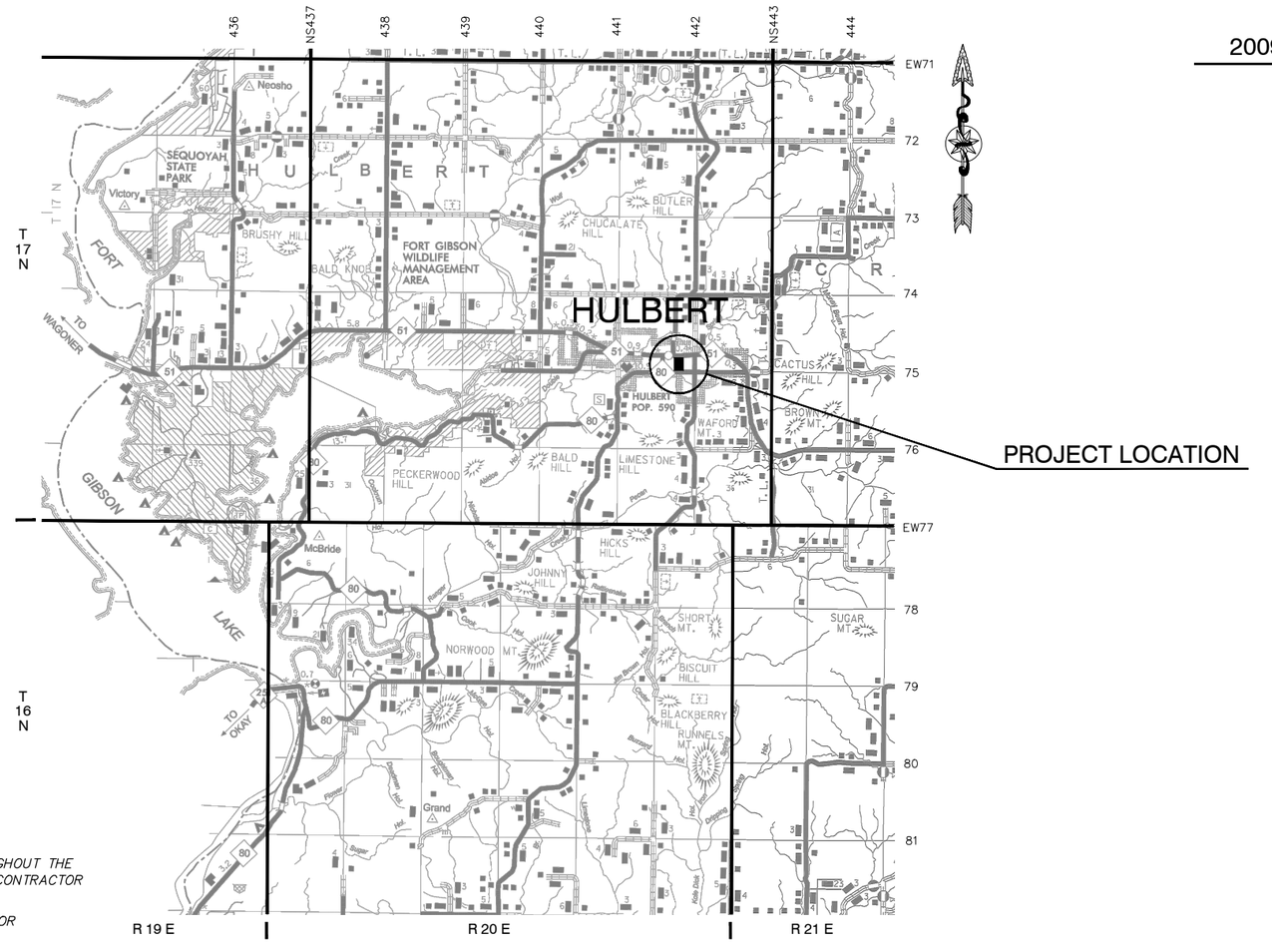
ROADWAY AND PARKING LOT PLANS

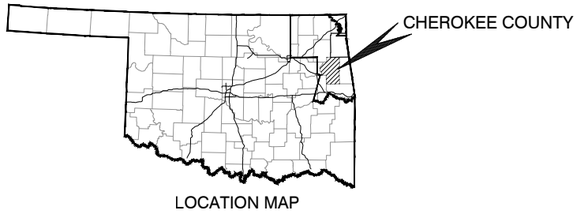
TRIBAL COUNCIL DISTRICT #1
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

INDEX OF SHEETS

2009 O.D.O.T. STANDARD DRAWINGS

ROADWAY	TRAFFIC SIGNING
SSS-1	RSD1-1
PCES-4	SBS1-1
CET4S-3	GMS1-1
SMD-3	FGS1-1
ASCD-5	
CSCD-5	
SPI-4	
SPB-1	
FHTMPP-1	





LOCATION MAP

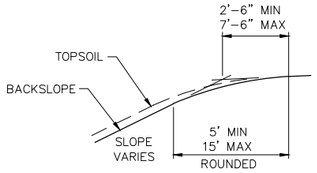
THE CONTRACTOR SHALL BE AWARE OF EXISTING UTILITIES LOCATED THROUGHOUT THE PROJECT. ANY UTILITY DAMAGE RESULTING FROM THE NEGLIGENCE OF THE CONTRACTOR SHALL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.

PRIOR TO PERFORMING ANY GRADING OR EXCAVATING WORK THE CONTRACTOR SHALL NOTIFY ALL UTILITY OWNERS OR 'CALL OKIE (OKLAHOMA ONE-CALL)' NOT LESS THAN 48 HOURS IN ADVANCE AND SHALL VERIFY OR ESTABLISH THE EXACT LOCATION AND DEPTH OF ALL UNDERGROUND LINES.

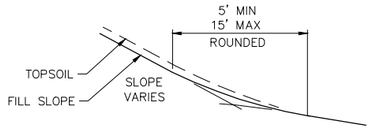
CHEROKEE NATION WILL NOT BE RESPONSIBLE FOR LOCATING UTILITIES, OR DAMAGE AS A RESULT OF NEGLIGENCE.

NORTH/SOUTH ALIGNMENT_____689 LIN FT _____ 0.130 MILES
PARKING LOT AREA _____ 86,840 SQ FT

THE OKLAHOMA DEPARTMENT OF TRANSPORTATION 2009 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION SHALL GOVERN

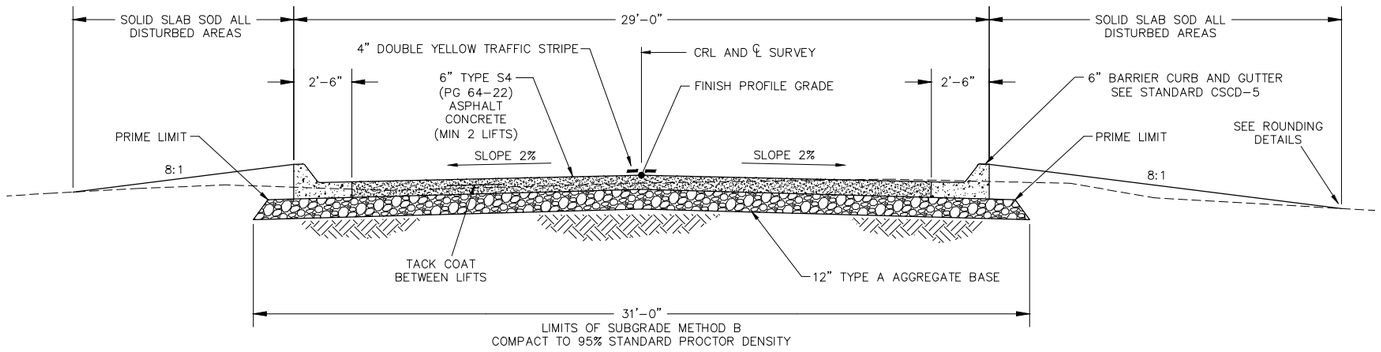


TOP OF CUT ROUNDING



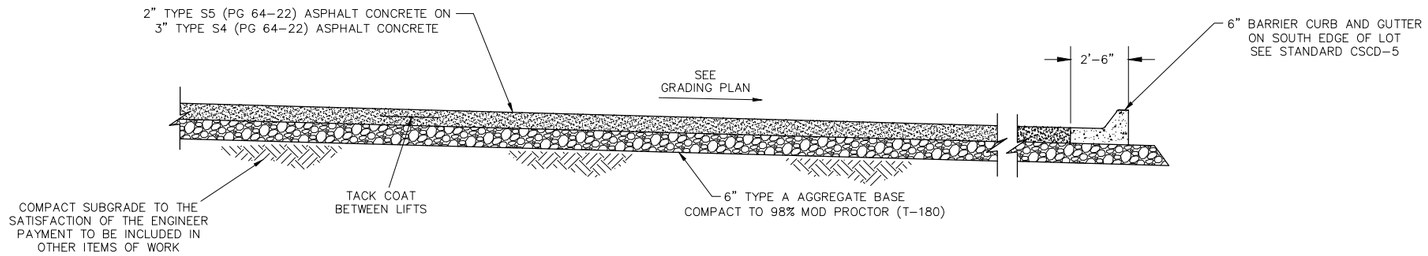
TOE OF FILL ROUNDING

TYPICAL ROUNDING DETAILS



TYPICAL SECTION 1

NORTH/SOUTH ALIGNMENT



PAVEMENT SECTION

ASPHALT PARKING LOT

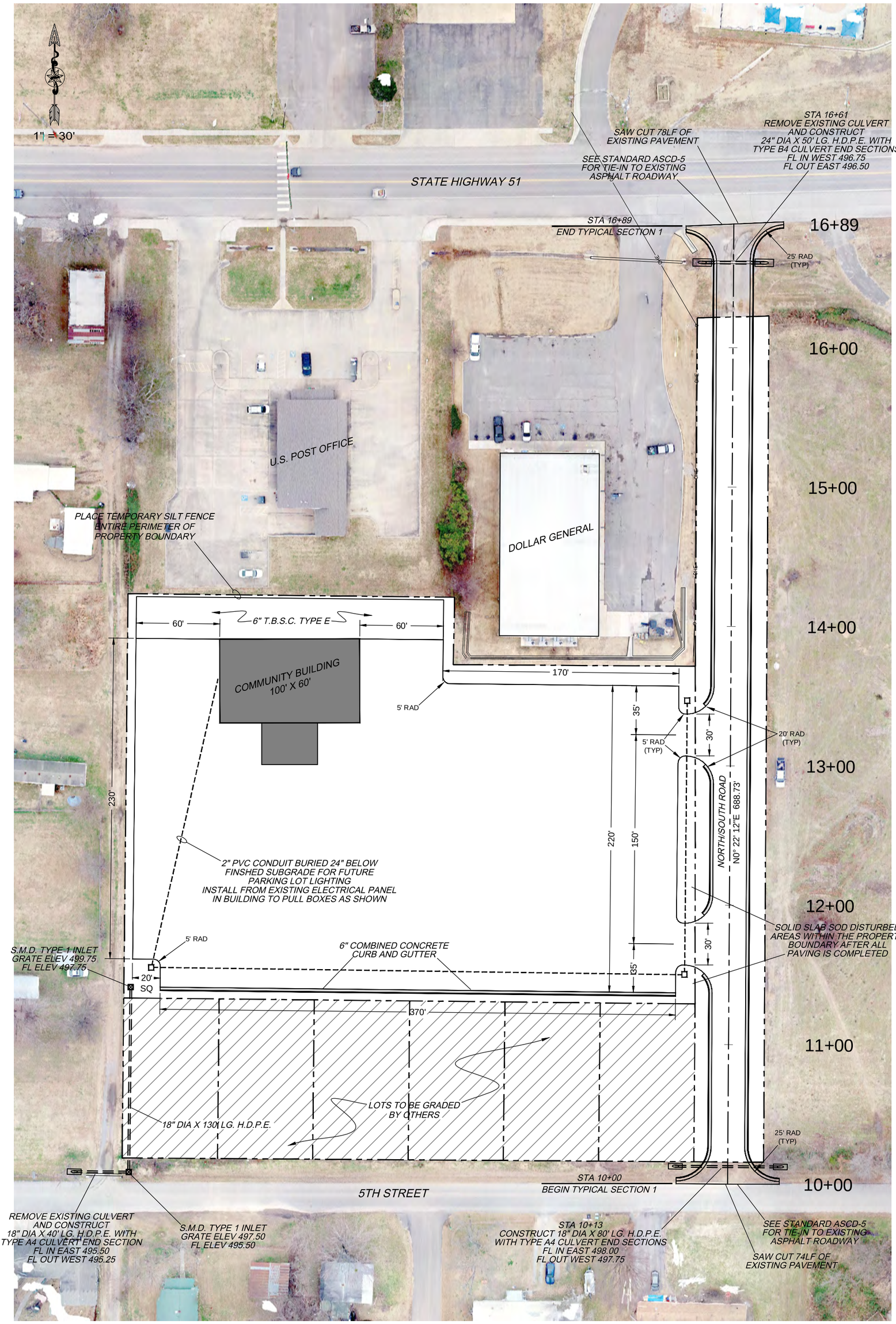
TYPICAL SECTIONS

DESIGN BY: DMOORE | CHECK BY: C.N.D.O.T. | DATE: 1/2019 | SHEET 2 OF 10

HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

CHEROKEE NATION

TAHLEQUAH, OKLAHOMA



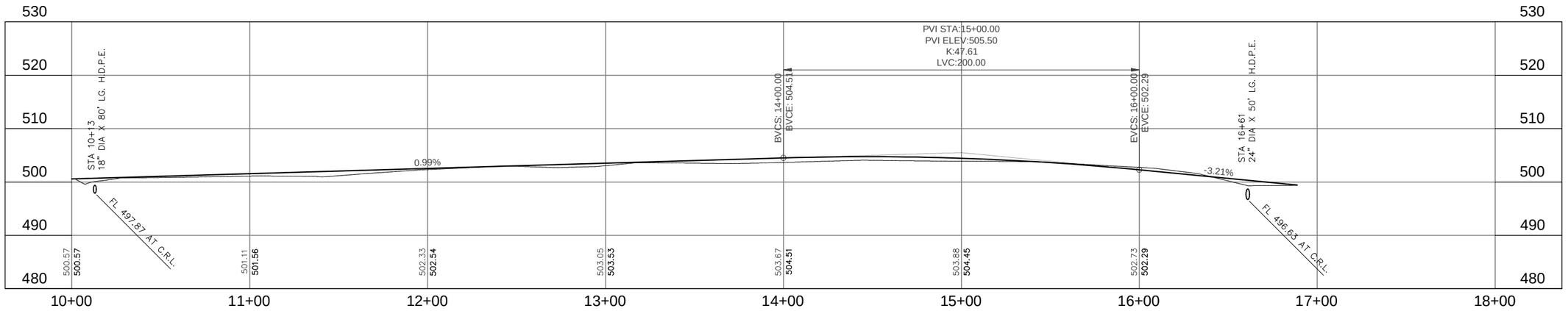
CHEROKEE NATION

TAHLEQUAH, OKLAHOMA

HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

ROADWAY AND PARKING LOT PLAN

DESIGN BY: DMOORE	CHECK BY: C.N.D.O.T.	DATE: 1/2019	SHEET 3 OF 10



NORTH/SOUTH ROADWAY PROFILE

ROADWAY PROFILE

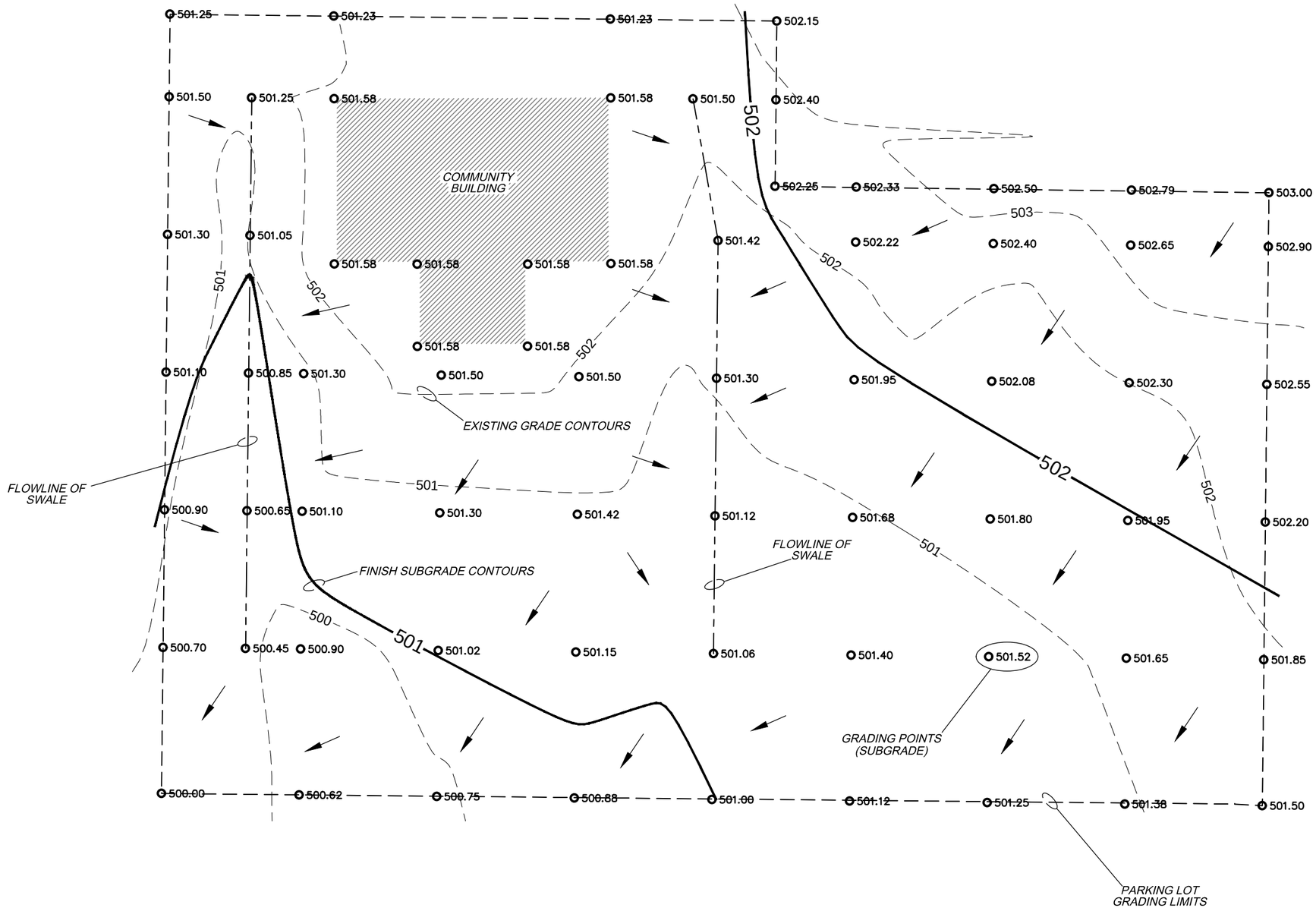
DESIGN BY: DMOORE | CHECK BY: C.N.D.O.T. | DATE: 1/2019 | SHEET 4 OF 10

HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

CHEROKEE NATION

TAHLEQUAH, OKLAHOMA

1" = 20'



PARKING LOT GRADING PLAN

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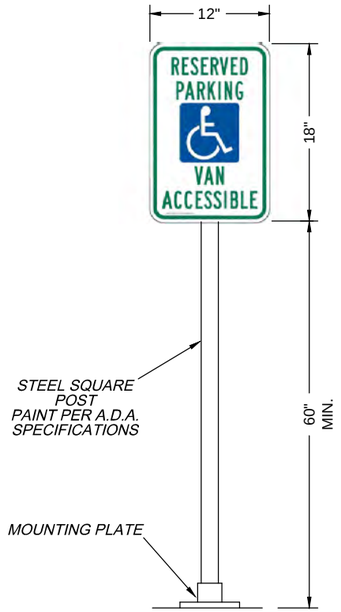
HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

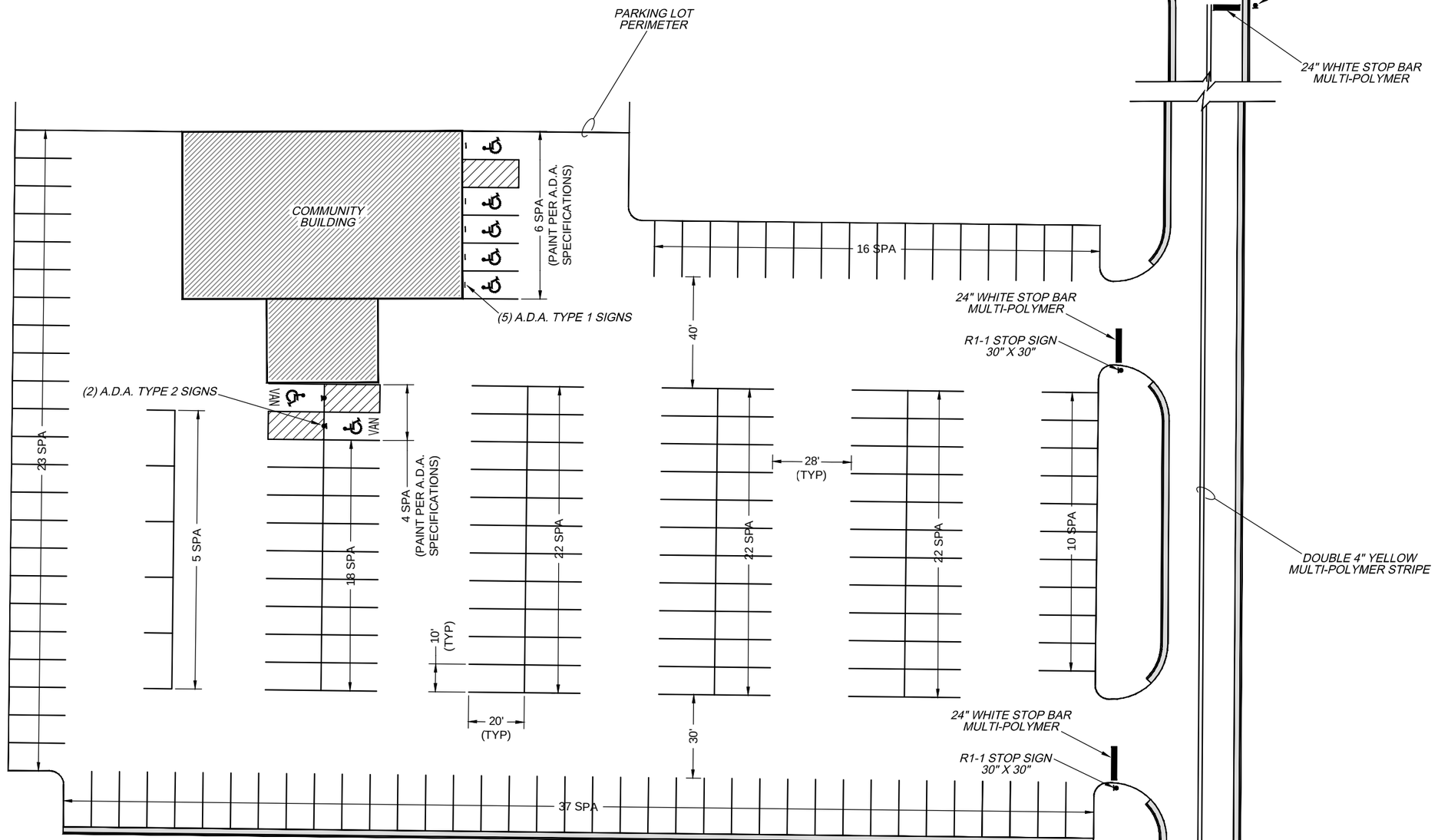
CHEROKEE NATION

TAHLEQUAH, OKLAHOMA



A.D.A. SIGN
TYPE 2
(2 REQ'D)

A.D.A. SIGN
TYPE 1
MOUNTED ON BUILDING EXTERIOR
(5 REQ'D)



(175) STANDARD 20' X 10' PARKING SPACES
(5) A.D.A. 20' X 10' PARKING SPACES
(2) A.D.A. VAN ACCESSIBLE 20' X 10' PARKING SPACES

SIGNING AND STRIPING PLAN

DESIGN BY: DMOORE | CHECK BY: C.N.D.O.T. | DATE: 1/2019 | SHEET 6 OF 10

HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

CHEROKEE NATION
TAHLEQUAH, OKLAHOMA

SUMMARY OF ROADWAY TYPICAL SECTIONS

STATION RANGE	WIDTH	SUPERPAVE TYPE S4 411(C) (TON)	COMBINED CURB AND GUTTER 609(A) (LF)	SUBGRADE METHOD B 310(B) (SY)	AGGREGATE BASE TYPE A 303(A) (CY)	PRIME COAT 408 (GAL)	SAWING PAVEMENT 619(C) (LF)
TYPICAL SECTION 1 - NORTH/SOUTH ALIGNMENT							
10+00 - 16+89	29'-0"	**638**	**1,354**	**2,433**	**811**	**608**	**152**

SUMMARY OF PARKING LOT PAVING

TOTAL SQUARE FOOTAGE (INCLUDING DRIVES)	SUPERPAVE TYPE S4 411(C) (TON)	SUPERPAVE TYPE S5 411(D) (TON)	COMBINED CURB AND GUTTER 609(A) (LF)	AGGREGATE BASE TYPE A 303(A) (CY)
86,840	**1,621**	**1,081**	**370**	**1,608**

SUMMARY OF STRIPING

DESCRIPTION	TRAFFIC STRIPE MULTI-POLYMER 4" WHITE 856(A) (LF)	TRAFFIC STRIPE MULTI-POLYMER 4" YELLOW 856(A) (LF)	TRAFFIC STRIPE MULTI-POLYMER 24" WHITE 856(A) (LF)	TRAFFIC STRIPE MULTI-POLYMER SYMBOLS, WORDS 856(B) (EA)
PARKING LOT				
STD. 20' X 10' PARKING SPACES	4,450	-	-	-
A.D.A. PARKING	350	-	-	9
STOP BARS	-	-	20	-
NORTH/SOUTH ALIGNMENT				
STA 10+00 TO STA 16+89	-	1,274	20	-
TOTAL	**4,800**	**1,274**	**40**	**9**

SUMMARY OF SIGNS

DESCRIPTION	SHEET ALUMINUM SIGNS 850(A) (SF)
PARKING LOT	
A.D.A. PARKING (7 REQ'D)	16.50
STOP SIGNS (2 REQ'D)	12.50
NORTH/SOUTH ALIGNMENT	
STOP SIGNS (2 REQ'D)	12.50
TOTAL	**41.50**

SUMMARY OF QUANTITIES

DESIGN BY: DMOORE | CHECK BY: C.N.D.O.T. | DATE: 1/2019 | SHEET 7 OF 10

HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

CHEROKEE NATION

TAHLEQUAH, OKLAHOMA

PAY QUANTITY NOTES:

(R–30) PRICE BID TO INCLUDE COST OF TACK COAT, MEETING THE REQUIREMENTS OF SECTION 407 OF THE STANDARD SPECIFICATIONS.

(R–32) ESTIMATED AT 112 LBS. PER SQ. YD. PER 1" THICK.

(1) INCLUDES ALL GRADING REQUIRED TO COMPLETE THE ENTIRE PROJECT INCLUDING PARKING LOT, ROADWAY AND DRAINAGE.

(2) ESTIMATED QUANTITY TO BE USED ONLY IF REQUIRED. IF THE EXISTING ROADWAY SUBGRADE MATERIAL IS NOT CAPABLE OF MEETING THE SPECIFICATIONS FOR SUBGRADE METHOD 'B', THEN THE ENGINEER MAY REQUIRE THE CONTRACTOR TO PLACE SELECT BORROW. THE PARKING LOT SUBGRADE MATERIAL MAY ALSO REQUIRE SELECT BORROW IN ORDER TO SATISFY THE ENGINEER. ALL UNSATISFACTORY MATERIAL REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF IN A MANNER APPROVED BY THE ENGINEER.

(3) SHALL BE PLACED AROUND THE ENTIRE PERIMETER OF THE PROPERTY LESS THE CONSTRUCTION ENTRY. THIS PAY ITEM SHALL ALSO INCLUDE THE REMOVAL AND DISPOSAL OF ACCUMULATED SILT AS DIRECTED BY THE ENGINEER. SILT FENCE WILL BE REMOVED AFTER SODDING OPERATIONS ARE COMPLETED.

(4) SHALL BE PLACED ON ALL DISTURBED AREAS AFTER ALL PAVING IS COMPLETED. SODDING WILL NOT BE REQUIRED ON THE SIX PLATTED LOTS ON THE SOUTH SIDE OF THE PROPERTY.

(5) ESTIMATED AT 125 POUNDS PER CUBIC FOOT. THE CONTRACTOR SHALL PLACE AND COMPACT 175 TONS ON THE NORTH SIDE OF THE COMMUNITY BUILDING AS DIRECTED BY THE ENGINEER. THE REMAINING 75 TONS SHALL BE FOR MISCELLANEOUS USE AS DIRECTED BY THE ENGINEER.

(6) SHALL INCLUDE THE COST OF TRENCHING AND STANDARD BEDDING MATERIAL AS REQUIRED BY STANDARD DRAWINGS SPI–4 AND SPB–1.

(7) SHALL INCLUDE THE COST OF THE SHEET METAL SIGN, STEEL SQUARE POST, MOUNTING PLATE, PAINT, MOUNTING BRACKETS AND ALL HARDWARE TO COMPLETE THE ENTIRE SIGN.

(8) SEE THE SUMMARY OF STRIPING ON SHEET 7 TO DESIGNATE BETWEEN WHITE AND YELLOW 4" WIDE MULTI–POLYMER TRAFFIC STRIPE.

(9) ESTIMATED AT 0.25 GALLONS PER SQUARE YARD OF AGGREGATE BASE.

(10) SHALL INCLUDE THE COST OF TRENCHING, BACKFILLING AND ALL OTHER CONSTRUCTION PROCEDURES REQUIRED TO INSTALL THE CONDUIT FROM THE EXISTING ELECTRICAL PANEL INSIDE OF THE COMMUNITY BUILDING TO THE PULLBOX LOCATIONS SHOWN ON THE PLAN. INSTALLATION PROCEDURES SHALL BE SUBMITTED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

ROADWAY GENERAL CONSTRUCTION NOTES:

(G–46) PRIOR TO FINAL ACCEPTANCE, ALL EXPOSED CURB SURFACES SHALL BE CLEANED OF ALL DISCOLORATION SUCH AS ASPHALT STAIN, TIRE MARKS, OR OTHER DISFIGUREMENT.

(G–47) EXCESS ASPHALT AT JOINTS AND CRACKS IN EXISTING PAVEMENT SHALL BE REMOVED FLUSH TO TOP OF PAVING IN A MANNER APPROVED BY THE ENGINEER.

(G–48) IN ACCORDANCE WITH THE OKLAHOMA UNDERGROUND FACILITIES DAMAGE PREVENTION ACT THE CONTRACTOR SHALL NOTIFY THE OKLAHOMA ONE–CALL SYSTEM, INC. 48 HOURS PRIOR TO BEGINNING EXCAVATION. OKLAHOMA ONE–CALL SYSTEM, INC. "CALL OKIE" 1–800–522–6543 OR 811.

THE CONTRACTOR SHALL GIVE NOTICE, IN WRITING, FOURTEEN DAYS PRIOR TO THE BEGINNING OF CONSTRUCTION ACTIVITIES TO THE CHEROKEE NATION.

CONSTRUCTION STAKING FOR BOTH THE ROADWAY AND PARKING LOT WILL BE PERFORMED BY THE CHEROKEE NATION DEPARTMENT OF TRANSPORTATION. THE CONTRACTOR SHALL GIVE NOTICE TO THE DEPARTMENT FIVE DAYS IN ADVANCE OF ANY STAKING THAT THE CONTRACTOR MAY NEED PERFORMED. THE DEPARTMENT WILL PERFORM STAKING FOR THE SUBGRADE, AND AFTER THE CONTRACTOR HAS COMPLETED THE GRADING AND HAS MET THE SPECIFICATIONS FOR SUBGRADE METHOD 'B' (ROADWAYS) AND THE SATISFACTION OF THE ENGINEER (PARKING LOT), THE CONTRACTOR SHALL THEN PLACE THE TYPE A AGGREGATE BASE TO AN ESTIMATED 'TOP OF AGGREGATE' GRADE. THE DEPARTMENT OF TRANSPORTATION SHALL THEN 'BLUETOP' THE AGGREGATE BASE FOR BOTH THE ROADWAY AND THE PARKING LOT.

THE CONTRACTOR SHALL PROVIDE A COMPETENT SUPERVISOR EXPERIENCED IN THE PROJECT SCOPE OF WORK AND TRAINED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS. DELEGATE AUTHORITY TO THE SUPERVISOR TO MAKE BINDING DECISIONS ON BEHALF OF THE CONTRACTOR AND TO PROVIDE LABOR, EQUIPMENT, AND MATERIAL REQUIRED FOR EFFECTIVE PROJECT WORK PROGRESS. THE CONTRACTOR SHALL HAVE THE SUPERVISOR AVAILABLE ON SITE ANYTIME CONTRACT WORK IS BEING PERFORMED ON THE PROJECT.

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PAY QUANTITIES

ITEM	CODE	DESCRIPTION	NOTES	UNIT	QUANTITY
202(H)	0185	EARTHWORK	1	LSUM	1
202(E)	0186	SELECT BORROW	2	CY	2,000
221(C)	2801	TEMPORARY SILT FENCE	3	LF	2,230
230(A)	2806	SOLID SLAB SODDING	4	SY	2,500
303(A)	2100	AGGREGATE BASE TYPE A		CY	2,419
310(B)	0149	SUBGRADE METHOD B		SY	2,433
402(E)	0225	TRAFFIC BOUND SURFACE COURSE TYPE E	5	TON	250
408	5774	PRIME COAT	9	GAL	608
411(C)	5960	SUPERPAVE TYPE S4 (PG 64-22)	R-30, R-32	TON	2,259
411(D)	5975	SUPERPAVE TYPE S5 (PG 64-22)	R-30, R-32	TON	1,081
609(A)	0383	COMBINED CURB AND GUTTER (6" BARRIER)	G-46	LF	1,724
611(G)	6000	INLET (SMD-TYPE 1)		EA	2
613(EE)	5610	18" CORRUGATED POLYPROPYLENE PIPE	6	LF	250
613(EE)	5620	24" CORRUGATED POLYPROPYLENE PIPE	6	LF	50
613(M)	7186	TYPE A4 CULVERT END TREATMENT		EA	3
613(M)	7187	TYPE B4 CULVERT END TREATMENT		EA	2
619(C)	0924	SAWING PAVEMENT		LF	152
643	0087	(SP) CONTRACTOR QUALITY CONTROL		LSUM	1
850(A)	8110	SHEET ALUMINUM SIGNS	7	SF	41.50
856(A)	8530	TRAFFIC STRIPE (MULTI-POLYMER) (4" WIDE)	8	LF	6,074
856(A)	8555	TRAFFIC STRIPE (MULTI-POLYMER) (24" WIDE)		LF	40
856(B)	8525	TRAFFIC STRIPE (MULTI-POLYMER) (SYMBOLS,WORDS,ETC)		EA	9
(SPECIAL)		2" PVC CONDUIT, FITTINGS AND PULLBOXES	10	LF	800

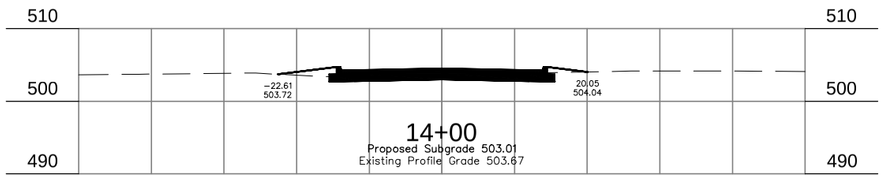
PAY QUANTITIES AND NOTES

DESIGN BY: DMOORE | CHECK BY: C.N.D.O.T. | DATE: 1/2019 | SHEET 8 OF 10

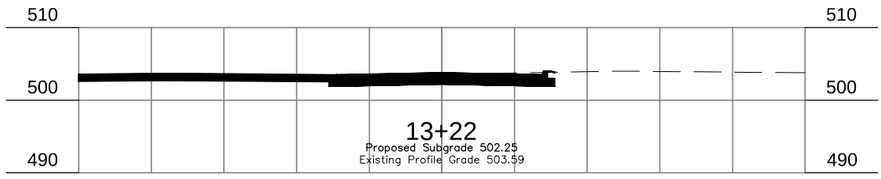
HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

CHEROKEE NATION

TAHLEQUAH, OKLAHOMA



14+00
Proposed Subgrade 503.01
Existing Profile Grade 503.67



13+22
Proposed Subgrade 502.25
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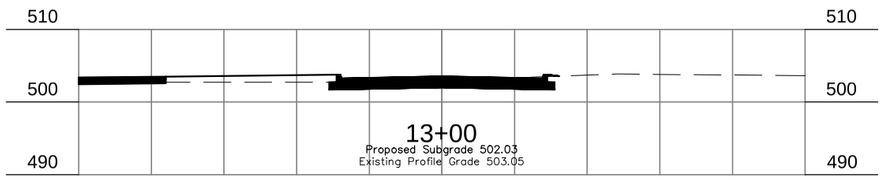

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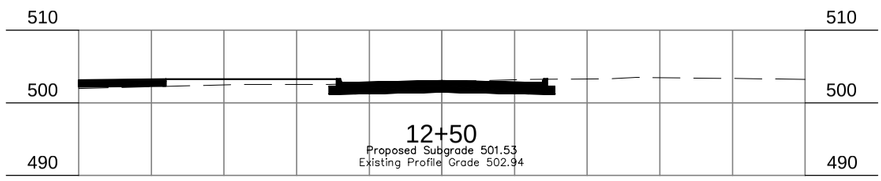

12+50
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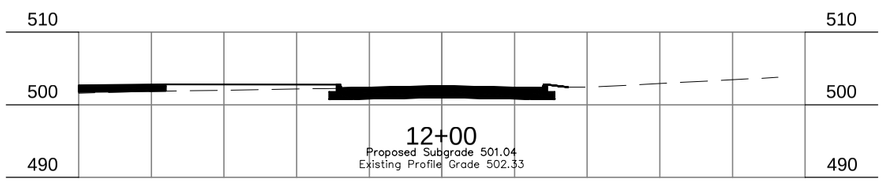

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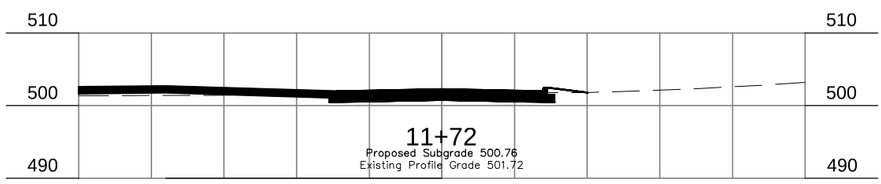
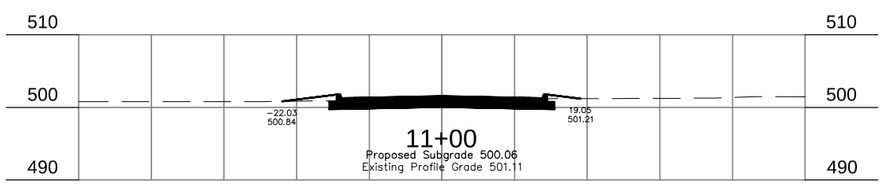


11+72
Proposed Subgrade 500.76
Existing Profile Grade 501.72



11+00
Proposed Subgrade 500.06
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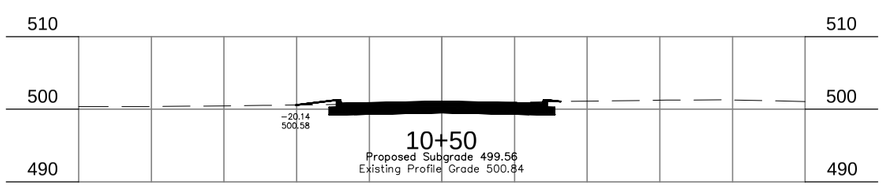
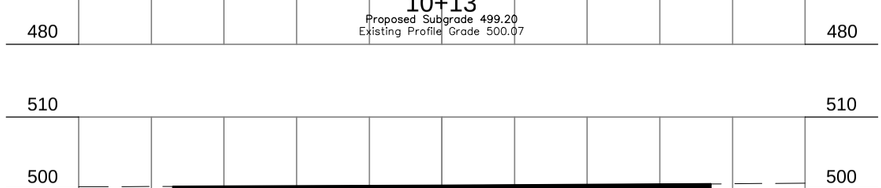


10+50
Proposed Subgrade 499.56
Existing Profile Grade 500.84

18" DIA X 80' LG. H.D.P.E. W/ TYPE A4 C.E.T.

10+13
Proposed Subgrade 499.20
Existing Profile Grade 500.07



10+00
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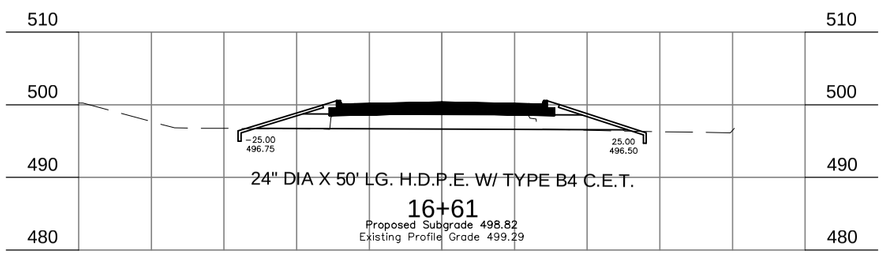
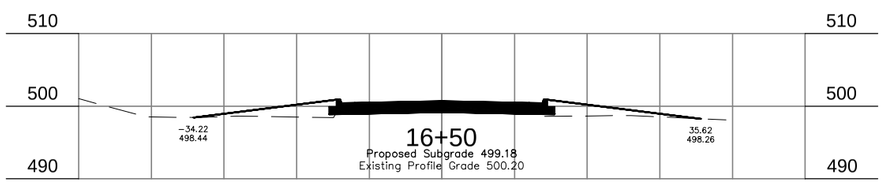
CHEROKEE NATION
TAHLEQUAH, OKLAHOMA

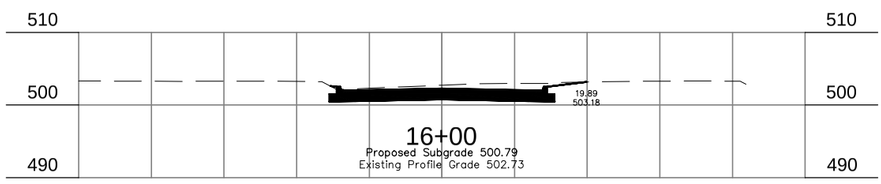
HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

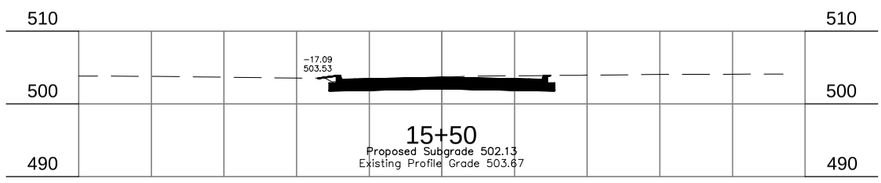
CROSS SECTIONS
NORTH/SOUTH ROAD

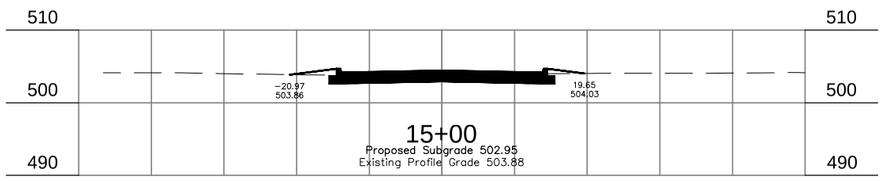
DESIGN BY: DMOORE | CHECK BY: C.N.D.O.T. | DATE: 1/2019 | SHEET 9 OF 10

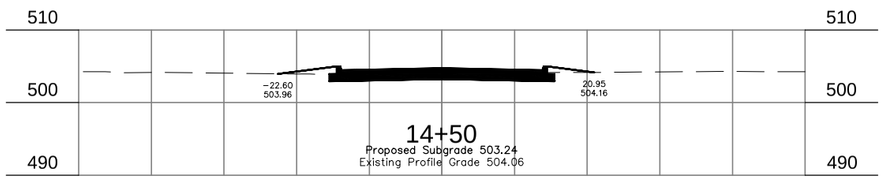












CHEROKEE NATION

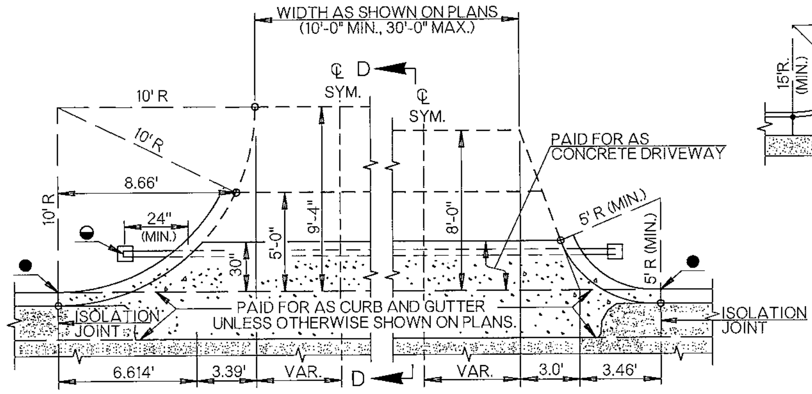
TAHLEQUAH, OKLAHOMA

HULBERT COMMUNITY CENTER
TOWN OF HULBERT, OKLAHOMA
CHEROKEE COUNTY

CROSS SECTIONS
NORTH/SOUTH ROAD

DESIGN BY: DMOORE	CHECK BY: C.N.D.O.T.	DATE: 1/2019	SHEET 10 OF 10

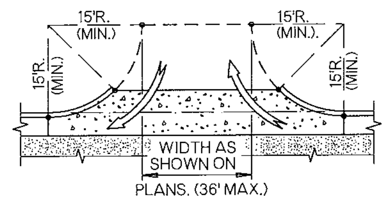
STANDARD REVISIONS	
DESCRIPTION	DATE



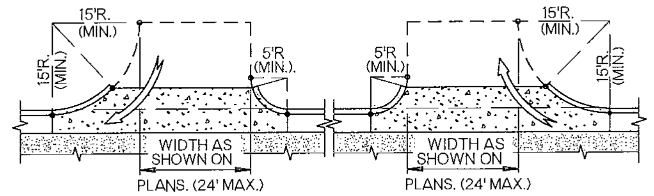
TYPE I DRIVEWAYS (PRIVATE OR RESIDENTIAL)

◒ IF SPECIFIED IN THE PLANS, CONSTRUCT CONDUIT CROSSING OF THE SPECIFIC SIZE AND TYPE AT APPROXIMATELY 30" BELOW FINISHED GRADE OF THE RAMP. SEE GENERAL NOTES FOR DETAILS.

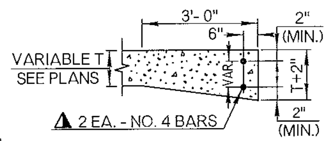
● BEGIN ROLL CURB. TERMINATE CURB & GUTTER.



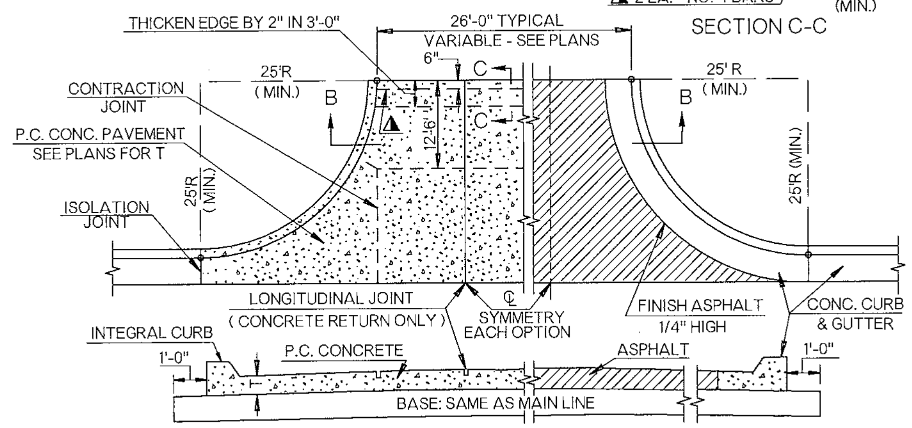
TYPE 2 DRIVEWAY (TWO -WAY OPERATION)



TYPE 2A DRIVEWAYS (ONE -WAY OPERATIONS)



SECTION C-C



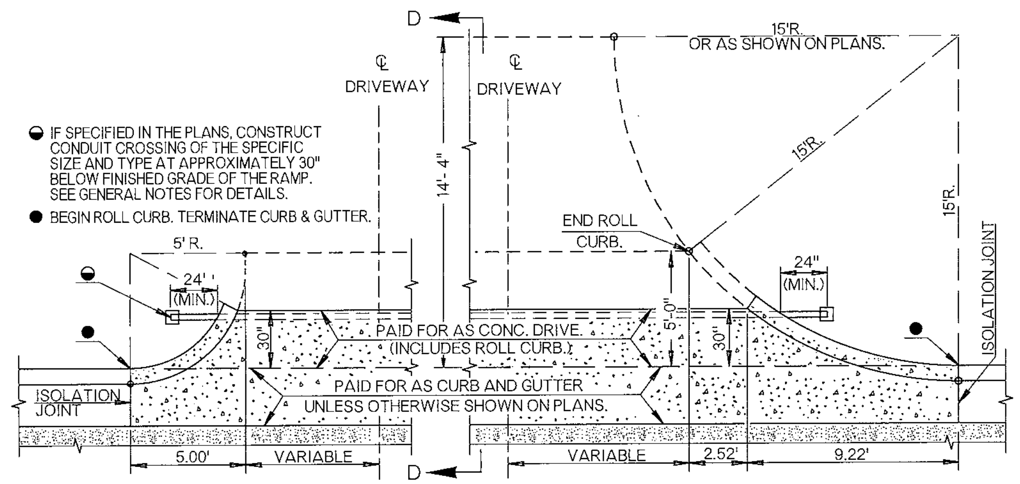
ALT. SECTION B-B CONCRETE RETURN

ALT. SECTION B-B ASPHALT RETURN (WHERE CURB AND GUTTER IS USED)

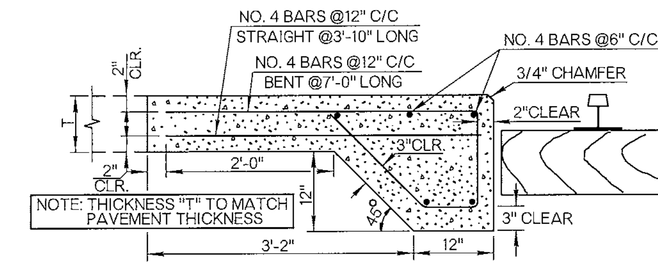
TYPICAL STREET RETURN

◒ IF SPECIFIED IN THE PLANS, CONSTRUCT CONDUIT CROSSING OF THE SPECIFIC SIZE AND TYPE AT APPROXIMATELY 30" BELOW FINISHED GRADE OF THE RAMP. SEE GENERAL NOTES FOR DETAILS.

● BEGIN ROLL CURB. TERMINATE CURB & GUTTER.

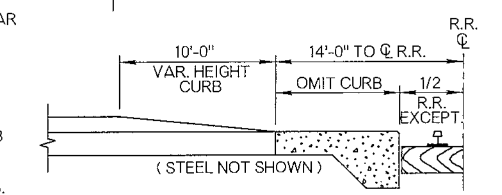


TYPE 2 & 2A COMMERCIAL DRIVEWAYS

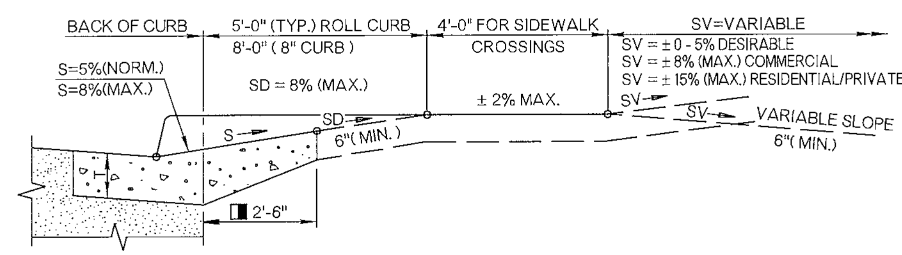


P. C. RAILROAD APPROACH SLAB WITH THICKENED EDGE AT RAILROAD CROSSING

THICKENED EDGE OF CONCRETE RAILROAD APPROACH SLAB SHALL EXTEND FROM OUTSIDE TO OUTSIDE OF SHOULDERS. COST OF CLASS A CONCRETE & REINFORCING STEEL TO BE INCLUDED IN THE PRICE BID FOR RAILROAD APPROACH SLAB.

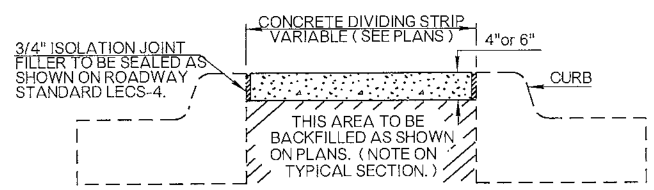


DETAIL OF CURBS ADJACENT TO RAILROAD CROSSINGS

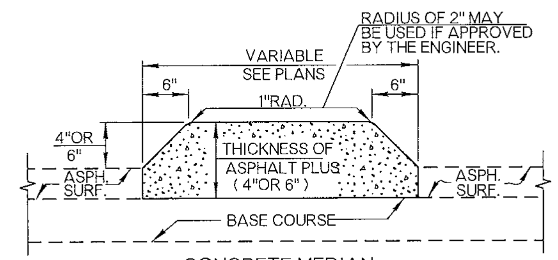


SECTION D-D ALONG ℄ DRIVE

◨ WHEN SIDEWALK IS BUILT DIRECTLY BEHIND CURB, THE CONCRETE DRIVEWAY SHOULD BE CONSTRUCTED & EXTENDED TO THE BACK EDGE OF SIDEWALK.



CONCRETE DIVIDING STRIP

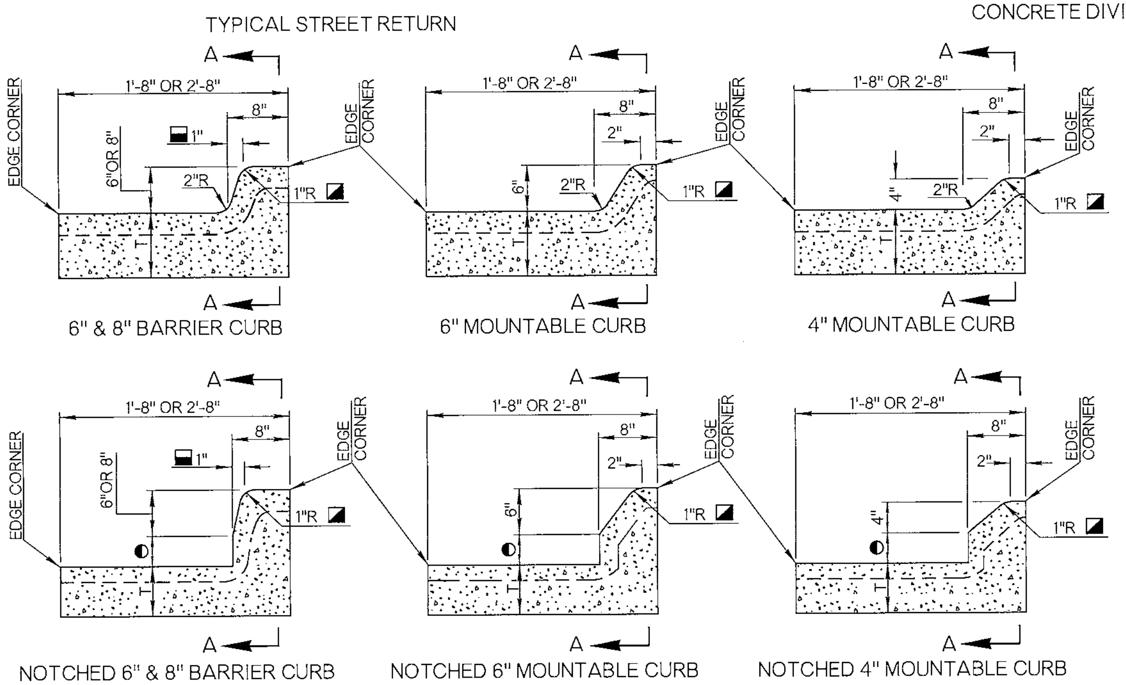


CONCRETE MEDIAN MOUNTABLE CURB TYPE

(TO BE PAID FOR AS CLASS A CONCRETE.)

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. COST OF JOINT FILLERS, SEALING AND REINFORCING STEEL SHALL BE INCLUDED IN PRICE BID FOR OTHER ITEMS OF WORK.
3. TRANSVERSE ISOLATION JOINTS FOR CONCRETE DIVIDING STRIP AND CONCRETE MEDIAN (MOUNTABLE CURB TYPE) TO BE 1/2" ISOLATION JOINT FILLER AT 50' C/C, 1/4" ISOLATION JOINT MATERIAL AT 1/3 POINTS BETWEEN 1/2" ISOLATION JOINTS. FILLER MATERIAL TO BE PREMOLDED AND JOINTS TO BE SEALED AS SHOWN ON ROADWAY STANDARD LECS-4.
4. COMBINED CURB & GUTTER SHALL HAVE 3/4" ISOLATION JOINTS AT DRAINAGE STRUCTURES, STREET CURB RETURNS AND AT THOSE LOCATIONS SHOWN ON THE PLANS. BUTT OR SAWED JOINTS SHALL BE SPACED AT 20'-0" CENTERS MAX. JOINT FILLER IN THE CURBS SHALL EXTEND TO WITHIN 2" OF THE FACE & TOP OF CURB. ALL JOINTS SHALL BE SEALED AS SHOWN ON ROADWAY STANDARD LECS-4.
5. ALL CONDUIT CROSSINGS ARE TO BE TRENCHED, PLACED, BACKFILLED AND COMPACTED PRIOR TO SURFACING. BORING OR PUSHING PROCEDURES MAY BE USED WHERE SURFACING IS ALREADY IN PLACE AND IF APPROVED BY THE ENGINEER.
6. IF CONDUIT IS NOT CONTINUOUS BETWEEN DRIVEWAYS OR RAMPS, CAP BOTH ENDS OF EACH CONDUIT CROSSING AND PLACE MARKER TO PREVENT DAMAGE DURING CONSTRUCTION.
7. CONDUIT SHALL NOT TERMINATE BELOW A SURFACED AREA, BUT SHALL EXTEND A MINIMUM OF 2'-0" PAST EDGE OF PAVING.
8. FOR PULL BOX INSTALLATION DETAILS, SEE TRAFFIC STANDARD PBD1-1 (PULL BOX DETAILS).



6" & 8" BARRIER CURB — 6" MOUNTABLE CURB — 4" MOUNTABLE CURB

NOTCHED 6" & 8" BARRIER CURB — NOTCHED 6" MOUNTABLE CURB — NOTCHED 4" MOUNTABLE CURB

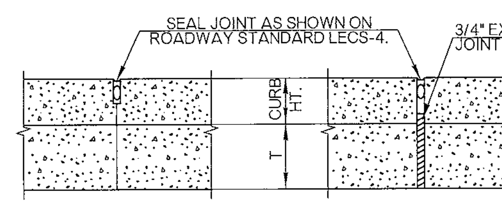
COMBINED CURB & GUTTER TYPICAL SECTIONS

NOTE: T DIMENSION EQUALS THE THICKNESS SHOWN ON TYPICAL SECTION. (MIN.=6")

◐ DIMENSION EQUALS THE THICKNESS ASPHALT CONC. SHOWN ON TYPICAL SECTION. (MIN.=2"; MAX.=4")

◪ RADIUS OF 2" MAY BE USED IF APPROVED BY THE ENGINEER.

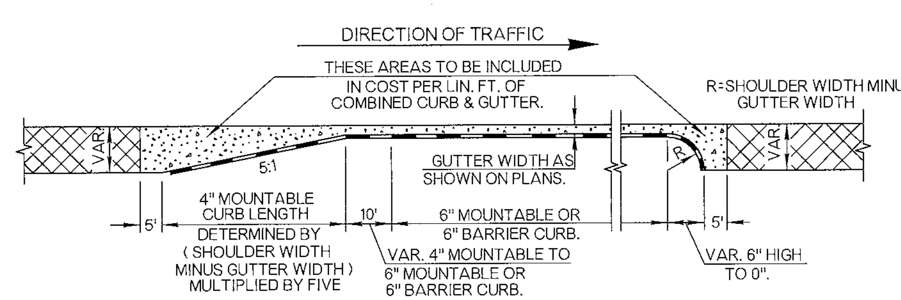
⬓ BATTER OF 2" MAY BE USED IF APPROVED BY THE ENGINEER.



SECTION A-A BUTT JOINTS — SECTION A-A ISOLATION JOINTS

CURB & GUTTER JOINTS

BUTT & ISOLATION JOINTS TO EXTEND THROUGH CURB & GUTTER TO BACK OF CURB



BEGINNING CURB & GUTTER — ENDING CURB & GUTTER

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
414 (H)	P. C. RAILROAD APPROACH SLABS	SY
509 (B)	CLASS A CONCRETE	CY
609 (B)	■ COMBINED CURB & GUTTER (▲)	LF
610 (B)	▼ CONCRETE DRIVEWAY	SY
610 (C)	▼ CONCRETE DIVIDING STRIP	SY
610 (H)	▼ ASPHALT DIVIDING STRIP	SY

■ WIDTH OF CURB & GUTTER WILL BE SPECIFIED.
▲ HEIGHT & TYPE OF CURB SHALL BE SPECIFIED.
▼ THICKNESS WILL BE SPECIFIED.

APPROVED BY ROADWAY ENGINEER [signature] DATE 04/14/15

ROADWAY DESIGN DIVISION STANDARD

ODOT

ASPHALT SURFACING CONSTRUCTION DETAILS

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

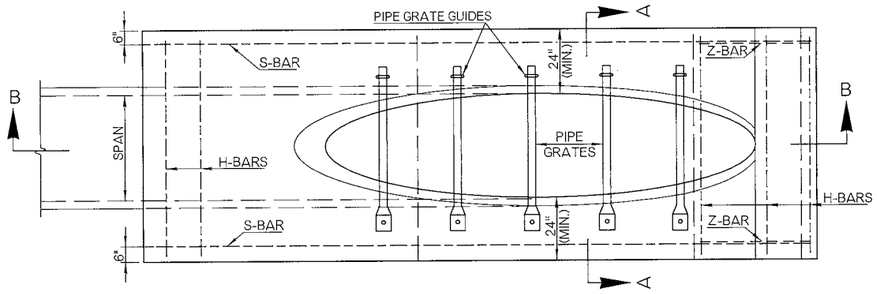
ASCD-5 | 2

OKLAHOMA DEPARTMENT OF TRANSPORTATION

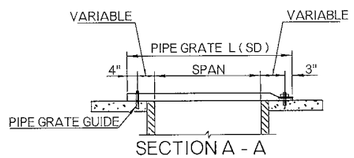
STANDARD REVISIONS	
DESCRIPTION	DATE

TABLE A - SCHEDULE OF PIPE SAFETY GRATES

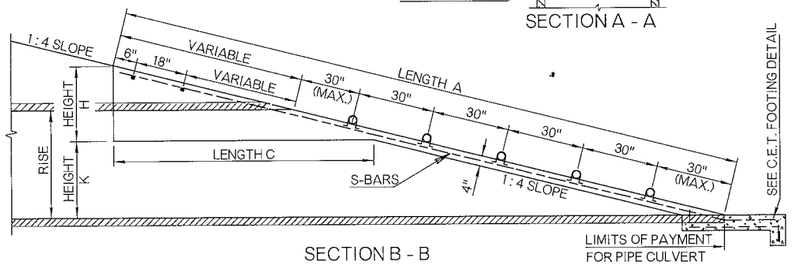
C. E. T. TYPE	CULVERT TYPE: REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	SIDE DRAIN: NO. OF GRATES	SIDE DRAIN: GRATE LENGTH L (SD)	CROSS DRAIN: NO. OF GRATES	CROSS DRAIN: GRATE LENGTH L (CD)
A4	18"				2	36"		NONE
		22" x 13"	14" x 23"	21" x 15"	2	42"		NONE
				24" x 18"	2	45"		NONE
B4	24"				2	45"		NONE
		28" x 18"	19" x 30"		2	48"	1	10'-9"
				28" x 20"	2	48"		NONE
		36" x 22"	22" x 34"		3	54"	1	12'-0"
				35" x 24"	3	54"	1	12'-6"
			24" x 38"		3	57"	1	12'-6"
C4	30"				5	50"		NONE
		43" x 26"			3	64"	1	13'-6"
				42" x 29"	3	64"	1	14'-3"
			29" x 45"		3	64"	1	14'-3"
		51" x 31"			4	70"	1	15'-3"
				49" x 33"	4	70"	1	15'-9"
			34" x 53"		4	72"	1	15'-9"
D4	36"				4	54"	1	16'-6"
	42"				5	60"	1	18'-9"
		58" x 36"	38" x 60"	57" x 38"	5	78"	1	17'-3"
		65" x 40"			5	84"	2	18'-0"
				64" x 43"	5	84"	2	19'-0"
E4	48"				6	66"	1	20'-9"
			43" x 68"		5	88"	2	19'-0"
		73" x 45"		71" x 47"	6	92"	2	20'-6"
			48" x 76"		6	96"	2	20'-9"



PLAN (SIDE DRAIN SHOWN)



SECTION A - A

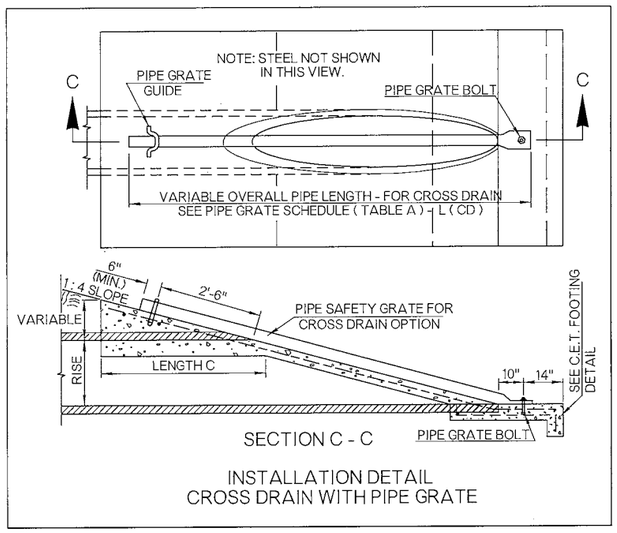


SECTION B - B

TABLE B - SCHEDULE OF DIMENSIONS

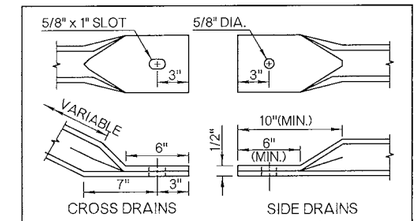
CET TYPE	LENGTH A	Ⓡ WIDTH B	Ⓐ Ⓔ WIDTH B	LENGTH C	HEIGHT H	HEIGHT K	Ⓡ CONC. CY	Ⓐ Ⓔ CONC. CY	REINF. BAR LENGTH: Ⓡ H-BARS	Ⓐ Ⓔ H-BARS	S-BARS
A4	10'-4"	5'- 6"	6'- 2"	5'- 8"	21"	9"	1.70	2.00	5'- 2"	5'-10"	12'- 4"
B4	12'-4"	6'- 0"	7'- 2"	6'- 0"	22"	14"	2.00	2.60	5'- 8"	6'-10"	15'- 4"
C4	15'-9"	6'- 6"	8'- 5"	7'- 4"	26"	20"	2.85	3.95	6'- 2"	8'- 1"	19'- 6"
D4	19'-3"	7'- 6"	9'- 6"	8'- 0"	28"	27"	3.50	5.05	7'- 2"	9'- 2"	21'- 6"
E4	20'-8"	8'- 0"	10'- 4"	8'- 8"	30"	30"	4.05	5.75	7'- 8"	10'- 0"	23'- 4"

Ⓡ ROUND SHAPE CULVERT OPTIONS
Ⓐ ARCH SHAPE CULVERT OPTIONS
Ⓔ HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

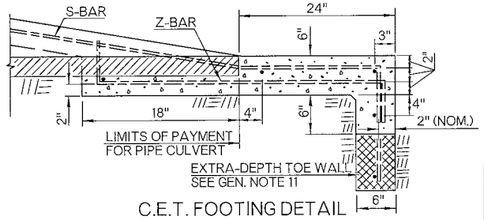


SECTION C - C

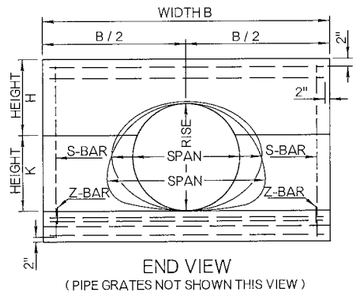
INSTALLATION DETAIL
CROSS DRAIN WITH PIPE GRATE



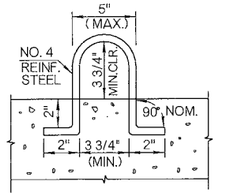
ANCHOR END DETAIL
PIPE GRATE MEMBERS



C.E.T. FOOTING DETAIL

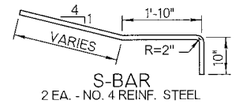


END VIEW
(PIPE GRATES NOT SHOWN THIS VIEW)

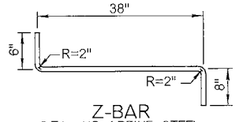


PIPE GRATE GUIDE (U-BOLT)

TYPICAL ABBREVIATIONS
RS - ROUND SIDE DRAIN
RC - ROUND CROSS DRAIN
AS - ARCH SIDE DRAIN
AC - ARCH CROSS DRAIN
GR - GRATED
NG - NON-GRATED



S-BAR
2 EA. - NO. 4 REINF. STEEL



Z-BAR
2 EA. - NO. 4 REINF. STEEL

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. QUANTITIES SHOWN IN TABLE B ARE FOR ONE END ONLY. CLASS A CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE SPECIFICATIONS.
3. TYPES A4 THROUGH E4 END SECTIONS, AS SHOWN IN TABLE B, MAY BE USED WITH ANY AASHTO DESIGNATED METAL, ALUMINUM & CONCRETE PIPE SIZES, AS SHOWN IN TABLE A. END SECTION QUANTITIES ARE BASED ON METAL PIPE DIMENSIONS, NO PIPE WALL THICKNESS AND SMALLEST LISTED CULVERT ROUND OR ARCH PIPE WITHIN TYPE.
4. SLOPED END OF CULVERT PIPE SHALL BE SHOP CUT. TWO COATS OF COLD GALVANIZATION WILL BE APPLIED TO CUT EDGES OF STEEL CULVERT PIPE. COST OF CUTTING AND GALVANIZING IS INCLUDED IN THE PRICE BID FOR PIPE CULVERT.
5. ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 4 SLOPE.
6. PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES TO BE INCLUDED IN PRICE BID FOR THE C.E.T.
7. ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC RICH PAINT.
8. REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULV. END TREATMENT.
9. CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
   (A) ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.
   (B) ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEARZONE.
   (C) ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME AND SIZE OF CULVERT.
   NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.
10. ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1/2" x 5 1/2" GALVANIZED BOLT, NUT AND WASHER. THREADS, 1 3/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
11. FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH B TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
613 (M)	◒ CULVERT END TREATMENT	EA

◒ SPECIFY TYPE OF END TREATMENT (EXAMPLE: TYPE B4 CULVERT END TREATMENT)

■ CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES. (SEE TYPICAL ABBREVIATIONS)

APPROVED BY ROADWAY ENGINEER: _____ DATE: 04/14/15

ROADWAY DESIGN DIVISION STANDARD

CULVERT END TREATMENT
SINGLE PIPE INSTALLATION
1 TO 4 SAFETY SLOPE

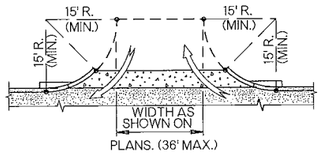
OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

CET4S-3 | 2

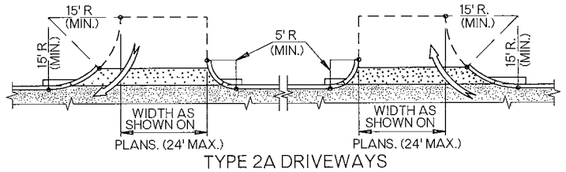
R-26

STANDARD REVISIONS	
DESCRIPTION	DATE

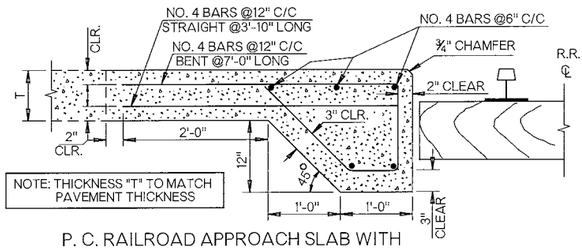
OKLAHOMA DEPARTMENT OF TRANSPORTATION



TYPE 2 DRIVEWAY
(TWO -WAY OPERATION)

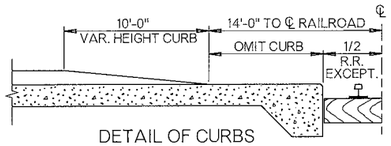


TYPE 2A DRIVEWAYS
(ONE -WAY OPERATION)

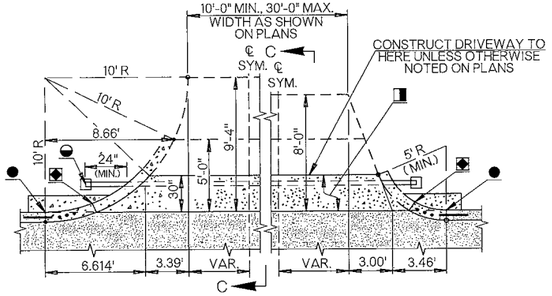


NOTE: THICKNESS "T" TO MATCH PAVEMENT THICKNESS

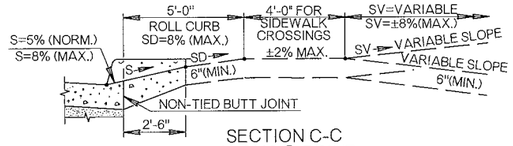
P. C. RAILROAD APPROACH SLAB WITH
THICKENED EDGE AT RAILROAD CROSSING



DETAIL OF CURBS
ADJACENT TO RAILROAD CROSSINGS



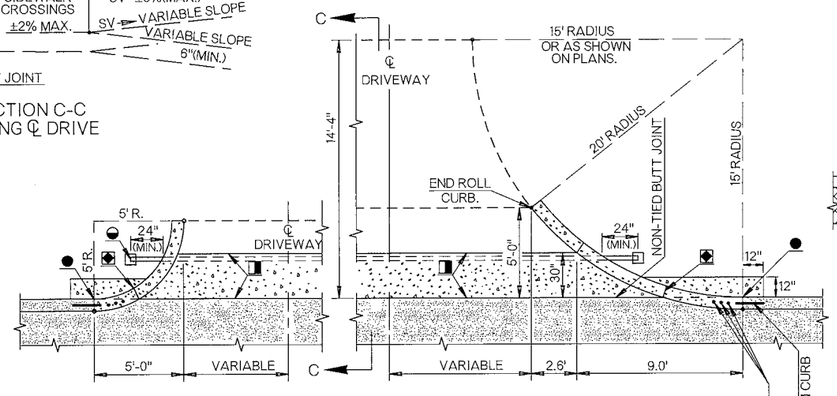
TYPE I DRIVEWAYS
(PRIVATE OR RESIDENTIAL)



SECTION C-C
ALONG ℄ DRIVE

FOR STREET RETURN DETAILS SEE ROADWAY STD. ASCD-5.

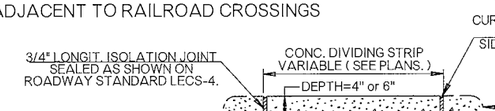
- ◆ ¾" EXPANSION JOINT NO LOAD TRANSFER DEVICES
- ◧ PAID FOR AS CONCRETE DRIVEWAY (INCLUDES CURB)
- ● BEGIN ROLL CURB & TERMINATE INTEGRAL CURB, POUR APRON & CURB INTEGRAL WITH DRIVEWAY
- ◒ IF SPECIFIED IN THE PLANS, CONSTRUCT CONDUIT CROSSING OF THE SAME SIZE & TYPE SPECIFIED AT APPROXIMATELY 30" BELOW FINISHED GRADE OF RAMP. SEE GENERAL NOTES FOR DETAILS.



TYPE 2 & 2A COMMERCIAL DRIVEWAYS

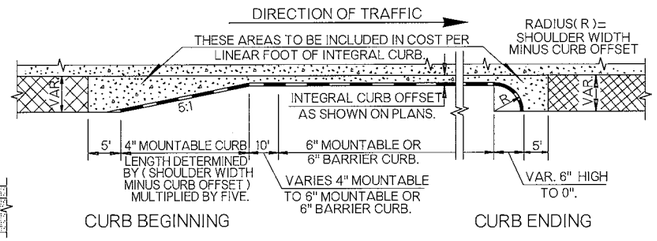
- ◆ ¾" EXPANSION JOINT NO LOAD TRANSFER DEVICES
- ◧ PAID FOR AS CONCRETE DRIVEWAY (INCLUDES CURB)
- ● BEGIN ROLL CURB & TERMINATE INTEGRAL CURB, POUR APRON & CURB INTEGRAL WITH DRIVEWAY
- ◒ IF SPECIFIED IN THE PLANS, CONSTRUCT CONDUIT CROSSING OF THE SAME SIZE & TYPE SPECIFIED AT APPROXIMATELY 30" BELOW FINISHED GRADE OF RAMP. SEE GENERAL NOTES FOR DETAILS.

NOTE: WHEN SIDEWALK IS BUILT DIRECTLY BEHIND THE CURB THE CONCRETE DRIVEWAY SHOULD BE CONSTRUCTED AND EXTENDED TO THE BACK EDGE OF SIDEWALK.



CONCRETE DIVIDING STRIP

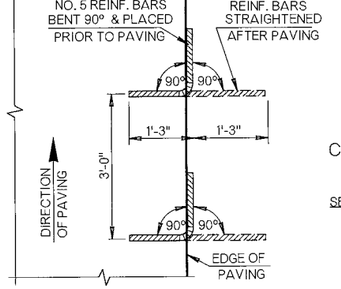
TRANSVERSE EXPANSION JOINTS TO BE 1/2" EXPAN. JOINT FILLER AT 50'-0" C/C, 1/4" EXPANSION JOINT MATERIAL AT 1/3 POINTS BETWEEN 1/2" EXPANSION JOINTS. FILLER MATERIAL TO BE PREMOLDED & JOINTS TO BE SEALED AS SHOWN ON STANDARD DRAWING LECS-4. JOINTS IN DIVIDING STRIP SHOULD ALIGN WITH CURB EXPANSION JOINTS.



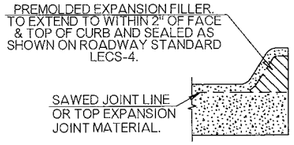
CURB BEGINNING CURB ENDING

GENERAL NOTES

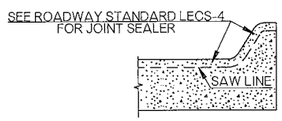
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. ALL COST OF CLASS A CONCRETE & REINFORCING STEEL IN THICKENED EDGE AT RAILROAD CROSSINGS SHALL BE INCLUDED IN THE UNIT PRICE BID FOR APPROACH SLAB-RAILROAD.
3. COST OF JOINT FILLERS, SEALING AND REINFORCING STEEL SHALL BE INCLUDED IN PRICE BID FOR OTHER ITEMS OF WORK.
4. CONTRACTION JOINTS IN JOINTED P.C. PAVEMENT SHALL BE AT APPROXIMATELY 15'-0" CENTERS, UNLESS OTHERWISE SHOWN ON THE PLANS.
5. CURB & GUTTER SHALL BE PLACED INTEGRAL WITH THE PAVING SLAB UNLESS OTHERWISE SHOWN IN THE PLANS. TRANSVERSE JOINTS SHALL MATCH PAVEMENT JOINTS AND PLACED AT DRAINAGE STRUCTURES. LONGITUDINAL JOINTS SHALL BE TIED WITH #5 DEFORMED TIE BARS 2'-6" LONG AT 3'-0" CTRS. SEE TIED BUTT AND LONGITUDINAL CONSTRUCTION JOINT DETAIL ON ROADWAY STANDARD LECS-4.
6. ALL CONDUIT CROSSINGS ARE TO BE TRENCHED, PLACED, BACKFILLED, AND COMPACTED PRIOR TO SURFACING. BORING OR PUSHING PROCEDURES MAY BE USED WHERE SURFACING IS ALREADY IN PLACE AND IF APPROVED BY THE ENGINEER.
7. IF CONDUIT IS NOT CONTINUOUS BETWEEN DRIVEWAYS/RAMPS, CAP BOTH ENDS OF EACH CONDUIT CROSSING AND PLACE MARKER TO PREVENT DAMAGE DURING CONSTRUCTION.
8. CONDUIT SHALL NOT TERMINATE BELOW A SURFACED AREA, BUT SHALL EXTEND MINIMUM OF 24" PAST EDGE OF PAVING.
9. FOR PULL BOX INSTALLATION DETAILS, SEE TRAFFIC STANDARD PBD1-1.



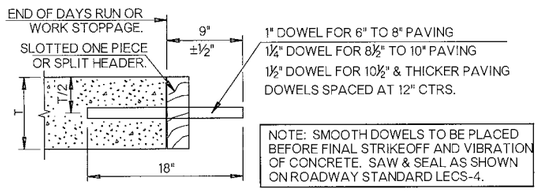
SECTION B-B



CURB JOINT WITH EXPANSION MATERIAL

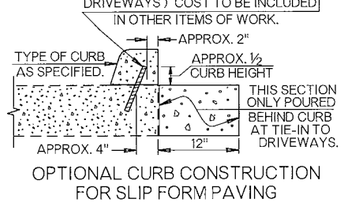


ALTERNATE CURB JOINT

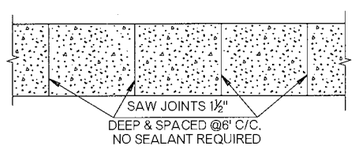


NOTE: SMOOTH DOWELS TO BE PLACED BEFORE FINAL STRIKEOFF AND VIBRATION OF CONCRETE. SAW & SEAL AS SHOWN ON ROADWAY STANDARD LECS-4.

TRANSVERSE CONSTRUCTION JOINT
(TO BE USED AT END OF DAYS PLACEMENT OF CONCRETE OR ANY STOPPAGE OF 30 MINUTES OR MORE.)

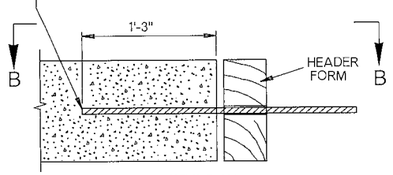


OPTIONAL CURB CONSTRUCTION
FOR SLIP FORM PAVING



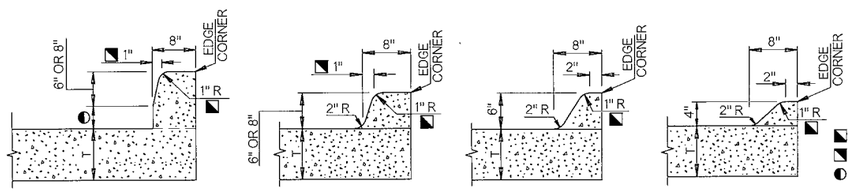
PLAN DETAIL OF CONCRETE SIDEWALK

NO. 5 DEF. TIE BAR SPACED @ 3'-0" C/C MAY BE PRE-BENT 90° AND PLACED INTO EDGE OF SLAB AND POSITIONED BEFORE OR DURING SLIP FORM OPERATIONS AND THEN STRAIGHTENED BEFORE PAVING THE ADJACENT PARALLEL LANE. STRAIGHT BARS MAY ALSO BE PLACED THROUGH DRILLED HOLES IN FORMS PRIOR TO PAVING.



SECTION
TIED LONGITUDINAL BUTT JOINT
(TO BE USED BETWEEN ADJACENT PAVING LANES)

NOTE: LONGITUDINAL BUTT JOINT TIE BAR STEEL AND PLACEMENT METHOD NOT COVERED ON THIS STANDARD SHALL BE APPROVED BY THE ENGINEER.



NOTCHED 6" & 8" BARRIER
6" & 8" BARRIER
6" MOUNTABLE
4" MOUNTABLE

INTEGRAL CURB TYPICAL SECTIONS

- ◩ RADIUS OF 2" MAY BE USED IF APPROVED BY THE ENGINEER.
- ◪ BATTER OF 2" MAY BE USED IF APPROVED BY THE ENGINEER.
- ◐ DIMENSION EQUALS THICKNESS OF ASPHALT CONCRETE SHOWN ON TYPICAL SECTION ASPHALT CONCRETE THICKNESS (2" MIN. ; 4" MAX.)

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
414 (H)	P. C. RAILROAD APPROACH SLABS	SY
609 (A)	■ CONCRETE CURB (INTEGRAL)	LF
610 (A)	▼ CONCRETE SIDEWALK	SY
610 (B)	▼ CONCRETE DRIVEWAY	SY
610 (C)	▼ CONCRETE DIVIDING STRIP	SY

■ HEIGHT & TYPE OF CURB SHALL BE SPECIFIED.
▼ THICKNESS SHALL BE SPECIFIED IN INCHES.

APPROVED BY ROADWAY ENGINEER Caleb F. H DATE: 04/16/15

ROADWAY DESIGN DIVISION STANDARD

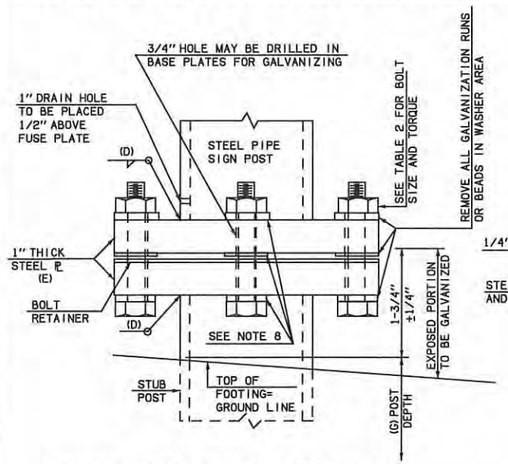
CONCRETE SURFACING CONSTRUCTION DETAILS

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

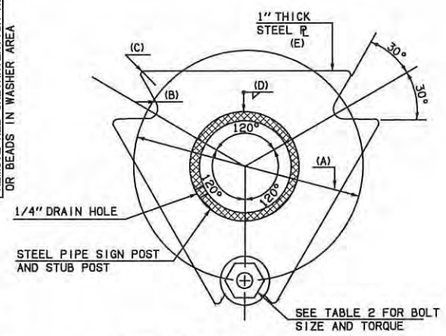
CSCD-5	3
	R-12

DESCRIPTION	REVISIONS	DATE

TABLE I														
FTG. DES. NO.	POST SIZE REQUIRED	BASE PLATE DIMENSIONS						FOOTING DIMENSIONS					QUANTITIES	
		TRIANGLE SIZE	A	B	C	D	E	SIZE DIA.	LENGTH	POST (G) DEPTH	VERTICAL BARS	HORIZONTAL BARS	CLASS "A" CONCRETE	REINFORCING STEEL
											NO./SIZE	NO./SIZE		
A-1	1-1/2" ø 2.72 plf	NO BASE PLATE REQUIRED						12"	2'-0"	24"	NONE	NONE	.06 CY	NONE
A-2	2" ø 3.65 plf	NO BASE PLATE REQUIRED						12"	2'-0"	24"	NONE	NONE	.06 CY	NONE
A-3	2-1/2" ø 5.79 plf	9" x 9" x 9"	6-1/4"	9/16"	1/4"	1/4"	1"	18"	3'-0"	24"	4 / #5	4 #4	.20 CY	24 lbs
A-4	3" ø 7.58 plf	9" x 9" x 9"	6-1/4"	9/16"	1/4"	1/4"	1"	18"	3'-6"	24"	6 / #5	4 #4	.23 CY	32 lbs
A-5	3-1/2" ø 9.11 plf	10" x 10" x 10"	7-1/16"	11/16"	1/4"	5/16"	1"	18"	4'-0"	30"	6 / #5	5 #4	.26 CY	38 lbs
A-6	4" ø 10.79 plf	10" x 10" x 10"	7-1/16"	11/16"	1/4"	5/16"	1"	18"	4'-6"	30"	6 / #5	5 #4	.30 CY	42 lbs



STEEL PIPE POST BASE CONNECTION



NOTE : BASE PLATE FOR STUB POST SAME AS BASE PLATE FOR SIGN POST.

PIPE POST BASE PLATE

PROCEDURE FOR ASSEMBLY OF BASE CONNECTION

1. ASSEMBLE POST TO STUB WITH BOLTS AND WASHERS. USE ONE FLAT WASHER PER BOLT AND BOLT RETAINER BETWEEN BASE PLATES.
2. SHIM AS REQUIRED TO PLUMB AND ALIGN POST(S) BEFORE OR IMMEDIATELY AFTER POURING CONCRETE FOOTING.
3. TIGHTEN ALL BOLTS, IN A SYSTEMATIC ORDER, TO THE PRESCRIBED TORQUE TO BED WASHERS AND SHIMS AND CLEAN BOLT THREADS.
4. LOOSEN AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS INITIAL TIGHTENING. DO NOT OVER TIGHTEN.

NO. REQ'D. PL 9" X 9" X 9"

(3) 1/2" ϕ X 3-1/4" H. S. BOLT
(3) HEX. NUTS
(9) FLAT WASHERS (SEE NOTE 8)

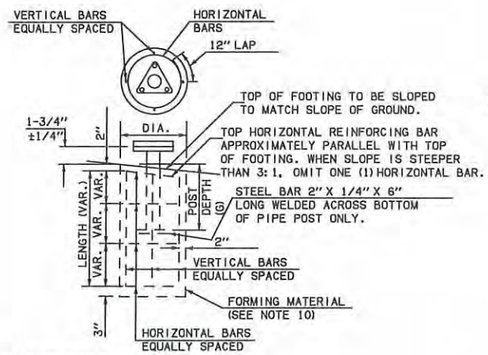
NO. REQ'D. PL 10" X 10" X 10"

(3) 5/8" ϕ X 3-3/4" H. S. BOLT
(3) HEX. NUTS
(9) FLAT WASHERS (SEE NOTE 8)

TABLE 2		
BASE PLATE CONNECTION DATA TABLE		
BOLT TORQUE FOR BASE PLATES		
BOLT SIZE	MINIMUM	MAXIMUM
1/2" ϕ X 3-1/4"	16.6 FT LBS	25.0 FT LBS
5/8" ϕ X 3-1/4"	37.5 FT LBS	56.6 FT LBS
3/4" ϕ X 3"	67.5 FT LBS	88.3 FT LBS

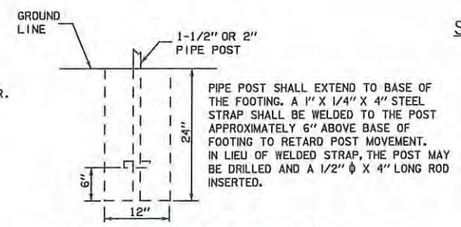
BOLT TORQUE LIMITS

THE HIGH STRENGTH BOLTS AT THE BASE CONNECTION SHOULD BE TORQUED WITHIN THE LIMITS SPECIFIED IN THE ABOVE TABLE. HOWEVER THE LOWER LIMIT SHOWN IN THE "BASE PLATE CONNECTION DATA TABLE" IS MORE DESIRABLE.



NOTE : PIPE STUB POST MAY BE INSTALLED TO THE BASE OF THE FOOTING IF DESIRED, BUT ONLY THE PIPE POST SPECIFIED IN THE FOOTING DESIGN WILL BE PAID FOR. PIPE POST EXTENDING TO THE BASE OF THE FOOTING SHALL HAVE THE STEEL BAR WELDED TO THE POST A MINIMUM OF 6" ABOVE THE BASE OF THE FOOTING.

TYPICAL "A" FOOTING DETAIL

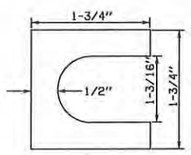


WHEN HOLE FOR FOOTING CAN BE DRILLED AND MAINTAINED AS A "NEAT LINE" HOLE IN THE OPINION OF THE ENGINEER, THE UPPER PORTION NEED NOT BE FORMED. IF FORMING IS REQUIRED, A MINIMUM OF 6" SHALL BE REQUIRED AT THE TOP OF FOOTING. FORMING MAY BE ACCOMPLISHED BY USE OF A CARDBOARD CASING OR SIMILAR MATERIAL THAT MAY BE LEFT IN PLACE. ANY VOID AROUND FINAL FOOTING SHALL BE BACK-FILLED AND FIRMLY TAMPED.

TYPICAL "A-1" & "A-2" FOOTING DETAIL

CUT FROM 30 GAUGE GALVANIZED SHEET METAL. PLACE BETWEEN BASE PLATES. SIZE---VARIES TO FIT BASE PLATES.

SHEET METAL BOLT RETAINER



FURNISH 2 ϕ 0.012 THICK AND 2 ϕ 0.32 THICK SHIMS FOR POST. SHIMS SHALL BE FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM-B36.

SHIM DETAIL

CONSTRUCTION NOTES

1. ALL PIPE AND WIDE FLANGE BEAM POST SHALL CONFORM TO THE 2009 STANDARD SPECIFICATIONS.
2. ALL BOLTS, NUTS AND WASHERS SHALL NOT BE GALVANIZED OR PLATED, BUT SHALL BE PAINTED, AFTER INSTALLATION, WITH A ZINC RICH PAINT.
3. STRUCTURAL STEEL TO BE GALVANIZED AFTER FABRICATION, EXCEPT AS NOTED, IN ACCORDANCE WITH THE 2009 STANDARD SPECIFICATIONS.
4. POST LENGTHS AS SHOWN ON THE PLANS INCLUDE BOTH SIGN POST AND STUB POST WHICH IS SET IN THE CONCRETE FOOTING.
5. ALL WELDING MATERIALS AND METHODS, INCLUDING QUALIFICATIONS OF WELDERS, SHALL CONFORM WITH THE REQUIREMENTS OF THE 2009 STANDARD SPECIFICATIONS.
6. STRUCTURAL EXCAVATION TO BE PAID FOR IN OTHER ITEMS OF WORK.
7. TOP AND BOTTOM WASHERS ON BASE PLATE SHALL BE 1/4" THICK. WASHERS MAY BE ROUND OR SQUARE. USE STANDARD ROUND WASHERS BETWEEN BASE PLATES. REMOVE ALL GALVANIZING RUNS OR BEADS IN WASHER AREA.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
804(A)	STRUCTURAL CONCRETE	CY
804(B)	REINFORCING STEEL	LB
851(B)	GALVANIZED STEEL PIPE POST	LF

APPROVED BY TRAFFIC ENGINEER: Harold Osman DATE: 8/5/10

TRAFFIC STANDARD

STANDARD FOOTINGS FOR GROUND MOUNTED SIGNS (GALVANIZED PIPE)

2009 SPECIFICATIONS

FGS1-1 | 00

T-141

FULL CIRCLE STEEL PIPE CULVERT

PIPE DIAMETER FOR CORRUGATION PATTERN				MIN. COVER TOP OF PIPE TO TOP OF SUBGRADE	MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE						
					EQUIV. STANDARD GAGE						
2 2/3" x 1/2"	3" x 1"	5" x 1"	6" x 2"		16	14	12	10	8	7	5
18"				12"	61'	67'	86'	90'	94'		
21"				12"	53'	57'	74'	77'	81'		
24"				12"	46'	50'	65'	68'	71'		
27"				12"	41'	44'	57'	60'	63'		
30"				12"	37'	40'	52'	54'	56'		
36"				12"	30'	33'	43'	45'	47'		
	36"			12"	53'	66'	77'	89'	100'		
42"				12"	34'	44'	46'	47'	49'		
	42"			12"	45'	56'	64'	71'	78'		
48"				12"		41'	44'	45'	46'		
	48"			12"	39'	49'	56'	61'	66'		
		48"		12"	49'	52'	56'	61'	66'		
54"				12"		36'	43'	44'	45'		
	54"			12"	35'	44'	51'	55'	58'		
		54"		12"	47'	48'	52'	55'	58'		
60"				12"			42'	43'	43'		
	60"			12"	31'	39'	49'	51'	53'		
		60"		12"	43'	46'	49'	51'	53'		
			60"	12"			46'	68'	90'	96'	106'
66"				12"				42'	43'		
	66"			12"	29'	36'	47'	48'	50'		
		66"		12"	39'	45'	47'	48'	50'		
			66"	12"			42'	62'	78'	82'	90'
72"				12"				42'	42'		
	72"			12"	26'	33'	45'	47'	48'		
		72"		12"	36'	44'	45'	47'	48'	73'	78'
			72"	12"			38'	57'	69'		
78"				12"					42'		
	78"			12"	24'	30'	44'	45'	46'		
		78"		12"	33'	42'	44'	45'	46'		
			78"	12"			35'	53'	63'	66'	70'
84"				12"					42'		
	84"			12"	22'	28'	42'	44'	45'		
		84"		12"	31'	39'	43'	44'	45'		
			84"	12"			33'	49'	59'	61'	64'
	90"			12"		26'	39'	44'	44'		
		90"		12"	29'	36'	43'	44'	44'		
			90"	12"			31'	45'	55'	57'	60'
	96"			12"		24'	36'	43'	44'		
		96"		12"		34'	43'	43'	44'		
			96"	12"			29'	43'	53'	54'	57'
	102"			24"			34'	41'	43'		
		102"		24"		32'	42'	43'	43'		
	108"			24"			32'	39'	43'		
		108"		24"			42'	42'	43'		
			108"	24"			25'	38'	49'	50'	52'
	114"			24"			31'	37'	41'		
		114"		24"			40'	42'	42'		
	120"			24"			29'	35'	39'		
		120"		24"			38'	42'	42'		
			120"	24"			23'	34'	45'	48'	49'

FULL CIRCLE ALUMINUM PIPE CULVERT

PIPE DIAMETER FOR CORRUGATION PATTERN			MIN. COVER TOP OF PIPE TO TOP OF SUBGRADE	MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE				
				EQUIV. STANDARD GAGE				
2 2/3" x 1/2"	3" x 1"	6" x 1"		16	14	12	10	8
18"			12"	36'	36'	63'		
24"			12"	27'	27'	47'	50'	
27"			12"	24'	24'	42'	44'	
30"			12"	22'	21'	37'	39'	
	30"		12"	40'	50'	68'		
36"			12"		18'	32'	33'	
	36"		12"	33'	41'	57'	85'	
		36"	12"	20'				
42"			12"			54'	57'	
	42"		12"	27'	35'	48'	73'	
48"			12"			47'	49'	51'
	48"		12"	24'	30'	42'	63'	82'
54"			12"			41'	44'	45'
	54"		12"	21'	27'	37'	56'	73'
		54"	12"		29'	42'	67'	66'
60"			12"				39'	41'
	60"		12"	19'	24'	33'	24'	66'
		60"	12"		25'	37'	59'	58'
66"			12"				36'	37'
	66"		12"	14'	18'	26'	40'	51'
		66"	12"		23'	33'	53'	52'
	72"		12"		28'	27'	41'	54'
		72"	15"		19'	27'	36'	43'
	78"		15"		18'	25'	38'	50'
		78"	15"		17'	25'	32'	40'
	84"		18"		17'	23'	35'	47'
		84"	18"			23'	30'	37'
	90"		18"			21'	33'	43'
		90"	18"			21'	28'	34'
	96"		18"			20'	31'	40'
		96"	18"			19'	26'	32'
	102"		21"			18'	28'	37'
		102"	21"			18'	25'	29'
	108"		21"				27'	35'
		108"	21"			17'	23'	28'
	114"		24"				25'	34'
		114"	24"			16'	21'	26'
	120"		24"				24'	32'
		120"	24"				20'	25'

METAL PIPE ARCH - FILLS TO 10 FT. MAX.

APPROX. EQUIV. ROUND PIPE	SIZE SPAN x RISE	2 2/3" x 1/2" CORRUGATION PATTERN			
		STEEL		ALUMINUM	
		MIN. GAGE	MIN. COVER	MIN. GAGE	MIN. COVER
15"	17" x 13"	16	12"	16	12"
18"	21" x 15"	16	12"	16	12"
21"	24" x 18"	16	12"	16	12"
24"	28" x 20"	16	12"	14	12"
30"	35" x 24"	14◒	12"	14	12"
36"	42" x 29"	14	12"	12	15"
42"	49" x 33"	14	12"	12	15"
48"	57" x 38"	12	12"	10	15"
54"	64" x 43"	12	12"	10	18"
60"	71" x 47"	10	12"	8	18"
66"	77" x 52"	8	12"	8	18"
72"	83" x 57"	8	12"	8	18"
3" x 1" & 5" x 1" CORRUGATION PATTERN					
36"	40" x 31"	14	12"		
42"	46" x 36"	14	12"		
48"	53" x 41"	14	12"		
54"	60" x 46"	14	12"	14	15"
60"	66" x 51"	14	12"	14	18"
66"	73" x 55"	14	12"	14	18"
72"	81" x 59"	14	12"	12	21"
78"	87" x 63"	14	12"	12	21"
84"	95" x 67"	12	12"	12	24"
90"	103" x 71"	12	18"	10	24"
96"	112" x 75"	12	18"	10	27"
102"	117" x 79"	12	18"		
108"	128" x 83"	10	24"		
114"	137" x 87"	10	24"		
120"	142" x 91"	10	24"		

◒ WHEN INSTALLED UNDER PAVEMENT INCLUDING ALL P.C. OR A.C. SURFACING UNDER MAINLINE TRAFFIC AND MAJOR STREET RETURNS. A MINIMUM PIPE GAGE OF 16 MAY BE USED FOR INSTALLATION REQUIRING 30 INCH EQUIVALENT ROUND CONDUITS (MAX.) AND LIMITED TO LOW VOLUME COUNTY OR OFF-SYSTEM ROADS, MINOR STREET RETURNS, DRIVEWAYS OR TEMPORARY DETOURS, AS APPROVED BY THE ENGINEER.

POLY-PROPYLENE PIPE DIAMETER	MAXIMUM FILL HEIGHT OVER CULVERT (FT.) ◑			
	UNDER PAVEMENT		OUTSIDE PAVEMENT	
	95% COMPACT	90% COMPACT	Class C - 85% COMPACT	Class D - 85% COMPACT
18	25	18	16	13
24	22	16	14	12
30	23	17	13	12
36	22	16	11	11
42	22	15	11	11
48	21	15	11	10
60	23	16	11	10

◑ REFER TO ROADWAY DESIGN STANDARD SPB-1 FOR MINIMUM FILL HEIGHT AND OTHER POLYPROPYLENE INSTALLATION DETAILS.

EQUIVALENT METAL THICKNESS AND GAGE

GAGE NUMBER	METAL THICKNESS (INCHES)	
	■ STEEL	♦ ALUMINUM
16	0.064	0.060
14	0.079	0.075
12	0.109	0.105
10	0.138	0.135
8	0.168	0.164
7	0.188	----
5	0.218	----

■ THE THICKNESS OF THE SHEET INCLUDES BOTH THE BASE STEEL AND THE COATING.

♦ THE THICKNESS SHOWN REFERS TO THE CLAD SHEET.

GENERAL NOTES

1. METAL PIPE FILL HEIGHT DESIGNS ARE BASED ON A CLASS B BEDDING, NEGATIVE PROJECTION, HS-20 LIVE LOADING AND 120 LBS/C.F. SOIL WEIGHT. POLYPROPYLENE PIPE FILL HEIGHTS ARE BASED ON AASHTO M330 FOR POLYPROPYLENE, TYPE S, PIPE WITH OUTER CORRUGATED WALL AND SMOOTH INNER WALL.
2. IN THE EVENT LOADS IN EXCESS OF HS-20 ARE TO BE OPERATED OVER OR ADJACENT TO THE PIPE INSTALLATION DURING THE CONSTRUCTION PHASE, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A MINIMUM OF FOUR FEET OF COVER OVER THE PIPE AT WHEEL OR TRACK PATHS.
3. PROPER INSTALLATION PRACTICES MUST BE ADHERED TO AS SHOWN ON ROADWAY STANDARDS SPI-4, FPI-3 AND SPB-1. POLYPROPYLENE PIPE SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321.
4. ANY PIPE DEFORMED PRIOR TO FINAL ACCEPTANCE SHALL BE REPLACED BY THE CONTRACTOR AT HIS EXPENSE. SURFACE DISTRESS MUST BE REPAIRED TO THE SATISFACTION OF THE ENGINEER OR REPLACED AT THE CONTRACTOR'S EXPENSE.
5. MAXIMUM FILL HEIGHTS ARE MEASURED TO TOP OF SUBGRADE (OR BOTTOM OF ASPHALT OR PC PAVEMENT) FOR METAL AND POLYPROPYLENE PIPES.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

STANDARD REVISIONS

DESCRIPTION	DATE

APPROVED BY ROADWAY ENGINEER: Caleb F. H DATE: 04/14/15

ROADWAY DESIGN DIVISION STANDARD

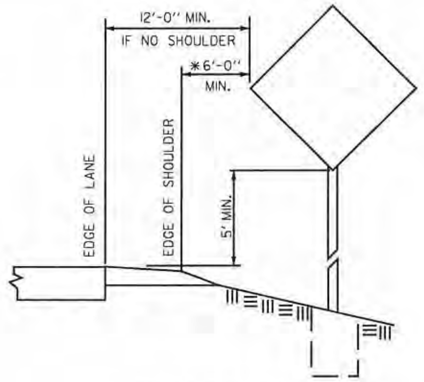
FILL HEIGHT TABLES (METAL & POLYPROPYLENE PIPES)

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

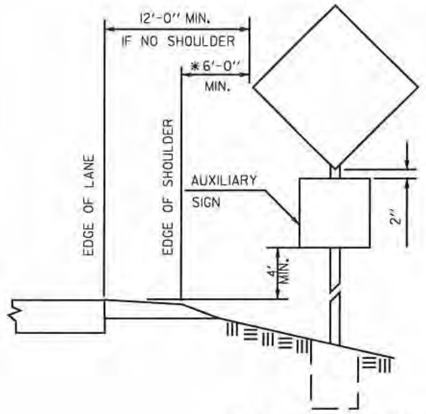
FHTMPP-1 | 0

R-50

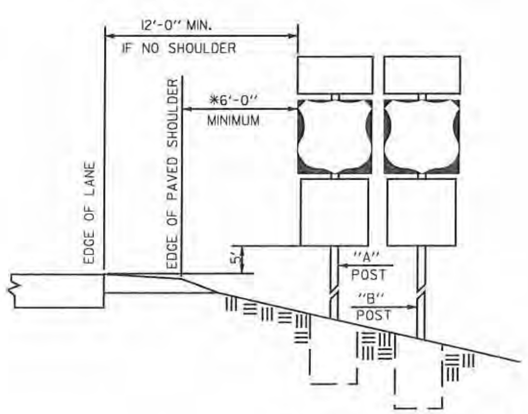
DESCRIPTION	REVISIONS	DATE



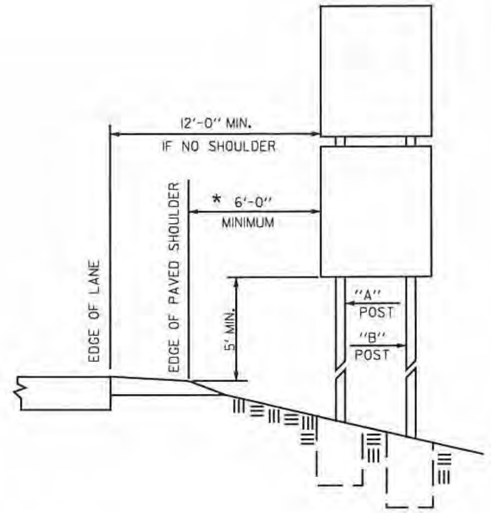
SINGLE POST (RURAL)



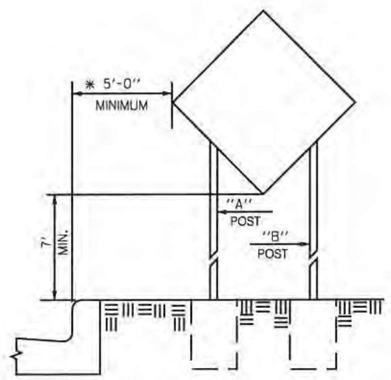
SINGLE POST WITH AUXILIARY SIGN (RURAL)



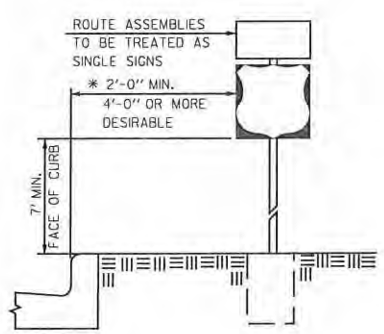
ROADSIDE ASSEMBLY (RURAL)



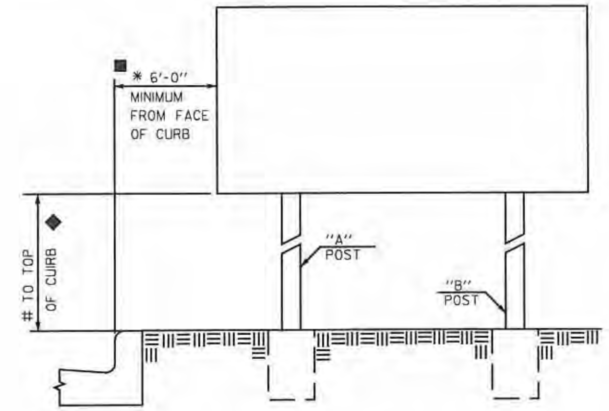
DOUBLE POST MAXIMUM & MINIMUM SPEED LIMIT SIGNS (RURAL)



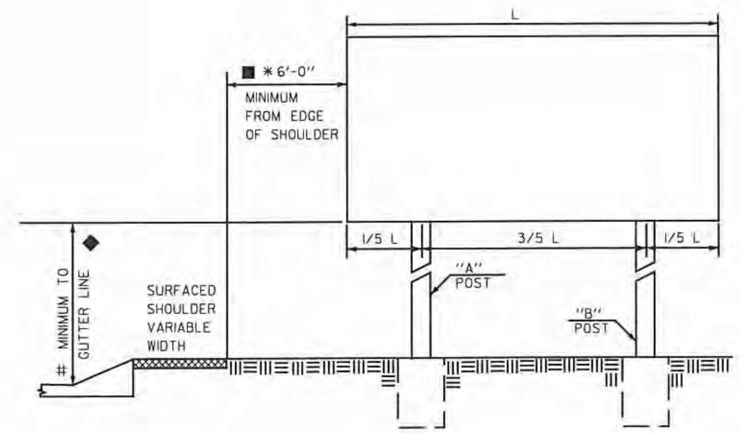
BUSINESS, COMMERCIAL OR RESIDENTIAL AREA



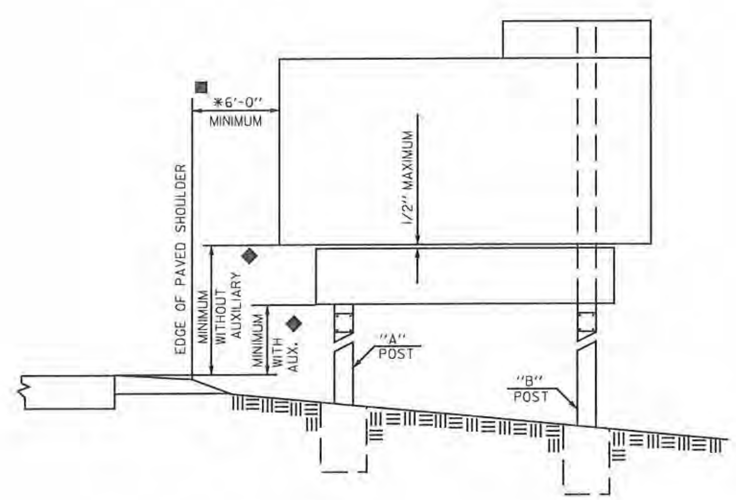
BUSINESS, COMMERCIAL OR RESIDENTIAL AREA



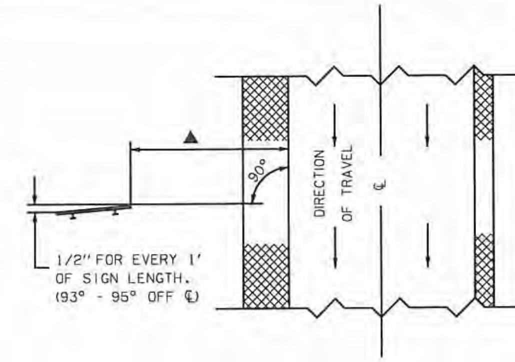
INFORMATION SIGN WITH NON-MOUNTABLE CURB



INFORMATION SIGN WITH MOUNTABLE CURB



FREEWAY OR EXPRESSWAY SIGN (WITH OR WITHOUT AUXILIARY SIGN)



SIGN POSITIONING DETAIL

*1 SIGNS SHALL BE SO POSITIONED TO ELIMINATE OR MINIMIZE SPECULAR REFLECTION. DUE TO THE NUMEROUS VARIATIONS IN ROAD CURVES AND GRADES, THIS GENERAL RULE MAY NOT ALWAYS BE APPLICABLE, AND SIGNS SHALL BE POSITIONED AS DETERMINED BY THE ENGINEER.

*2 IF FURTHER CLARIFICATION OF VERTICAL AND LATERAL CLEARANCES IS REQUIRED, SEE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (LATEST REVISION).

◆ WHEN LATERAL CLEARANCE OF STANDARD OR SPECIAL INFORMATION GUIDE SIGNS IS 30' OR GREATER (AS REQUIRED BY CLEAR ZONE) FROM THE EDGE LINE, THE MINIMUM VERTICAL CLEARANCE IS 7'. IF AN AUXILIARY SIGN IS MOUNTED BELOW A STANDARD OR SPECIAL INFORMATION GUIDE SIGN, THE RECOMMEND VERTICAL CLEARANCE FOR THE STANDARD OR SPECIAL INFORMATION GUIDE SIGN IS MINIMUM 8' AND THE AUXILIARY SIGN IS MINIMUM 5'.

* THE MINIMUM LATERAL CLEARANCE OF THE SIGN FROM THE EDGE OF SHOULDER OR FACE OF CURB SHALL BE AS SHOWN ON THIS STANDARD DRAWING UNLESS OTHERWISE SHOWN OR NOTED ON PLANS. WHEN SIGNS ARE NOTED TO BE PLACED 5' TO 9' FROM SHOULDER, THE TOLERANCE SHALL BE THE DISTANCE SHOWN +2'.

IN INSTANCES WHERE THE LATERAL CLEARANCE SHOWN CAUSES THE FOOTING TO BE LOCATED UNDESIREABLY, SUCH AS THE BOTTOM OF DITCHES, ETC., THE LOCATION MAY BE ADJUSTED OUTWARD FROM THE ROADWAY IF NECESSARY AT THE DISCRETION OF THE ENGINEER.

IN RURAL AREAS THERE SHALL BE A 12' MINIMUM FROM TRAVELWAY (EDGELINE) TO THE EDGE OF THE SIGN IF NO SHOULDER EXISTS.

■ NORMALLY, ON FREEWAY AND EXPRESSWAY MAINLINE, STANDARD OR SPECIAL INFORMATION SIGNS SHALL BE LOCATED WITH A LATERAL CLEARANCE OF 10' FROM THE FACE OF NON-MOUNTABLE CURBS OR GUARD RAILS, 20' FROM EDGE OF SHOULDER. IN ALL CASES EXCEPT WHEN SIGN SUPPORTS ARE PROTECTED BY BARRIERS, SIGNS SHALL HAVE A LATERAL CLEARANCE OF 30' OR GREATER (AS REQUIRED BY CLEAR ZONE) FROM EDGE OF DRIVING LANE.

ALONG INTERCHANGE RAMPS THE LATERAL CLEARANCE SHALL NORMALLY BE 10' OR GREATER (AS REQUIRED BY CLEAR ZONE).

▲ WHEN LATERAL CLEARANCE IS 30'-0'' OR GREATER FROM EDGE OF PAVEMENT, THE SIGN IS TO BE APPROXIMATELY PERPENDICULAR TO ROADWAY.

APPROVED BY TRAFFIC ENGINEER [signature] DATE 8/3/10

TRAFFIC STANDARD

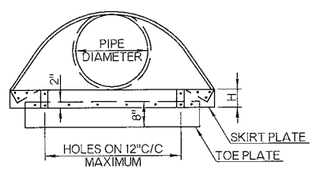
TYPICAL INSTALLATIONS OF GROUND MOUNTED SIGNS

2009 SPECIFICATIONS

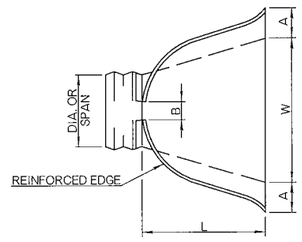
GMS1-1	00
	T-136

OKLAHOMA DEPARTMENT OF TRANSPORTATION	
STANDARD REVISIONS	
DESCRIPTION	DATE

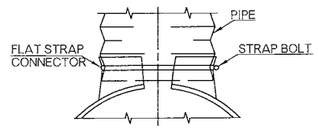
DIMENSIONS OF END SECTIONS FOR ROUND METAL PIPE								
PIPE DIA.	GA.	A	B	H	L	W	APPROX. SLOPE	BODY TYPE
12"	16	6"	6"	6"	21"	24"	1:2 1/2	1 PC.
15"	16	7"	8"	6"	26"	30"	1:2 1/2	1 PC.
18"	16	8"	10"	6"	31"	36"	1:2 1/2	1 PC.
21"	16	9"	12"	6"	36"	42"	1:2 1/2	1 PC.
24"	16	10"	13"	6"	41"	48"	1:2 1/2	1 PC.
30"	14	12"	16"	8"	51"	60"	1:2 1/2	1 PC.
36"	14	14"	19"	9"	60"	72"	1:2 1/2	2 PC.
42"	12	16"	22"	11"	69"	84"	1:2 1/2	2 PC.
48"	12	18"	27"	12"	78"	90"	1:2 1/4	2 PC.
54"	12	18"	30"	12"	84"	102"	1:2	2 PC.
60"	12	18"	33"	12"	87"	114"	1:1 3/4	3 PC.
66"	12	18"	36"	12"	87"	120"	1:1 1/2	3 PC.
72"	12	18"	39"	12"	87"	126"	1:1 1/3	3 PC.
78"	12	18"	42"	12"	87"	132"	1:1 1/4	3 PC.
84"	12	18"	45"	12"	87"	138"	1:1 1/6	3 PC.



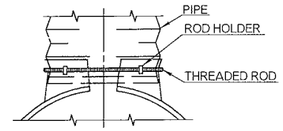
ROUND METAL PIPE END SECTION
END VIEW



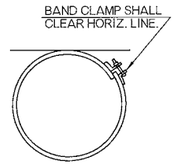
METAL END SECTION
PLAN VIEW



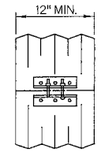
TYPE 1
FOR 12" TO 24" ROUND AND
EQUIVALENT ROUND PIPE ARCH SIZES.



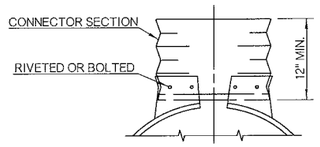
TYPE 2
FOR 30" TO 36" ROUND AND
30" TO 48" EQUIVALENT ROUND
PIPE - ARCH SIZES.



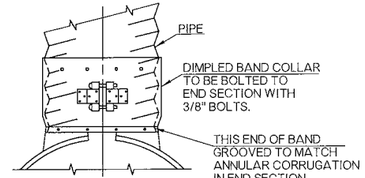
COUPLING BAND



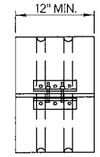
STANDARD
COUPLING BAND



TYPE 3
FOR 42" TO 84" ROUND AND
54" TO 72" EQUIVALENT ROUND
PIPE - ARCH SIZES.



TYPE 4
FOR USE WITH ALL ROUND
AND PIPE ARCH SIZES.

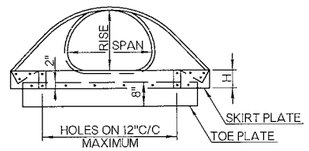


DIMPLED
COUPLING BAND

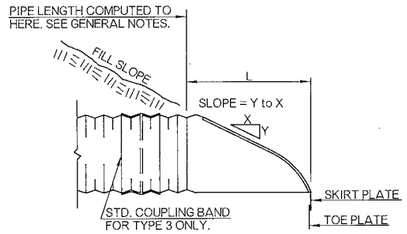
TYPICAL METAL END SECTION CONNECTIONS

DIMENSIONS OF END SECTIONS FOR METAL PIPE - ARCH									
SPAN x RISE	EQUIV. ROUND	GA.	A	B	H	L	W	APPROX. SLOPE	BODY TYPE
17" x 13"	15"	16	7"	9"	6"	19"	30"	1:2 1/2	1 PC.
21" x 15"	18"	16	7"	10"	6"	23"	36"	1:2 1/2	1 PC.
24" x 18"	21"	16	8"	12"	6"	28"	42"	1:2 1/2	1 PC.
28" x 20"	24"	#16	9"	14"	6"	32"	48"	1:2 1/2	1 PC.
35" x 24"	30"	14	10"	16"	6"	39"	60"	1:2 1/2	1 PC.
42" x 29"	36"	#14	12"	18"	8"	46"	75"	1:2 1/2	1 PC.
49" x 33"	42"	12	13"	21"	9"	53"	85"	1:2 1/2	2 PC.
57" x 38"	48"	12	18"	26"	12"	63"	90"	1:2 1/2	2 PC.
64" x 43"	54"	12	18"	30"	12"	70"	102"	1:2 1/4	2 PC.
71" x 47"	60"	12	18"	33"	12"	77"	114"	1:2 1/4	3 PC.
77" x 52"	66"	12	18"	36"	12"	77"	126"	1:2	3 PC.
83" x 57"	72"	12	18"	39"	12"	77"	138"	1:2	3 PC.

FOR ALUMINUM END SECTIONS THE 28" x 20" SHALL BE 14 GAGE AND THE 42" x 29" SHALL BE 12 GAGE.



ARCH METAL PIPE END SECTION
END VIEW

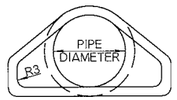


METAL END SECTION
SIDE VIEW

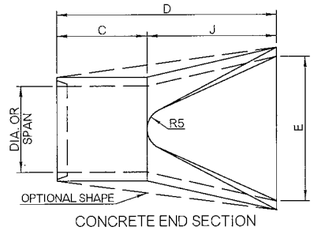
GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. CULVERT END SECTIONS SHALL BE OF THE SAME MATERIAL AND SHAPE (ROUND, ARCH, OR ELLIPTICAL) AS THE PIPE ON WHICH THEY ARE INSTALLED.
3. DIMENSIONS SHOWN FOR END SECTIONS ARE SUBJECT TO MANUFACTURER TOLERANCES.
4. TOE PLATE WILL BE REQUIRED ON ALL METAL END SECTIONS UNLESS SOLID ROCK IS ENCOUNTERED. HOLES IN TOE PLATE TO BE PUNCHED TO MATCH HOLES IN SKIRT PLATE. 3/8" BOLTS TO BE FURNISHED. LENGTH OF TOE PLATES FOR ROUND PIPE END SECTIONS SHALL BE W=10" FOR 12" TO 30" DIAMETER PIPE, W=20" FOR 36" TO 84" DIAMETER PIPE. LENGTH OF TOE PLATES FOR ARCH PIPE END SECTIONS SHALL BE W=10" FOR A RISE OF 13" TO 29" AND W=20" FOR A RISE OF 33" TO 57".
5. CONNECTOR SECTION, SKIRT PLATE, AND TOE PLATE ON METAL END SECTIONS SHALL BE THE SAME GAGE AND MATERIAL AS THE SKIRT AND SHALL BE INCLUDED IN PRICE BID FOR END SECTION.
6. IF TYPE 3 METAL END SECTION IS USED AS OPTIONAL PIPE, THE LENGTH OF PIPE TO BE REDUCED BY 12" FOR EACH END SECTION. IF CONCRETE PIPE OPTION IS USED, THE LENGTH OF PIPE TO BE REDUCED BY THE C DIMENSION FOR EACH END SECTION.

DIMENSIONS OF PRECAST END SECTIONS FOR ROUND PIPE										
DIAMETER	R3	R4	R5	T	K	J	C	D	E	SLOPE
18"	3"	3"	6"	2 1/2"	9"	2.25'	3.83'	6.08'	3.00'	1:3
24"	3"	3"	7"	3"	9 1/2"	3.63'	2.50'	6.12'	4.00'	1:3
30"	3"	3"	8"	3 1/2"	12"	4.50'	1.65'	6.16'	5.00'	1:3
36"	3"	3"	10 1/2"	4"	15"	5.25'	2.90'	8.15'	6.00'	1:3
42"	3"	3"	10 1/2"	4 1/2"	21"	5.25'	2.92'	8.17'	6.50'	1:3
48"	6"	6"	14"	5"	24"	6.00'	2.17'	8.17'	7.00'	1:3
54"	6"	6"	-	5 1/2"	27"	5.42'	2.92'	8.33'	7.50'	1:2 1/2
60"	6"	6"	-	6"	30"	5.00'	3.25'	8.25'	8.00'	1:2
66"	6"	6"	-	6 1/2"	24"	6.50'	1.75'	8.25'	8.50'	1:2
72"	6"	6"	-	7"	24"	6.50'	1.75'	8.25'	9.00'	1:2

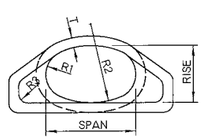


ROUND CONCRETE PIPE
END SECTION
END VIEW

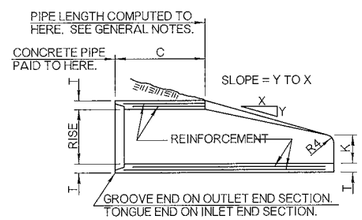


CONCRETE END SECTION
PLAN VIEW

APPROX. EQUIV. DIAMETER	DIMENSIONS OF PRECAST END SECTIONS FOR ELLIPTICAL PIPE												
	RISE	SPAN	R1	R2	R3	R4	R5	T	K	J	C	D	E	SLOPE
18"	14"	23"	6"	20"	3"	3"	6"	2 3/4"	8"	2.25'	3.75'	6.00'	3.00'	1:3
24"	19"	30"	8 1/4"	26 1/4"	3"	3"	7"	3 1/4"	8 1/2"	3.25'	2.75'	6.00'	4.00'	1:3
30"	24"	38"	10 1/4"	32 3/4"	3"	3"	9"	3 3/4"	9 1/2"	4.50'	1.50'	6.00'	5.00'	1:3
36"	29"	45"	12 1/4"	39 1/4"	3"	3"	12"	4 1/2"	11 1/4"	5.00'	3.00'	8.00'	6.00'	1:3
42"	34"	53"	14 1/2"	46"	6"	6"	13"	5"	15 3/4"	5.00'	3.00'	8.00'	6.50'	1:3
48"	38"	60"	16 1/2"	51 1/2"	6"	6"	14"	5 1/2"	21"	5.00'	3.00'	8.00'	7.00'	1:3
54"	43"	68"	18 3/4"	58 1/2"	6"	6"	16"	6"	25 1/2"	5.00'	3.00'	8.00'	7.50'	1:3
60"	48"	76"	20 3/4"	65"	6"	6"	36 11/16"	6 1/2"	30"	5.00'	3.25'	8.25'	8.00'	1:2
66"	53"	83"	22 3/4"	71 1/2"	6"	6"	36 1/8"	7 1/2"	24"	6.50'	1.75'	8.25'	8.50'	1:2
72"	58"	91"	24 3/4"	78"	6"	6"	38"	7 1/2"	24"	6.50'	1.75'	8.25'	9.00'	1:2

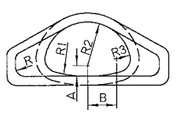


ELLIPTICAL CONCRETE PIPE
END SECTION
END VIEW



CONCRETE END SECTION
SIDE VIEW

APPROX. EQUIV. DIAMETER	DIMENSIONS OF PRECAST END SECTIONS FOR ARCH PIPE																
	SPAN	RISE	A	B	R	R1	R2	R3	R4	R5	T	K	J	C	D	E	SLOPE
18"	22"	13"	- 1/4"	5 3/4"	2"	27 1/2"	13 3/4"	5 1/4"	3"	13"	2 1/2"	7"	2.25'	3.75'	6.08'	3.00'	1:3
24"	28"	18"	3 7/16"	9 21/32"	3"	40 11/16"	14 9/16"	4 19/32"	3"	16 13/16"	3"	9 1/2"	3.58'	2.50'	6.08'	4.00'	1:3
30"	36"	22"	3 3/4"	12 3/32"	3"	51"	18 3/4"	6 1/32"	3"	18 1/2"	3 1/2"	12"	4.50'	1.58'	6.08'	5.00'	1:3
36"	43"	26"	4 1/8"	15 1/2"	6"	62"	22 1/2"	6 3/8"	3"	24 5/16"	4"	15"	5.25'	2.90'	8.15'	6.00'	1:3
42"	51"	31"	5 1/16"	18"	6"	73"	26 1/4"	7 9/16"	3"	27 1/2"	4 1/2"	21"	5.25'	2.92'	8.17'	6.50'	1:3
48"	58"	36"	6"	20 1/2"	6"	84"	30"	8 3/4"	3"	28 1/2"	5"	24"	6.00'	2.17'	8.17'	7.00'	1:3
54"	65"	40"	6 5/8"	22 11/16"	6"	92 1/2"	33 3/8"	9 13/16"	6"	33 1/8"	5 1/2"	27"	5.42'	2.92'	8.34'	7.50'	1:2.4
60"	73"	45"	7 1/2"	25 9/32"	6"	105"	37 1/2"	11 7/32"	6"	33 11/16"	6"	30"	5.00'	3.25'	8.25'	8.00'	1:2
72"	88"	54"	9"	31 7/16"	6"	126"	45"	12 9/16"	6"	38 15/16"	7"	24"	6.50'	1.75'	8.25'	9.00'	1:2



ARCH CONCRETE PIPE
END SECTION
END VIEW

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (L)	▼ PREFAB. CULVERT END SECTION, ROUND	EA
613 (L)	▼ PREFAB. CULVERT END SECTION, ARCH	EA
613 (L)	▼ PREFAB. CULVERT END SECTION, ELLIPTICAL	EA

▼END SECTION DIMENSION(S) SHALL BE SPECIFIED.

APPROVED BY
ROADWAY ENGINEER: Caleb F. H DATE: 04/14/15

ROADWAY DESIGN DIVISION STANDARD

PREFABRICATED CULVERT END SECTIONS

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

PCES-4 | 1

R-30

STOP

R1-1 30 x 30 5.18 SF
R1-1E 36 x 36 7.46 SF
R1-1F 48 x 48 13.26 SF

COLOR:
LEGEND AND BORDER:
WHITE (REFLECTORIZED)
BACKGROUND:
RED (TRANSPARENT REFLECTORIZED)

YIELD

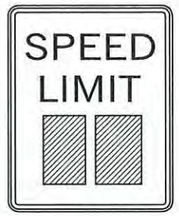
R1-2 36 x 36 x 36 3.90 SF
R1-2E 48 x 48 x 48 6.93 SF
R1-2F 60 x 60 x 60 10.83 SF

COLOR:
LEGEND AND BORDER:
RED (TRANSPARENT REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

ALL-WAY

R1-3P 18 x 6 0.75 SF
R1-3PE 30 x 12 2.50 SF

COLOR:
LEGEND AND BORDER:
WHITE (REFLECTORIZED)
BACKGROUND:
RED (TRANSPARENT REFLECTORIZED)



SPEED LIMIT

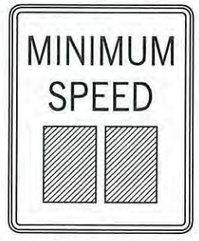
R2-1(SPEED) 24 x 30 5.00 SF
R2-1E( ) 36 x 48 12.00 SF
R2-1F( ) 48 x 60 20.00 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

TRUCK SPEED LIMIT

R2-2P(SPEED) 24 x 24 4.00 SF
R2-2PE( ) 36 x 36 9.00 SF
R2-2PF( ) 48 x 48 16.00 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)



MINIMUM SPEED LIMIT

R2-4P(SPEED) 24 x 30 5.00 SF
R2-4PE( ) 36 x 48 12.00 SF
R2-4PF( ) 48 x 60 20.00 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

NO RIGHT TURN

R3-1 24 x 24 4.00 SF
R3-1E 36 x 36 9.00 SF
R3-1F 48 x 48 16.00 SF

COLOR:
ARROW AND BORDER:
BLACK (NON-REFLECTORIZED)
CIRCLE AND DIAGONAL:
RED (TRANSPARENT REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

NO LEFT TURN

R3-2 24 x 24 4.00 SF
R3-2E 36 x 36 9.00 SF
R3-2F 48 x 48 16.00 SF

COLOR:
ARROW AND BORDER:
BLACK (NON-REFLECTORIZED)
CIRCLE AND DIAGONAL:
RED (TRANSPARENT REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

NO TURN

R3-3 24 x 24 4.00 SF
R3-3E 36 x 36 9.00 SF
R3-3F 48 x 48 16.00 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

NO U TURN

R3-4 24 x 24 4.00 SF
R3-4E 36 x 36 9.00 SF
R3-4F 48 x 48 16.00 SF

COLOR:
ARROW AND BORDER:
BLACK (NON-REFLECTORIZED)
CIRCLE AND DIAGONAL:
RED (TRANSPARENT REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

LEFT TURN ONLY

R3-5(L) 30 x 36 7.50 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

RIGHT TURN ONLY

R3-5(R) 30 x 36 7.50 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

LANE-LEFT

R3-6(L) 30 x 36 7.50 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

LANE-RIGHT

R3-6(R) 30 x 36 7.50 SF

COLOR:
LEGEND AND BORDER:
BLACK (NON-REFLECTORIZED)
BACKGROUND:
WHITE (REFLECTORIZED)

REVISIONS	
DESCRIPTION	DATE

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
850(A)	SHEET ALUMINUM SIGNS	SF

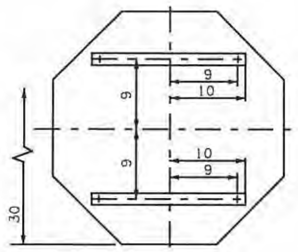
APPROVED BY TRAFFIC ENGINEER: David Streb DATE: 8/5/10

TRAFFIC STANDARD
REGULATORY SIGN DETAILS
(R-SERIES)

2009 SPECIFICATIONS

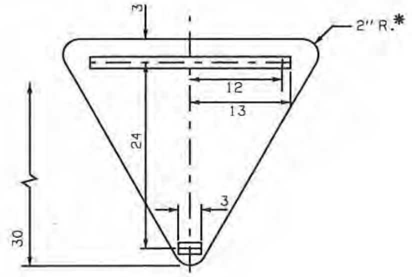
RSD1-1 00
T-114

DESCRIPTION	REVISIONS	DATE



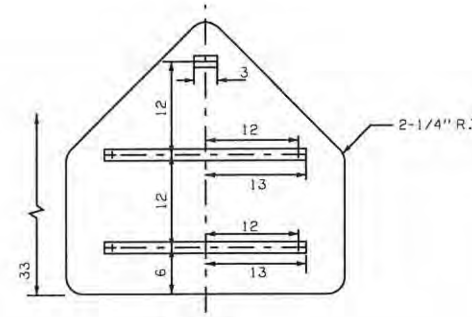
B-30(O)

(1) 2" SQUARE TUBE POST
(1) 2" PIPE POST



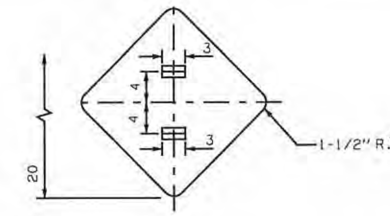
B-36(T)

(1) 2" SQUARE TUBE POST
(1) 2" PIPE POST



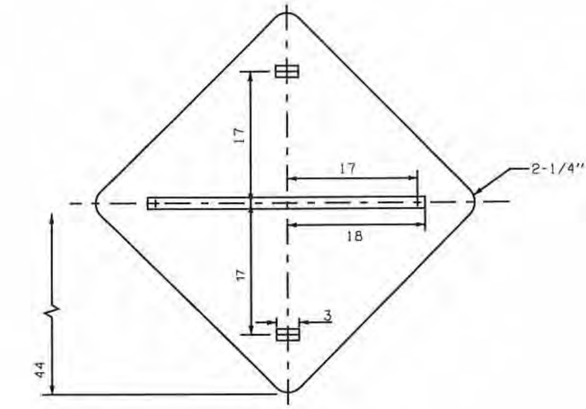
B-36(P)

(1) 2" SQUARE TUBE POST
(1) 2" PIPE POST



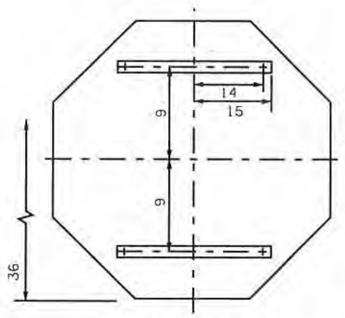
B-18(D)

(1) 2" SQUARE TUBE POST
(1) 1-1/2" PIPE POST



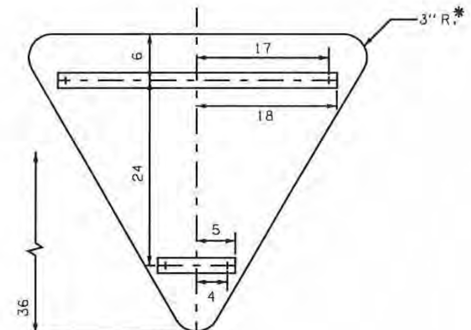
B-36(D)

(1) 2" SQUARE TUBE POST
(1) 2-1/2" PIPE POST



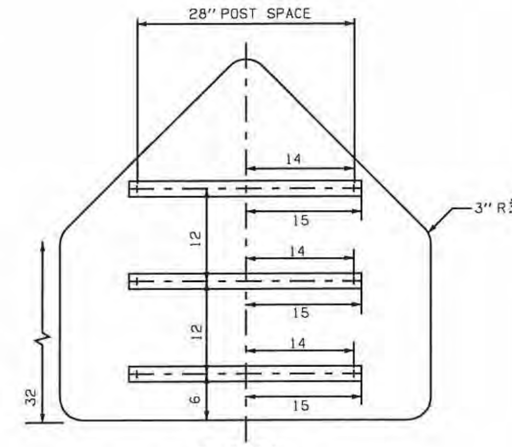
B-36(O)

(1) 2" SQUARE TUBE POST
(1) 2-1/2" PIPE POST



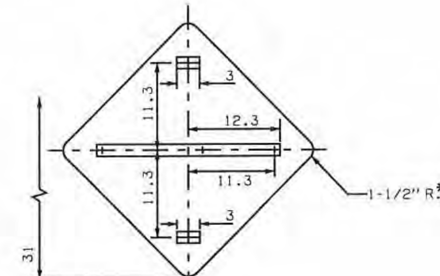
B-48(T)

(2) 2" SQUARE TUBE POSTS
(1) 2-1/2" PIPE POST



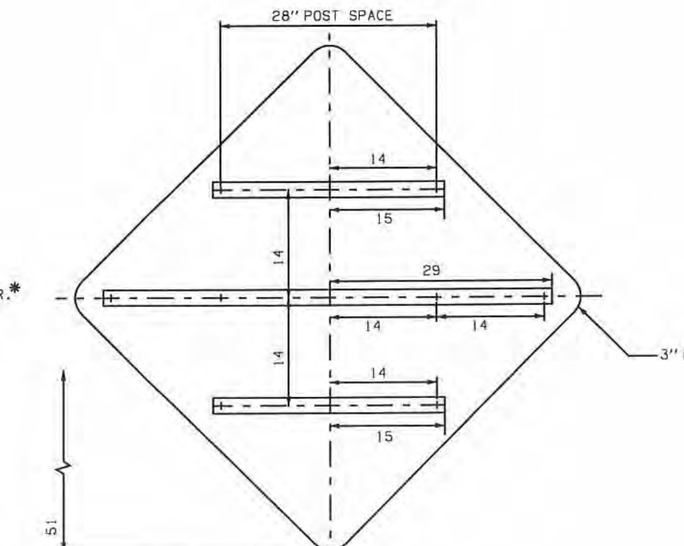
B-48(P)

(2) 2" SQUARE TUBE POSTS
(2) 2" PIPE POSTS



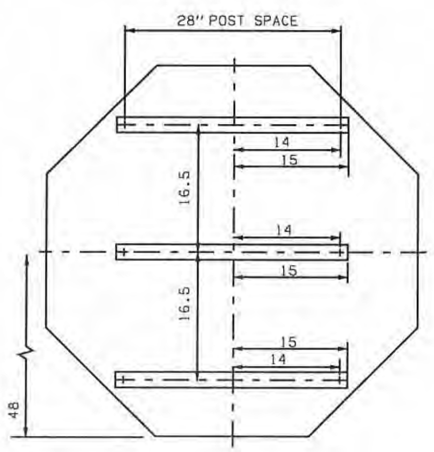
B-24(D)

(1) 2" SQUARE TUBE POST
(1) 2" PIPE POST



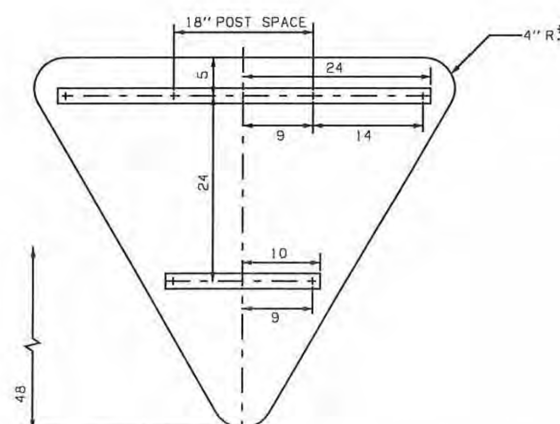
B-48(D)

(2) 2" SQUARE TUBE POSTS
(2) 2-1/2" PIPE POSTS



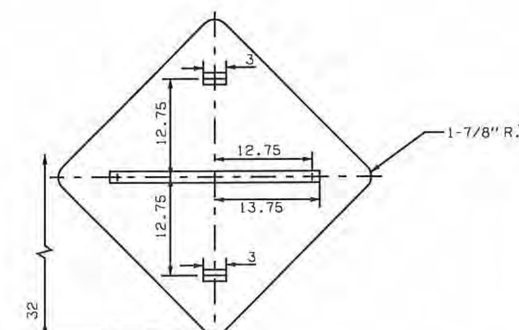
B-48(O)

(2) 2" SQUARE TUBE POSTS
(2) 2-1/2" PIPE POSTS



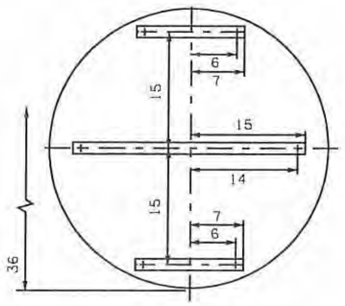
B-60(T)

(2) 2" SQUARE TUBE POSTS
(2) 2" PIPE POSTS



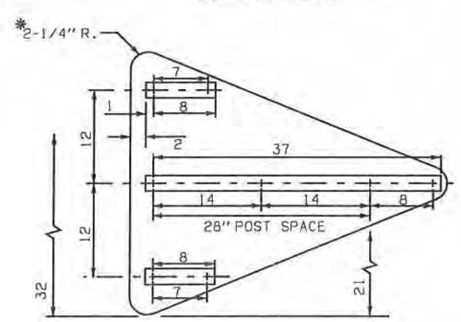
B-30(D)

(1) 2" SQUARE TUBE POST
(1) 2" PIPE POST



B-36(R)

(1) 2" SQUARE TUBE POST
(1) 2-1/2" PIPE POST



B-4836(T)

(2) 2" SQUARE TUBE POSTS
(2) 2" PIPE POSTS

CONSTRUCTION NOTES:

(1) ALL FLAT SHEET SIGNS SHALL USE GALVANIZED STEEL POSTS.

(2) THICKNESS OF MATERIALS FOR FLAT SHEET SIGNS SHALL BE AS FOLLOWS, DETERMINED BY THE LONGEST DIMENSION OF THE SIGN UNLESS OTHERWISE SPECIFIED.

ALUMINUM ALLOY 6061-T6 OR 5052-H38	GALVANIZED STEEL
0.063" FOR SIGNS THROUGH 24"	16 GAUGE FOR SIGNS THROUGH 24"
0.080" FOR SIGNS 25" THROUGH 35"	14 GAUGE FOR SIGNS 25" THROUGH 35"
0.100" FOR SIGNS 36" AND LARGER	12 GAUGE FOR SIGNS 36" AND LARGER

(3) SIGN BRACKETS SHALL BE GALVANIZED STEEL OR ALUMINUM. HOLES FOR MOUNTING BRACKETS TO SIGN SHALL BE 5/16" D. HOLES FOR MOUNTING SIGN AND BRACKETS TO POST SHALL BE 3/8" D. HOLES SHALL BE PUNCHED BEFORE GALVANIZING. SIZE OF BRACKETS SHALL BE AS FOLLOWS: SIGNS THROUGH 36" SHALL USE A GALVANIZED STEEL OR ALUMINUM CHANNEL 1-1/2" X 1/2" X 1/8". SIGNS LARGER THAN 36" SHALL USE A GALVANIZED STEEL OR ALUMINUM CHANNEL 2" X 1/2" X 1/8". ALUMINUM SIGN BRACKETS SHALL BE ALLOY 6061-T6, 6062-T6 OR 6063-T6.

(4) ALL BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED STEEL OR CADMIUM PLATED. ALL BOLT ENDS SHALL BE SUFFICIENTLY BRADDED AFTER INSTALLATION TO MINIMIZE REMOVAL BY VANDALISM.

(5) ALL POSTS SHALL EXTEND 2" ABOVE THE TOP SIGN BRACKET, BUT NOT ABOVE THE TOP OF THE SIGN.

* (6) CORNER RADIUS FOR ALL FLAT SHEET SIGNS SHALL BE AS SHOWN.

(7) ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

APPROVED BY TRAFFIC ENGINEER: [signature] DATE: 8/3/10

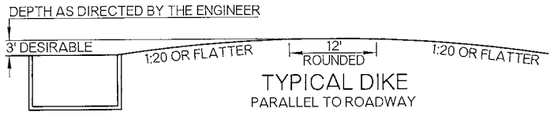
TRAFFIC STANDARD

SIGN BLANK AND BRACKET DETAILS

2009 SPECIFICATIONS | SBS1-1 | 00 | T-130

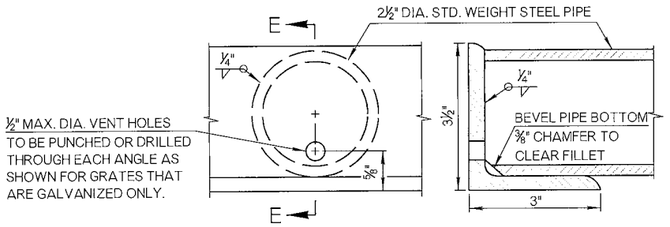
OKLAHOMA DEPARTMENT OF TRANSPORTATION

STANDARD REVISIONS	
DESCRIPTION	DATE

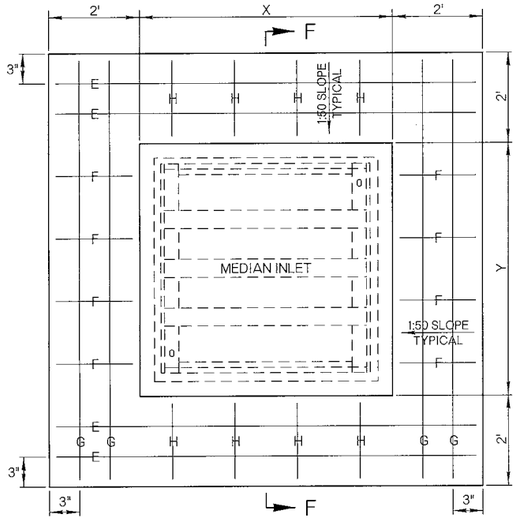


TYPICAL DIKE
PARALLEL TO ROADWAY

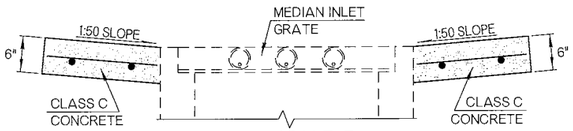
NOTE: WHEN A DIKE IS REQUIRED, IT SHALL BE CONSTRUCTED SLOPING UP FROM THE INLET ON A 1:20 SLOPE TO A DESIRABLE HEIGHT OF 3 FEET. IN NO CASE SHALL THE DIKE TOP BE HIGHER THAN 6" BELOW THE FINISHED GRADE OF THE INNER EDGE OF SURFACING AS SHOWN ON THE PLAN AND PROFILE SHEET.



VENT HOLE DETAIL SECTION E-E



MEDIAN DRAIN CONCRETE APRON DETAIL



SECTION F-F

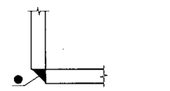
APRON REINFORCING STEEL LOCATION & LENGTHS (#4 BARS - EQUALLY SPACED @ 18" MAXIMUM)*							APRON REINF. STEEL°	APRON CLASS C CONCRETE°
DIAMETER	E - BARS	F - BARS	G - BARS	H - BARS	X	Y		
IN.	(NO.) FT. - IN.	(NO.) FT. - IN.	(NO.) FT. - IN.	(NO.) FT. - IN.	FT. - IN.	FT. - IN.	LB.	C.Y.
18 & 24	(4) 7 - 2⅛	(8) 1 - 9	(4) 7 - 4¾	(8) 1 - 9	3 - 7¾	3 - 5⅛	57	0.41
30	(4) 7 - 10	(8) 1 - 9	(4) 7 - 4¾	(8) 1 - 9	3 - 7¾	4 - 1	59	0.43
36	(4) 8 - 5	(9) 1 - 9	(4) 8 - 5	(9) 1 - 9	4 - 8	4 - 8	66	0.49

*MINIMUM 1½" COVER OVER STEEL °QUANTITIES ARE FOR ONE APRON

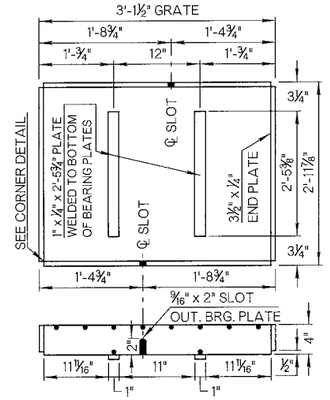
SMD BAR LIST					
BAR	SIZE	NO.	SHAPE	LENGTH	SPACE
TYPE 1 - 18" OR 24" RCP OR CGSP					
A	#4	5	BENT	11'-10"	6" C/C
B	#4	15	BENT	2'-11¾"	9" C/C
C	#5	7	STR.	3'-1⅛"	6" C/C
D	#5	6	STR.	3'-3⅜"	6" C/C
TYPE 2 - 18" OR 24" RCP OR CGSP					
A	#4	6	BENT	11'-10"	6" C/C
B	#4	16	BENT	3'-6½"	9" C/C
C	#5	7	STR.	3'-1⅛"	6" C/C
D	#5	6	STR.	3'-3⅜"	6" C/C
TYPE 2A - 18", 24" OR 30" RCP OR CGSP					
A	#4	7	BENT	12'-11½"	6" C/C
B	#4	18	BENT	4'-1"	9" C/C
C	#5	7	STR.	3'-3¾"	6" C/C
D	#5	7	STR.	3'-7"	6" C/C
TYPE 2B - 18",24",30" OR 36" RCP OR CGSP					
A	#4	8	BENT	16'-2"	6" C/C
B	#4	20	BENT	4'-7"	9" C/C
C	#5	7	STR.	4'-4"	6" C/C
D	#5	8	STR.	4'-4"	6" C/C

GRATES - OVERALL DIMENSIONS
TYPE 1 GRATE: 3'-1½" x 2'-11⅞"
TYPE 2 GRATE: 3'-1¼" x 2'-11¾"
TYPE 2A GRATE: 3'-1¼" x 3'-6½"
TYPE 2B GRATE: 4'-1½" x 4'-1½"
W = 8¼" FOR TYPE 2
W = 9" FOR TYPE 2A & 2B

PIPE GRATE MATERIAL
2½" I.D. STD. WEIGHT STEEL PIPE



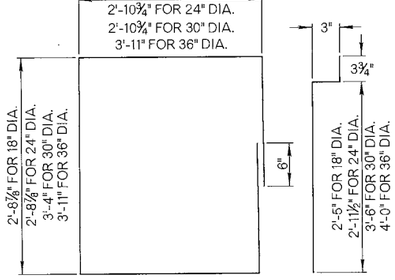
CORNER DETAIL
● ALL CORNERS SHALL HAVE FULL 4" CORNER WELDS



DETAIL ALTERNATE STIFFENER
TYPE 1 GRATE

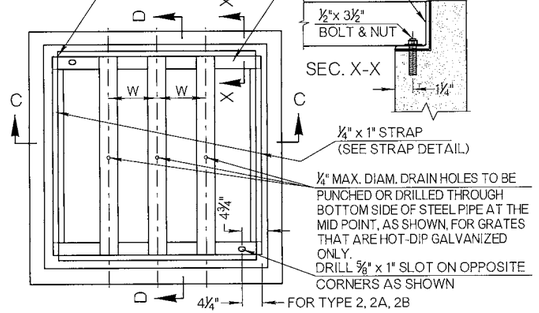
■ ½" DIA. x 3½" STD. HEX BOLT W/ NUT (2 TOTAL)
CROSS BARS - ⅜" DIA. x 2'-11⅞" (10 TOTAL)
END PLATES - 3½" x ¼" x 2'-11⅞" (2 TOTAL)
BEARING PLATES - 4" x ¼" x 3'-1" (16 TOTAL)

ESTIMATED SMD QUANTITIES						ADD'L SMD DEPTH PER VERT. FT.	
DESIGNATED PIPE SIZE IN INLET	TYPE OF GRATE	1 PIPE CLASS A CONC.	2 PIPES CLASS A CONC.	REINF. STEEL	CLASS A CONC.	REINF. STEEL
		CY	CY	LB.	CY	LB
18" RCP	1 OR 2	0.75	0.67	115	0.23	27
24" RCP	1 OR 2	0.85	0.76	129	0.23	27
30" RCP	2A	1.06	0.96	160	0.25	29
36" RCP	2B	1.52	1.38	211	0.31	35

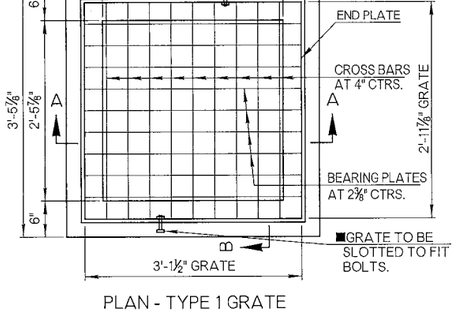


BAR A BAR B

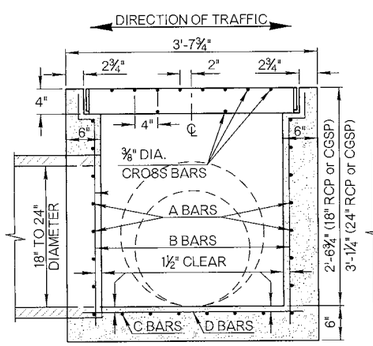
REINFORCING STEEL



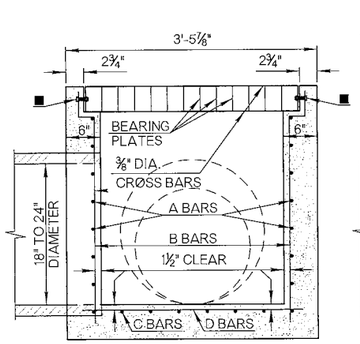
PLAN - TYPE 2, 2A, 2B GRATE



PLAN - TYPE 1 GRATE

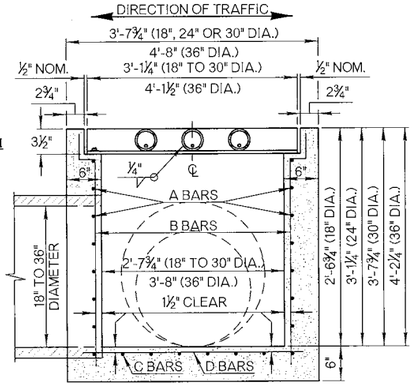


SEC A-A

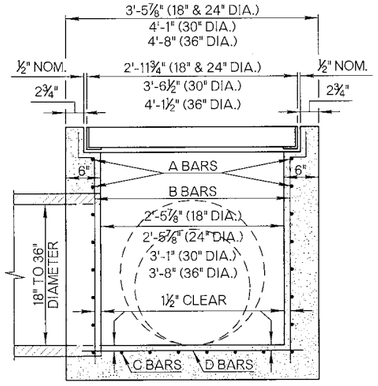


SEC B-B

SMD INLET WITH TYPE 1 GRATE

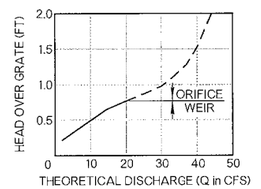


SEC C-C



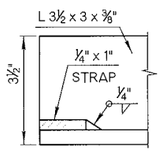
SEC D-D

SMD INLET WITH TYPE 2, 2A & 2B GRATE



HYDRAULIC PERFORMANCE CHART

NOTE: TO ALLOW FOR CLOGGING 60% THEORETICAL DISCHARGE IS THE RECOMMENDED FACTOR TO USE IN AREAS SUBJECT TO FLOODING.



STRAP DETAIL

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. VENT HOLES AND DRAIN HOLES FOR HOT DIP GALVANIZATION SHALL BE DRILLED OR PUNCHED IN GRATE AS SHOWN.
3. BICYCLE AND PEDESTRIAN SAFE GRATES, SIMILAR TO TYPE 1 GRATES, MAY BE SUBSTITUTED FOR TYPE 2A AND 2B GRATES, IF THEY MEET THE MINIMUM EQUIVALENT HYDRAULIC AND STRUCTURAL REQUIREMENTS AND PROPOSED DESIGNS ARE APPROVED BY THE ENGINEER. GRATES SIMILIAR TO TYPE 1 GRATES, USED AS ALTERNATIVES TO TYPE 2A AND 2B GRATES, SHALL BE DESIGNATED TYPES 1A AND 1B GRATES. COST FOR TYPE 1A AND 1B GRATES SHALL BE INCLUDED IN THE PRICE BID FOR THE RESPECTIVE INLET.
4. EXPOSED ROUNDED EDGING. ALL EXPOSED SURFACES SHALL BE FINISHED IN ACCORDANCE WITH SECTION 509.
5. COST OF APRON MATERIALS (INCLUDING REINFORCING STEEL), LABOR, AND INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR SMD INLET.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (G)	INLET (SMD-TYPE 1)	EA
611 (G)	INLET (SMD-TYPE 2)	EA
611 (G)	INLET (SMD-TYPE 2A)	EA
611 (G)	INLET (SMD-TYPE 2B)	EA

NOTE: COST OF INLET GRATE SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET. COST OF ALL CLASS A CONCRETE AND REINFORCING STEEL NECESSARY FOR ADDITIONAL DEPTH SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET. INLET ADDITIONAL DEPTH DATA SHALL BE NOTED ON THE PLANS.

APPROVED BY ROADWAY ENGINEER: Caleb F. A DATE: 04/11/15

ROADWAY DESIGN DIVISION STANDARD

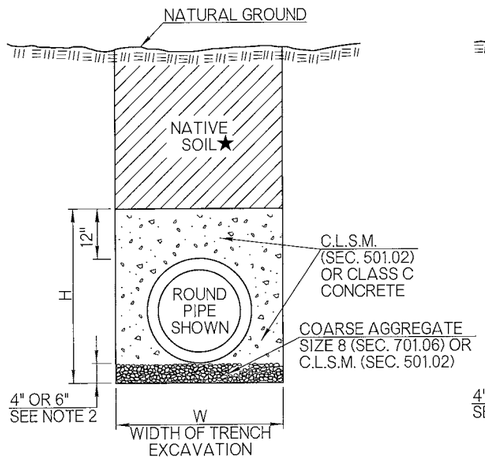
STANDARD MEDIAN DRAINS (18" TO 36" PIPES)

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

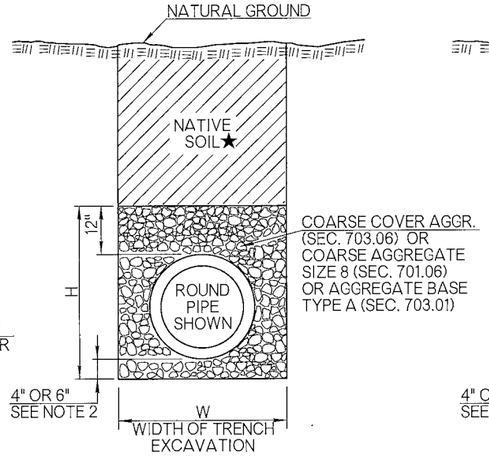
SMD-3 | 1

R-36

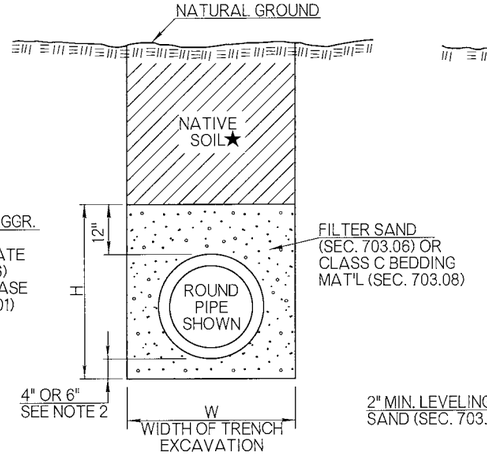
OKLAHOMA DEPARTMENT OF TRANSPORTATION	
STANDARD REVISIONS	
DESCRIPTION	DATE



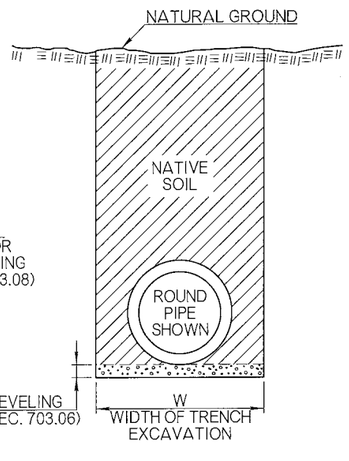
CLASS A BEDDING



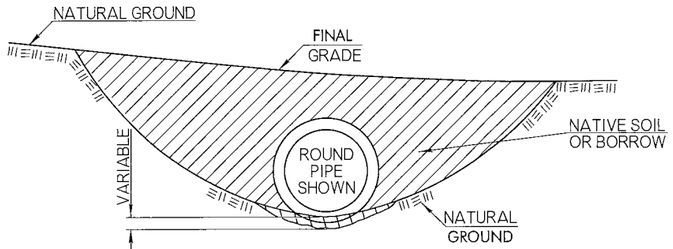
CLASS B BEDDING



CLASS C BEDDING



CLASS D BEDDING
ALTERNATE 1



NATIVE SOIL OR SAND (SEC. 703.06) MAY BE USED TO ADJUST FLOWLINE OF NATURAL DITCH TO PROVIDE SMOOTH BEDDING SURFACE FOR PIPE CONDUIT AND ATTAIN PROPER DESIGN GRADE. SEE SECTION 613.04.G

CLASS D BEDDING
ALTERNATE 2

PIPE BEDDING CLASS/DESIGN TABLE							
	■ UNDER PAVING				OUTSIDE PAVING		
TYPE OF PIPE	CROSS DRAIN (NHS OR ADT > 6000 VPD)	CROSS DRAIN (OTHER)	STORM SEWER (NHS OR ADT > 6000 VPD)	STORM SEWER (OTHER)	CROSS DRAIN	SIDE DRAIN	STORM SEWER
REINFORCED CONCRETE PIPE	B	C	B	C	C	D	C
CORRUGATED GALV. STEEL PIPE (CGSP)	NA	B	NA	B	C	D	C
MILL PRECOATED CGSP	NA	B	NA	B	C	D	C
CORRUGATED GALV. STRUCT. PLATE	NA	B	NA	B	C	D	C
ALUMINIZED TYPE II CSP	NA	B	NA	B	C	D	C
CORRUGATED POLYETHYLENE / PVC	NA	A	NA	A	B	B	B
POLYVINYL CHLORIDE (SC 40/80 PVC)	NA	NA	NA	NA	NA	NA	NA
POLYPROPYLENE PIPE (PP) ▲	NA	B	NA	B	C	D	C

■ WHEN THERE IS ANY POSSIBILITY OF THE PAVEMENT BEING WIDENED DURING THE LIFE OF THE DRAINAGE STRUCTURE, THE BEDDING SHALL MEET THE 'UNDER PAVING SECTION' CRITERIA FOR THE FULL EXTENT OF ANY ANTICIPATED EXPANSION TO THE FACILITY.

▲ BACKFILL WITH A MINIMUM OF TWO (2) FEET OF APPROVED BACKFILL MATERIAL.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. EQUIVALENT PIPE SIZES 66 INCHES AND LARGER REQUIRE 6 INCHES OF BEDDING MATERIAL BELOW PIPE CONDUIT.
3. NATIVE SOIL FOR BACKFILL, TO BE COMPACTED IN ACCORDANCE WITH SECTION 202.04 OF THE STANDARD SPECIFICATIONS.
4. A BETTER CLASS OF BEDDING MAY BY SUBSTITUTED FOR THE NEXT LOWER CLASS. EXAMPLE: CLASS A STANDARD BEDDING CAN BE USED IN LIEU OF CLASS B STANDARD BEDDING.
5. FOR TRENCH WIDTH (W), BEDDING HEIGHT (H), PIPE DATA, MULTIPLE PIPE SPACING & BEDDING DATA, SEE ROADWAY STANDARDS SPI-4 & FPI-3.
6. DATA TABLE WILL DISPLAY 'NA' WHEN PIPE MATERIALS ARE NOT ALLOWED.
7. STANDARD BEDDING CLASS D MATERIAL(S) (ALTERNATE 1) WILL BE CONSIDERED AS INCIDENTAL AND NOT BE PAID FOR SEPARATELY. COST FOR BORROW OR FILL MATERIAL, NEEDED FOR ALTERNATE 2, WILL BE INCLUDED IN THE PRICE OF THE PIPE.
8. PIPE MATERIAL(S)/PRODUCT(S) NOT SHOWN IN THE PIPE BEDDING TABLE WILL BE EVALUATED AND APPROVED ON A CASE BY CASE BASIS.
9. ALL TEMPORARY PIPES SHALL HAVE CLASS D BEDDING UNLESS OTHERWISE SHOWN IN THE PLANS.
10. BEDDING MATERIAL TYPE B, C, AND D, SHALL BE PLACED IN 6" LAYERS AND COMPACTED TO THE SPECIFIED DENSITY USING HAND OPERATED EQUIPMENT ONLY.

★11. WHEN PIPE INSTALLATION IS UNDER PAVING, IN LIEU OF BACKFILLING WITH NATIVE SOIL, PLACE BEDDING MATERIAL ALL THE WAY TO TOP OF TRENCH.

12. THE USE OF AN ALTERNATE PIPE AND ITS CORRESPONDING BEDDING MATERIAL WILL BE ACCEPTABLE PROVIDED THE CRITERIA IN THE DESIGN TABLE IS MET
13. POLYPROPYLENE PIPE SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (R)	STANDARD BEDDING MATERIAL, CLASS A	CY
613 (S)	STANDARD BEDDING MATERIAL, CLASS B	CY
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY

APPROVED BY ROADWAY ENGINEER: Calvin A. DATE: 04/14/15

ROADWAY DESIGN DIVISION STANDARD

STANDARD PIPE BEDDING

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

SPB-1 | 4

R-49

OKLAHOMA DEPARTMENT OF TRANSPORTATION	
STANDARD REVISIONS	
DESCRIPTION	DATE

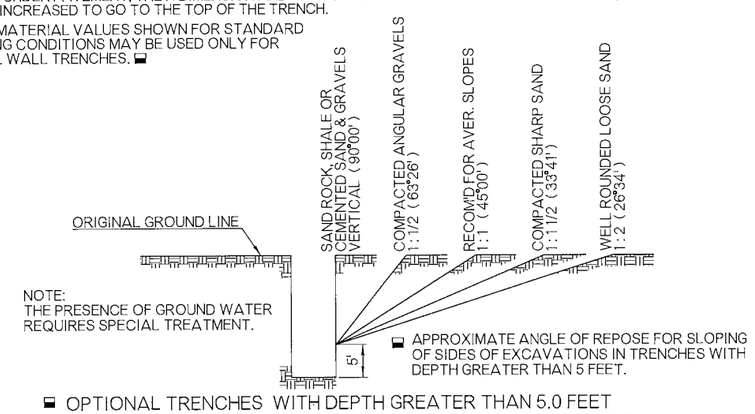
TRENCHING DIMENSIONS AND STANDARD BEDDING MATERIAL QUANTITIES

	PIPE DIAM. OR DESIGN EQUIV.	H ■	T	SINGLE PIPE STANDARD TRENCHING		DOUBLE PIPE STANDARD TRENCHING		TRIPLE PIPE STANDARD TRENCHING		SPECIAL TRENCHING SINGLE, DOUBLE & TRIPLE PIPE OPTIONS W+12"
				W	STANDARD BEDDING MATERIAL ■	W	STANDARD BEDDING MATERIAL ■	W	STANDARD BEDDING MATERIAL ■	ADD'L STANDARD BEDDING MATERIAL
	IN.	FT.	FT.	FT.	CY/LF	FT.	CY/LF	FT.	CY/LF	CY/LF
ROUND PIPE	18	3.25	0.208	3.17	0.274	5.67	0.468	8.17	0.663	0.120
	24	3.83	0.25	4.00	0.386	7.00	0.629	10.00	0.873	0.142
	30	4.42	0.292	4.58	0.474	8.33	0.811	12.08	1.146	0.163
	⊠ 36	5	0.333	6.17	0.751	10.67	1.193	15.17	1.636	0.185
	⊠ 42	5.58	0.375	6.75	0.870	12.00	1.429	17.25	1.989	0.207
	⊠ 48	6.17	0.417	7.33	0.996	13.33	1.688	19.33	2.379	0.228
	⊠ 54	6.75	0.458	7.92	1.126	14.67	1.960	21.42	2.794	0.250
	⊠ 60	7.33	0.5	9.50	1.532	17.00	2.521	24.50	3.510	0.271
	⊠ 66	8.08	0.542	10.08	1.757	18.33	2.965	26.58	4.173	0.299
	⊠ 72	8.67	0.583	10.67	1.931	19.67	3.327	28.67	4.724	0.321
	⊠ 78	9.25	0.625	11.25	2.107	20.75	3.615	30.25	5.122	0.343
	⊠ 84	9.83	0.667	11.83	2.288	21.83	3.908	31.83	5.529	0.364
	⊠ 90	10.42	0.708	12.42	2.479	22.92	4.219	33.42	5.959	0.386
	⊠ 96	11	0.75	13.00	2.671	24.00	4.527	35.00	6.383	0.407
ARCH PIPE	18	2.88	0.208	3.50	0.271	6.33	0.471	9.17	0.671	0.106
	21	3.08	0.229	4.12	0.338	7.29	0.567	10.46	0.796	0.114
	24	3.33	0.250	4.38	0.374	7.75	0.624	11.13	0.874	0.123
	30	3.79	0.291	6.10	0.603	10.13	0.915	14.16	1.227	0.140
	36	4.20	0.333	6.81	0.700	11.67	1.097	16.53	1.493	0.156
	42	4.69	0.375	7.50	0.813	13.17	1.308	18.83	1.802	0.173
	⊠ 48	5.17	0.416	9.21	1.180	15.71	1.842	22.21	2.504	0.191
	⊠ 54	5.58	0.458	9.83	1.243	17.05	1.946	24.28	2.649	0.207
	⊠ 60	6.08	0.500	10.58	1.392	18.69	2.228	26.81	3.064	0.225
	⊠ 66	6.75	0.542	11.00	1.488	19.56	2.365	28.11	3.242	0.250
	⊠ 72	7.00	0.583	12.00	1.690	21.78	2.803	31.55	3.917	0.259
	⊠ 78	7.83	0.625	12.42	1.854	22.64	3.071	32.86	4.288	0.272
	⊠ 84	7.83	0.667	13.33	1.983	24.67	3.385	36.00	4.788	0.290
	⊠ 90	8.92	0.708	14.50	2.382	27.08	4.131	39.67	5.881	0.330
	⊠ 96	9.46	0.750	15.17	2.625	28.33	4.549	41.50	6.473	0.350
HORIZONTAL ELLIPTICAL PIPE	18	2.96	0.229	3.62	0.282	6.54	0.487	9.46	0.691	0.109
	24	3.46	0.27	4.54	0.387	8.04	0.640	11.54	0.893	0.128
	30	3.96	0.312	6.29	0.629	10.51	0.954	14.74	1.28	0.147
	36	4.50	0.375	7.00	0.743	12.00	1.153	17.00	1.564	0.167
	⊠ 42	5.00	0.416	7.75	0.862	13.64	1.379	19.53	1.896	0.185
	⊠ 48	5.42	0.458	9.42	1.170	16.08	1.788	22.75	2.406	0.200
	⊠ 54	5.92	0.5	10.17	1.311	17.72	2.050	25.28	2.789	0.219
	⊠ 60	6.42	0.541	10.92	1.478	19.36	2.368	27.81	3.259	0.238
	⊠ 66	6.91	0.583	11.58	1.626	20.81	2.648	30.03	3.67	0.256
	⊠ 72	7.41	0.625	12.33	1.807	22.44	3.004	32.56	4.201	0.275
	⊠ 78	7.91	0.667	13.00	1.962	23.89	3.305	34.78	4.649	0.293
	⊠ 84	8.58	0.708	13.75	2.239	25.53	3.850	37.31	5.462	0.318
	⊠ 90	9.00	0.75	14.42	2.364	26.83	4.062	39.25	5.759	0.333
	⊠ 96	9.5	0.791	15.17	2.570	28.25	4.408	41.33	6.245	0.352

NOTE: QUANTITIES FOR 66" & 78" EQUIV. DIAM. ARCH PIPE BASED ON METAL PIPE & ESTIMATED WALL THICKNESS.

■ FOR PIPES UNDER PAVEMENT, THE H DIMENSION AND THE STANDARD BEDDING MATERIAL QUANTITY, SHALL BE INCREASED TO GO TO THE TOP OF THE TRENCH.

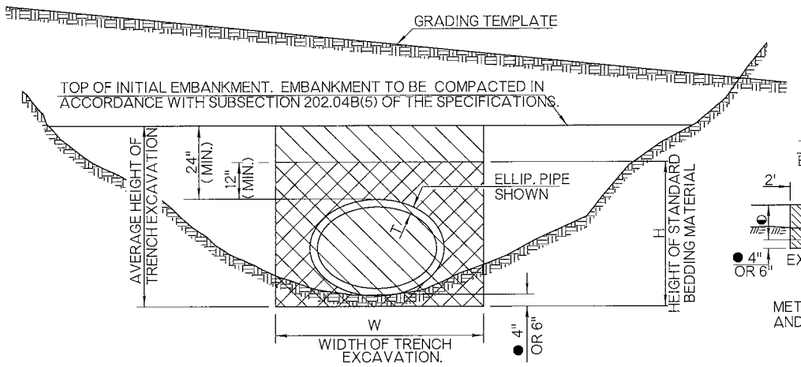
▨ BEDDING MATERIAL VALUES SHOWN FOR STANDARD TRENCHING CONDITIONS MAY BE USED ONLY FOR VERTICAL WALL TRENCHES. ⬓



⬓ APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS IN TRENCHES WITH DEPTH GREATER THAN 5 FEET.

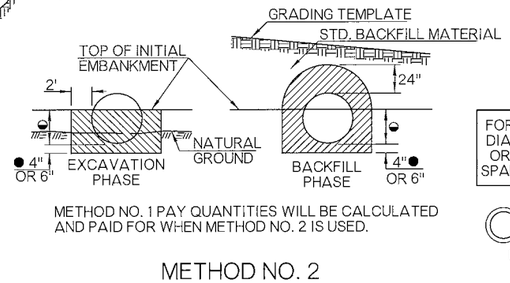
⬓ OPTIONAL TRENCHES WITH DEPTH GREATER THAN 5.0 FEET

EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF SHEETING & SHORING WAS USED. (SPECIAL TRENCHING=STD. WIDTH TRENCH+12")



METHOD NO. 1

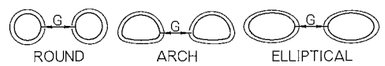
◒ EMBANKMENT HEIGHT PRIOR TO EXCAVATION
PIPE SIZES FROM 18" TO 42" =30"
PIPE SIZES FROM 48" TO 84" =2/3 DIAM.
PIPE SIZES LARGER THAN 84" =60"



METHOD NO. 1 PAY QUANTITIES WILL BE CALCULATED AND PAID FOR WHEN METHOD NO. 2 IS USED.

METHOD NO. 2
(OPTIONAL INSTALLATION FOR R. C. PIPE)

	CONDUIT SHAPE			DIST.
	ROUND	ARCH	ELLIPTICAL	G
FOR DIA. OR SPAN	UP TO 24"	UP TO 36"	UP TO 36"	12"
	25" TO 72"			D/2"
		37" TO 108"	37" TO 108"	D/3"
	OVER 73"	OVER 108"	OVER 108"	36"



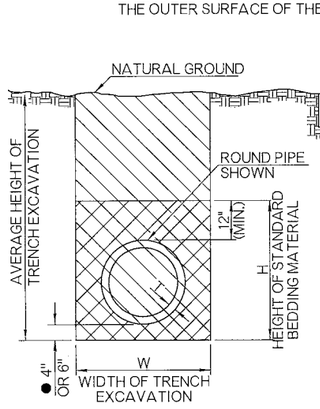
DOUBLE PIPE INSTALLATION
(USED WITH CET END TREATMENTS)

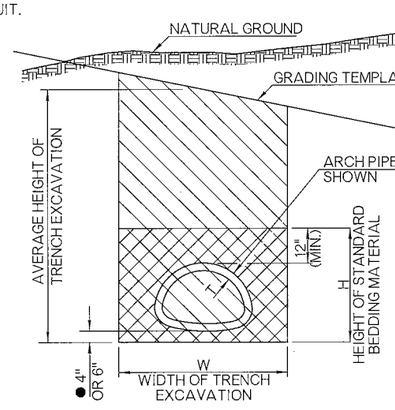
TRENCH EXCAVATION IN EMBANKMENT SECTIONS

▨ LIMITS OF STANDARD BEDDING MATERIAL

QUANTITIES FOR BEDDING MATERIAL DO NOT INCLUDE THE SPACE WITHIN AND BOUNDED BY THE OUTER SURFACE OF THE PIPE CONDUIT.

▨ LIMITS OF TRENCH EXCAVATION





TRENCH EXCAVATION IN CUT SECTIONS

TABLE OF EQUIVALENT PIPES

EQUIV. DIA.	REINF. CONC. ARCH PIPE	STEEL ARCH PIPE	ALUMINUM ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE ◑
18"	22" x 13"	21" x 15"	21" x 15"	14" x 23"
21"		24" x 18"	24" x 18"	
24"	28" x 18"	28" x 20"	28" x 20"	19" x 30"
27"				22" x 34"
30"	36" x 22"	35" x 24"	35" x 24"	24" x 38"
36"	43" x 26"	42" x 29"	42" x 29"	29" x 45"
42"	51" x 31"	49" x 33"	49" x 33"	34" x 53"
48"	58" x 36"	57" x 38"	57" x 38"	38" x 60"
54"	65" x 40"	64" x 43"	64" x 43"	43" x 68"
60"	73" x 45"	71" x 47"	71" x 47"	48" x 76"
66"		77" x 52"	77" x 52"	53" x 83"
72"	88" x 54"	83" x 57"	83" x 57"	58" x 91"
78"		87" x 63"	92" x 65" ▲	63" x 98"
84"	102" x 62"	95" x 67"	95" x 67" ▲	68" x 106"
90"	115" x 72"	103" x 71"	103" x 71" ▲	72" x 113"
96"	122" x 77"	112" x 75"	112" x 75" ▲	77" x 121"

▲ STRUCTURAL PLATE ARCH.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. TRENCH EXCAVATION AND BEDDING MATERIAL WILL NOT BE REQUIRED FOR PIPE INSTALLATIONS OF SIDE DRAINS UNLESS OTHERWISE NOTED ON THE PLANS.
3. FOR PIPE UNDERDRAIN INSTALLATIONS, SEE ROADWAY STANDARD PUD-3.
4. ⬓ SPECIAL TRENCHING CONDITIONS ARE THOSE AS DEFINED BY O.S.H.A. REGULATIONS, TITLE 29 CFR CHAPTER XVII, PART 1926.650, 1926.651 & 1926.652, SO DEFINED WILL APPLY UNTIL THEY ARE IN CONFLICT WITH CURRENT SPECIFICATIONS, FOR TRENCH DEPTHS OVER FIVE FEET. WHERE O.S.H.A. REGULATIONS FOR SPECIAL TRENCHING ARE APPLIED, QUANTITIES AND DIMENSIONS FOR SPECIAL TRENCHING WILL BE USED FOR COMPUTING QUANTITIES. SEE TABLE OF TRENCHING DIMENSIONS AND STANDARD BEDDING MATERIAL QUANTITIES.
5. NORMAL BACKFILLING OPERATIONS SHALL FOLLOW BEDDING AND PIPE INSTALLATION AS CLOSELY AS PRACTICAL. IN NO CASE SHALL A PIPE INSTALLATION SUBJECT TO SUDDEN FLOW DEVELOPMENT BE LEFT WITHOUT SUFFICIENT BACKFILL TO RESTRAIN THE CONDUIT AND PREVENT JOINT SEPARATION AND/OR PIPING SCOUR. PHYSICALLY RESTRAINING THE CONDUIT MAY BE USED TO AUGMENT OR REPLACE THIS IMMEDIATE BACKFILL REQUIREMENT.
6. ANY EXCESS EXCAVATION NOT USED FOR BACKFILL WILL BECOME THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF, BY HIM, IN A MANNER APPROVED BY THE ENGINEER.
7. ○ STANDARD BEDDING QUANTITIES FOR ROUND PIPE ARE BASED ON AASHTO DESIGNATED CLASS III (WALL B) REINFORCED CONCRETE PIPE.
8. ⬓ WHEN REQUIRED, THE SIDES OF THE TRENCHES SHALL BE SHEETED AND SHORED OR OTHERWISE SUPPORTED WHEN THE TRENCH IS MORE THAN 5.0 FEET IN DEPTH. IN LIEU OF SHEETING, THE SIDES OF THE TRENCH ABOVE THE 5.0 FOOT LEVEL MAY BE SLOPED TO PRECLUDE COLLAPSE, SEE OPTIONAL TRENCHES DETAIL THIS SHEET.
9. ⊠ PROPER COMPACTION OF BACKFILL REQUIRES A VERTICAL WALLED TRENCH TO 24 INCHES ABOVE TOP OF PIPE, REGARDLESS OF EXCAVATION ABOVE THAT ELEVATION.
10. ● EQUIVALENT PIPE SIZES 66 INCHES AND LARGER REQUIRE 6 INCHES OF BEDDING MATERIAL BELOW PIPE CONDUIT.
11. ◑ ELLIPTICAL PIPE DIMENSIONS CONFORM TO AASHTO M 207, AS DESIGNATED RISE BY SPAN.
12. FOR COMPUTING TRENCH EXCAVATION & STANDARD BEDDING QUANTITIES, THE LENGTH OF THE CULVERT SHALL INCLUDE END SECTION AND END TREATMENT LENGTHS.
13. MULTIPLE PIPE INSTALLATIONS WILL REQUIRE A MINIMUM OF 12" BETWEEN PIPES FOR PROPER COMPACTION.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
613 (R)	STANDARD BEDDING MATERIAL, CLASS A	CY
613 (S)	STANDARD BEDDING MATERIAL, CLASS B	CY
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY
613 (V)	TRENCH EXCAVATION	CY

APPROVED BY ROADWAY ENGINEER: Calista F. A DATE 04/16/15

ROADWAY DESIGN DIVISION STANDARD

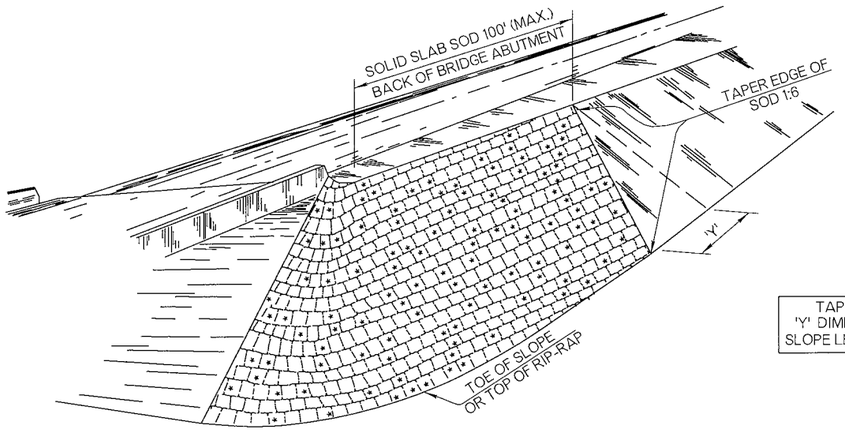
STANDARD PIPE INSTALLATION

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

SPI-4 | 1

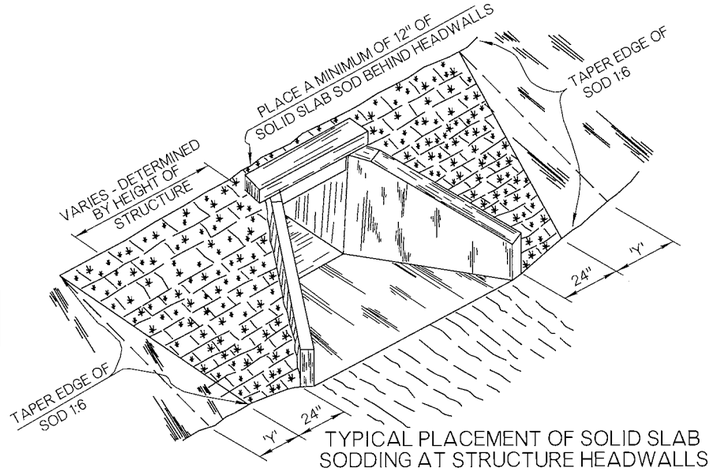
R-47

OKLAHOMA DEPARTMENT OF TRANSPORTATION	
STANDARD REVISIONS	
DESCRIPTION	DATE



TYPICAL PLACEMENT OF SOLID SLAB SODDING
ON FILL SLOPES, APPROACHES TO OVERPASSES AND BRIDGES.

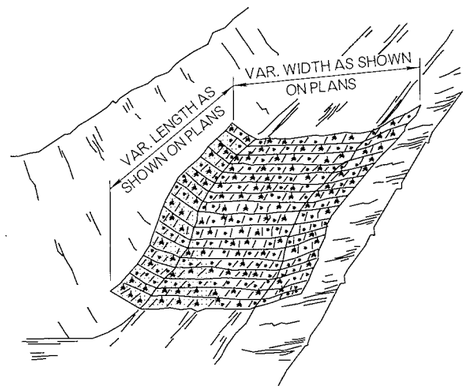
TAPER NOTE
'Y' DIMENSION =
SLOPE LENGTH x 0.17



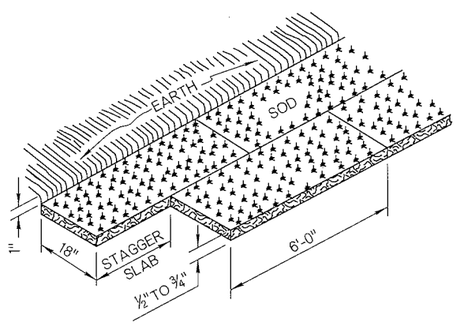
TYPICAL PLACEMENT OF SOLID SLAB
SODDING AT STRUCTURE HEADWALLS

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. SOLID SLAB SOD SHALL BE PLACED IN HORIZONTAL ROWS WITH THE LONGEST SIDE OF EACH SLAB RUNNING PARALLEL TO THE ROADWAY, AND THE SLABS IN ALTERNATE ROWS STAGGERED HALF THE LENGTH OF EACH INDIVIDUAL SLAB. ENSURE THE ROWS RUN PARALLEL TO THE ROADWAY.
3. SLABS SHALL BE CUT AND HARVESTED WITH A COMMERCIAL SOD CUTTER TO THE DIMENSIONS SHOWN, THEN LOADED, TRANSPORTED AND HANDLED ON PALLETS.
4. AFTER PLACEMENT OF SOLID SLAB SOD, EARTH AT THE OUTER EDGES OF THE PLACEMENT SHALL BE BACKFILLED AND LOOSELY COMPACTED TO AT LEAST 1" ABOVE THE TOP OF THE SOLID SLAB SODDING.
5. STAKE SOD ON ALL SLOPES 1:2 OR STEEPER, AND ON ANY AREAS THAT ARE IN SUCH CONDITION THAT THERE IS DANGER OF SOD SLIPPING. PERFORM STAKING CONCURRENTLY WITH SOD PLACEMENT AND PRIOR TO TAMPING WITH SOUND WOODEN STAKES APPROXIMATELY 1 INCH SQUARE OR 1 INCH IN DIAMETER AND NOT LESS THAN 12 INCHES IN LENGTH, OR USE METAL STAPLES IN PLACE OF WOODEN STAKES. PLACE, STAKE AND STAPLE THE SOD WHERE NECESSARY, AND AS DETERMINED BY THE ENGINEER.



TYPICAL PLACEMENT OF
SOLID SLAB SODDING IN DITCHES



SOLID SLAB SODDING
(MARCH 1 THRU AUGUST 31)

THE PLACEMENT OF SOLID SLAB SOD SHALL BE RESTRICTED TO THE PERIOD FROM MARCH 1 THRU AUGUST 31, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
230(A)	SOLID SLAB SODDING	SY

APPROVED BY
ROADWAY ENGINEER: _____ DATE: 04/16/15

ROADWAY DESIGN DIVISION STANDARD

SOLID SLAB SODDING

OKLAHOMA DEPARTMENT OF TRANSPORTATION
2009 SPECIFICATIONS

SSS-1	1
	R-3