SECTION 626 - INSTALLATION OF PRECAST CONCRETE CROWN UNIT CULVERTS

~~##This section cross-references Sections 173, 204, 602, 610, 611, 613, 614, 687, 689 and 812.~~
~~If any of the above sections are relevant, they should be included in the specification.~~
~~If any of the above sections are not included in the specification, all references to those sections should be struck out, ensuring that the remaining text is still coherent:~~

626.01 GENERAL

This section specifies requirements for the installation of reinforced precast concrete crown unit culverts and the associated cast-in-place concrete, including excavation, bedding preparation, placing of units, backfilling and compaction.

626.02 CONSTRUCTION PROCEDURE

HP **Culvert construction shall not commence until the Contractor's construction quality procedure and inspection and test plan(s) addressing all requirements of this section are in place ~~have been reviewed by the Superintendent~~.**

626.03 TOLERANCES FOR PLACEMENT OF UNITS

The culvert shall be constructed in the location, to the alignment, cross sectional shape, dimensions and levels shown on the drawings with the following tolerances:

Grade	5 mm in 5 m (1 in 1000)
Overall plan position	50 mm
Gap between adjacent units	12 mm maximum
Step at joint between adjacent units	12 mm maximum horizontal or vertical.

626.04 DIVERSION AND DISPOSAL OF WATER

Before obstructing or diverting any waterway, stream or channel for construction purposes, the Contractor shall obtain and provide to ~~the Superintendent~~ Council the written approval of the relevant authority to construct the obstruction or diversion. The Contractor shall observe all requirements imposed by the relevant authority and included in the written approval.

The Contractor shall:

(a) Divert or dispose of water where necessary to enable construction of the culvert. The diversion shall be in the form of temporary channels or temporary pipes. **Pumping options shall not be used.**

Culvert construction shall not commence until water flow has been diverted to the satisfaction of ~~the Superintendent~~ Council.

(b) Devise and install measures to prevent the escape of sediment and/or construction materials into the watercourse in accordance with the approved Site Environmental Management Plan (SEMP).

(c) Implement appropriate measures to prevent damage to other parts of the works or surrounding properties that might result from the temporary modification of flows. The Contractor shall rectify any damage that may occur to the works or to adjacent properties to the satisfaction of ~~the Superintendent~~ Council.

The Contractor shall produce a written declaration from the relevant ~~authority~~ authorities that the waterway has been left in a satisfactory condition prior to Practical Completion/Statement of Compliance.

Where a cofferdam is constructed to facilitate construction of the culvert, the cofferdam shall be extended below the foundation to prevent loosening of the foundation materials by water rising through the bottom of the excavation and it shall be watertight to prevent seepage of water from the sides and damage to the concrete.

Cofferdams shall be adequately braced and the cofferdam details including supporting calculations shall be proof engineered in accordance with Section 613 and Section 614.

Removal of the cofferdam shall be such that the in situ structure is not damaged or weakened.

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626.05 EXCAVATION

Excavation shall be as shown on the drawings and shall comply with Section 204.

The required ground bearing pressure shall be as stated on the drawings.

Excavation for the culvert shall include all excavation necessary to provide the specified depth of bedding to place the units and associated walls, working space and space required for filling, including the removal and replacement of unsuitable material below the level of the underside of the bedding.

The foundation material at the level of the underside of the bedding shall be test rolled in accordance with Section 173. Foundation material that is soft, excessively wet, unstable, does not comply with the requirements for test rolling, or does not achieve the required ground bearing pressure stated on the drawings, shall be treated as unsuitable material. Such unsuitable material shall be excavated and replaced with 40 mm Class 3 crushed rock, spread in layers not exceeding 150 mm compacted thickness and compacted to achieve the required ground bearing pressure stated on the drawings.

When the foundation is in rock, all loose rock and pockets of unsound material, mud or water, shall be removed to expose the sound rock and the surface shall be brought to level as necessary with blinding concrete.

The excavation shall be supported in accordance with Section 602.

626.06 BEDDING

Bedding material shall comply with Section 812.

Bedding for the cast-in-place concrete base slab shall consist of a compacted layer of 20 mm Class 3 crushed rock, of not less than 150 mm compacted thickness or as shown on drawings. ~~Where shown on the drawings, this material shall be placed on 40 mm Class 3 crushed rock spread in layers not exceeding 150 mm compacted thickness and compacted to achieve the required bearing pressure specified on the drawings.~~

HP No bedding material shall be placed until the foundation or foundation materials have been inspected and approved by ~~the Superintendent~~ Council.

626.07 CAST-IN-PLACE CONCRETE

All cast-in-place concrete for culvert construction shall comply with the drawings and Section 610.

Steel reinforcement shall comply with the drawings and Section 611.

HP Construction of the concrete base slab shall not commence until the bedding has been approved by ~~the Superintendent~~ Council.

626.08 PLACING CROWN UNITS

The cast-in-place concrete base slab shall be cured in accordance with Section 610. Precast concrete units shall not be placed on the concrete base slab prior to 7 days after casting and shall also ensure that the minimum curing periods of Clause 610.23, Table 610.231 are satisfied. Placement of precast concrete units earlier than 7 days shall comply with Clause 610.16(l) or Clause 610.16(m) for early application of loading.

Crown units shall not be moved sideways along the ground during handling or installation. Crown units shall be lifted clear off the ground when moved, to prevent inducement of any lateral stresses in the legs.

Immediately prior to placing crown units, including link slab units, the surfaces of the bearing areas which support the crown units or link slab units shall be cleaned, wetted and then covered with a sufficiently stiff cementitious mortar to give a continuous finished thickness not less than 5 mm and not more than 10 mm after the crown units or link slab units have been placed.

The cementitious mortar shall comply with Clause 610.32 and shall be mixed with only sufficient water to a moist dry-pack consistency that can be displaced to provide an even bearing.

The crown units or link slab units shall be placed in position before the mortar has stiffened to ensure that a uniform bearing is achieved.

All surplus mortar shall be removed from the installation before the mortar hardens.

After placing the crown units, any gap between the inside bottom of the crown unit leg and the side of the base recess or upstand shall be filled with cementitious mortar.

All mortar joints shall be protected and cured in accordance with Section 610.

Cast-in lift anchors shall be cut off flush with the concrete substrate, and recesses filled to the surface with shrinkage compensating proprietary polymer modified cementitious mortar in accordance with Section 689.

626.09 COVERING OF EXTERNAL SURFACES OF JOINTS BETWEEN ADJACENT UNITS WITH FABRIC COVER

External surfaces of joints (top and sides) between adjacent units shall be covered full length with one layer strips of 150 mm wide synthetic nonwoven fabric, factory impregnated with a rubberised bitumen or a neutral petrolatum based compound, to seal the joints and prevent loss of fines.

The nonwoven fabric shall have the following properties:

(a) breaking tensile strength not less than 200 N (50 mm wide strip)

(b) thickness not less than 1.25 mm, and

(c) mass not less than 1.4 kg/m^2.

The fabric covers shall not be wrinkled and shall be applied on surfaces free of foreign matter in accordance with the manufacturer's recommendations to ensure effective adhesion onto the outer surfaces of the adjacent units.

In the case of multi-cell culverts, fabric covers are not required where the gap between adjacent cells is filled with cementitious mortar or grout which complies with Clause 610.32.

HP The Contractor shall submit to ~~the Superintendent~~ Council for review all test certificates related to the supply of fabric cover material at least 14 days prior to commencement of installation.

626.10 STRUCTURAL FILLING

Structural filling shall comply with the drawings and Section 204.

626.11 CONSTRUCTION LOADING ON CULVERTS

If construction vehicles or plant are required to cross the culvert at any time before completion of the road construction, the Contractor shall construct a temporary riding surface over the culvert.

Construction vehicles or plant with axle load-effects (including the load due to the actual depth of construction or temporary riding surface) that exceed the design load-effect shall not be permitted to pass over the culvert at any time without the approval of ~~the Superintendent~~ Council. The Contractor shall submit its proposals (including supporting calculations) to move such vehicles to ~~the Superintendent~~ Council for review not later than two weeks prior. Supporting calculations shall be proof engineered in accordance with Section 613.

The temporary riding surface shall have a smooth profile to produce a surface free from ruts and bumps. The depth of the temporary riding surface shall be determined by the Contractor but shall be not less than 600 mm.

Construction vehicles or plant shall not pass over the culvert or base slab until at least 7 days has elapsed following casting of the base slab, and provided that the cylinder compressive strength of the base slab concrete has achieved 32 MPa. The minimum curing periods of Clause 610.23, Table 610.231 shall also be satisfied.

If vibrating rollers are required to work on or move over the temporary riding surface, the axle load for determining the required depth of cover shall be the combined static and dynamic load.

The Contractor shall maintain the temporary riding surface for the period during which construction traffic is required to pass over the culvert and shall remove it prior to construction of the final embankment and pavement. The temporary materials may be left in place at the discretion of ~~the Superintendent~~ Council subject to the suitability of the material, its density and condition.

626.12 REPAIR OF CONCRETE

Repair of damaged or defective cast in situ or precast concrete shall be undertaken in accordance with Section 610, Section 687 and Section 689.