SECTION 5 - STORMWATER DRAINS AND PITS

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5.1 DESCRIPTION

This section covers the requirements for the supply, delivery, transport, and installation of all precast underground stormwater drains and culverts, together with the construction of drainage pits, manholes, inlet and outlet structures (endwalls, catchpits, etc) and drainage connections, all as shown on the drawings as specified.

The general terms, “underground stormwater drains” and “pipes” shall be taken to refer also to culverts for the purpose of this specification.

5.2 MATERIALS

(a) Pipe sections shall comply with the following Australian Standards:

Precast reinforced concrete drainage pipes	AS 4058
Precast reinforced concrete box culverts	AS 1597
Rubber joint rings	AS 1646
Fibre reinforced concrete pipes	AS 4139
“Black Brute” Polyethylene Pipe	AS 1463
Code of Practice for Installation of UPVC Pipe Systems	AS 2032
Installation of “Black Brute” Polyethylene Pipe Systems	AS 2033

HP **The Contractor shall provide evidence satisfactory to the Superintendent that the pipes and/or box culvert sections supplied under the contract conform with the appropriate Australian Standard.**

(b) Concrete

Unless otherwise specified or shown on the drawings, concrete for incidental construction shall comply with the requirements of AS 3600 - Concrete Structures.

(c) Mortar

Mortar used in the laying of box culvert sections or as jointing for pipes shall consist of three parts of sand to one part of cement, by mass, with sufficient water to produce a mix of consistency appropriate to the intended use. The cement shall comply with the requirements of AS 3972 - Portland and Blended Cements.

(d) Backfill Materials

Unless otherwise specified, backfill material to be used under areas to be paved or subject to vehicle traffic shall be 20 mm Class 2 Fine Crushed Rock.

Unless otherwise specified, backfill material to be used under areas not to be paved or not subject to vehicle traffic shall be natural material obtained from trench excavation free from perishable matter and conforming to the requirements of Table 5.2.1.

Table 5.2.1

Sieve Size – AS (mm)	75.0	37.5	19.0	2.36	0.075
Percentage Passing (by mass)	100	-	-	40-100	-
Plasticity Index (Max)	20				

5.3 SUPPLY, DELIVERY AND HANDLING OF PIPES AND BOX CULVERTS

All pipes and box culverts are to be supplied and delivered by the Contractor. Where the pipes or box culverts are not immediately laid they are to be placed and stored in a position and in a manner that will safeguard the public against personal or property injury, in the event of which, the Contractor will be held entirely responsible.
The Contractor shall employ adequate means in handling pipes and box culverts and shall be responsible for all damage done to these in unloading from delivery vehicles, cartage to the site and laying in position.

All pipes or box culverts damaged in these operations will be replaced or repaired, as directed by the Superintendent, at the Contractor's expense. No pipe or box culvert section shall be laid which is cracked, spalled or damaged, and all such sections shall be removed by the Contractor from the site of the works.

5.4 PIPE TYPES/CLASS TO BE USED

Pipe Types:

Pipes to be laid in easements and road reserves shall be:

(a) Fibre reinforced cement pipes (FRC) – as specified on the plans.
(b) Pre-cast reinforced concrete pipes (RC) – as specified on the plans.
(c) UPVC Pipe conforming to AS 1260 – 1974 (sewer quality)
(d) HDPE Pipe conforming to AS 1463
(e) "Black Brute" Polyethylene Pipe conforming to AS 1463

Joint Types:

Location	Diameter	Joint Type
All locations	All RC and FRC pipes	Spigot and socket, rubber ring joints
Road reserves	All RC and FRC pipes	Spigot and socket, rubber ring joints
All locations	Up to 225 mm UPVC pipe	Solvent joints

Class Types:

(a) For roadways and heavy trafficed areas:

Pipe Type	Depth in mm				
	400 – 600	600 – 1500	1500 – 2500	2500 – 3800	Over 3800
FRC	2	2	2	3	To be advised
RC Pipe	2	2	2	3	To be advised
HDPE Pipe 🗐	Not to be used	2000 N/m/m	3000 N/m/m	4000 N/m/m	To be advised
UPVC Pipe 🗐	SEH	SH	SH	SH	To be advised

(b) For areas not under traffic loadings

Pipe Type	Depth in mm				
	400 – 600	600 – 1500	1500 – 2500	2500 – 3800	Over 3800
FRC	2	1	2	3	To be advised
RC Pipe	2	2	2	3	To be advised
Black Brute Pipe 🗐	Not to be used	1250 N/m/m	1250 N/m/m	3500 N/m/m	To be advised
UPVC Pipe 🗐	SH	SH	SH	SH	To be advised

Note: SEH – Sewer extra heavy, SH – Sewer heavy. 🗐 only with approval of the Superintendent.

5.5 CONFORMITY WITH DRAWINGS

The Contractor shall set out the drainage work in accordance with the drawings, or as directed by the Superintendent.

5.6 STOCKPILING OF MATERIALS

Materials shall not be stockpiled or stored on any carriageway or footpath without the consent of the Superintendent.

5.7 PROVISION FOR DRAINAGE DURING CONSTRUCTION

The Contractor shall provide for the safe discharge of seepage, drainage, and stormwater at all times during the construction of any drain, and for the effective de-watering of excavations. Before obstructing any waterway, channel, culvert, or pipe, the Contractor shall make provision for temporary diversion of flow.

5.8 INSTALLATION OF CULVERTS IN FILLS UNDER CONSTRUCTION

Unless otherwise specified or shown on the drawings, before laying any single row or multiple row drainage pipes in a fill, the fill shall first be constructed and compacted to subgrade level or to a level 0.3 m above the top of the proposed culvert, whichever is the lower, for a distance of not less than 6 m clear on either side of the proposed trench. The trench shall then be excavated through this fill as provided in Clause 5.7 and the culvert installed.

5.9 EXCAVATION

Excavation for installation of pipes shall include all excavation necessary to prepare the pipe foundation and to provide the full specified depth of pipe bedding. Refer to Standard Drawing SD 100 Pipe Laying Detail.

HP **The Contractor shall not commence any excavation until sufficient plant and materials are on the site to ensure the safety and uninterrupted progress of the works.**

All trenches shall be excavated rectangular in section and the minimum bottom width shall be:

(a) Pipe dia. up to 1800 mm – the external dia of the pipe + 200 mm
(b) Pipe dia. exceeding 1800 mm – the external dia of pipe + 400 mm
(c) “Black Brute” Polyethylene Pipe – the external dia of pipe + 400 mm

sufficient to allow for proper jointing of the pipe sections and thorough compaction of the bedding and backfill material under and around the pipe. Where practical, trench walls shall be vertical.

For box culverts, the width of the trench shall be such that the clearance from the outside of the culvert to the wall of the trench or to the inside of sheeting is in the range 0.5 to 1.0 times the overall height of the culvert.

HP **Before commencing any excavation in which the depth of face exceeds 1.5 metres, or any tunnelling operation, the Contractor shall notify in writing the Department of Labour, Building and Construction Industry Division, Construction/Excavation Section and shall comply with the requirements of the Department and the instructions of any authorised Inspector.**

No trench shall be opened up until sufficient pipes are on the ground ready for laying and not more than thirty (30) metres is to be opened up at any one time.

All excavations are to be taken out for pipe laying to a sufficient depth below the specified invert levels and grades to allow for the wall thickness of the pipe and the specified depth of bedding material.

Excavated material shall not be deposited in such a way as to cause obstruction to roadways, properties, etc. All topsoil shall be preserved and used in the top layer of the trench when backfilled. All surplus materials from excavations shall be disposed of as soon as possible from the site as directed by the Superintendent.

The base of the trench shall be firm and uniform for its full length and compacted to refusal using mechanical plant so as to avoid any unequal settlement along the length of the pipe.

Excess excavation below the required level shall be backfilled at the Contractor's expense with material approved by the Superintendent and thoroughly compacted.

It is deemed that in submitting its tender, the Contractor has satisfied itself as to the various types of ground likely to be met with during construction, and will have made due allowance for contingencies arising therefrom in its tender. **No variation claim in the rates or price set out in the tender schedule will be made on account of the nature of the ground encountered within the trench excavation.**

Where directed and authorised in writing by the Superintendent, the Contractor shall treat or replace all soft, wet or unstable material below the level required to provide the minimum specified thickness of pipe bedding, as specified in Clause 5.10. Replacement material if used, shall be approved by the Superintendent and thoroughly compacted to ensure an unyielding foundation.

Payment for authorised excavation and replacement of unsuitable material shall be made at the schedule rate applicable for this work.

Wet or unstable areas of any depths which, in the opinion of the Superintendent, have been caused by the Contractor's negligence or improper methods shall be excavated and replaced with approved stable material spread and compacted at the Contractor's own expense.

Where the excavation is made in an existing concrete or asphalt surface a saw cut shall be made on each side of the trench 100 mm clear of the outside walls of the trench. The section to be removed shall be broken up and carefully taken out without disturbing the remaining surfaces.

All materials that will have a salvage value shall be carefully removed to avoid damage and shall, unless otherwise directed, be neatly stacked on the road reserve at points designated by the Superintendent and reserved for the use and disposition of the Frankston City Council.

5.10 CULVERT BEDDING

Refer to Standard Drawing SD 100 Pipe Laying Detail.

Bedding shall be 20 mm Class 2 Fine Crushed Rock clean and free from clay or other deleterious matter. Bedding material shall be placed for the full width of the trench or, where the culvert is to be placed without trenching, to a width 0.8 m greater than the overall width of the culvert. Bedding shall be compacted to refusal using hand held mechanical equipment.

The compacted thickness of bedding material following any shaping necessary shall be not less than:

75 mm where D < 1500 mm

150 mm where D > 1500 mm

where D is the nominal pipe diameter or culvert height.

Bedding material which has a swell equal to or greater than 2.5% shall be maintained at a mean moisture ratio of 92% between the completion of rolling and the placement of the overlying layer.

In saturated trench conditions, a bedding of approved screenings shall be used instead of Fine Crushed Rock.

5.11 LAYING

(a) General

HP **Pipes shall not be laid before the trench and bed has been inspected and approved by the Superintendent.**

Pipe laying shall commence at the outlet unless otherwise directed by the Superintendent. Pipes shall only be laid in a dry trench.

The invert of the drainage pipe or box culvert shall be not more than 25 mm from the specified level and not more than 50 mm from the specified line.

When the sections are in position, an additional layer of bedding material shall be placed to a height equal to 30% of the nominal pipe diameter or culvert height. This material shall be placed between the pipe and the outer limits of the lower layers of bedding, and shall be carefully and tightly packed under and beside the pipe.

Lifting holes, where provided, shall be sealed with a plug provided by the manufacturer.

(b) Pipe Drains

All reinforced concrete (RC) and fibre reinforced cement (FRC) pipes shall be rubber ring joint pipes except where the size of the pipe to be used is not available as a rubber ring jointed pipe, in which case a flush joint pipe may be used.

Rebate and socket ends of pipe sections shall be placed facing upstream. The ends of rebated and socketed pipes shall be fully entered.

The lower portion of the pipe circumference shall be in contact with the bedding for the full length of each section.

Where applicable, the top of the pipe as marked shall be set within five degrees of the vertical axis of the culvert.

(c) Box Culverts

Consecutive sections of box culverts shall be firmly butted together. The top sections shall be matched to the bottom sections and shall not be lapped over adjoining bottom sections.

The contact areas between the top and bottom sections shall be mortared.

Unless otherwise specified or shown on the drawing, multi-row box culverts shall be laid with the sections in each row in contact with the sections in the adjacent rows.

(d) House Drains

(i) Drains in easements - Refer to Frankston City Council Standard Drawing SD 243.

The Contractor shall supply and lay house drains associated with easement drainage to each allotment where shown on the plans or where directed by the Superintendent and shall allow for connection of existing house drains that are within 2 metres away from the drainage line.

Property inlet pits are to be located at low points of each allotment in accordance with the plans or where directed by the Superintendent.

Provision shall be made for future household drains at the lower side of vacant allotments or as shown on the drawings or as directed by the Superintendent.

(ii) Drains in road reserves - Refer to Frankston City Council Standard Drawing SD 243 and SD 245.

The Contractor shall supply and lay house drains associated with road drainage to each allotment where shown on the plans or where directed by the Superintendent and shall allow for connection of existing house drains that are within 2 metres inside the property boundary.

Unless otherwise specified, existing household drains which are not connected to underground stormwater drains shall be altered as necessary and connected through the kerb to drain into the channel using approved kerb entry adaptors.

Property inlet pits are to be located at low points of each allotment in accordance with the plans or where directed by the Superintendent.

Provision shall be made for future household drains at the lower side of vacant allotments or as shown on the drawings or as directed by the Superintendent.

5.12 JOINTING

Rubber ring joint pipes shall be jointed with rubber rings.

Where other types of pipes are used, such as UPVC, they shall be jointed in accordance with the manufacturer's recommendations.

5.13 BACKFILLING

Refer to Standard Drawing SD 100 Pipe Laying Detail.

(a) Culvert Under Area not to be Paved or not Subject to Vehicle Traffic

After the pipe laying has been completed, the Contractor shall fill in to the level of the spring line with 20 mm Class2 Fine Crushed Rock, and shall carefully and tightly pack such material under and beside the pipe. The remainder of the trench shall be refilled with natural material from the site of the works, of uniform composition free from organic material meeting the requirements of Table 5.2.1. This material shall be thoroughly compacted by ramming and/or watering in not more than 200 mm (loose) layers, or by and alternative method as proposed by the Contractor and reviewed by the Superintendent.

(b) Culvert Under Area to be Paved or Subject to Vehicle Traffic

After the pipe laying has been completed, the Contractor shall fill in to the level of the spring line with 20 mm Class2 Fine Crushed Rock, and shall carefully and tightly pack such material under and beside the pipe. The remainder of the trench shall be backfilled to design subgrade level with 20 mm Class 2 Fine Crushed Rock, and above that level with appropriate pavement material. This material shall be thoroughly compacted by ramming and/or watering in not more than 200 mm (loose) layers, or by and alternative method as proposed by the Contractor and reviewed by the Superintendent.

(c) Culvert Under Paved Area – Pavement Reinstated

After the pipe laying has been completed, the Contractor shall fill in to the level of the spring line with 20 mm Class2 Fine Crushed Rock, and shall carefully and tightly pack such material under and beside the pipe. Where the pipe is laid under existing road pavement, backfill trench with 20 mm Class2 Fine Crushed Rock to underside of patching. This material shall be thoroughly compacted by ramming and/or watering in not more than 200 mm (loose) layers, or by and alternative method as proposed by the Contractor and reviewed by the Superintendent.

Pavement patching to consist of 25 mm depth of 10 mm asphalt on 35 mm depth of 14 mm asphalt on 100 mm depth of 20 mm Class 2 Fine Crushed Rock on a minimum 175 mm depth of 40 mm Class 3 Fine Crushed Rock, keyed in 100 mm both sides.

In the case of excavations in concrete, brick paving, asphalt or gravel type footpaths and driveways, the existing construction shall be carefully removed and made good with a similar paving material to that used in the surrounding footpath or driveway.

The maximum difference between filling placed on opposite sides of the pipe shall not exceed one-quarter the height of the culvert or 0.5 m, whichever is the less and, unless the Superintendent directs or consents otherwise, filling shall not be placed within 2 m of an exposed pipe end where a further section is to be placed.

The Contractor shall maintain such backfilling in trenches to the specific levels in a safe trafficable condition for the full term of the contract including the maintenance period as specified.

5.14 COMPACTION OF BACKFILL

Backfill materials shall be placed and compacted in layers not exceeding 200 mm (loose) thickness, and shall
have moisture contents in the range of 85% to 115% of the optimum moisture contents

Backfill material which has a swell equal to or greater than 2.5% shall be maintained at a mean moisture ratio of 92% between the completion of rolling and the placement of the overlying layer.

All natural material backfill within properties shall be compacted until the dry density is in excess of 95% of the maximum dry density obtained from the Standard Compaction Test in accordance with AS 1289-5.1.1-1993.

All natural material backfill within road reserves shall be compacted until the dry density is in excess of 98% of the maximum dry density obtained from the Standard Compaction Test in accordance with AS 1289-5.1.1-1993.

All Fine Crushed Rock backfill material shall be compacted to 95% of the Modified Compaction Test in accordance with AS 1289-5.2.1-1993.

Bedding and backfill shall be assessed for compaction and or moisture (as appropriate) in lots. The number of tests per lot shall be three. A lot shall consist of one layer of bedding or backfill for a culvert length between adjacent pits or endwalls, a minimum of 20% of all lots shall be tested.

5.15 REMOVAL AND/OR RELAYING OF EXISTING PIPES

(a) General

Where specified the Contractor shall remove pipes from existing paved areas.

Except where the pavement under which the culvert passes is to be abandoned the trench shall be kept to the minimum width consistent with ease in removal of the pipe or laying a replacement.

All excess materials excavated shall be removed from the site and used in fills or dumped to waste unless otherwise approved by the Superintendent.

(b) Treatment of Residual Excavation

Where a pipe has been removed and the excavation is not to be backfilled, the excavation shall be neatly trimmed to slopes not steeper than 1 in 1.5 and the ends of the trench shaped to facilitate the smooth flow of water.

Where the trench is to be backfilled, this shall be done in accordance with Standard Drawing SD100 and the provisions of Clause 5.13 and 5.14 and unless otherwise specified, the final surface shall be shaped to conform with the adjoining profile.

(c) Stacking of Salvaged Pipe Sections

Where salvaged pipe sections are not to be relaid, they shall be cleaned and neatly stacked at such locations as may be directed by the Superintendent.

(d) Relaying of Salvaged Pipes

Where salvaged pipe sections are to be relaid, they shall be carefully cleaned by the Contractor for examination by the Superintendent, and only such sections as the Superintendent may designate shall be relaid.

5.16 INLET AND OUTLET STRUCTURES

Inlet and outlet structures shall be constructed in accordance with the drawings and specification.

The footings of the structures shall extend to the depths shown on the drawings or to such further depths as may be necessary in order to secure a satisfactory foundation. If backfilling to the specified level is required, selected backfill material shall be used.

When the proposed foundation is unsatisfactory due to neglect or the use of inappropriate methods by the Contractor, no payment will be made for the work and materials necessary to provide a satisfactory foundation at the specified level.

5.17 EXIT AND ENTRY CHANNELS

Where shown on the drawings, channels shall be excavated to facilitate the flow of water. They shall be of regular shape and of sufficient area to take the flow of water and shall not contain any low spots which might retain water. Any low areas shall be filled with suitable excavated material and firmly compacted.

5.18 DRAINAGE PITS

The Contractor shall construct drainage pits including the associated excavation, backfilling, culvert connections and supply and fitting of covers and associated components in accordance with the following clauses and standard drawings at the locations indicated on the plans.

5.19 MATERIALS

Unless otherwise specified or shown on the drawings, concrete shall be N32 standard strength grade complying with the requirements of AS 1379 - Specification and supply of concrete and the construction of the items covered by this section shall comply with the relevant requirements of AS 3600 - Concrete Structures.

Covers, grates, lids and lintels shall be as shown on the drawings.

Step irons shall be manufactured from steel AS 1204 grade 250 and after fabrication shall be prepared and pre-treated for hot dip galvanising in accordance with the requirements of AS 1627 and galvanised in accordance with the requirements of AS 1650, or shall be manufactured from 13 mm steel bar covered with polypropylene plastic to a design and sample approved by the Superintendent.

5.20 EXCAVATION

(a) General

Excavation shall be to the depth indicated on the drawings or to such further depths as may be necessary in order to secure a satisfactory foundation. Backfill material conforming with clause 5.13 shall be supplied, placed and compacted in accordance with clause 5.29.

(b) Pre-Cast Pits

For pre-cast pits the excavation shall provide a clearance from all external faces of the pit to each face of the excavation of not less than 400 mm. Bedding conforming with the requirements of clause 5.10 shall be supplied, placed and compacted to a thickness not less than 75 mm on an earth foundation or 150 mm on a rock foundation.

5.21 CAST-IN-PLACE PITS

Pits shall be constructed at the locations and to the dimensions shown on the drawings.

Unless otherwise specified, cast-in-place pits shall be constructed in accordance with the requirements of AS3600 - Concrete Structures.

5.22 PRE-CAST PITS

Where the Contractor proposes to use pre-cast pits, they shall be manufactured, supplied and installed in accordance with the requirements of AS3600 - Concrete Structures and the following requirements:

(a) General

Pits shall be installed at the locations and to the dimensions shown on the drawings except that pit wall thicknesses may be reduced as specified and shown on the drawings.

(b) Provision for Stormwater Drainage Connections

Provision shall be made for the connection of all stormwater drainage, culverts and subsurface drains as shown on the drawings.

Holes for subsurface drains shall be 100 mm diameter, unless otherwise specified or shown on the drawings.

Weepholes of 50 mm diameter shall be provided in all pits and shall be placed between the midpoint and top of the stormwater drain in those walls which have openings for drains.

(c) Segments

If a pit is cast in segments, each section of the pit shall be rebated to ensure correct alignment and to prevent horizontal movement. A minimum rebate of 15 mm shall be used.

(d) Completion on Site

Where pre-cast pits are to be completed on-site, the provision of cut outs and protruding reinforcement shall be as specified or in accordance with the drawings.

5.23 STORMWATER DRAINAGE CONNECTIONS

All stormwater drainage connections to pits, drains, and the like shall be neatly made, and where necessary the ends of all drains shall be trimmed off and finished with cement mortar.

Where directed, the Contactor shall provide an entry into pits for future stormwater drainage pipes by the provision of a suitably sized pipe stub as directed by the Superintendent.

Holes for subsoil drains shall be 100 mm diameter, unless otherwise specified or shown on the drawings.

5.24 STEP IRONS

Pits greater than 1.0 m deep shall be fitted with step irons as shown on the drawings. Steps shall be so located that they do not obstruct openings other than subsurface drainage openings and that water does not discharge onto them. Steps shall be set into a wall which has no openings, or beside an opening, or across a corner of the pit.

Step irons of an approved proprietary type shall be installed in accordance with the manufacturer's instructions.

5.25 SHAPING OF FLOOR

Pit floors shall be smoothly shaped from the inlets to the outlet for a height of one-third of the diameter of the outlet pipe.

5.26 PIT COVERS

Where specified, “Terra Firma” Fibreglass pit covers or other approved type shall be installed by the Contractor in accordance with the Standard Drawings at locations indicated on the drawings.

Grout to fill 50 mm gap between pit wall and frame shall consist of two parts of sand, one part of cement and sufficient water to produce a mix of suitable consistency.

The level at every point of the perimeter shall be within 10 mm of the design level for that point, and the line of the cover shall be within 10 mm of the design kerb line.

5.27 ANCHOR BLOCKS

Concrete anchor block shall be installed on pipe lines where the grade exceeds 10% or where specified. The spacing of anchor blocks shall be as shown on plans, with a maximum distance of 10 metres between centres of anchor blocks.

The anchor blocks shall be constructed as shown on Standard Drawing SD 250.

5.28 SUBSOIL DRAINS

(a) General

The Contractor shall supply and install perforated sub-soil drains where indicated on the plans or where directed by the Superintendent.

Subsoil drains shall be constructed as shown on Standard Drawing SD 105.

(b) Materials

(i) Pipes

Subsoil pipes shall be 100 mm diameter slotted flexible plastic (PVC) Class 1000 with filter sock, unless directed otherwise.

(ii) Filter Material

Filter material shall be 20 mm nominal size igneous or granitic screenings in clay or 7 mm nominal size igneous or granitic screenings for sand free from clay balls and organic matter.

(c) Installation

The trenches shall be 300 mm (max) wide and the pipes shall be laid true to line and level at a depth as specified measured below top of the kerb and grade to discharge into pits or in accordance with the drawings. A deeper trench may be required to avoid other services or conduits or where dictated by ground conditions as directed by the Superintendent.

The pipes shall be laid firmly embedded in the filter material and the trench filled to a height of 75 mm from finished level, or to the underside of road pavement, with filter material. The final 75 mm shall be filled with approved topsoil. On rural roads under shoulders complete filling with fine crushed rock.

5.29 BACKFILLING AROUND PITS

Backfilling around pits shall be placed in layers not exceeding 300 mm loose thickness and compacted to refusal using hand held mechanical equipment.

5.30 CCTV VERIFICATION

After completion of, backfill, surface restoration, and/or road pavement works and any other works that could cause construction traffic to traverse over the pipe drainage system and prior to the project being considered for its defect/maintenance period, a CCTV inspection of the pipe drainage system is required to demonstrate that the standard of the constructed pipe drainage system is acceptable.

In this regard, the pipe drainage system will be acceptable if the Superintendent is satisfied that the CCTV inspection does not reveal any defects (cracking, spalling, defective jointing, ponding, incorrect gradient/alignment etc) that would constitute a departure from the relevant Australian Standard, this specification, other relevant Frankston City Council Specification, or manufacturer recommendations.

The Superintendent may direct:

(a) That any defective pipelines identified by the inspection be replaced or if the defects are of a minor nature that appropriate repairs will restore the pipeline to its design level of service and operational life span.

(b) That defects identified by the inspection be repaired using one of the following repair techniques or such other technique as may be approved by the Superintendent:
• Tiger patch liner
• Econoliner
• PL Quick Sleeve System
• Flexi-Bond method

The cost of CCTV verification shall be borne by the Contractor.