

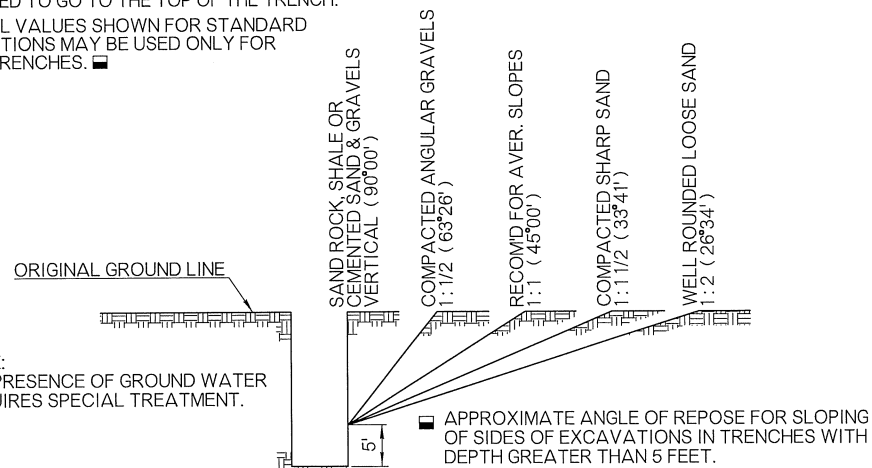
TRENCHING DIMENSIONS AND
STANDARD BEDDING MATERIAL QUANTITIES

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 CY/LF ■	W	STANDARD BEDDING MATERIAL CY/LF ■	W	STANDARD BEDDING MATERIAL CY/LF ■	
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	5.68	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

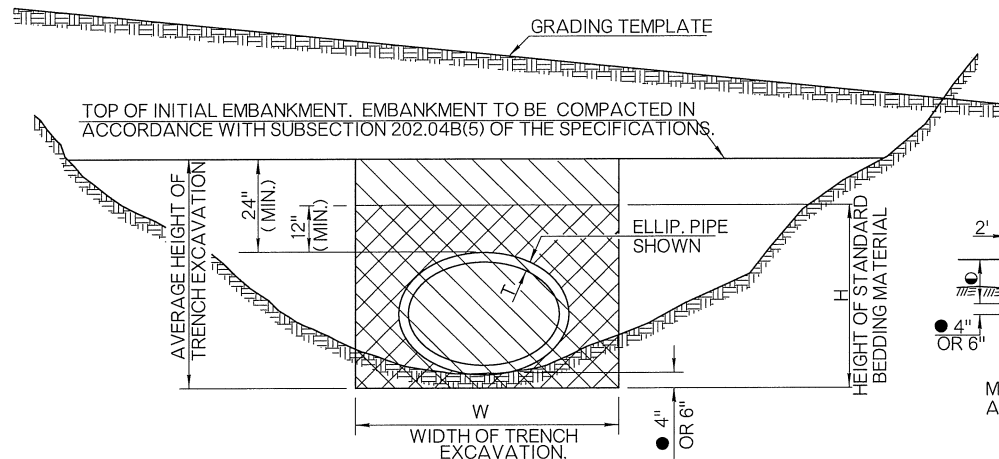
NOTE: QUANTITIES FOR 66" & 78" EQUIV. DIAM. ARCH PIPE BASED ON METAL PIPE & ESTIMATED WALL THICKNESS.

■ 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. ■

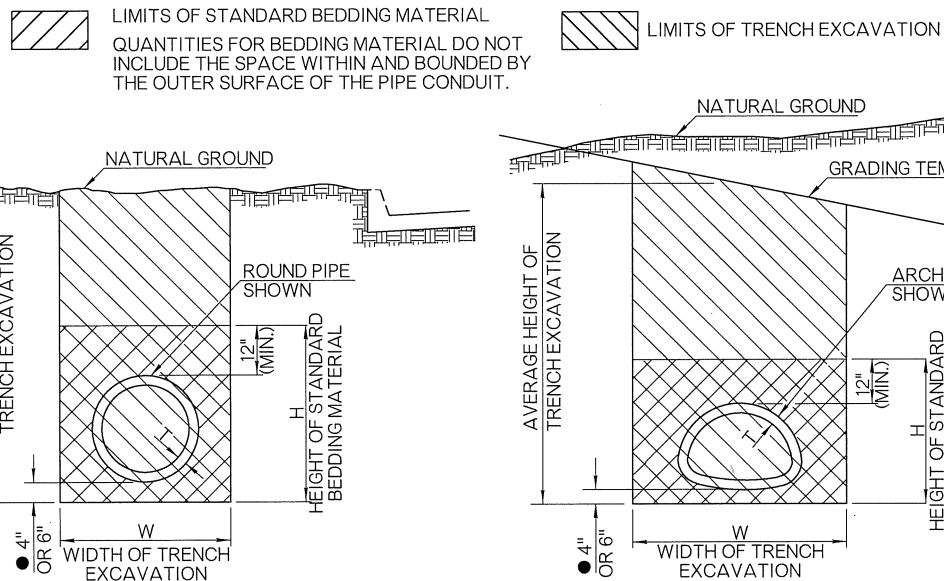


■ OPTIONAL TRENCHES WITH DEPTH GREATER THAN 5.0 FEET EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF SHEETING & SHORING WAS USED. (SPECIAL TRENCHING=STD. WIDTH TRENCH+12")



METHOD NO. 1

TRENCH EXCAVATION IN EMBANKMENT SECTIONS



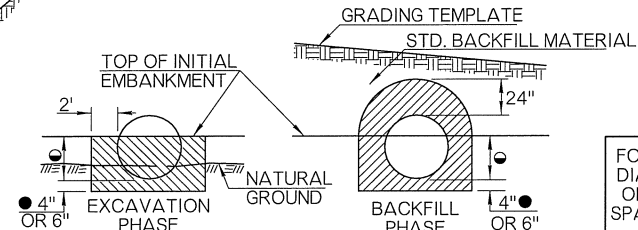
TRENCH EXCAVATION IN CUT SECTIONS

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.

● 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"

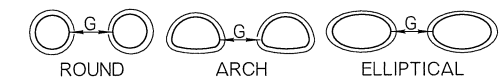


METHOD NO. 1 PAY QUANTITIES WILL BE CALCULATED AND PAID FOR WHEN METHOD NO. 2 IS USED.

METHOD NO. 2

(OPTIONAL INSTALLATION FOR R. C. PIPE)

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

DOUBLE PIPE INSTALLATION
(USED WITH CET END TREATMENTS)

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
- TRENCH EXCAVATION AND BEDDING MATERIAL WILL NOT BE REQUIRED FOR PIPE INSTALLATIONS OF SIDE DRAINS UNLESS OTHERWISE NOTED ON THE PLANS.
- FOR PIPE UNDERDRAIN INSTALLATIONS, SEE ROADWAY STANDARD PUD-3.
- 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.
- 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.
- 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.
- STANDARD BEDDING QUANTITIES FOR ROUND PIPE ARE BASED ON AASHTO DESIGNATED CLASS III (WALL B) REINFORCED CONCRETE PIPE.
- 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.
- PROPER COMPACTION OF BACKFILL REQUIRES A VERTICAL WALLED TRENCH TO 24 INCHES ABOVE TOP OF PIPE, REGARDLESS OF EXCAVATION ABOVE THAT ELEVATION.
- EQUIVALENT PIPE SIZES 66 INCHES AND LARGER REQUIRE 6 INCHES OF BEDDING MATERIAL BELOW PIPE CONDUIT.
- ELLIPTICAL PIPE DIMENSIONS CONFORM TO AASHTO M 207, AS DESIGNATED RISE BY SPAN.
- FOR COMPUTING TRENCH EXCAVATION & STANDARD BEDDING QUANTITIES, THE LENGTH OF THE CULVERT SHALL INCLUDE END SECTION AND END TREATMENT LENGTHS.
- 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: *Calvin F. A.*

DATE: 04/16/15

ROADWAY DESIGN DIVISION STANDARD

STANDARD PIPE INSTALLATION