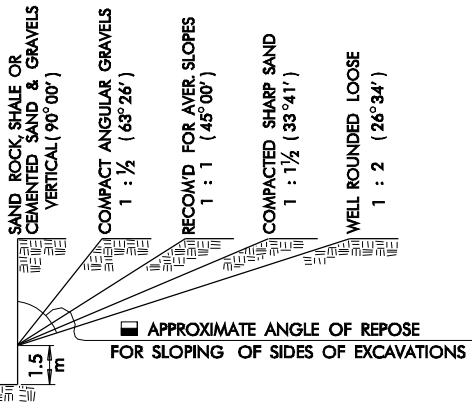


TABLE OF TRENCHING AND STANDARD BEDDING MATERIAL QUANTITIES

CONCRETE / METAL	PIPE DIAM. OR DESIGN EQUIV.	PIPE DIAM. OR DESIGN EQUIV.	H	T	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE		SPECIAL TRENCHING SINGLE, DOUBLE & TRIPLE PIPE OPTIONS W + 300 mm
					STANDARD TRENCHING		STANDARD TRENCHING		STANDARD TRENCHING		
					W	STANDARD BEDDING MATERIAL	W	STANDARD BEDDING MATERIAL	W	STANDARD BEDDING MATERIAL	ADD'L STANDARD BEDDING MATERIAL
	IN.	mm	mm	mm	mm	m ³ /m	mm	m ³ /m	mm	m ³ /m	m ³ /m
C ROUND PIPE	18	450	976	63	876	0.594	1401	0.846	1851	1.025	0.293
	24	600	1150	75	1200	0.938	2100	1.531	3000	2.125	0.345
	30	750	1326	88	1376	1.151	2501	1.969	3626	2.788	0.398
	36	900	1500	100	1850	1.825	3200	2.899	4550	3.974	0.450
	42	1050	1676	113	2026	2.117	3601	3.478	5176	4.839	0.503
	48	1200	1850	125	2200	2.419	4000	4.097	5800	5.776	0.555
	54	1350	2029	140	2379	2.743	4404	4.768	6429	6.792	0.609
	60	1500	2205	152	2855	3.736	5105	6.139	7355	8.541	0.661
	66	1650	2380	165	3030	4.133	5505	6.944	7980	9.756	0.714
	72	1800	2555	178	3205	4.542	5905	7.793	8605	11.044	0.767
	78	1950	2781	191	3381	5.135	6231	8.793	9081	12.452	0.834
	84	2100	2957	203	3557	5.581	6557	9.516	9557	13.451	0.887
90	2250	3132	216	3732	6.038	6882	10.255	10032	14.472	0.939	
96	2400	3307	229	3907	6.510	7207	11.012	10507	15.514	0.992	
ARCH PIPE	18	450	871	63	986	0.594	1921	1.166	2781	1.661	0.261
	21	525	933	69	1248	0.678	2208	1.392	3168	1.954	0.280
	24	600	1010	75	1325	0.938	2350	1.535	3375	2.151	0.303
	30	750	1146	88	1846	1.151	3073	2.237	4299	3.001	0.344
	36	900	1275	100	2060	1.825	3540	2.713	5020	3.700	0.382
	42	1050	1421	113	2276	2.117	4009	3.250	5743	4.489	0.426
	48	1200	1565	125	2785	2.419	4765	4.282	6745	5.793	0.470
	54	1350	1691	138	2976	2.743	5176	4.847	7376	6.614	0.507
	60	1500	1845	150	3205	3.736	5678	5.587	8152	7.703	0.553
	66	1650	ARCH PIPE NOT AVAILABLE FOR THIS EQUIVALENT METRIC PIPE SIZE.								
	72	1800	2120	175	3635	4.542	6615	7.040	9595	9.865	0.636
	78	1950	ARCH PIPE NOT AVAILABLE FOR THIS EQUIVALENT METRIC PIPE SIZE.								
84	2100	2375	200	4040	5.581	7493	8.521	10947	12.084	0.713	
90	2250	2780	250	4470	6.038	8363	10.733	12257	15.298	0.834	
96	2400	2910	250	4650	6.510	8783	11.649	12917	16.721	0.873	
HORIZONTAL ELLIPTICAL PIPE	18	450	903	69	1088	0.701	1963	1.209	2838	1.718	0.271
	24	600	1054	82	1384	0.979	2454	1.627	3524	2.275	0.316
	30	750	1198	94	1898	1.554	3178	2.368	4458	3.182	0.359
	36	900	1356	113	2126	1.850	3659	2.896	5193	3.942	0.407
	42	1050	1505	125	2345	2.145	4138	3.460	5932	4.774	0.451
	48	1200	1651	138	2861	2.944	4908	4.544	6954	6.144	0.495
	54	1350	1795	150	3080	3.304	5387	5.221	7693	7.137	0.539
	60	1500	1946	163	3296	3.687	5856	5.941	8416	8.196	0.584
	66	1650	2090	175	3500	4.063	6300	6.663	9100	9.263	0.627
	72	1800	2241	188	3731	4.485	6804	7.496	9878	10.506	0.672
	78	1950	2385	200	3945	4.895	7272	8.316	10598	11.737	0.715
	84	2100	2581	213	4166	5.537	7753	9.579	11339	13.621	0.774
90	2250	2730	225	4380	5.994	8220	10.514	12060	15.035	0.819	
96	2400	2876	238	4596	6.462	8689	11.478	12783	16.494	0.863	

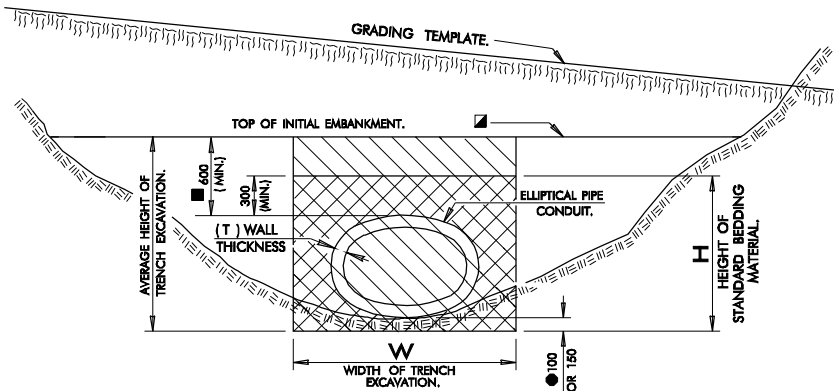
NOTE: THE PRESENCE OF GROUND WATER REQUIRES SPECIAL TREATMENT.

NOTE: BEDDING MATERIAL VALUES SHOWN FOR STANDARD TRENCHING CONDITIONS MUST BE USED ONLY FOR VERTICAL WALLED TRENCHES.



OPTIONAL TRENCHES WITH DEPTH GREATER THAN 1.5 METERS.

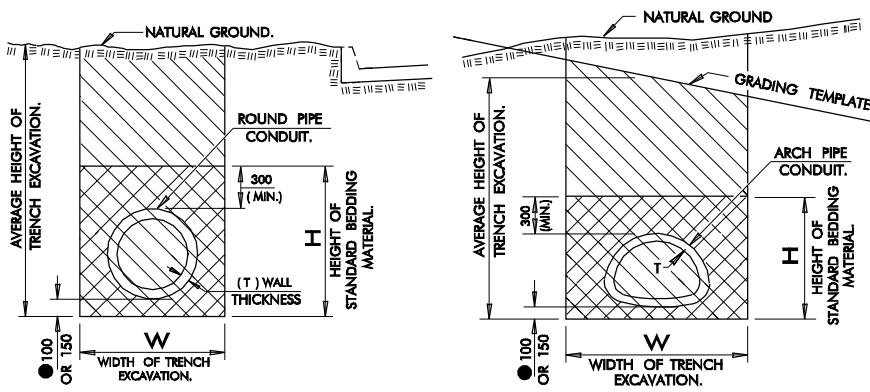
EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF SHEETING & SHORING WAS USED. (SPECIAL TRENCHING=STD. WIDTH TRENCH+300 mm)



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.

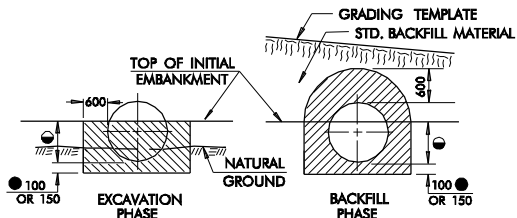
LIMITS OF TRENCH EXCAVATION.



TRENCH EXCAVATION IN CUT SECTIONS

TABLE OF EQUIVALENT PIPES

EQUIV. DIAMETER	REINF. CONC. ARCH PIPE	STEEL ARCH PIPE	ALUMINUM ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE
in. mm	mm x mm	mm x mm	mm x mm	mm x mm
16 400		450 x 340	450 x 340	
18 450	560 x 345	510 x 380	510 x 380	365 x 575
20 500		560 x 420	560 x 420	
21 525	660 x 395			
24 600	725 x 460	680 x 500	680 x 500	490 x 770
27 675				550 x 865
28 700		800 x 580	800 x 580	
30 750	920 x 570			610 x 960
32 800		910 x 660	910 x 660	
33 825				670 x 1055
36 900	1110 x 675	1030 x 740	1030 x 740	730 x 1150
39 975				795 x 1250
40 1000		1150 x 820	1150 x 820	
42 1050	1300 x 795			855 x 1345
48 1200	1485 x 915	1390 x 970	1390 x 970	975 x 1535
54 1350	1650 x 1015			1095 x 1730
56 1400		1630 x 1120	1630 x 1120	
60 1500	1855 x 1145			1220 x 1920
64 1600		1880 x 1260	1880 x 1260	
66 1650				1340 x 2100
72 1800	2235 x 1370	2130 x 1400	2130 x 1400	1465 x 2305
78 1950				1585 x 2495
80 2000		2230 x 1700	2230 x 1700	
84 2100	2590 x 1575			1705 x 2690
88 2200		2500 x 1830	2500 x 1830	
90 2250	2920 x 1830			1830 x 2880
96 2400	3100 x 1960	2800 x 1950	2800 x 1950	1950 x 3070



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

EMBANKMENT HEIGHT PRIOR TO EXCAVATION

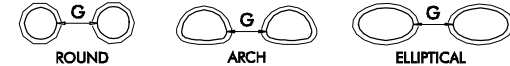
PIPE SIZES FROM 450 mm TO 1050 mm = 750 mm

PIPE SIZES FROM 1200 mm TO 2100 mm = 2/3 DIAMETER

PIPE SIZES LARGER THAN 2100 mm = 1500 mm

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 600	UP TO 900	UP TO 900	
625 TO 1800				D/2
OVER 1825		925 TO 2700	925 TO 2700	D/3
		OVER 2700	OVER 2700	900



DOUBLE PIPE INSTALLATION

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL CONFORM TO THE 1999 METRIC 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 ROADWAY STANDARD DRAWING PIPE UNDERDRAIN INSTALLATION, PUD-3.
- SPECIAL TRENCHING CONDITIONS ARE THOSE AS DEFINED BY O.S.H.A. REGULATIONS, TITLE 29 CFR, STANDARDS 1926.650, 1926.651 & 1926.652, SO DEFINED WILL APPLY, UNTIL THEY ARE IN CONFLICT WITH CURRENT SPECIFICATIONS, FOR TRENCH DEPTHS OVER 1.5 METERS. 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 3.5 METERS OF DEPTH, INCLUDING SURFACING.
- TO BE COMPACTED IN ACCORDANCE WITH SUBSECTION 202.04(C) OF 1999 METRIC STANDARD SPECIFICATIONS.
- WHEN REQUIRED, THE SIDES OF THE TRENCHES SHALL BE SHEETED AND SHORED OR OTHERWISE SUPPORTED WHEN THE TRENCH IS MORE THAN 1.5 METERS IN DEPTH. IN LIEU OF SHEETING, THE SIDES OF THE TRENCH ABOVE THE 1.5 METER LEVEL MAY BE SLOPED TO PRECLUDE COLLAPSE. SEE OPTIONAL TRENCHES DETAIL THIS SHEET.
- PROPER COMPACTION OF BACKFILL REQUIRES A VERTICAL WALLED TRENCH TO 600 mm ABOVE TOP OF PIPE, REGARDLESS OF EXCAVATION ABOVE THAT ELEVATION.
- EQUIVALENT PIPE SIZES 1650 mm AND LARGER REQUIRE 150 mm OF BEDDING MATERIAL BELOW PIPE CONDUIT.
- ELLIPTICAL PIPE DIMENSIONS CONFORM TO AASHTO M 207M, AS DESIGNATED RISE BY SPAN.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
613.06(\$)	TRENCH EXCAVATION	CUBIC METER
613.06(T)	STANDARD BEDDING MATERIAL	CUBIC METER

APPROVED BY ROADWAY ENGINEER

DATE

OKLAHOMA DEPT. OF TRANSPORTATION
ROADWAY STANDARD (METRIC)

PIPE INSTALLATION

1999 SPECIFICATIONS

SPI-3

OOM

ALL DIMENSIONS ON THIS SHEET IN MILLIMETERS UNLESS OTHERWISE NOTED.

R-74AM