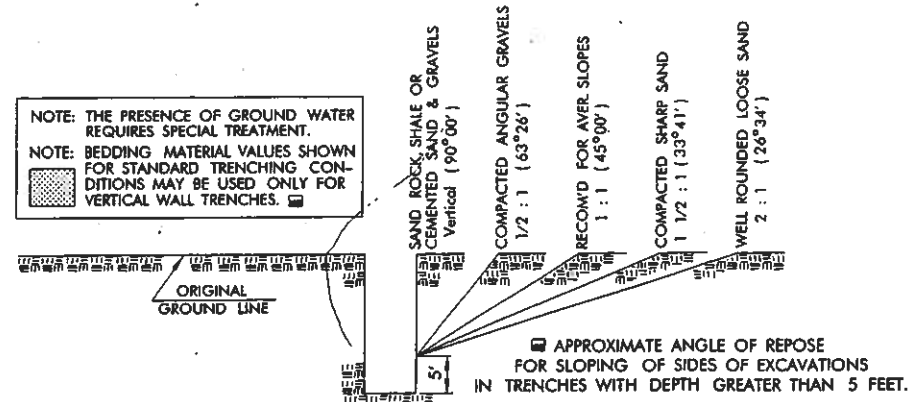


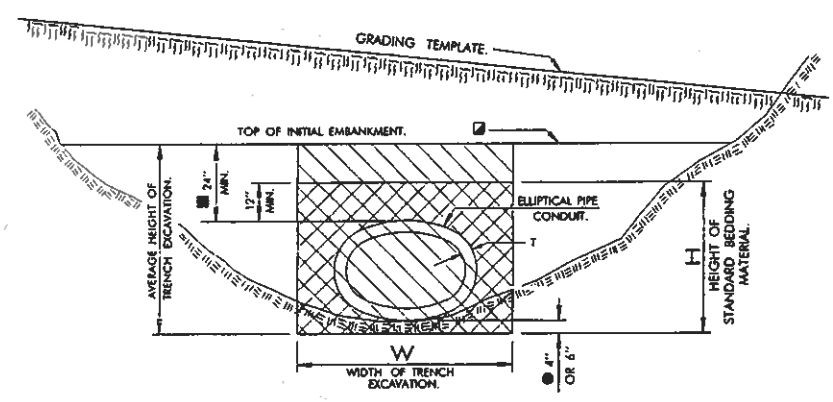
### TABLE OF TRENCHING AND STANDARD BEDDING MATERIAL QUANTITIES

CONCRETE / METAL PIPE DIAM. OR DESIGN EQUIV.	H	T	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE		SPECIAL TRENCHING SINGLE, DOUBLE & TRIPLE PIPE OPTIONS W + 12"
			STANDARD TRENCHING		STANDARD TRENCHING		STANDARD TRENCHING		
			W	STANDARD BEDDING MATERIAL	W	STANDARD BEDDING MATERIAL	W	STANDARD BEDDING MATERIAL	
IN.	FT.	FT.	C.Y./L.F.	FT.	C.Y./L.F.	FT.	C.Y./L.F.	C.Y./L.F.	
18	3.25	0.208	3.17	0.274	5.67	0.468	8.17	0.663	0.120
24	3.83	0.250	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	5.00	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	0.500	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	11.00	0.750	13.00	2.671	24.00	4.527	35.00	6.383	0.407
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
18	2.96	0.229	3.62	0.282	6.54	0.487	9.46	0.691	0.109
24	3.46	0.270	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	1.280	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	0.500	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	3.670	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	0.750	14.42	2.364	26.83	4.062	39.25	5.759	0.333
96	9.50	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.



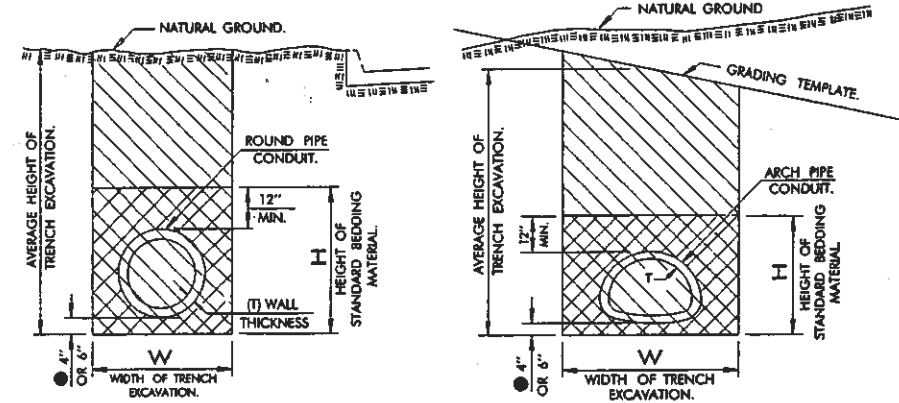
OPTIONAL TRENCHES WITH DEPTH GREATER THAN 5.0 FEET  
 EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF SHEETING & SHORING WAS USED. (SPECIAL TRENCHING=STD. WIDTH TRENCH+12")



METHOD NO. 1  
 TRENCH EXCAVATION IN EMBANKMENT SECTIONS

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.

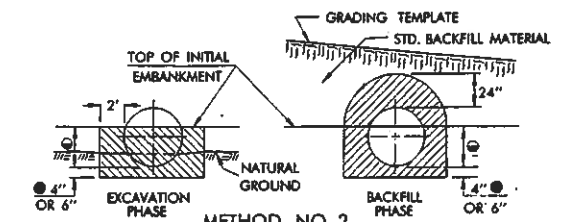


TRENCH EXCAVATION IN CUT SECTIONS

#### TABLE OF EQUIVALENT PIPES

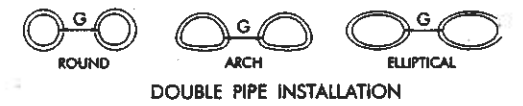
EQ. DIAM.	REINF. CONC. ARCH PIPE	STEEL ARCH PIPE	ALUMINUM ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE
IN.	INCHES	INCHES	INCHES	Ø INCHES
18	22 X 13 1/2	21 X 15	21 X 15	14 X 23
21	26 X 15 1/2	24 X 18	24 X 18	
24	28 1/2 X 18	28 X 20	28 X 20	19 X 30
27				22 X 34
30	36 1/4 X 22 1/2	35 X 24	35 X 24	24 X 38
36	43 3/4 X 26 5/8	42 X 29	42 X 29	29 X 45
42	51 1/8 X 31 5/16	49 X 33	49 X 33	34 X 53
48	58 1/2 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 1/2	112 X 75	112 X 75 ▲	77 X 121

▲ STRUCTURAL PLATE ARCH.



METHOD NO. 2  
 (OPTIONAL INSTALLATION FOR R.C. PIPE)  
 TRENCH EXCAVATION IN EMBANKMENT SECTIONS  
 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.

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



DOUBLE PIPE INSTALLATION

#### GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL CONFORM TO THE 1999 ENGLISH STANDARD SPECIFICATIONS.
- TRENCH EXCAVATION AND BEDDING MATERIAL WILL NOT BE REQUIRED FOR PIPE INSTALLATIONS OF SIDE DRAINS UNLESS OTHERWISE NOTED ON THE PLANS.
- TRENCH EXCAVATION WILL BE PAID FOR ON PIPE UNDERDRAIN. SEE 1999 ENGLISH ROADWAY STANDARD DRAWING PIPE UNDERDRAIN INSTALLATION, 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.
- THIS METHOD PRODUCES A GUARANTEED NEGATIVE PROJECTION CONDITION. THE ONLY EXCEPTION TO THIS IS FOR INSTALLATION OF SHALLOWLY COVERED SIDE DRAINS OF LESS THAN 10.0 FEET OF DEPTH, INCLUDING SURFACING.
- TO BE COMPACTED IN ACCORDANCE WITH SUBSECTION 202.04(C) OF 1999 ENGLISH STANDARD SPECIFICATIONS.
- 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.

#### BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
613.06(S)	TRENCH EXCAVATION	C.Y.
613.06(T)	STANDARD BEDDING MATERIAL	C.Y.

APPROVED BY ROADWAY ENGINEER *C. M. Sienkowski* DATE 9/1/99

OKLAHOMA DEPT. OF TRANSPORTATION  
 ROADWAY STANDARD (ENGLISH)  
 PIPE INSTALLATION