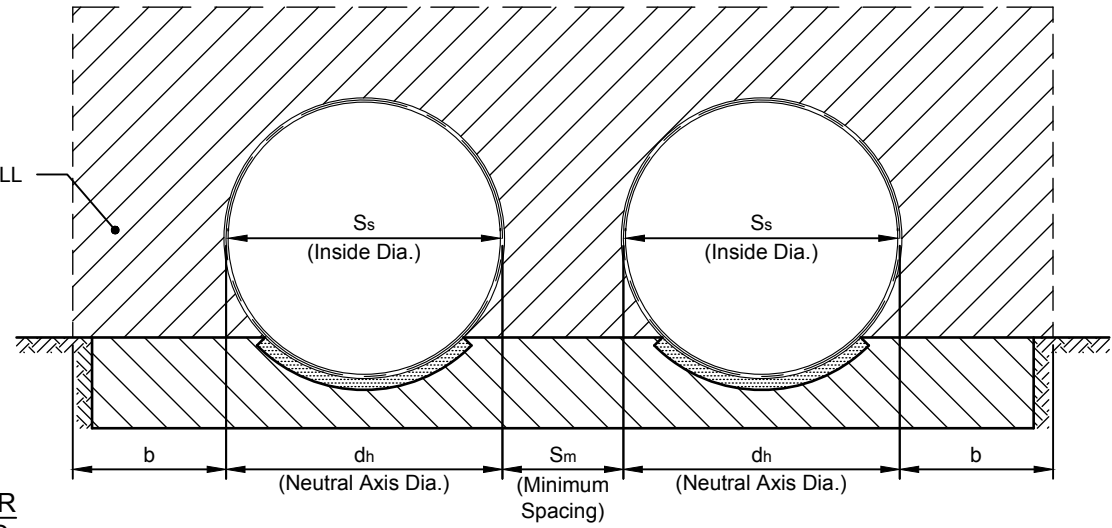


1. **FOUNDATION AND BEDDING:** (Ref. AS/NZS 2041.2:2011 Section 2.6)
- a)  $d_e = 40\text{mm/m}$  of cover over metal structures, but not greater than 600mm unless specified by the designer.
  - b) Special consideration will need to be made in soft soils to eliminate settlement.
  - c) The Structure Foundation shall be sufficiently strong, stable and uniform to support the full length of the installation, but shall not be stiffer than the foundation supporting the fill on each side of the structure.  
Note: For buried flexible structures, it is desirable to achieve columns of side fill that are less compressible than the structure so that positive soil arching can occur. It is undesirable to make the structure stiffer or more unyielding than the adjacent side fill. Providing for some structure settlement helps to induce positive soil arching and avoids possible down-drag due to consolidation of the adjacent side fill. The foundation design may be varied along the length of the structure to accommodate variations in load, or reflect variations in ground conditions.
  - d) Where the natural foundation is assessed as suitable, it shall be prepared for bedding as specified in Clause 1(g) in these notes, and as shown in the Firm Foundation detail on this drawing.
  - e) Rock foundations shall be excavated to a depth  $d_e$ , (where  $d_e = \text{lesser of } 0.04h \text{ and } 600 \text{ mm}$ ), and replaced with compacted select material to the same level below the invert as required for bedding. The minimum width of this zone of select material shall be equal to  $d_h$ , and sufficient to ensure no part of the structure bears directly on rock so that uniform support is provided, as shown in Rock Foundation detail on this drawing.
  - f) Soft or unstable foundation material (such as highly plastic clays or silts), including unstable soils, shall be removed and replaced with suitable compacted material to provide adequate support as shown in the Soft Foundation detail on this drawing.
  - g) A uniform layer of uncompacted coarse granular bedding material shall be placed over the foundation and prepared to the correct line and level to allow the corrugations of the structure invert to bed in. Bedding material shall be coarse sand or gravel with 12mm maximum particle size to a depth below the invert level of 75mm.
  - h) Bedding shall extend over a minimum width of  $d_h/3$  for circular pipes.
  - i) Where considered necessary, appropriate geotechnical advice shall be obtained.

2. **TRENCH CONDITION:**
- a)  $b =$  Minimum transverse backfill distance.
  - b) Where a structure is in a trench, the select fill shall extend to a minimum distance equal to the value given in AS/NZS 2041.2:2011 Table 2.4.3

3. **BACKFILL ENVELOPE:**
- a)  $b =$  Minimum transverse backfill distance.
  - b) The structural backfill for a single-conduit structures under different fill conditions shall extend transversely at least the distance specified in AS/NZS 2041.2:2011 Table 2.4.3 and shown in the Backfill Envelope detail on each side ( $b$ ) beyond the spring lines of the conduit, and vertically up to the minimum design height of cover required, ( $h_b$ )
  - c) Select Engineered Backfill shall be compacted to greater than or equal to 95% of the Maximum Dry Density ratio for standard compaction as specified by the designer and in accordance with the relevant AS 1289 test method. Moisture control during compaction shall be  $\pm 3\%$  of optimum moisture content or  $\pm 2\%$  if the material has more than 20% passing the 0.425mm sieve.



Soil Type	Span Range	$d_h \leq 3000$		$3000 < d_h \leq 8000$	
		Unified Soil Classification			
1-Coarse	GW, GP	SW, SP	Acceptable	Acceptable	Acceptable
		GW-GM, GP-GM	Acceptable	Acceptable	Acceptable
		SW-SM, SP-SM	Acceptable	Acceptable	Acceptable
		GW-GC, GP-GC	Acceptable	Acceptable	Acceptable
		GM	Acceptable	Acceptable	Acceptable
2-Medium	SM	GC	Acceptable	Acceptable	Acceptable
		SC	Acceptable	Acceptable	Acceptable
		ML, CL, OL	Not Acceptable	Not Acceptable	Not Acceptable
3-Fine	MH, CH, OH	Pt	Not Acceptable	Not Acceptable	Not Acceptable
		Maximum percentage fines (%) *	20	12	
Coefficient of Gradation ( $C_c$ )		0.5-3.0	0.7-3.0		
Minimum Coefficient of Uniformity ( $C_u$ )		2	3		
Maximum Linear Shrinkage (%)		10	8		
Maximum Plasticity Index (%) **		15	12		

\* The percentage of soil passing the 75  $\mu\text{m}$  sieve  
\*\* Plasticity index is waived if fines content is less than or equal to 5%

Structural Backfill Location	Structural Backfill Type	Minimum Transverse Backfill Distance ( $b$ ), mm		
		Structure Type		
		$d_h \leq 600$	$600 < d_h \leq 3000$	$3000 < d_h \leq 8000$
Trench in Rock	Compacted	600	800	1000
Trench in Rock	Flowable	150	200	300
Trench in good insitu soil	Compacted	600	800	1000
Trench in poor insitu soil	Compacted	600	$d_h/2$ but not less than 600	$d_h/2$ but not less than 1500
Embankment Construction	Compacted	600	$d_h/3$ but not less than 800	$d_h/3$ but not less than 1500

4. **MINIMUM SPACINGS FOR MULTIPLE STRUCTURES:**
- a) The minimum spacing between adjacent multiple structures shall be sufficient to ensure adequate select fill support is provided to the structures and the fill above. Spacings shall be as specified in the design but not less than the minimum spacings given in AS/NZS 2041.2:2011 Table 2.5.
  - b) These limits may be inadequate where earthquake effects are important and may need to be increased when significant earthquake effects are expected.
  - c) The limit state design method takes account of the effect of spacing on buckling of the corrugated metal structure.

Structural Backfill Location	Structural Backfill Type	Transverse Distance between Structures ( $S_m$ ), mm		
		Structure Type		
		$d_h \leq 600$	$600 < d_h \leq 3000$	$3000 < d_h \leq 8000$
Between Adjacent Structures	Compacted	600	800	1000
Between Adjacent Structures	Flowable	150	200	300

Rev	Date	Revision Description	Drawn	Draft Chk	Des Eng	Lead Eng
5						
4						
3						
2	19 JUN 17	MULTIPLE STRUCTURES ADDED	BF	BF		
1	22 MAR 17	ADDITIONAL NOTES ADDED	BF	BF		
0	09 SEP 16	INITIAL ISSUE	BF	BF		

A3 Scale:  
N.T.S

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CORRUGATED STEEL PIPES (CSP)  
CULVERT INSTALLATION  
FOUNDATION, TRENCH, BACKFILL AND  
MULTIPLE STRUCTURE DETAILS

Drq No. RDL-STD-CSP-01