

TABLE 202-A: EMBEDMENT SYSTEM SELECTION

SITUATION	DESCRIPTION	WHEN TO USE
TYPE A	GRADED	NO STRUCTURAL ISSUES OR GROUND WATER
TYPE B	CEMENT STABILISED	ASSET PROTECTION REQUIRED. eg: SEWERS UNDER MAJOR CROSSINGS
TYPE C	CONCRETE ENCASED	HIGH RISK OF THIRD PARTY DAMAGE
TYPE D	SINGLE SIZED AGGREGATE	SIGNIFICANT GROUND WATER IS PRESENT OR MAY BE COMMON
TYPE E	CEMENT STABILISED BASE	WHERE UNINTENTIONAL OVER EXCAVATION OCCURS DURING TRENCH EXCAVATION
TYPE F	CONCRETE BASE	UNSTABLE GROUND AND NO SIGNIFICANT RISK OF THIRD PARTY DAMAGE

NOTES Regarding Table 202-A:

- The designer shall specify the appropriate embedment system(s) for all pipelines.
 - All embedment systems nominated are suitable for all pipe types.
 - Where the contractor finds that the ground conditions are different to that expected by the designer (eg: when ground water is observed and Type A embedment proposed), the designer shall be consulted regarding the embedment system selection.
- Type B: Use premixed cement stabilised class 3 FCR in high risk situations, eg:
- where minimum cover cannot be achieved.
 - major crossings (rail, tram, river, freeway) where requested by the authority.
 - where sewer at grade > 1 in 20.
- Type C: Requires Water Agency approval. Pipes may be susceptible to third party damage where excavators will likely operate near the sewer main, eg: the sewer main crosses an open waterway which may be excavated.
- Type F: Unstable ground can exist where:
- ground susceptible to land slip.
 - highly reactive clays to the depth of the sewer main.
 - old refuse sites.
 - decomposing soils high in organic content.
 - un-compacted ground.

TABLE 202-B: EMBEDMENT MATERIALS

ITEM	DESCRIPTION	WSAA PRODUCT SPECIFICATION	PARTICLE SIZE MAX	SIZE DISTRIBUTION	MODULUS (WET) MPa
a	EMBEDMENT SAND	WSA PS 360	10	GRADED	5
b	5mm MINUS CRUSHED ROCK	WSA PS 361	5	GRADED	3
c	7mm CRUSHED ROCK	WSA PS 361 SEW	7	GRADED	5
d	RECYCLED GLASS SAND	WSA PS 368	4	GRADED	5
e	10mm WELL GRADED CRUSHED ROCK	WSA PS 362	10	GRADED	3
f	20mm WELL GRADED CRUSHED ROCK	WSA PS 362	20	GRADED	5
g	5 / 7mm SINGLE SIZED AGGREGATE	WSA PS 351	7	SINGLE SIZED	10
h	10mm SINGLE SIZED AGGREGATE	WSA PS 351	10	SINGLE SIZED	10
i	10 / 14mm SINGLE SIZED AGGREGATE	WSA PS 351	14	SINGLE SIZED	7
j	14mm SINGLE SIZED AGGREGATE	WSA PS 351	14	SINGLE SIZED	7
k	20mm SINGLE SIZED AGGREGATE	WSA PS 351	20	SINGLE SIZED	7
l	20mm CEMENT TREATED CLASS 3 FCR	WSA PS 352	20	GRADED	10

NOTES Regarding Table 202-B:

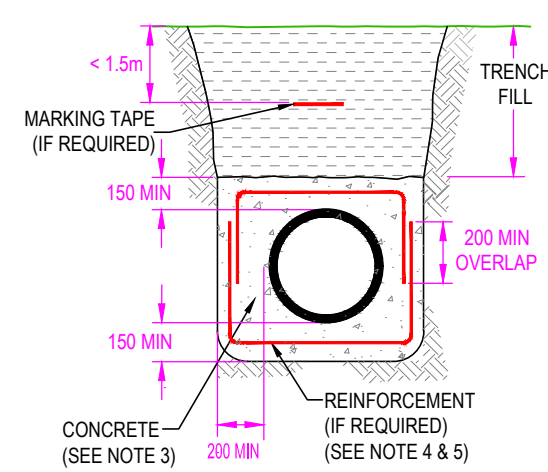
- Approved embedment materials are listed in the MRWA products portal.
- All material shall be installed with a moisture within 3% of optimum.
- Moisture conditioned embedment material shall be ordered in dry conditions.
- Moisture has a large impact on the ease with which compaction can be achieved and therefore a large impact on the ability of the embedment zone to resist pipe deflection.
- Item g. 5 / 7mm aggregate containing any distribution of particles between 2 and 7mm in size accepted.
- Item l. Shall be plant mixed with 3% cement.

TABLE 202-C: EMBEDMENT MATERIAL SELECTION

EMBEDMENT SYSTEM	PVC / PE / GRP (DN)		
	100 & 150	225 to 450	> 450
TYPE A, E & F	a, b, c, d	a, b, c, d, e	a, b, c, d, e, f
TYPE B	l	l	l
TYPE D	g	g, h	g, h, i, j

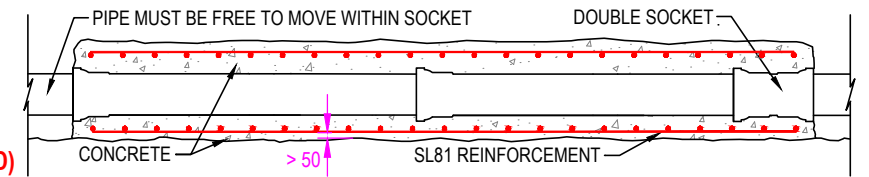
NOTES Regarding Table 202-B & C:

- Embedment material does not need to be specified as part of the design unless the structural integrity of the pipe is dependent on the modulus of the embedment material. In such cases, suitable embedment material(s) shall be specified in the design. Refer MRWA-S-203 and MRWA-S-204..
- Unless particular embedment materials are specified in the design, the Contractor may choose any of the materials nominated in Table 202-C which are suitable for the embedment system(s) selected by the Designer.

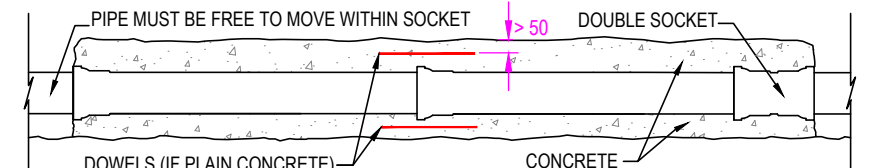


TYPE C: CONCRETE ENCASED EMBEDMENT

TYPE C1: CONCRETE ENCASED EMBEDMENT (REINFORCED)

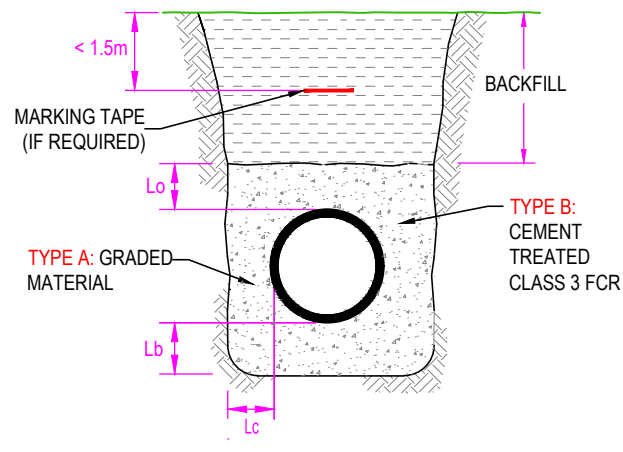


TYPE C2: CONCRETE ENCASED EMBEDMENT (DOWELLED)



NOTES Regarding Type C:

- Use this support where authorised by the Water Agency.
- Use minimum grade N20 concrete.
- Plain concrete acceptable means of asset protection.
- Steel reinforcement required if ground also unstable.
 - Reinforcement to consist of min SL81 grade mesh (AS/NZS 4671).
 - Steel reinforcement shall have >50 clear cover of concrete.
- Where concrete is not reinforced, provide 300 long N10 dowel pins at 150 spacing around each pipe joint (to prevent the pipe shearing at joints).
- Pipes will require a restraint system to prevent movement and/or floatation during encasing process.
- Finish concrete at edge of RRJ at both ends (if RRJ pipe). Double socket connector may be required at one end.



TYPE A: STANDARD EMBEDMENT SYSTEM

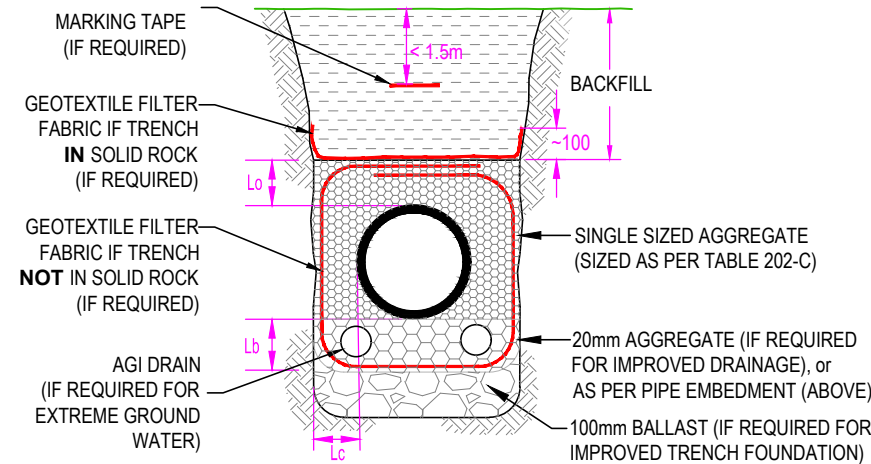
NOTES Regarding Type A:

- Graded material (Types A to E) may only be installed when:
 - The trench is not wet.
 - The pipe sits above the normal groundwater level.
- If significant groundwater is observed during excavation but embedment System A is nominated in the design, the designer shall be consulted to reconsider embedment system selection.

TYPE B: CEMENT STABILISED EMBEDMENT

NOTES Regarding Type B:

- Use Item l from Table 202-B only.



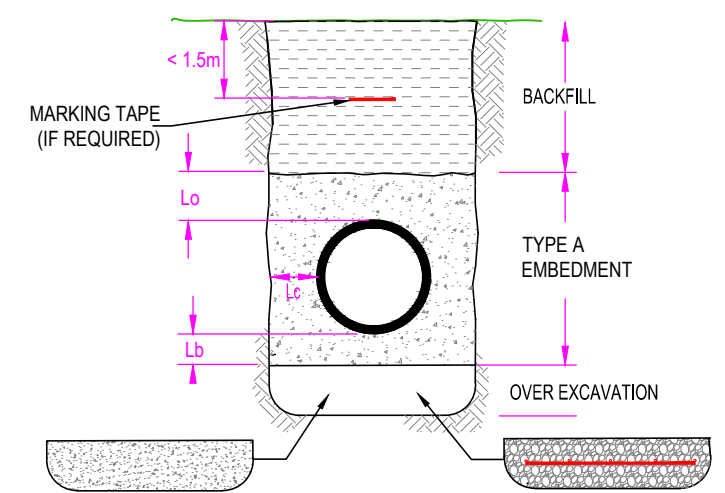
TYPE D: AGGREGATE (SINGLE SIZED) EMBEDMENT

NOTES Regarding Geotextile Wrapping:

- 5 / 7 mm aggregate shall be geotextile wrapped **unless**:
 - Sewer grade < 1 in 60, **and**
 - Embedment is not subject to tidal ground water, **and**
 - Aggregate > 7mm shall always be wrapped in geotextile fabric.
 - Lay geotextile fabric against the trench floor and wall such that it fully encases the embedment, **unless**:
 - There is solid rock on both sides and underneath, in which case only the top surface requires geotextile filter fabric. In this case, fold >100 of fabric up sides of trench prior to backfill placement.
 - Provide min of 250 lap at all filter fabric joints.

NOTES Regarding Type D:

- Where ground water volumes are substantial, use 20mm aggregate as embedment under the pipe.
- Where ground water volumes are extreme, install AGI drain as shown.
- Where the trench floor is soft (ie: boots sink into the floor under a person's weight), press 100 ballast into the trench floor until it is solid and can take a person's weight without significant movement.
- Provide trench stops / bulkheads and trench drainage (if required) as per MRWA-S-205 & 206.



TYPE E: OVEREXCAVATION. CEMENT STABILISED

NOTES Regarding Type E:

- Use where there is little or no ground water.
- Appropriate when unintentional over excavation occurs.
- Cement stabilised material to consist of Item l from Table 202-B.
- Place dry.

TYPE F: OVEREXCAVATION. CONCRETE

NOTES Regarding Type F:

- Use N20 concrete or better.
- Steel reinforcement is to consist of min SL81 grade mesh and N10 grade bar (as per AS/NZS 4671).
- Steel reinforcement shall have >50 clear cover.

ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

DESIGNED: R. JAGGER DATE: 1 JULY 2015

MELBOURNE RETAIL WATER AGENCIES

MRWA SEWERAGE STANDARDS

NOT TO SCALE

REV	DESCRIPTION	DATE	APPROVED
2	PUBLISHED FIRST ISSUE	01/10/15	CP / JT / KD / RJ
1	PRE-PUBLISHED DRAFT	01/03/15	CP / JT / KD / RJ

CHECKED:	NAME	DATE	APPROVED:	NAME	DATE
<input checked="" type="checkbox"/>	CWW	D. MOORE	<input checked="" type="checkbox"/>	CWW	R. CARRUTHERS
<input checked="" type="checkbox"/>	SEW	C. PAXMAN	<input checked="" type="checkbox"/>	SEW	D. O'DONOVAN
<input checked="" type="checkbox"/>	YVW	K. DAWSON	<input checked="" type="checkbox"/>	YVW	J. TOMASI

ISSUED 2015 VERSION 1



EMBEDMENT

MRWA-S-202

Planning	Design	Construction
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>