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# WAROONA COMMUNITY PRECINCT, BIG SHED

# SOUTH WESTERN HIGHWAY, WAROONA 6215

# INSITU CONCRETE SPECIFICATION

# SPEC-ST-001

Project Reference Number 24-151

Revision – A

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| WAROONA COMMUNITY PRECINCT, BIG SHED – INSITU CONCRETE SPECIFICATION | | | | | |
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# Contents

## 1.1. SCOPE

This section sets out the requirements for the supply, testing and placing of concrete; the design, fabrication, erection and stripping of formwork, and the fabrication, placing and supporting of reinforcement for all insitu concrete members. To be read in conjunction with the Architectural Specification and other relevant sections.

All work and material shall be in accordance with the Architectural and Structural Drawings and this Specification.

If, in the execution of the work, the Contractor should find discrepancies in the information from the Superintendent or Structural Engineer, he shall refer such discrepancies to the Superintendent for a decision before proceeding with the fabrication.

Reference in this Specification to specific clauses of the various codes is intended to highlight those points and shall not be taken to imply a lesser importance for all other applicable clauses.

## 1.2. CODES

All work shall comply with the following codes, and current copies of these codes shall be obtained by the Contractor at his own expense and kept at all times in the Foreman's Site Office until all concrete has been approved by the Superintendent.

| | |
|---|---|
| AS.1012 | Methods of Testing Concrete |
| AS.1379 | Specification and Supply of Concrete |
| AS.3600 | Concrete Structures Code |
| AS.3610 | SAA Formwork Code |

## 1.3. SETTING OUT

The Contractor shall engage the services of a fully qualified Surveyor, who shall be approved by the Superintendent, for the purposes of establishing and checking levels, dimensions, angles, verticality, etc. for the due execution of the concrete work.

Where documented that evidence of survey work is required, this shall be submitted in an approved format to the Superintendent within two working days of the survey work being carried out or earlier if so stated.

Before the Works are allowed to proceed above foundation level, the Contractor shall pay for and furnish to the Superintendent a certificate from the Surveyor showing by means of a drawing and dimensions, that the works have been correctly set out in accordance with the information supplied.

During the progress of the works, the Contractor shall:

a) Check that formwork to footings and slabs are correctly positioned within the tolerances specified including checking levels of formwork at the specified locations. Advise the Superintendent in writing, the levels and alignments prior to pouring.

If levels are not within tolerances, formwork shall be repositioned, check levels and alignments taken, recorded and resubmitted prior to pouring.

b) Check slab levels and alignment of edge thickenings and any proposed block-outs (critical to structural steel coordination and erection) within 48 hours of pouring slabs and before removal of any supports and prior to any further work immediately above. Results to be recorded and submitted to the Superintendent.

c) After removal of supporting props, shores or other formwork, check slab surface levels and edge alignments at specified locations. Results are to be recorded and submitted to the Superintendent.

The Contractor's attention is specifically drawn to the Clause and subsequent clauses on Dimensional Tolerances and he shall pay particular attention to this aspect.

## 1.4. INSPECTION BY STRUCTURAL ENGINEER

Unless otherwise agreed in writing, give notice to the Superintendent not less than 7 days before the intended placement of concrete to enable the excavation, formwork and reinforcement to be inspected by the Superintendent and where required, the Structural Engineer before any concrete is placed. The Contractor shall have checked the work before giving such notice to the Superintendent. Work which has not been checked will not be inspected.

## 1.5. SUB-CONTRACTORS AND SUPPLIERS

Where the Superintendent has approved a Sub-Contractor to carry out specified works, the Contractor shall ensure that the work is being executed in accordance with this Specification and the Drawings. Such work shall be checked by the Contractor before requested inspection by the Superintendent.

## 1.6. CONSTRUCTION PROCEDURE

The Structural Drawings indicate construction joints which are considered to be adequate for the construction of the concrete work. The Contractor shall confer with the Superintendent should he wish to vary the construction procedure. Such variation, if approved, shall be at the Contractor's expense.

## 1.7. RECORDS

The Contractor shall maintain on site an up-to-date record of all concrete delivered to site.

The following information concerning each concrete pour shall be kept in tabulated form in a book kept on site:

a) date and time;
b) supplier;
c) docket number;
d) concrete details as supplied - specified strength, aggregate, slump, cement content, water cement ratio;
e) volume of concrete supplied;
f) cumulative volume total for this pour;
g) location of concrete placed; and
h) weather conditions - temperature, wind, humidity, sun.

In addition where concrete tests are to be made, the following information shall also be recorded for each sample:

a) name of testing operator;
b) for each test sample taken, (one test consists of three standard cylinders) the identity of the batch sampled by recording the cumulative volume for that pour;
c) the actual slump of the sample; and
d) the type of specimens taken for laboratory testing e.g. 300 x 150 or 200 x 100 cylinders

At a later time, as test results come to hand for each sample taken, the following information shall also be recorded for each sample:

a) seven day concrete strength; and
b) twenty eight day concrete strength

The results of the concrete testing should be sent to the Superintendent within 7 days of receipt for review by the Structural Engineer.

## 1.8. CO-ORDINATION OF SERVICES

Before beginning the formwork for each pour, prepare clear diagrams of the penetrations to be made in each element for all services including those of nominated sub-contracts.

Submit these diagrams in triplicate to the Superintendents early enough to allow assessment of the need for any structural modifications due to grouping of penetrations and not less than one week before formwork construction begins of the element shown on a particular diagram.

Delays resulting from modifications to structural elements because of penetrations shall not be considered under any circumstances a reason for granting extensions of the time.

## 1.9. CONSTRUCTION PROCEDURE

The Contractor is responsible for the construction procedures and must ensure that no part of the structure is overstressed as a result of this procedure or as a result of the construction loads which are applied.

## 1.10. FORMWORK

This section sets out the requirements for the design, supply, fabrication, erection, treatment, testing and stripping of the formwork for all in-situ concrete members.

### Requirements

All formwork shall be designed and constructed to produce concrete members which will conform within the specified tolerance to the shapes, lines, levels and dimensions required by the contract drawings.

### Responsibility

The responsibility for the sufficiency of the whole of the formwork shall rest entirely with the Contractor.

### Codes and Standards

All formwork shall conform to the current requirements of the following Codes and Standards except where modified by the Specification.

AS 3610 SAA Formwork Code

### Drawings

Formwork drawings and computations if required, by the Superintendent, shall be prepared by the Contractor and submitted for examination by the Superintendent prior to construction of the formwork. These drawings shall contain generally the information outlined in Section 4 of AS 3610 and specifically any relevant requirements of subsequent clauses of this Specification including set-downs and set-ups in floors.

### Inspection

The Contractor shall give a minimum of 24 hours' notice to the Superintendent of the formwork being completed and ready for inspection.

## 1.11. DIMENSIONAL TOLERANCES

### General

The design and construction of the formwork shall be such that the concrete produced from the forms shall conform to the dimensional requirements of the contract drawings within the dimensional tolerances specified for each part of the works.

Leveling pins of a minimum length equal to slab depth, shall be provided at each column, at the centre of each line between columns and at the centre of each slab bay. Pins shall be of an approved type rigidly attached to the formwork.

Dimensional tolerances shall be in accordance with Section 3.4 of AS 3610, S.A.A. Formwork Code and Section 17.5 of AS 3600 Concrete Structures Code.

## 1.12. FORMWORK DESIGN

### General

The formwork shall be designed generally in accordance with Section 4 of AS 3610 and in particular with the relevant sections of this Specification.

### Stability

The formwork shall be designed to ensure the stability of the forms particularly under the action of horizontal loads arising from wind, lateral pressure of plastic concrete, prestressing forces, concrete dumping and stopping and starting of equipment and shall be provided with diagonal bracing or shoring as required.

### Deflection

The formwork shall be designed to withstand the applied loads so that the sum of the following will not exceed the absolute or relative deviations from true position permitted in AS 3610:

(a) its deflection under load,

(b) falsework settlement, and

(c) its initial inaccuracy in position

## 1.13. TYPES OF FORMWORK

### General

The types of formwork required throughout the project shall be determined by the Contractor to achieve the surface finishes and the shapes, lines, levels and dimensions of the concrete work required by the contract drawings and this Specification. The materials to be used in the formwork shall comply with the appropriate Australian Standards or in their absence other appropriate National Standards.

### Void Formers

The material and construction used for the forming of voids, blockouts and the like shall be of sufficient strength to prevent deformation or destruction under the load of wet concrete and such formers shall be so positioned and so secured that they will not be dislodged during the concreting and will produce the required void within the tolerances stipulated in this Specification.

If the void former is not removed it shall be of light-weight construction and unless fully surrounded and protected by concrete it shall also be incompatible.

Void Formers used to form a space to allow for differential movement between structural elements shall be of adequate strength to support the weight of wet concrete and shall have sufficient compressibility to permit the movement specified.

All void formers are to be adequately protected against damage by water by wrapping in P.V.C. membrane, or by other means.

### Ground Formwork

Where the contract documents indicate that concrete slab is to be cast on the ground then the ground whether natural or fill shall be compacted to a firm surface and in accordance with the "Siteworks" section of the Specification. Place concrete "blinding" layers in the locations indicated on the drawings.

### Permanent or Lost Formwork

Where it is not possible or practicable to remove formwork from formed surfaces permanent or lost formwork shall be used. Such formwork shall be of sufficient strength and rigidity to support the weight of the wet concrete and construction loads. Where such formwork is also acting as a part of a construction joint, it shall be capable of transmitting any shear at the joint by indentation, penetration or the like.

## 1.14. TREATMENT OF FORMS

### Form Coatings

The Contractor shall select the form coating necessary to produce the required quality of finished concrete surface. He shall provide sufficient evidence to ensure that no reaction which will affect the concrete surface will occur between the form coating and any form surface, the plastic concrete, any concrete material, admixture, sealant or curing compound. The selection of a suitable coating shall also take into account any effect it may have on subsequent finishes to the concrete such as paint, adhesives and the like.

### Release Agents

All form linings shall be coated prior to placing of concrete with a suitable release agent which also satisfies the requirements of the previous Clause. Care shall be taken to ensure that excessive application of the release agent does not 'puddle' and so cause staining of concrete surfaces. Care shall be taken to prevent coating of reinforcement or construction joints. Where colour control of a concrete surface is required by this Specification then prior to the first use of a form lining (and subsequent to the application of the release agent) it shall be coated with a cement wash which after drying shall be removed and the lining then made ready for use by again coating with the release agent. In the case of absorbent form linings, this process shall be repeated until even absorbency is obtained. In the case of steel linings a rust inhibiting release agent shall be used.

### Cleaning of Forms

All forms shall be thoroughly cleaned at the time of placing concrete and all dust, debris and rust or other stains shall be removed.

In order to facilitate the removal of major debris from within the forms and to allow inspection immediately before the placing of concrete, certain sections of the forms shall be readily removable. Minor debris, dust, etc. shall be removed by vacuum cleaning, compressed air or the equivalent.

### Repair of Formwork

Formwork which has become damaged shall not be used unless repair to the satisfaction of the Superintendent. Any repair carried out on the form surfaces shall be shown by test to produce the concrete surface finish required by the Specification for the concrete element concerned.

### Re-use of Forms

The number of re-uses and the conditions of faces and edges of forms shall be consistent with the concrete surface finish specified.

## 1.15. FINISHES FROM FORMS

### Classification of Form Finishes

The surface finishes required from forms in the various concrete elements of the structure are listed and classified within the drawings and this Specification. The classifications and requirements are generally in accordance with the categories of Surface Finish and Colour Uniformity listed in AS3610, but where they are modified this Specification shall prevail.

The minimum standard of finishes to formed concrete surfaces shall be as follows:

| Concrete Element Surface | Formwork Class | Colour Control Tonal Range |
|---|---|---|
| Normal architectural not otherwise specified | 2 | 5 tones |
| Surfaces to be rendered or hidden by other finishes | 4 | N/A |
| Surfaces permanently concealed | 5 | N/A |
| Surface to be finished with plaster skim coat or paint coating | 2 | 5 tones |
| Soffit of suspended slabs hidden by ceilings | 3 | N/A |

### Form Joints - Location, Type and Pattern

Where the Form Finishes indicate that the location, type and pattern of form joints for a particular concrete element is important and that either a regular arrangement as shown on the contract drawings or a regular arrangement to be determined by the Contractor is required then working drawings are to be prepared and shall be submitted by the Contractor for examination by the Superintendent. Formwork shall be sufficiently tight to prevent leakage of grout.

## 1.16. TESTS OF FORMWORK

### Tests of Proprietary Formwork

When proprietary prefabricated forms, shoring or components are to be used by the Contractor he shall submit to the Superintendent Test Reports from an approved N.A.T.A. laboratory indicating compliance with the requirements of AS 3610. The tests shall have been undertaken in accordance with the requirements of Appendix A of AS 3610.

## 1.17. FORMWORK TEMPERATURE

### Hot Conditions

When the likelihood of an ambient air temperature greater than 32 deg C may occur during placement of concrete, the forms shall be adequately shaded or sprayed with water so as to keep the temperature of the form faces below 32 deg C.

## 1.18. STRIPPING AND REMOVAL OF FORMWORK

### Generally

Removal of formwork shall be in accordance with Section 5 of AS3610 except where varied by this Specification.

The forms shall not be disturbed until the concrete in contact with them has hardened sufficiently to withstand such action without damage. Formwork shall not be removed until the concrete has acquired sufficient strength to support safely its own mass and any superimposed load without undue deflection. The removal of formwork shall be carried out in such a manner and sequence that the structure is not subjected to impact, excessive load or eccentric load.

In the case of those concrete elements in which off-form surface colour is important, it will be necessary for the forms to remain in contact with visually associated surfaces for comparable times. These times are to be specified and a pouring schedule shall be submitted by the Contractor.

Neither walls nor any permanent loading shall be erected in any part of the structure while it is still supported by formwork.

## 1.19. REINFORCEMENT SUPPLY AND FIXING

### General

This section of the specification for concrete sets out the requirements for fabrication, placing and supporting of the reinforcement for all in-situ concrete members.

### Codes

All work shall comply with following Codes, except where modified by this Specification.

| | |
|---|---|
| AS 3600 | Concrete Structure Code |
| AS/NZS 4671 | Steel Reinforcing Materials |

### Schedules

The Contractor shall be responsible for the production of any reinforcement schedules that may be necessary for the fabrication of the reinforcement. Include all tie wire, support bars, spacer bars and the like.

### Inspections

The Contractor shall give sufficient notice but not less than 7 days to the Superintendent of the completion of fixing of the reinforcement and shall allow further sufficient time but not less than 2 working hours for the carrying out of the inspection.

## 1.20. BENDING AND SPLICING AND WELDING

### Bending

Reinforcement shall not be bent or strained in a manner which will damage it. Where bending of reinforcement is required by the contract drawings, the diameter of such bends shall be restricted to the requirements of AS.3600.

### Splicing

Where splices in reinforcement are not shown on the contract drawings and are required by the Contractor he shall submit details of the proposed splices to the Superintendent. Mechanically join laps by lacing together with 1.6mm annealed wire.

### Welding

Reinforcement shall not be welded except where shown on the contract drawings or as requested by the Contractor and specifically approved by the Superintendent.

## 1.21. SURFACE CONDITION OF REINFORCEMENT

Reinforcement shall be supplied and maintained free from loose mill scale, loose rust, mud, oil, grease and other coatings which would reduce the bond between the concrete and the reinforcement. Where reinforcement is to be left exposed, it shall be protected by coating with a cement wash to the approval of the Superintendent.

## 1.22. FABRICATION TOLERANCES

Unless shown otherwise on the contract drawings the reinforcement shall be cut and bent or otherwise fabricated to the dimensional tolerances allowed by AS 3600.

## 1.23. IDENTIFICATION, TEST CERTIFICATES AND TESTS

### Identification

Reinforcement shall be readily identifiable as to grade and origin.

### Test Certificates and Tests

The Contractor shall provide copies of the manufacturer's test certificates required by the relevant Australian Standard Specification for the steel reinforcing material. Alternatively, the Contractor shall have carried out at a N.A.T.A. approved laboratory the standard proofing tests for steel reinforcing bars and wire as set out in the applicable Specification AS 1302, 1303 and 1304. Copies of the test results shall be made available to the Superintendent.

## 1.24. PLACING AND FIXING OF REINFORCEMENT

### Generally

Reinforcement shall be as shown on the contract drawings and shall be securely held in its correct position within the tolerances specified herein until the concrete has hardened.

### Supports for Reinforcement

Spacers, stools, hangers and ties may be used as supports for reinforcement and shall be made of metal, concrete or plastic but pieces of wood, aggregate, brick of the like shall not be used. Unprotected ferrous metal shall not be used in such supports where they extend to the surface of the concrete (e.g. in columns).

The supports shall be adequate to withstand construction traffic and shall be sufficient in number and spacing to maintain the reinforcement in its correct position. Particular care shall be given to the support of light gauge reinforcement and of reinforcement in general where the concrete is to be cast against the ground or against fill. In such cases supports shall be provided at 1000mm centres (max). Care shall be taken that no damage occurs to any waterproofing membrane or vapour barrier.

Reinforcement shown on the contract drawings is for the structural requirements only. Where the Contractor deems that additional reinforcement is required for construction, support, additional safety or any other purpose, this shall be designed and incorporated by the Contractor at their expense. The Contractor must

make all allowances for any additional reinforcement required and seek acceptance from the Superintendent prior to incorporating on site.

### Placing Tolerances

Unless shown otherwise on the contract drawings, the reinforcement shall be fixed and maintained in its correct position within the tolerances specified in AS 3600. Cover as per drawings or specifications shall be maintained.

## 1.25. PROTECTION IN HOT WEATHER

Where there is the likelihood of an ambient air temperature greater than 32 deg C occurring during the placement of the concrete then the reinforcement shall be adequately shaded or sprayed with water so as to keep its temperature below 32 deg C.

## 1.26. CORE HOLES, EMBEDDED SERVICES, ANCHOR BOLTS AND EMBEDDED FIXINGS

### General

The Contractor shall be wholly responsible for coordinating the core and embedment requirements of all trades and for the provision of them in accordance with the requirements of the contract documents.

### Location and Details

Where the location and details of the core holes, anchor bolts and embedded services and fixings are shown on the Structural Drawings of the contract documents, then such shall be followed. Where such information is not shown, the Contractor shall submit the requirements of the trades in this respect to the Superintendent for approval.

### INTEGRITY OF CONCRETE AND REINFORCEMENT

Reinforcement shall not be cut to provide space for core holes or embedments nor shall the hardened concrete be cut or cored without the approval of the Superintendent.

### SIZE AND SPACING OF EMBEDDED SERVICE PIPES, CONDUITS, ETC.

Embedded service pipes, conduits, etc. other than those passing through a concrete element, shall in general, not be larger in outside diameter than one-third the thickness of the slab or wall, or one-third of the minimum dimension of beams of columns in which they are embedded nor shall they be spaced closer than three diameters centre to centre.

### CONCRETE COVER TO BE MAINTAINED

The thickness of concrete measured from the nearest permanent surface of a concrete member to the outside of the pipe, conduit or the like embedded generally parallel to the surface of the member shall be not less than the cover specified.

### PLACING TOLERANCES

Unless shown otherwise on the contract drawings core holes and embedded service lines shall be fixed and maintained in their correct position within a tolerance of ±6mm.

### CORE HOLES, EMBEDDED SERVICES, DOWN PIPES AND FIXINGS

All core holes shall be formed with adequate forms and securely held in the correct position during concreting. Where core holes are to be sealed with concrete after the service conduit is in position a rebate shall be formed in the vertical surface of the core hole.

Build in all electrical conduits, water and waste pipes, drains, reglets, etc. to the details indicated on the Drawings and as required. Provide adequate temporary and permanent protection of all such items through the use of compressible foam wrapping/lagging to suit the application. Submit proposed material and methodology to Superintendent for review prior to proceeding with the works. Ensure that reinforcement within concrete elements containing cast-in items is not displaced. Refer to the structural engineer for additional guidance when required.

### CAST IN FIXINGS

Fixings are to be cast into the concrete elements at the locations indicated on the drawings. Unless noted otherwise, all fixings are to be hot dipped galvanised in accordance with AS 1214.

## 1.27. JOINTS AND JOINTING

### Location

Joints are generally shown on the contract drawings. Where such joints are shown they shall not be eliminated or varied in location without prior approval of the Superintendent. Where additional joints are required by the Contractor, he shall obtain approval for them from the Superintendent before including them.

### Types

The types of joints are specified in the contract drawings.

### Water Tightness

All joints in the concrete which may be submitted to the ingress of water shall be made watertight.

### Emergency Joints

When the placing of concrete is unexpectedly interrupted it may be necessary for the contractor to provide an emergency construction joint. The location and construction of the joint shall be to the approval of the Superintendent, but the strength of the structure shall not be impaired by such condition. The surface of the set concrete shall be roughened, and foreign matter cleaned off and thoroughly wetted before new concrete is poured against it.

### Finish

The finish to all joints shall be in accordance with the details shown on the contract drawings and shall be smooth and flush with the adjoining concrete surfaces. The edge of the first pour at such a joint shall be straight and true, free from imperfections such as slurry loss, chips and lack of sharpness and squareness. Any such edges that fail to meet the standards specified shall be rejected and rectified by approved means.

### Dimensional Tolerances

The maximum and relative deviation of a joint from its true position in space shall be in accordance with the requirements of this Specification.

### Treatment of Joint Surfaces

All joints shall be clean and dry before any jointing material is applied. Construction joints shall be treated as shown on the contract drawings and in accordance with this Specification.

### Period Between Pours

In order to minimise shrinkage effects of the concrete the contract drawings and this Specification require a certain minimum period to elapse between adjacent pours of concrete at joints.

These periods shall not be varied without the approval of the Superintendent. Where time periods between pours are not indicated in the contract documents the Contractor shall submit his requirements in this regard to the Superintendent for examination.

The time delay between concrete pours abutting vertical construction joints in walls shall not be less than 3 days.

The time delay between concrete pours abutting horizontal construction joints in slabs shall not be less than 3 days.

## 1.28. CONCRETE SUPPLY

### General

This section of the Specification for concrete sets out the requirements for the supply of concrete for all concrete members.

### Responsibility

The Contractor shall be wholly responsible for the supply of the concrete in accordance with this Specification and the associated contract documents.

### Codes

All concrete and its constituent materials shall comply with the current requirements of the following codes and standards except where modified by this Specification.

| | |
|---|---|
| AS 1141 | Method for sampling and testing aggregates |
| AS 1379 | Specification and Supply of Concrete |
| AS 1478 | Chemical Admixtures for Use in Concrete |
| AS 2758.1 | Aggregates and rock for Engineering Purposes. Part 1 - Concrete Aggregate |
| AS 3600 | Concrete Structures Code |
| AS 3972 | Portland and blended cements |

### Certificates

Prior to the supply of concrete to the project, the Contractor shall, upon the request of the Superintendent, supply copies of NATA endorsed test certificates covering the relevant tests from the current Australian Standard. The test results shall relate either to materials already stockpiled for the project or to the most recent production materials from the source and of the quality intended to be supplied to the project.

During the course of the project additional test certificates shall be supplied at the frequency listed in the schedule for each source of supply

### ACSE Special Concrete

The terms "ACSE Special Concrete" and "ACSE Special Concrete (S.G.)" may be used to describe concrete containing ACSE Specification type GP cement, and otherwise complying with the performance requirements of this Specification particularly in respect of slump and drying shrinkage.

## 1.29. MATERIALS

### General

Concrete shall be made with Portland Cement or Blended cement, fine aggregate, coarse aggregate, water and any admixtures that may be specified or approved.

Concrete for various concrete elements of the structure shall be either specified by performance, or by prescription, or by performance together with a requirement for a certain type of cement binder and water-cement ratio. All materials used shall satisfy the relevant Australian standards listed above in addition to the requirements of this specification.

Submit details of all concrete mixes and obtain approval from the Superintendent before commencement of work.

### Cement

All cement shall comply with AS 3972 Portland and Blended Cements.

Unless noted to the contrary, all cement shall be Type GP Portland cement, in accordance with AS 3972, with the following additional characteristics.

This cement is referred to as "ACSE Specification Type GP" and shall be used in all ACSE special concretes.

(a) The tricalcium aluminate shall be less than 7%.

(b) The surface area shall be not less than 280, nor greater than 350$m^2$/kg.

(c) The sulphuric anhydride shall be greater than 1.8%.

(d) The soundness as measured by AS 3972 shall be less than 5mm. Should the expansion exceed this limit, then another portion of the sample shall be aerated for seven days and tested when the expansion shall not exceed 3mm.

(e) There shall be a gain in compressive strength of not less than 5% between 3 days and 7 days, and not less than 5% between 7 days and 28 days.

Other cements including blended cements may be used if approved and if the resulting concrete has strength, durability and other characteristics not inferior to those required by this specification for Portland cement concrete.

### Aggregate

Dense aggregate shall comply with AS 2758.1, as necessary or applicable. The Contractor shall, prior to commencement of the work, supply the grading envelope and anticipated normal grading of each aggregate, together with the source of supply.

### Water

Water shall be free from matter harmful to concrete and its reinforcement and comply with AS1379.

### Chemical Admixtures

The use of admixtures will not be permitted except with the prior approval of the Superintendent. Chemical admixtures, if used, shall comply with AS 1478, Chemical Admixtures for use in Concrete.

Admixtures shall not contain chlorides, fluorides or nitrates.

### Fly Ash and Ground Granulated Slag

Fly ash and granulated slag, if approved for use, shall comply with AS 3582.1 and AS 3582.2.

### Storage

Cement shall be stored in weather-tight buildings, bins or silos which will provide protection from dampness and contamination. Bags shall be stacked to permit access for tallying, inspection and identification of each consignment.

Aggregate stockpiles shall be arranged and used in a manner which will prevent segregation or any contamination with other materials or with other sizes of aggregate. Stockpiles shall be free draining. Where colour uniformity of aggregates is important for concrete finishing it shall be necessary to stockpile all the aggregates on a site in a clean and protected situation.

Admixtures shall be stored in such a way as to ensure that there is no detrimental effect on their properties. The Contractor shall comply with any special requirement of the manufacturer of the product.

## 1.30. PERFORMANCE REQUIREMENTS

### General

The concrete for the various parts of the work shall be so designed and produced that the performance requirements of this section shall be met.

The selection, proportioning and mixing of the concrete materials shall be such as to produce a mix which works readily into corners and angles of the forms and around reinforcement with the method of placement employed on the work, but without permitting the material to segregate or excess free water to collect on the surface. The resultant concrete shall be sound and have the other qualities outlined in this Section.

Details of the proposed concrete mixes for each of the specified characteristic strengths shall be submitted to the Superintendents for approval not less than 7 days prior to the first placement of such concrete. The approval shall not alleviate the responsibility of the Contractor to produce off-form concrete that meets the performance requirements of this specification.

Warranty: The Contractor shall forward to the Superintendent a written guarantee that the Concrete is in conformity with the approved mix design and shall attain a stated strength at 28 days.

### Characteristic Compressive Strength F'c

The characteristic compressive strength of the concrete as defined in AS 3600, that is required for the various parts of the work shall be as shown on the contract drawings.

### Slump

The slump required for the various parts of the work shall be as shown on the contract drawings.

Tolerance on slumps shall be in accordance with AS 1379.

ACSE Special Concrete shall be designed with a slump of 80mm +15 for structural elements.

ACSE Special Concrete (S.G.) used in slabs on ground, unless noted otherwise shall be designed with an equivalent slump of 60mm +15 that may be increased to have an effective slump of 80mm +20mm by the addition of plasticisers approved in writing by the Superintendent.

## 1.31. DRYING SHRINKAGE

Unless otherwise specified all concrete shall have drying shrinkage test results to AS 1012 showing a maximum (including tolerance) of 650mm for concrete up to and including 32MPa, and 700mm for higher strength grades.

Where drying shrinkage results in accordance with Clause 5.6 of AS 1379 are not available, at least two samples shall be taken of trial mixes in accordance with AS 1012.13 and each sample shall provide a result being the average of three specimens at 56 days. These results shall show a maximum drying shrinkage as noted above. Project assessment of shrinkage using specimens prepared in the field may show a maximum tolerance of 150mm on the production assessment results or the results from trial mixes.

## 1.32. PLASTIC CRACKING

The concrete mix design shall be such as to minimise plastic settlement and shrinkage cracking.

### Maximum Aggregate Size

The maximum size of aggregate which shall be used in the structure shall be 20mm aggregate. Approval is to be sought for any mix in which the maximum aggregate size is required to vary from this.

## 1.33. QUALITY CONTROL

All concrete shall be supplied by manufacturers with a quality management system in place to at least the requirements of AS 1379.

The Contractor shall register the project with the manufacturer to receive production assessment information. The Contractor shall review and ensure that the production assessment results compare with the acceptance criteria of AS 1379 and AS 3600 and shall immediately pass the results with his comments on to the Superintendent.

All concrete delivered to the site shall be subject to project assessment for slump, compressive strength and any other tests specified.

The Contractor shall nominate a Concrete Delivery Supervisor who shall be a suitably experienced person to the approval of the Superintendent, to monitor the delivery and placing of the concrete for each pour on the project who shall prepare a daily report on all concrete placed. This report shall contain the serial numbers of the identification certificates of each batch, the amount of water, if any, added prior to commencement of discharge and the project assessment carried out during the day. The report should record where each batch was placed on the project, the method of placement and the climatic conditions during the pour.

## 1.34. READY-MIXED CONCRETE

Except where specified otherwise the concrete for every part of the works shall be supplied as ready-mixed concrete.

Ready-mixed concrete shall be supplied in accordance with AS 1379, except where modified by this specification.

The supplier of ready-mixed concrete shall be approved by the Superintendent prior to the commencement of the works. Ready mixed concrete shall be delivered in agitating trucks.

The Contractor shall ensure that the supplier of ready-mixed concrete will permit inspection of the plant and require that each batch of ready-mixed concrete be accompanied by an identification certificate in accordance with AS 1379 and containing the following additional information.

If a special class performance concrete, details of the specified performance and the type of cement binder.

If a special class prescription concrete, details of the mix and additives and the type of cement binder.

If required by the Superintendent, the manufacturer is to provide figures for the weight of cement binder and the designed volume of water required for the mix to reach its required properties for each supplied mix.

These identification certificates shall be retained by the Contractor as a record of all ready-mixed concrete delivered and this information shall be available to the Superintendent on request including records of where each batch was placed in the works. The Contractor should record any addition of water made at the site together with the name of the Concrete Delivery Supervisor.

The method of placement of the concrete by the Contractor must be nominated to the concrete manufacturer in order that the mix can be designed to be placed with the properties specified under the performance requirements of this specification.

The concrete suppliers shall inform the Contractor of any changes in the concrete mix likely to affect the performance of the concrete in the plastic or hardened state.

## 1.35. TRANSPORTATION

The concrete shall be transported from the ready-mixed truck or site mixing plant to its final position as rapidly as possible by means which will prevent segregation or loss of materials and contamination and in such a way

that the proper placing and compaction of the concrete will not be adversely affected. The plastic concrete is to be discharged to the formwork within the following time periods for concrete of various temperatures.

| CONCRETE TEMPERATURE at time of placement | MAXIMUM ELAPSED TIME from charging of mixer to discharge |
|---|---|
| Less than 10°C | not permitted |
| 10°C - 24°C | 2 hours |
| 24°C - 27°C | 1 hour 30 minutes |
| 27°C - 30°C | 1 hour |
| 30°C - 32°C | 45 minutes |
| greater than 32°C | not permitted |

The Superintendent may extend these times in special circumstances provided that the concrete complies with the specified performance requirements, including slump.

## 1.36. MIXING IN AN EMERGENCY

Under no circumstances will hand mixed concrete be permitted.

## 1.37. PUMPED CONCRETE MIXES

Pumped concrete shall only be used if approved by the Superintendent. Prior to approval being given full details of the proposed mix shall be submitted to the Superintendent for examination. The Contractor shall take full responsibility for the adequacy of the concrete mix so that the concrete can be pumped to its appropriate location and shall achieve the performance requirements set down in this Specification.

## 1.38. RE-TEMPERING

Concrete which has commenced to harden prior to placement will not be accepted.

## 1.39. HOT WEATHER MIXING

When the temperature exceeds 32 deg C the concrete shall be supplied at a temperature not exceeding 32 deg C by employing one or more of the following procedures:

(a) The use of chilled mixing water

(b) The addition of ice to the mixing water (no ice particle shall remain by the time of discharge of the concrete)

(c) Cooling of the coarse aggregate by shading and/or cold water spraying of the stock piles.

In those critical elements which are shown on the contract drawings as requiring special treatment to minimise cracking the concrete shall not be delivered at a temperature exceeding 18 deg C. This may be achieved by employing one or more of the abovementioned procedures.

## 1.40. CONCRETE PLACING

### General

This section of the Specification for concrete sets out the requirements for the placing of concrete in all concrete members.

### Responsibility

The Contractor shall be wholly responsible for the placing of the concrete in accordance with this Specification and the associated contract documents and in such a manner that the performance requirements set out in this Specification are met.

### Inspections

The Contractor shall give sufficient notice, and in any case not less than 24 hours, to the Superintendent of the placing of any concrete.

## 1.41. TRANSPORTING

The concrete shall be transported from the ready-mixed truck or site mixing plant to its final position as rapidly as possible by means which will prevent segregation or loss of materials and contamination and in such a way that the proper placing and compaction of the concrete will not be adversely affected.

The Contractor shall receive approval from the Superintendent for the use of pumping equipment and lines to transport the concrete.

## 1.42. PLACING

The concrete shall not be placed if the slump as measured in accordance with this Specification is not within the required limits.

The concrete shall not be placed at a time or under such conditions which will not permit the standard of concrete required by this Specification to be attained.

The concrete shall be placed in such a manner as to avoid segregation or loss of materials. Where necessary, the Contractor shall deposit the concrete through enclosed chutes or where allowed by the Superintendent through access hatches. These chutes shall be kept as vertical as possible and shall be kept as far as practicable full of concrete with their lower ends immersed in the newly placed concrete. The depositing of a large quantity of concrete at any point with the intention of moving it along the forms will not be permitted.

The use of clean troughs, chutes and pipes to aid in depositing concrete to its final position shall be permitted provided that they are kept clean and free of any coating of hardened concrete. The use of pumps and

pneumatic equipment shall be first approved by the Superintendent. The use of water to facilitate the movement of concrete along the troughs, chutes or pipes shall not be permitted.

The concrete placing shall be carried out continuously between construction joints and in such a manner that a plastic edge is maintained. Where the location of construction joints is shown on the contract drawings the construction joints shall neither be relocated nor eliminated without the approval of the Superintendent. Where no construction joints are shown on the contract drawings and such are required their location shall be to the approval of the Superintendent.

Before concrete is deposited against hardened concrete at construction joints the joint surfaces of the hardened concrete shall be thoroughly scabbled and cleaned so that all soft material, all foreign matter and all laitance are removed.

The concrete shall be placed in horizontal layers not more than 300 mm thick and each layer shall be compacted before the preceding layer has taken its initial set.

Concrete shall not be placed in wet trenches, wet forms or in running water.

## 1.43. COMPACTION

The concrete shall be thoroughly compacted by means of mechanical vibration and hand methods and shall be carefully worked around the reinforcement and embedded fixtures, under waterstops and into the corners of the formwork.

The coarse aggregate shall be worked back from the forms to bring a full surface of mortar against the form without the formation of excessive surface voids. The compaction shall be such that all air or stone pockets which may cause honeycombing, pitting or places of weakness are eliminated. Where specific off-form surfaces are specified, it will be necessary for the Contractor to ensure uniform compaction procedures and times and to implement high quality concreting techniques.

Vibrators shall not be used to transport concrete within the forms and shall not be placed in contact with freshly hardened non-plastic concrete or reinforcement which is embedded in it.

Vibrators shall be capable of transmitting vibration to the concrete at frequencies between 8,000 to 12,000 impulses per second and shall visibly affect the concrete at a radius of 300 mm.

The Contractor shall provide at least one vibrator for each 5 cubic meters of concrete placed per hour with a minimum of 2 vibrators.

Form vibrators shall be used only with the approval of the Superintendent.

## 1.44. CONCRETE PUMPING

Pumping shall be used for placing concrete only with the approval of the Superintendent. The Contractor shall ensure that the equipment to be used will permit the concrete being placed with the properties specified under the performance requirements of this Specification.

## 1.45. PROTECTION

Freshly cast concrete shall be protected from premature drying and excessively hot or cold temperatures. The Contractor is to take due regard of climatic conditions likely to increase the likelihood of plastic cracking such as hot, dry or windy conditions. He is to inform the supplier of the conditions under which the concrete will be placed. If the temperature of the surrounding air is higher than 35°C, suitable barriers shall be erected to protect the freshly placed plastic concrete from wind and sun until the concrete has hardened sufficiently to allow covering. Freshly finished concrete shall be protected from physical or thermal shock and traffic likely to damage the surface, including damage from rain.

## 1.46. CONCRETE SAMPLING AND TESTING

### General

This section of the Specification for concrete sets out the requirements for the sampling and testing of concrete for all concrete members.

The sampling and testing in this section are required to satisfy the quality control requirements of the Specification.

The acceptance and rejection criteria to be applied to the results of the concrete tests shall be those listed in the Specification.

The sampling and testing of all concrete shall be in accordance with AS 3600, Concrete Structures Code, except where modified by this Specification.

All aspects of sampling, site treatment and testing of concrete specimens shall be carried out by NATA registered laboratory and personnel. The Contractor shall allow for the whole of the costs involved in this Section.

### Location of Sampling

All concrete samples shall be taken at the site adjacent to the location of placing the concrete.

### Method of Sampling

Sampling and identification shall be carried out in accordance with AS 1012, Part I, Method of Sampling Fresh Concrete.

### Sampling Procedures

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested and the details of the sampling techniques shall be kept on record with the test results.

### Frequency of Sampling

The minimum frequency of sampling of the concrete of each type shall be in accordance with AS 1379 and is repeated in part here:

| Nº of Trucks per Pour | Nº of Samples |
|---|---|
| 1 | 1 |
| 2 to 5 | 2 |
| 6 to 10 | 3 |
| 11 to 20 | 4 |
| for each additional 10 | 1 additional sample |

For designated critical elements sampling frequency for strength testing shall be one sample per batch. Where requested by the Superintendent, testing facilities are to be available on site at agreed times during a pour.

### Size of Sample

The size of the sample shall be such that the number of test specimens required by the complete list of performance requirements can be obtained from it.

## 1.47. TEST SPECIMENS

### General

The frequency of taking specimens from the concrete samples for the testing of the various performance requirements of the concrete shall be as listed below.

Generally, at least three specimens shall be taken from the sample to represent a particular property and they shall be prepared in accordance with the relevant Section of AS 1012.

Records shall be kept and be made available to the Superintendent on request of all aspects of the Project Assessment. These records shall provide the full history of sampling and testing of all specimens.

### Test for Characteristic Compressive Strength F'c

At least three specimens shall be made concurrently from each of the samples required by the specification and these shall be taken and tested in accordance with the relevant part of AS 1012.

One cylinder shall be tested at 7 days and two cylinders at 28 days.

### Slump

From each of the samples of concrete required by the specification a slump test specimen shall be prepared and tested in accordance with AS1012, Part 3. The criterion for compliance with the performance requirements of this specification shall be specified.

### Drying Shrinkage

In addition to at least two initial sets of results on trial mixes, the manufacturer shall sample and test for drying shrinkage each type of concrete supplied, at least every three months during the course of the project or for every 3000 cubic meters placed, and provide reports. Alternatively, where specified in the schedule the concrete supplied to the project shall be sampled and tested for drying shrinkage by the manufacturer at the nominated frequency, and reports provided to the Superintendent.

For assessment of shrinkage three specimens shall be taken in accordance with AS 1012 Part 13 from the concrete sampled in accordance with AS 1012, Part 1. The assessment of drying shrinkage shall be on the basis of the average of the three specimen test results. The criterion for compliance shall be as specified in this specification.

## 1.48. TEST RESULTS

NATA Test Certificates shall be forwarded to the Superintendent immediately they are available. The results of these tests shall also be kept in tabulated form on the site.

## 1.49. FINISHES TO UNFORMED CONCRETE SURFACES

The unformed surfaces of each concrete member shall be finished in accordance with the Schedule of finishes and the relevant contract drawings. The description of the required finishes and the special requirements relating to them are detailed in this Section.

## 1.50. FINISHES AS LAID

### Generally

The finishes described in the following sub-clauses are those produced by the working of the surface of the concrete while it is still in its plastic condition.

### Floor Screeds and Granolithic Topping Type 1

The top surface of the concrete specified to take screed or topping may be left in a "Screeded" condition in the areas where no higher degree of finish (steel troweled, etc.), is required. Cast in all wire ties in the areas shown on the drawings, and scabble all surfaces as necessary prior to placing applied finishes.

To surfaces and set downs specified to take graded screed in Kitchens and Toilet areas, cut in 'U' shaped 3mm diameter galvanised wire stirrups 50mm wide x 65mm high with hooked ends embedded 40mm into structural slab at 600mm centres both directions to connect screed to slab.

The screeded surface shall have a maximum deviation of + 12mm and - 0mm from correct position with a maximum relative deviation of 1:750.

The concrete shall be placed, struck off, consolidated and leveled to a class C tolerance.

### Steel Troweled Finish Type 2

Concrete surfaces shall be finished integral with the floor slab in one operation, where scheduled.

After screeding, wood floating shall not be started until the moisture film has disappeared from the surface and the concrete has hardened enough to prevent excess fine material and water from being worked to the surface. The surface shall then be wood floated, and a steel troweled finish applied. The surface shall be re-troweled as many times as necessary to obtain a hard, glossy appearance. The final troweling shall be at such a time that considerable pressure is necessary to make any impression on the surface. The finished surface shall be free from any troweled marks, uniform in texture and appearance, and shall be planed to a Class A tolerance.

Under no circumstances shall Portland cement or other driers be sprinkled onto the surface and troweled in to absorb surplus water. Any laitance brought to the surface by compaction or troweling shall be removed without disturbing core aggregate.

The finished surface shall have a maximum deviation from correct position of + 5mm -0mm with a maximum relative deviation of 1:750.

All joints and discontinuities are to be ground flush.

### Floors with Admixtures Type 3

For treatment to floors requiring special hardness, dust proofing, stain proofing and non-slip properties, refer Supplement Section (if required).

### Location of Floor Finishes

Unless otherwise shown on the Drawings the various floor finishes shall be generally provided where indicated on the following schedule:

| | |
|---|---|
| Type 1 | floor slabs to receive waterproof membranes, topping shown on structural and architectural drawings, and graded screed. |
| Type 2 | floor slabs integrally finishes, and to all areas to receive sheet vinyl, lino floor covering and parquetry. |
| Type 3 | floors treated with admixtures as listed in the Supplement Section, if required. |

## 1.51. APPLIED SEPARATE FINISHES

### Generally

Refer to Tiling and Paving Section of the Specification for separate applied finishes on concrete surfaces.

## 1.52. FINISHES TO FORMED CONCRETE SURFACES

### General

This section of the Specification for concrete sets out the requirements for the finishes to the formed surfaces of all concrete members.

### Responsibility

The Contractor shall be wholly responsible for the provision of the finishes in accordance with this Specification and the associated contract documents and for the preparation of the concrete surfaces as to ensure the integrity of finish and concrete member.

### Codes

Finishes shall be to the requirements of AS 3610, except where modified by this Specification.

### Schedule of Finishes

The formed surfaces of each concrete member shall be finished in accordance with the schedules of the relevant clauses of this specification and contract drawings. The description of the required finishes and the special requirements relating to them are detailed in this section.

### "Off-Form" Finishes

The finishes described in the following sub-clauses are those directly resulting from the formwork to the surfaces of the concrete element.

### Plain Finishes

These are as listed in this Specification.

### Tolerance of Finish

The surfaces of all finishes to concrete shall be within true planes within the tolerances specified in Section 3.4 of AS 3610. SAA Formwork Code. The trueness of such surfaces shall be determined by placing of a 3 meter long straight edge anywhere on the surface and the measurement of the deviation of the surface from it.

## 1.53. CONCRETE CURING AND PROTECTION

### General

The requirements of AS 3600 shall apply except where modified by this Specification.

### Curing

Freshly cast concrete shall be protected from premature drying and excessively hot or cold temperatures. In windy conditions, wind breaks shall be erected to shield the concrete surfaces during and after placement. The concrete shall be maintained at a reasonably constant temperature with minimum moisture loss for the curing period. Curing methods which do not conform to the requirements of this Specification shall not be used without the prior approval of the Superintendent.

### Curing Methods for Normal Conditions

During the curing period one of the following methods shall be adopted by the Contractor for the curing of the unformed surfaces of each concrete member. Where formed surfaces are exposed during the curing period then these also shall be cured by one of these methods for the remainder of the curing period. PVA compounds shall not be used.

(a) Ponding or continuous sprinkling with water.

(b) The use of an absorptive cover kept continuously wet.

(c) The use of an impermeable sheet membrane over a moistened surface so fixed and lapped that no air circulation can occur at the concrete surface.

(d) The use of a low pressure steam curing in accordance with agreed principles.

Curing compounds will not be permitted unless approval is obtained from the Superintendent.

## Curing Methods for Abnormal Conditions

The requirements specified for curing under normal conditions shall apply except as follows:

### Hot Weather Curing

When the temperature of the surrounding air during curing is higher than 32 deg C the concrete shall be cured only by means shown in this specification.

## Curing Period

Curing shall commence immediately after initial set of the concrete and shall continue for seven days thereafter. Rapid drying out at the end of the curing period shall be prevented. Adjacent sections of visually important concrete and each member of identical precast members shall be identically cured to achieve uniformity in colour and dimensional consistency.

## Curing Compounds

When curing compounds permitted by the Specification are used, they shall be applied in accordance with the Manufacturer's instructions and shall not be used on any surface until the successful completion of the following tests:

(a) Tests for curing efficiency.

(b) Tests to provide that discolouration of off-form or other special surfaces will not occur due to the compound or interaction between it and any additive, form coatings or release agents.

(c) Tests to show that the adhesion of any applied finish will not be adversely affected by the compound.

Curing compounds shall conform to AS 3799.

## Protection

The concrete shall be protected from damage due to load over-stresses, heavy shocks and excessive vibrations particularly during the curing period. Construction load shall not be placed on self-supporting structures which will overstress them. The Contractor shall provide calculations for examination by the Superintendent to justify the adequacy of the structure to sustain any construction loads.

### Surface Protection - Generally

All finished concrete surfaces shall be protected from damage from any cause such as construction equipment, materials or methods and by rain, running water or wind.

### Surface Protection - Particular

Completed "off-form" concrete surface shall be protected from mortar splashes during subsequent pours by fitting a suitable protection apron to the forms prior to placing subsequent concrete or by other equivalent methods.

Starter bars, miscellaneous metal work and other exposed reinforcement shall be protected to prevent rusting and the subsequent staining of completed concrete surfaces caused by water run-off. Timber used in contact with a completed surface shall be cleared from areas where run-off on to finished concrete can occur. The area of any pour shall be checked to ensure that all debris, pieces of metal reinforcement and timber off-cuts, shavings and sawdust have been removed. Chemical and other stain removal methods shall not be used as an alternative method to prevention of stains on finishes concrete surfaces.

## 1.54. ACCEPTANCE CRITERIA FOR AND REJECTIONS OF CONCRETE

### General

Concrete which has been specified shall satisfy certain performance requirements and concrete which has been tested for such performance in accordance with this specification shall be deemed to comply if the criteria specified in this Clause are satisfied. When the concrete fails to satisfy these criteria it will be liable to rejection.

Nevertheless, the Superintendent may allow the rejected concrete to be retained on the basis of a structural investigation or such additional tests as outlined in AS3600 or as the result of approved remedial work. All costs associated with the acceptance of work that has been found liable to rejection shall be met by the Contractor.

Where concrete work has been finally rejected it shall be removed to the extent determined by the Superintendent. Generally, this extent will not exceed the whole of the concrete between adjacent construction joints which contain the deficient concrete.

### Acceptance Criteria

Characteristic Compressive Strength F'c

The concrete shall be deemed to comply with the strength requirements of this specification if its characteristic strength complies with AS 1379.

### Slump

The slump shall be deemed to comply if it lies within the specified tolerances. Concrete found to have slump outside these tolerances shall be removed from the site unless the Superintendent's nominated representative allows adjustment by water addition prior to discharge. Under no circumstances is the total amount of water added to exceed the designed volume of water for the mix to achieve its required properties.

### Drying Shrinkage

The criterion for compliance with the drying shrinkage of the specification shall be that the average test result for drying shrinkage of the three specimens shall not exceed the specified value.

### Colour and Finish

Any part of the concrete construction shall comply with the specified requirements for colour and finish for that part if in the opinion of the Superintendent its surface colour and finish lies within the colour and finish range of the test panels.

### Other Rejection Criteria

Hardened concrete shall also be liable to rejection if any of the following defects occur:

a) It does not comply with AS 3600 Clause 19.1.10.2

b) A construction joint has been made at a location or in a manner not in accordance with this specification

c) The construction tolerances have not been met

d) The reinforcing steel has been displaced from its correct location

e) Waterstops, inserts and other items embedded in concrete have been displaced from their correct position

f) The required surface finish has not been achieved

g) The concrete work can be shown to be otherwise defective.

## 1.55. SLAB ON GROUND

Form, reinforce and pour the slab on the ground as shown on the drawing.

Reinforcement to be securely propped during concreting to ensure final cover. The use of concrete blocks at 1000mm c/c is recommended. Lifting or hooking of reinforcement during concreting is not permitted.

Provide Smorgon or similar approved 250-micron thickness, high impact resistant, damp proof membrane as an underlay to all concrete laid on ground.

Place the underlay over the prepared base. Lap up over the edge of formwork. Ensure the underlay folds down into beam trenches and laps up over the top of the formwork. Lap underlay at least 200mm at joints. Continuous taping of joints is required. Then cut the underlay, turn up and tape around all drainage pipes. Place a piece over the top to prevent debris entering and tape to turned up underlay.

# 1.56. QUALITY ASSURANCE TESTING - CONCRETE

## Quality Assurance Program

The Contractor shall establish, document and maintain a Quality Assurance Program to be used throughout the Contract to ensure that the quality of the Contractor's and subcontractors work complies with the requirements of the Contract Documents including:

Procedural checks that are carried out as a normal procedure of the Contractors workmanship to ensure the works comply with the specification.

Quality Verification checks which include those tests/checks that are mandatory for compliance with the Technical Specification.

## Quality Assurance Statement

The Contractor is required to produce a Quality Assurance Statement which details the Quality Control Procedures to be implemented by the Contractor during construction of the works to demonstrate to the Superintendent that all the work complies with the requirements of the Technical Specification. The statement shall be compiled fortnightly and shall provide a continuous record of the quality verification procedures through all phases of the work. It is a requirement that statements be submitted by the Contractor to the Superintendent 2 days after the fortnightly period.

## Independent Testing Authority

Unless otherwise specified any testing required by the Contract to be by an independent authority shall be carried out by an approved member of the National Association of Testing Authorities Australia (NATA).

## Proforma Quality Verification Checklist

Example proforma checklists are to be submitted by the Contractor with his Tender. The Contractor shall submit for approval by the Superintendent checklists for all building trades including off-site manufacture of components to be included in the works. The checklists shall form part of the Quality Assurance Statement specified above. Should extra checklists be required, the Superintendent shall advise, and these shall be included, without variation to the contract.

Such checklists shall cover all aspects of formwork design and erection, reinforcement placement, concrete production and placement, curing etc. The Contractor is to ensure that all components of the work be signed off by the direct workforce or sub-contractor and signed by the Contractor upon his inspection.

## Control Testing by Superintendent

Notwithstanding the above, the Superintendent reserves the right to take whatever samples and carry out whatever testing he considers necessary to satisfy himself the requirements of the Specification are being adhered to. The Contractor shall provide free of charge whatever assistance, whether plant or labour, the Superintendent may request to assist the Superintendent with the carrying out of testing and/or the obtaining of samples.