

## **SECTION FIVE**

### **CONCRETE**

#### **5.01 GENERAL**

This Section specifies concrete for use in drainage works, kerbs and channels, concrete paving and other concrete structures.

#### **5.02 MATERIALS**

The Contractor will be fully responsible for the supply of materials necessary for all work covered in this Section.

(a) Materials for concrete

Materials for concrete must comply with the requirements of the following as applicable:

AS3972-1991	Portland and Blended Cements
AS2758.1	Concrete Aggregates
AS1478-1992	Chemical Admixtures for Concrete

Water used must be free from all substances harmful to concrete and steel reinforcement.

(b) Ready Mixed Concrete

The mixing and delivery of ready mixed concrete is to comply with:

AS1379-1991	The Specification and Manufacture of Concrete
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(c) Reinforcement

Reinforcement for concrete must:

(i) Comply with the requirements of the following as applicable:

AS1302-1991	Steel Reinforced Bars for Concrete
AS1303-1991	Steel Reinforced Wire for Concrete
AS1304-1991	Welded Wire Reinforcing Fabric for Concrete

(ii) be free from any coating which will reduce or prevent bonding of the concrete to the steel.

#### **5.03 STORAGE OF MATERIALS**

Any material which has deteriorated or has been damaged must not be used for construction purposes. Cement and aggregates are to be stored separately in a manner such as will prevent deterioration and the inclusion of foreign materials.

#### **5.04 MIXTURES**

The concrete is to consist of a mixture of cement, fine aggregate, coarse aggregate and water mixed in such proportions necessary to produce concrete complying with the requirements of this Specification.

The proportion of fine aggregate to coarse aggregate will depend on the grading of the materials, but the amount of fine aggregate will always be the minimum which when combined with cement, will produce only sufficient mortar to fill the voids in the coarse aggregate and leave a slight excess for finishing.

The proportions of the mix will be determined by the Superintendent and must be strictly adhered to by the Contractor.

#### **5.05 PREMIXED CONCRETE**

All concrete used on the Contract Works is to be pre-mixed concrete, from sources approved by the Superintendent, mixed at a central mixing plant, delivered and placed in strict accordance with Australian Standard AS 1379-1991 'The Specification and Manufacture of Concrete'.

It is the responsibility of the Contractor, not the concrete supplier, to ensure that requirements of this specification are met. The concrete must be delivered to the site of the works and placed in its final position before initial set takes place and the addition of water or other retempering of the concrete before placing will not be permitted.

#### **5.06 MIXED ON-SITE CONCRETE**

Mixed on-site concrete will not be used except when specifically approved by the Superintendent where small quantities of concrete are required. When required and approved, mixed on-site concrete must be hand or machine mixed as specified by the Superintendent to produce concrete complying with the requirements of this Specification.

#### **5.07 CEMENT MORTAR**

All cement mortar is to consist of:

- One (1) part cement
- One and one quarter (1 1/4) parts sand
- One and one quarter (1 1/4) parts screened bluestone dust.

The materials are to be thoroughly mixed with a proper quantity of water by a method and to a consistency approved by the Superintendent.

#### **5.08 ADDITIVES**

Additives will not be permitted.

## **5.09 CONSISTENCY**

The concrete to be placed in the work must be of such consistency that it can be readily placed and compacted in the forms without causing segregation of the materials or excess free water to collect on the surface.

The consistency of the concrete is to be determined by a slump test in accordance with Australian Standard AS 1012 Methods of Testing Concrete.

The maximum slump allowable for concrete used in the works will be 75mm.

Concrete used in kerb extrusion machines is to be of such consistency that after extrusion, the shape of the kerb is maintained.

## **5.10 CONCRETE STRENGTH**

Concrete is to develop a minimum compression strength at 7 days of 18 Megapascals and at 28 days of 25 Megapascals.

## **5.11 STANDARD TESTS FOR MATERIAL AND CONCRETE**

The materials and concrete will be tested as and when directed by the Superintendent in accordance with Australian Standard AS 1012 - Methods of Testing Concrete.

Test cylinders are to be prepared by the Contractor when directed by the Superintendent and must be numbered and marked with dates. The Contractor must keep a register of such test cylinders which also shows the dimensions and chainages of the various concrete works executed on every day and in particular those executed on the day on which the samples were taken.

The Contractor will be responsible for having the samples tested at an approval Laboratory.

Three cylinders will be prepared and disposed of as follows:

- No. 1 Tested for 7 day strength 18 Megapascals
- No. 2 Tested for 28 day strength 25 Megapascals

In the event of the No. 2 not reaching the required standard, No. 3 will be tested. The result of this test will be binding and final on the Contractor and the Superintendent. The Contractor is to take immediate steps to remove and reconstruct any work condemned by reason of this Section of the Specification.

## **5.12 FORMWORK**

Formwork and framing for concrete must be in accordance with the provisions of Australian Standard AS 3600 'Concrete Structures'.

The forms are to be to the shapes, lines and dimensions required by the Contract drawings.

Forms must be properly supported and braced to maintain position during and after the placing of concrete and must not be stripped until the concrete has hardened and obtained sufficient strength to support its even weight and any construction loads without damage to the concrete.

In no case are the forms to be removed before 12 hours after placing the concrete.

### **5.13 REINFORCEMENT**

Where detailed, reinforcement is to be accurately fixed in accordance with the accompanying drawings and the provisions of Australian Standard AS 3600 'Concrete Structures'.

Reinforcement must be thoroughly cleaned of all loose scale, rust and other detrimental coatings and is to be accurately placed, secured and maintained in position until incorporated in the concrete.

### **5.14 INSPECTION**

No concrete is to be placed before the formwork, reinforcement and bedding, in place, have been inspected by the Superintendent.

### **5.15 PLACEMENT OF CONCRETE**

After mixing, concrete is to be conveyed to the place of final deposit, without delay and place into its final position as rapidly as possible by methods which prevent loss or segregation of materials.

Dropping concrete a greater height than 1 metre, depositing large quantities at any point and moving or working it along the forms will not be permitted. A plastic surface must be maintained until the completion of the unit.

Concrete placing must be carried out continuously up the construction joints as shown on the drawings or as directed by the Superintendent.

Whenever the work of placing concrete is delayed until the concrete shall be taken its initial set, the point of stopping will be deemed a construction joint. The location of construction joints is to be planned in advance and must be made only when approved by the Superintendent. The placing of concrete is to be carried out continuously from joint to joint. These joints are to be perpendicular to the principal lines of stress and in general are to be located at points of minimum shear.

Before placing new concrete on or against concrete which has set, the form must be re-tightened and the surface of the set concrete is to be roughened as required by the Superintendent, thoroughly cleaned of foreign matter, laitance and loose or porous material and saturated with water. The surface must then be covered with a thin coat of stiff neat cement to ensure bond and concreting is to proceed immediately.

Precautions must be taken in placing concrete when air temperatures are above 30<sup>0</sup>c and below 5<sup>0</sup>c. No concrete is to be placed under water, unless methods used are approved by the Superintendent.

## **5.16      COMPACTION OF CONCRETE**

The concrete must be thoroughly compacted to the satisfaction of the Superintendent whilst it is being placed in the works. Compaction is to be by means of continuous tamping, spading and vibration with approved vibrators.

Care must be taken to fill every part of the forms, to force the concrete under and around the reinforcement without displacing it, to work back coarse aggregate from the face and to remove all air bubbles and voids.

## **5.17      CURING**

Concrete and rendering is to be cured so as to prevent excessive loss of moisture from the surface for at least 7 days continuously following the time of placing. In hot weather the Superintendent may direct the curing period to be extended up to 14 days.

Curing is to be accomplished by one or more of the following methods:

- a) Covering with hessian, plastic sheeting or similar material maintained in wet condition.
- b) Covering with at least 25mm thickness of sand or earth maintained in a damp condition.
- c) Coating with approved curing compound.

New surfaces must be effectively protected from rain until hard set has occurred.

## **5.18 DEFECTIVE CONCRETE**

The Contractor will be fully responsible for employing effective methods of mixing, placing, protecting and curing concrete and for the adequacy of false work and forms. Approval of any such work or methods by the Superintendent will be tentative only and will not relieve the Contractor of this responsibility. Concrete which is not placed and completed in accordance with this Specification or which is in the opinion of the Superintendent, defective, must be removed within the limits assigned by the Superintendent and replaced to his satisfaction.