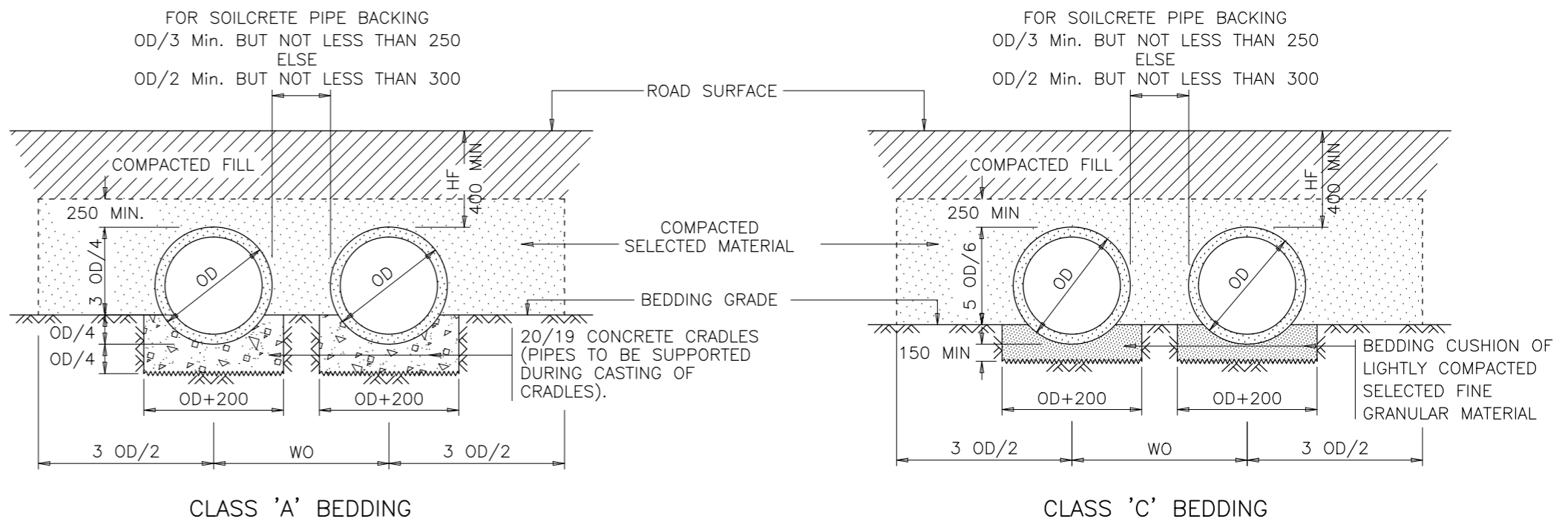


CLASS 'A' BEDDING

CLASS 'C' BEDDING

ROCK FOUNDATION

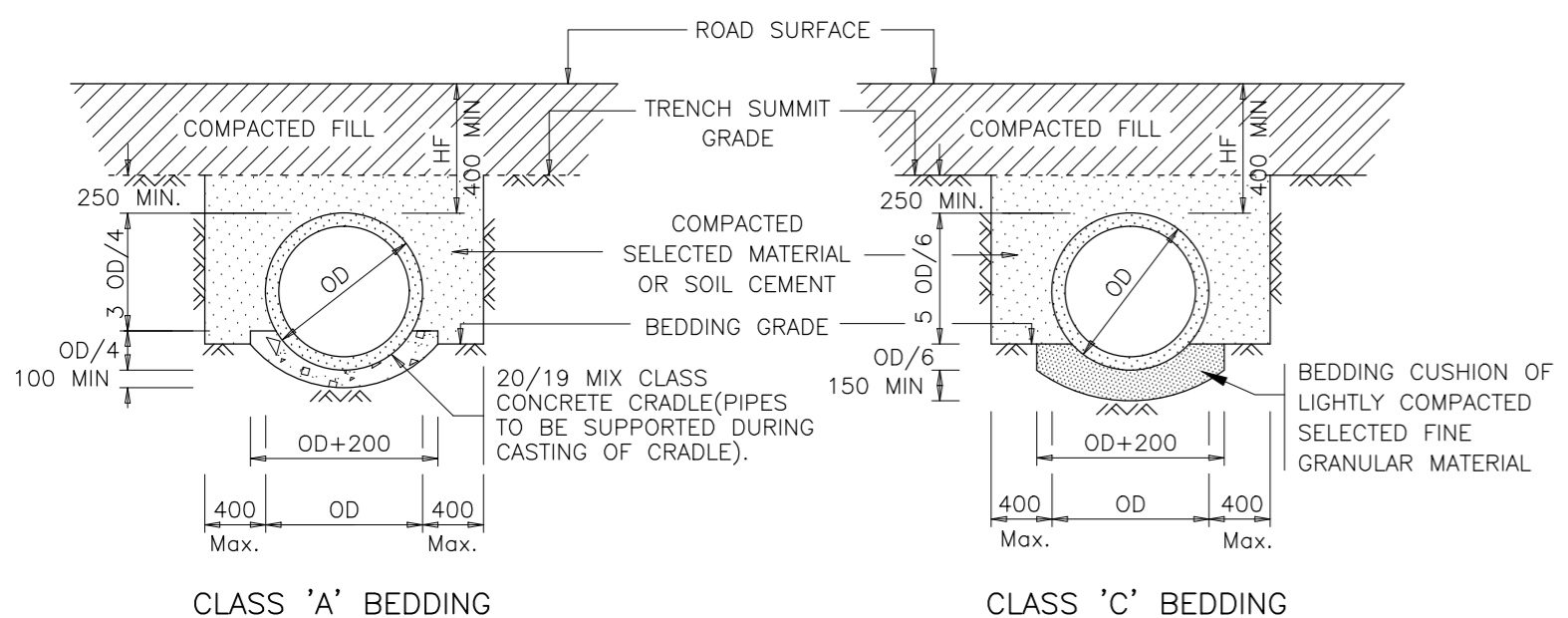


CLASS 'A' BEDDING

CLASS 'C' BEDDING

SOIL FOUNDATION

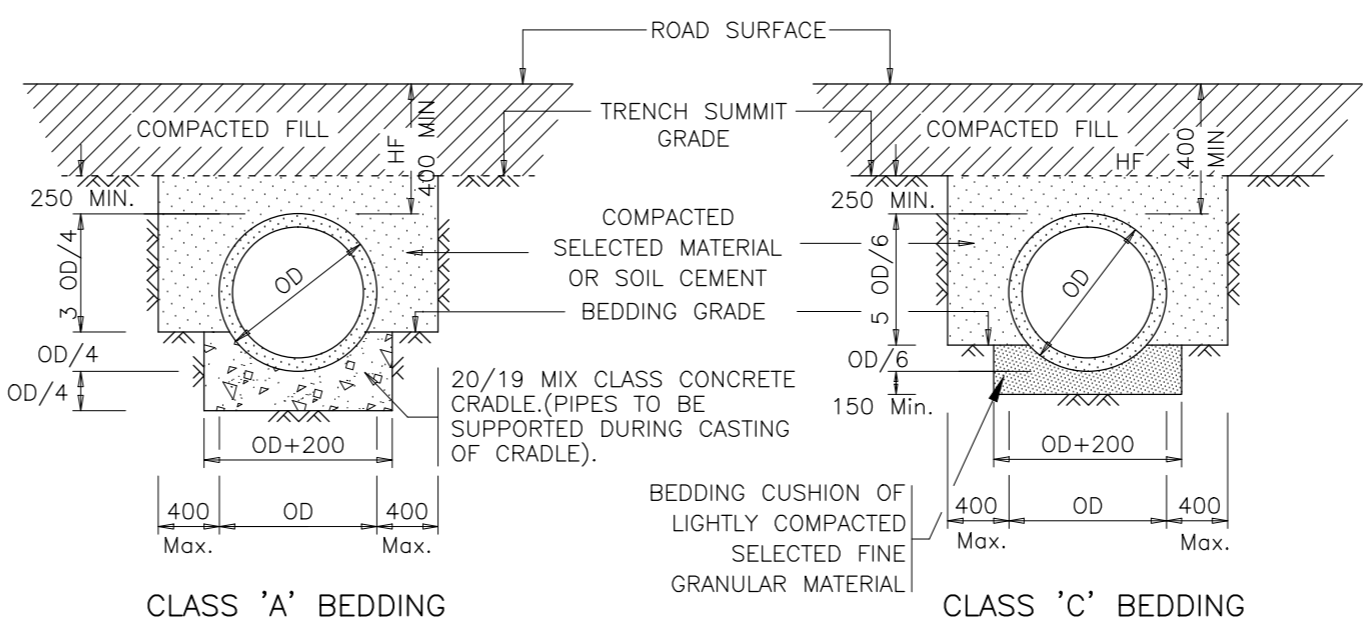
EMBANKMENT INSTALLATION



CLASS 'A' BEDDING

CLASS 'C' BEDDING

ROCK FOUNDATION



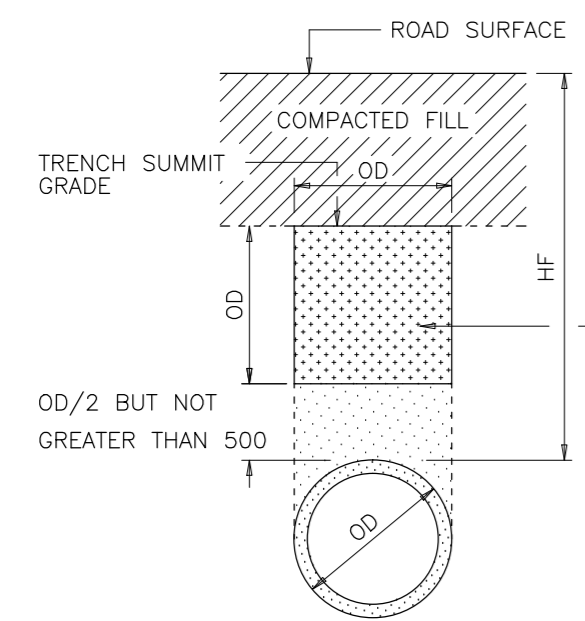
CLASS 'A' BEDDING

CLASS 'C' BEDDING

SOIL FOUNDATION

TRENCHED INSTALLATION

FOR MULTIPLE PIPE OR GREATER TRENCH WIDTH  
USE THE EMBANKMENT INSTALLATION TABULATIONS  
IN DETERMINING THE REQUIRED PIPE STRENGTH



CLASS 'A' OR 'C' BEDDING

INDUCED TRENCH INSTALLATION  
SINGLE PIPE ONLY

INDUCED TRENCH INSTALLATION PROCEDURE

1. INSTALL PIPE UNDER EMBANKMENT CONDITIONS ON CLASS 'A' OR 'C' BEDDING.
2. PLACE AND COMPACT THE ROAD SUBGRADE TO THE ELEVATION OF THE TRENCH SUMMIT GRADE USING SELECTED MATERIALS WHICH CAN BE EXCAVATED INTO.
3. EXCAVATE THE TRENCH OVER THE TOP OF THE PIPE AS SHOWN AND FILL WITH SAWDUST, STRAW OR OTHER COMPRESSIBLE MATERIAL.
4. COMPLETE THE EMBANKMENT FILLING IN THE NORMAL MANNER.

NOTATION :  
OD - OUTSIDE DIAMETER OF PIPE  
WO - WIDTH BETWEEN LONGITUDINAL CENTRE LINES OF OUTER PIPES FOR MULTIPLE PIPES  
HF - HEIGHT OF FILL

THE CULVERT STRENGTH CLASS, JOINT TYPE, BEDDING CLASS AND INSTALLATION TYPE TO BE SPECIFIED BY THE ENGINEER. REFER TO DWG. No. WCS/22/2/D1 .

- INSTALLATION NOTES :
- A. WHERE THE BEDDING GRADE REVEALS OBJECTIONABLE MATERIAL OR MATERIAL NOT UNIFORMLY FIRM, THE BEDDING GRADE SHALL BE EXCAVATED DEEPER INTO THE MATERIAL. THE DEPTH OF ADDITIONAL EXCAVATION SHALL NOT BE LESS THAN 200mm AND, IN ADDITION, ALL POCKETS OF UNSTABLE OR POOR FOUNDATION MATERIAL SHALL BE REMOVED TO A DEPTH OF AT LEAST ONE METRE. EXCAVATIONS ADDITIONALLY EXECUTED SHALL BE BACKFILLED WITH SELECTED MATERIAL, PROPERLY COMPACTED TO PROVIDE A FIRM FOUNDATION.
  - B. SELECTED MATERIAL TO BE USED FOR THE BEDDING CUSHION SHALL BE FINE GRANULAR MATERIAL SUCH AS COARSE SAND OR WELL-GRADED CRUSHED STONE OF NOMINAL SIZE NOT EXCEEDING 6,7mm AND NOT MORE THAN 10% OF WHICH SHALL PASS THROUGH A 0,15mm SIEVE.
  - C. SELECTED MATERIAL TO BE USED FOR BACKFILLING SHALL BE SAND, GRAVEL, WELL-GRADED CRUSHED STONE OR OTHER APPROVED MATERIAL CONTAINING NO MORE SILT OR CLAY THAN IS NECESSARY TO PROVIDE A DENSE AND STABLE FILLING. THE MATERIAL SHALL BE PLACED AT OPTIMUM MOISTURE CONTENT IN LAYERS EACH OF MAXIMUM THICKNESS 150mm AND COMPACTED TO AT LEAST 90% MOD.AASHTO DENSITY, OR THE DENSITY REQUIRED FOR ADJOINING LAYERS.
  - D. ALTERNATIVELY A WET MIXTURE OF SOIL CEMENT MAY BE USED FOR PIPE BACK-FILLING. THE MIXTURE SHALL CONSIST OF AN APPROVED SOIL OR GRAVEL MIXED WITH 5% (BY MASS) OF PORTLAND CEMENT BY VOLUME AND ONLY SUFFICIENT WATER TO GIVE A CONSISTENCY THAT WILL PERMIT THE SOIL CEMENT TO BE PLACED WITH VIBRATORS SO THAT ALL VOIDS BE PROPERLY FILLED. THE AGGREGATE USED FOR SOIL CEMENT SHALL PREFERABLY BE A SANDY MATERIAL BUT MAY CONTAIN LARGER PARTICLES UP TO 38mm AND IT SHALL NOT HAVE A P.I. EXCEEDING 10.
  - E. THE PIPE SHALL BE ADEQUATELY SUPPORTED DURING CASTING OF THE CLASS 'A' CONCRETE CRADLE. THE CONSTRUCTION SHALL BE MONOLITHIC WITHOUT HORIZONTAL JOINTS AND THE MIX SHALL BE SLOPPY AND SHALL BE PLACED ON ONE SIDE OF THE PIPE FLOWING THROUGH TO THE OTHER SIDE. VIBRATION SHALL NOT BE USED.
  - F. THE CLASS 'C' BEDDING CUSHION SHALL BE PLACED AND LIGHTLY COMPACTED TO THE LOWEST LEVEL OF THE UNDERSIDE OF PIPE WHEREUPON THE PIPE SHALL BE PLACED AND THE BEDDING CUSHION COMPLETED BY RAMMING AND TAMPING ADJACENT TO AND UNDER THE PIPE. ALTERNATIVELY, FOR APPROPRIATE IN SITU MATERIAL, THE BEDDING CUSHION MAY BE OMITTED AND THE SOIL FOUNDATION SHAPED TO FIT THE LOWER PART OF THE PIPE EXTERIOR WITH REASONABLE CLOSENESS.
  - G. BACKFILLING SHALL BE CARRIED OUT SIMULTANEOUSLY AND EQUALLY ON BOTH SIDES OF A CULVERT TO PREVENT UNEQUAL LATERAL FORCES FROM OCCURRING.

THIS DRAWING TO BE READ IN CONJUNCTION WITH SECTION 2200 OF THE COLTO DOCUMENT "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE WORKS FOR STATE ROAD AUTHORITIES"

FOR TABULATIONS AND DESIGN NOTES, REFER TO DWG No. WCS/22/2/D1.

No.	DATE	ADDITIONS AND AMENDMENTS	APPROVED	DATE	Issue Date:	STANDARD PLANS	L.G.FOURIE CHIEF DIRECTOR ROAD NETWORK MANAGEMENT	PREFABRICATED CONCRETE PIPE CULVERTS	SCALE : N.T.S.	INDEX NO.
					MARCH 2016					WESTERN CAPE GOVERNMENT DEPARTMENT OF TRANSPORT AND PUBLIC WORKS
										PLAN NO. SHEET 1 OF 6

NOMINAL INSIDE PIPE DIAM (mm)	HEIGHT OF FILL HF (m)	EMBANKMENT									
		FOUNDATION MATERIAL									
		TRENCHED		ROCK		FIRM SOIL		YIELDING SOIL			
		BEDDING		BEDDING		BEDDING		BEDDING			
CLASS A	CLASS C	CLASS A	CLASS C	CLASS A	CLASS C	CLASS A	CLASS C	CLASS A	CLASS C		
D - LOAD				D - LOAD				D - LOAD			
600	0,4	50	75	50	75	50	75	50	75	50	75
	1,0	50	75	50	75	50	75	50	75	50	75
	1,5	50	75	50	75	50	75	50	75	50	75
	2,0	50	75	50	75	50	75	50	75	50	75
	2,5	50	75	50	75	50	75	50	75	50	75
	3,0	50	75	50	75	50	75	50	75	50	75
	3,5	50	75	50	100	50	75	50	75	50	75
	4,0	50	75	50	100	50	100	50	75	50	75
	4,5	50	100	75	SP(105)	50	100	50	75	50	75
	5,0	50	100	75	SP(120)	75	100	50	100	50	100
	5,5	50	100	75	SP(130)	75	SP(110)	50	100	50	100
	6,0	75	100	75	SP(145)	75	SP(120)	50	100	50	100
	6,5	75	SP(110)	100	SP(155)	75	SP(135)	75	SP(105)	50	100
	7,0	75	SP(115)	100	SP(170)	75	SP(145)	75	SP(115)	50	100
	7,5	75	SP(125)	100	SP(180)	100	SP(155)	75	SP(120)	50	100
	8,0	75	SP(130)	100	SP(195)	100	SP(165)	75	SP(130)	50	100
8,5	75	SP(140)	SP(105)	SP(205)	100	SP(175)	75	SP(140)	50	100	
9,0	75	SP(145)	SP(115)	SP(220)	100	SP(185)	75	SP(145)	50	100	
9,5	100	SP(155)	SP(120)	SP(235)	100	SP(195)	100	SP(155)	50	100	
10,0	100	SP(160)	SP(125)	SP(245)	SP(105)	SP(205)	100	SP(165)	50	100	
750	0,4	50	75	50	75	50	75	50	75	50	75
	1,0	50	75	50	75	50	75	50	75	50	75
	1,5	50	75	50	75	50	75	50	75	50	75
	2,0	50	75	50	75	50	75	50	75	50	75
	2,5	50	75	50	75	50	75	50	75	50	75
	3,0	50	75	50	75	50	75	50	75	50	75
	3,5	50	75	50	100	50	75	50	75	50	75
	4,0	50	75	50	100	50	100	50	75	50	75
	4,5	50	75	75	100	50	100	50	75	50	75
	5,0	50	100	75	SP(110)	75	100	50	100	50	100
	5,5	50	100	75	SP(125)	75	SP(110)	50	100	50	100
	6,0	50	100	75	SP(135)	75	SP(120)	50	100	50	100
	6,5	75	SP(105)	100	SP(150)	75	SP(130)	75	100	50	100
	7,0	75	SP(110)	100	SP(160)	75	SP(145)	75	SP(110)	50	100
	7,5	75	SP(120)	100	SP(175)	100	SP(155)	75	SP(115)	50	100
	8,0	75	SP(125)	100	SP(185)	100	SP(165)	75	SP(125)	50	100
8,5	75	SP(135)	SP(105)	SP(200)	100	SP(175)	75	SP(130)	50	100	
9,0	75	SP(140)	SP(110)	SP(210)	100	SP(185)	75	SP(140)	50	100	
9,5	75	SP(150)	SP(115)	SP(225)	100	SP(195)	100	SP(150)	50	100	
10,0	100	SP(155)	SP(125)	SP(235)	SP(105)	SP(205)	100	SP(155)	50	100	
900	0,4	50	75	50	75	50	75	50	75	50	75
	1,0	50	75	50	75	50	75	50	75	50	75
	1,5	50	75	50	75	50	75	50	75	50	75
	2,0	50	75	50	75	50	75	50	75	50	75
	2,5	50	75	50	75	50	75	50	75	50	75
	3,0	50	75	50	75	50	75	50	75	50	75
	3,5	50	75	50	75	50	75	50	75	50	75
	4,0	50	75	50	100	50	100	50	75	50	75
	4,5	50	75	50	100	50	100	50	75	50	75
	5,0	50	100	75	SP(105)	50	100	50	100	50	100
	5,5	50	100	75	SP(120)	75	SP(105)	50	100	50	100
	6,0	50	100	75	SP(130)	75	SP(115)	50	100	50	100
	6,5	75	100	100	SP(145)	75	SP(125)	75	100	50	100
	7,0	75	SP(105)	100	SP(155)	75	SP(135)	75	SP(105)	50	100
	7,5	75	SP(115)	100	SP(170)	100	SP(145)	75	SP(115)	50	100
	8,0	75	SP(120)	100	SP(180)	100	SP(155)	75	SP(125)	50	100
8,5	75	SP(130)	100	SP(195)	100	SP(165)	75	SP(135)	50	100	
9,0	75	SP(135)	SP(110)	SP(205)	100	SP(175)	75	SP(140)	50	100	
9,5	75	SP(145)	SP(115)	SP(220)	100	SP(190)	75	SP(150)	50	100	
10,0	75	SP(150)	SP(120)	SP(230)	SP(105)	SP(200)	100	SP(155)	50	100	

NOMINAL INSIDE PIPE DIAM (mm)	HEIGHT OF FILL HF (m)	EMBANKMENT									
		FOUNDATION MATERIAL									
		TRENCHED		ROCK		FIRM SOIL		YIELDING SOIL			
		BEDDING		BEDDING		BEDDING		BEDDING			
CLASS A	CLASS C	CLASS A	CLASS C	CLASS A	CLASS C	CLASS A	CLASS C	CLASS A	CLASS C		
D - LOAD				D - LOAD				D - LOAD			
1200	0,4	25	50	25	50	25	50	25	50	25	50
	1,0	25	50	25	50	25	50	25	50	25	50
	1,5	25	50	25	50	25	50	25	50	25	50
	2,0	25	50	25	50	25	50	25	50	25	50
	2,5	25	50	25	50	25	50	25	50	25	50
	3,0	50	75	50	75	50	75	25	50	50	75
	3,5	50	75	50	75	50	75	50	75	50	75
	4,0	50	75	50	100	50	75	50	75	50	75
	4,5	50	75	50	100	50	100	50	75	50	75
	5,0	50	100	75	100	50	100	50	75	50	75
	5,5	50	100	75	SP(110)	75	100	50	100	50	100
	6,0	50	100	75	SP(125)	75	SP(110)	50	100	50	100
	6,5	50	100	75	SP(135)	75	SP(120)	50	100	50	100
	7,0	75	SP(105)	100	SP(150)	75	SP(130)	75	SP(105)	50	100
	7,5	75	SP(110)	100	SP(160)	75	SP(140)	75	SP(115)	50	100
	8,0	75	SP(115)	100	SP(170)	100	SP(150)	75	SP(120)	50	100
8,5	75	SP(125)	100	SP(185)	100	SP(160)	75	SP(130)	50	100	
9,0	75	SP(130)	100	SP(195)	100	SP(170)	75	SP(135)	50	100	
9,5	75	SP(135)	SP(105)	SP(205)	100	SP(180)	75	SP(145)	50	100	
10,0	75	SP(145)	SP(115)	SP(220)	100	SP(190)	100	SP(155)	50	100	
1500	0,4	25	50	25	50	25	50	25	50	25	50
	1,0	25	50	25	50	25	50	25	50	25	50
	1,5	25	50	25	50	25	50	25	50	25	50
	2,0	25	50	25	50	25	50	25	50	25	50
	2,5	25	50	25	50	25	50	25	50	25	50
	3,0	25	50	25	50	25	50	25	50	25	50
	3,5	50	75	50	75	50	75	50	75	50	75
	4,0	50	75	50	75	50	75	50	75	50	75
	4,5	50	75	50	100	50	100	50	75	50	75
	5,0	50	75	50	100	50	100	50	75	50	75
	5,5	50	100	75	SP(105)	50	100	50	100	50	100
	6,0	50	100	75	SP(120)	75	SP(105)	50	100	50	100
	6,5	50	100	75	SP(130)	75	SP(115)	50	100	50	100
	7,0	75	100	75	SP(145)	75	SP(125)	75	SP(105)	50	100
	7,5	75	SP(110)	100	SP(155)	75	SP(135)	75	SP(110)	50	100
	8,0	75	SP(115)	100	SP(165)	75	SP(145)	75	SP(120)	50	100
8,5	75	SP(120)	100	SP(180)	100	SP(155)	75	SP(125)	50	100	
9,0	75	SP(130)	100	SP(190)	100	SP(165)	75	SP(135)	50	100	
9,5	75	SP(135)	SP(105)	SP(205)	100	SP(175)	75	SP(140)	50	100	
10,0	75	SP(140)	SP(110)	SP(215)	100	SP(190)	75	SP(150)	50	100	
1800	0,4	25	50	25	50	25	50	25	50	25	50
	1,0	25	50	25	50	25	50	25	50	25	50
	1,5	25	50	25	50	25	50	25	50	25	50
	2,0	25	50	25	50	25	50	25	50	25	50
	2,5	25	50	25	50	25	50	25	50	25	50
	3,0	25	50	25	50	25	50	25	50	25	50
	3,5	50	75	50	75	50	75	25	50	50	75
	4,0	50	75	50	75	50	75	50	75	50	75
	4,5	50	75	50	100	50	75	50	75	50	75
	5,0	50	75	50	100	50	100	50	75	50	75
	5,5	50	100	75	100	50	100	50	100	50	100
	6,0	50	100	75	SP(110)	75	SP(105)	50	100	50	100
	6,5	50	100	75	SP(125)	75	SP(115)	50	100	50	100
	7,0	50	100	75	SP(135)	75	SP(125)	50	100	50	100
	7,5	75	SP(105)	100	SP(150)	75	SP(135)	75	SP(110)	50	100
	8,0	75	SP(110)	100	SP(160)	75	SP(145)	75	SP(115)	50	100
8,5	75	SP(120)	100	SP(170)	100	SP(155)	75	SP(125)	50	100	
9,0	75	SP(125)	100	SP(185)	100	SP(165)	75	SP(130)	50	100	
9,5	75	SP(135)	100	SP(195)	100	SP(175)	75	SP(140)	50	100	
10,0	75	SP(140)	SP(105)	SP(210)	100	SP(185)	75	SP(145)	50	100	

HEIGHT OF FILL HF(m)	BEDDING	
	CLASS A	CLASS C
≤ 5	25	25
5 < HF < 9	25	50
9 < HF < 17	25	75
17 < HF < 22	25	100
22 < HF < 24	50	100
24 < HF < 30	50	---

INDUCED TRENCH INSTALLATION TABULATION

DESIGN NOTES :

- SUPERIMPOSED DESIGN LOADING – EARTH DEAD LOAD AND HIGHWAY LIVE LOAD IN ACCORDANCE WITH TMH 7, PARTS 1 & 2.
- TABLATIONS SATISFY THE FOLLOWING REQUIREMENT: FOR ANY DEPTH OF EMBANKMENT FILLING GREATER THAN 400mm, THE STRENGTH OF THE PIPE SHALL NOT BE LESS THAN THE STRENGTH WHICH WOULD RESULT FROM 400mm EARTH COVER DEAD AND LIVE LOADING CONDITIONS.
- THE D-LOAD STRENGTH DESIGNATION IS THE MINIMUM LOAD, IN kN/m LENGTH PER UNIT NOMINAL INTERNAL DIAMETER, THAT THE PIPE IS REQUIRED TO WITHSTAND IN SATISFYING THE PROOF TEST LOAD SPECIFIED IN SANS 677.
- THE DESIGNATION SP INDICATES THAT THE STANDARD MANUFACTURED D-LOAD STRENGTHS ARE INADEQUATE TO SATISFY THE SUPERIMPOSED LOADING AND THAT A SPECIAL PIPE WILL BE REQUIRED. THE FIGURE IN BRACKETS IS THE MINIMUM REQUIRED D-LOAD STRENGTH. WHEREVER POSSIBLE, AVOID THE UTILISATION OF SPECIAL PIPES BY ALTERN