



DEVELOPMENT CONSTRUCTION SPECIFICATION

CQS

QUALITY SYSTEM REQUIREMENTS

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
<i>EXAMPLE 1</i>	<i>Provision for acceptance of nonconformance with deduction in Payment</i>	<i>XYZ.00</i>	<i>AP</i>	<i>KP</i>	<i>2/6/97</i>
1	Measurement and Payment Pay Items	CQS27	O	JRM	18/10/00

SPECIFICATION CQS QUALITY SYSTEM REQUIREMENTS

GENERAL

CQS1 SCOPE

1. This Specification covers the contractual requirements for the Quality System documentation and operation.

CQS2 PREAMBLE

1. The Contractor shall establish, implement and maintain a Quality System in accordance with this Specification and the requirements of AS/NZS 3905.2 and AS/NZS ISO 9002

Standards

2. The Quality System as expressed in the Quality Plan shall be used throughout the course of the Contract to ensure that the quality of the Contractor's and any sub-contractor's work complies with the requirements of the Contract Documents. This shall apply to all work under the Contract, both on site and off site.

**Applicable to
Work On and
Off Site**

3. Notwithstanding any statements to the contrary in the Contractor's Quality Manual or Quality Plan, no part of the Quality System shall be used to pre-empt, preclude or otherwise negate the requirements of any part of the Contract Documents. Quality System elements shall be used as an aid in achieving compliance with the Contract Documents and documenting such compliance. In no way shall they relieve the Contractor of his responsibility to comply with the Contract Documents.

**Compliance
with Contract
Documents**

CQS3 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

**Documents
Standards Test
Methods**

AS/NZS 3905.2 -	Guide to AS/NZS ISO 9001, AS/NZS ISO 9002 and AS/NZS ISO 9003 for construction.
AS/NZS 3913 -	Quality manuals - Guide to preparation.
AS/NZS ISO 8402	Quality management and quality assurance - Vocabulary.
AS/NZS ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing.
AS/NZS ISO 10013	Guidelines for developing quality manuals.
SAA QS5 -	Guide to the assessment and auditing of quality management systems

2. Clause references shown on the right margin (keyword column) relate to AS/NZS ISO 9002 and are referenced in AS/NZS 3905.2 unless otherwise stated.

CQS4	DEFINITIONS	Synonym or Abbreviation
1.	For the purpose of this Specification, the definitions as in AS/NZS 3905.2 and AS/NZS ISO 8402 and those below apply:	
	Corrective Action	
	Measures, including preventative measures, taken to rectify conditions which have caused or might cause nonconformity.	Corrective Action
	Corrective Action Request	
	A formal advice/instruction from the Superintendent regarding departures from the Quality System or Methods as approved in the Quality Plan. Unless specifically noted, it will not require raising of a Nonconformance Report.	CAR
	Disposition	
	Action to be taken to resolve nonconformance. (Lot Specific)	Rectification
	Hold Point	
	A defined position in the construction/manufacturing stages of the Contract beyond which work shall not proceed without mandatory verification and acceptance by the Superintendent.	HP
	The issue of a Nonconformance Report (NCR) or a Notice of Nonconformance (NNC) automatically creates a Hold Point.	
	Inspection and Test Plan	
	The working document which identifies the specific inspections and tests to be carried out for works required by the Contract.	ITP
	Lot	
	A lot consists of any part of the works which has been constructed/manufactured under essentially uniform conditions and is essentially homogeneous with respect to material and general appearance.	
	The whole of the work included in a lot shall be of a uniform quality without obvious changes in attribute values.	
	Method Statement	
	A document that specifies the key steps and sequence in the manufacture/construction for an activity; what, how and by whom it shall be done; what materials and equipment shall be used to achieve the required quality standards.	<ul style="list-style-type: none"> - Procedures - Technical Procedures - Process Descriptions - Specific Procedures
	Nonconformance Report	
	A mandatory (standard format) report submitted by the Contractor that details the nonconforming work and the Contractor's proposed disposition of the nonconformance.	NCR
		Synonym or

	Abbreviation
<p>Notice of Nonconformance</p> <p>Formal instruction from the Superintendent regarding product nonconformance from that specified. It automatically creates a Hold Point and requires a Nonconformance Report from the Contractor.</p>	NNC
<p>Performance Audit</p> <p>An examination to evaluate whether established methods and procedures are being adhered to in practice.</p>	<ul style="list-style-type: none"> - Process Audit - Technical Procedure Audit - Methods Audit
<p>Product Audit</p> <p>An assessment of the conformity of the product with the specified technical requirements.</p>	<ul style="list-style-type: none"> - Conformance Audit - Service Audit
<p>Quality Assurance</p> <p>The management actions covering planning, quality control testing, inspection and verification procedures integrated with production to provide a product fit for the purpose.</p>	QA
<p>Quality Assurance Representative</p> <p>Appointed by the Principal for a specific project and responsible for the auditing, review and surveillance of procedures and documentation required by the Contractor's approved Quality Plan.</p>	QAR
<p>Quality Check Lists</p> <p>Forms completed during the manufacture/construction process verifying key steps, and records required for the Quality Register. Check lists apply to each identified lot of work.</p>	
<p>Quality Management Representative</p> <p>Appointed by the Contractor for a specific project with the authority and responsibility for the implementation and operation of the Quality Plan, to ensure that Quality System requirements are not subordinated to design and productivity.</p>	QMR
<p>Quality Manual</p> <p>A document setting out the general quality policies, procedures and practices of an organisation.</p>	QM
<p>Quality Plan</p> <p>The Quality Assurance documentation specific to a Contract which comprises of the Corporate Quality Manual with its job specific annexures, method statements, inspection and test plans and check lists.</p>	QP
	Synonym or Abbreviation

Quality Register

The files containing all quality control records such as test results, completed check lists, certificates of compliance, consignment dockets for materials procured.

QR

Quality System Elements

The administrative activities affecting quality that need to be implemented and controlled to ensure that the product or a service meets specified quality requirements.

**- System Element
- Quality Management Element**

Special Processes

Those processes, the results of which cannot be directly examined to establish full conformance. Assurance of satisfactory conformance depends on evidence generated during the process.

System Audit

An examination of the documented Quality System represented by the Quality Manual, Quality Plan and Quality Register to evaluate their effectiveness in meeting the requirements of Australian Standards and the Specification.

Witness Point

A nominated position in the manufacture/construction stages of the Contract where the option of attendance may be exercised by the Superintendent, after notification of the requirement.

WP

CQS5 ABBREVIATIONS

1. Abbreviations used in this specification are:

- CAR - Corrective Action Request
- CQS - Contract Quality System
- HP - Hold Point
- ITP - Inspection and Test Plan
- NATA - National Association of Testing Authorities
- NCR - Nonconformance Report
- NNC - Notice of Nonconformance
- QA - Quality Assurance
- QAR - Quality Assurance Representative (Principal)
- QM - Quality Manual
- QMR - Quality Management Representative (Contractor)
- QP - Quality Plan
- QR - Quality Register
- SED - System Element Description
- WP - Witness Point

QUALITY MANUAL AND QUALITY PLAN

CQS6 QUALITY MANUAL

1. The Company Quality Manual shall cover and include the requirements as specified in the Quality System Documentation section of AS/NZS 3905.2 with guidance

to preparation by AS/NZS 3913 and AS/NZS ISO 10013.

2. It shall incorporate all applicable System Element Descriptions with reasons for those not regarded as applicable. Additionally it should include standard Method Statements and Inspection and Test Plans for the activities usually undertaken by the Contractor. It would be normal to have these in separate volumes.

SEDs

CQS7 QUALITY PLAN

1. The Quality System shall be incorporated in the project Quality Plan. The Company Quality Manual with its System Element Descriptions, standard Method Statements and Check Lists and the project specific components make up the Quality Plan. This is illustrated conceptionally in Figure CQS1.

Content of QP

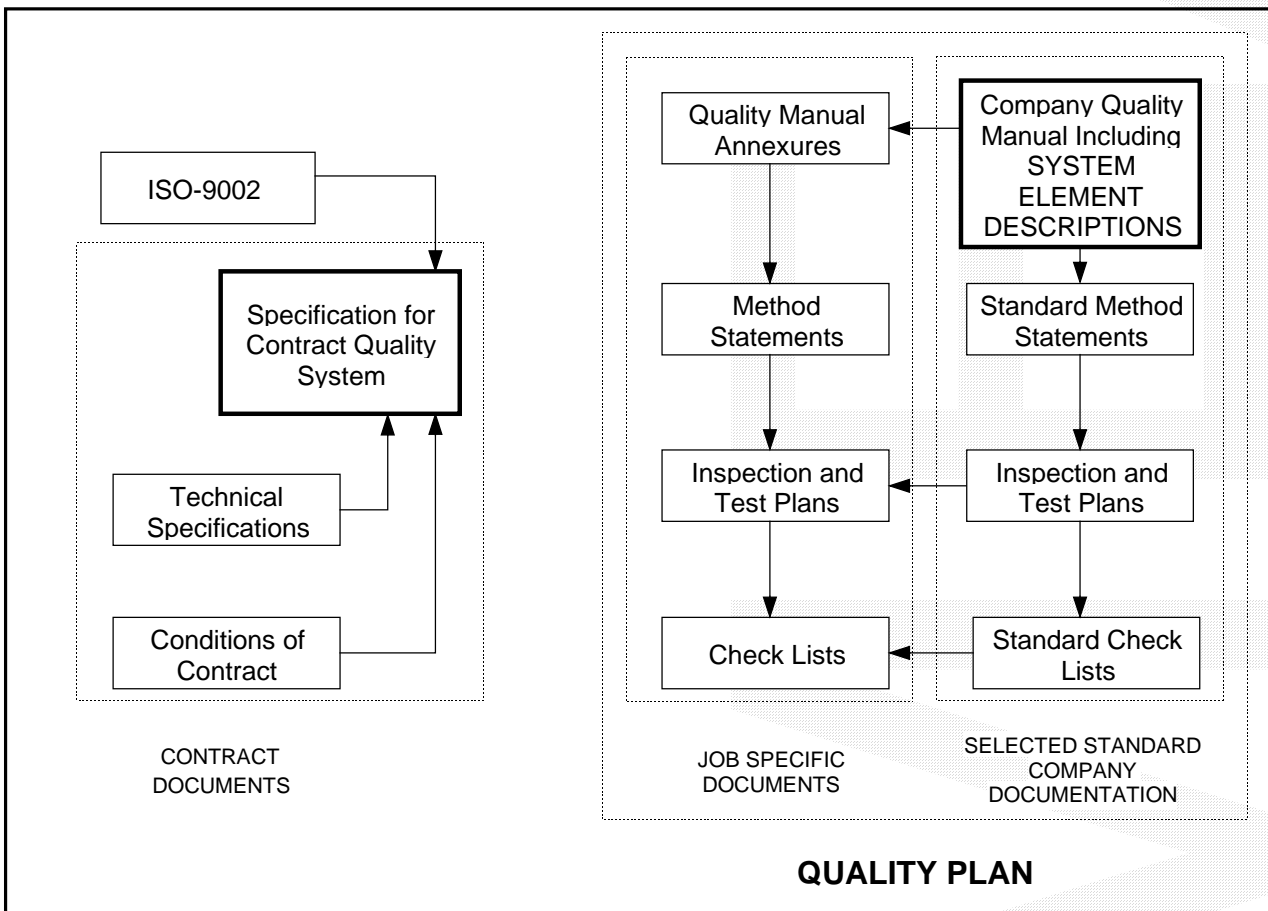


Figure CQS1 - Project Quality System Documentation

CQS8 ANNEXURES TO QUALITY MANUAL

The following details shall be provided by appropriate annexures to the Company Quality Manual:

CQS8.1 Organisation Structure

- The organisation structure for the management of the project with details of the specific responsibilities and authorities of the nominated key personnel. **Structure**
- The Quality Management Representative (QMR) including this person's qualifications, technical experience and present position together with responsibilities and authorities to resolve quality matters. **QMR**
- The personnel or contracted testing organisations who will be conducting each type of compliance inspection of testing of completed works, their experience, qualification and responsibilities. **Personnel**
- The person authorised to change construction processes on site. **Authority for Changes**

CQS8.2 Addendums to System Element Descriptions

The System Element Descriptions in the Company Quality Manual shall be augmented with suitable addendums to satisfy the requirements of this Specification. **Additional SEDs**

CQS8.3 Register of Method Statements

A Register of Method Statements giving the title, identifier and revision status, shall be provided. This Register shall list all Method Statements that are to be included in the Quality Plan for the Contract and shall include any suitable Method Statements already incorporated in the Company Quality Manual. **Content**

JOB SPECIFIC REQUIREMENTS

CQS9 GENERAL

1. In the Quality Plan, the System Element Descriptions in the Company Quality Manual will need augmentation to cover the requirements of AS/NZS ISO 9002, AS/NZS 3905.2 and this Specification. This shall be provided in the form of suitable Annexures or where applicable included in the Method Statements or Inspection and Test Plans.

Clause 4.9

CQS10 METHOD STATEMENTS

1. Method Statements shall be provided for all activities scheduled in Annexure CQS-B. This requirement applies to both contract and subcontracted work. The documentation shall cover, as applicable, planning, methods, verification and control. **Documentation**

2. The presentation of Method Statements may be either descriptive, in the form of flow charts or a combination of both. In either case it must be accompanied by a Check List which shall include the relevant inspection and test points, surveying control points and Hold Points and the officer responsible to verify each check point. **Presentation**

3. A system audit of each Method Statement shall be carried out by the Contractor whilst the process is in effect. **System Audit**

4. The absence of a Method Statement for activities where it has been specified will automatically create a **Hold Point**. **Requirement**

CQS11 DOCUMENT CONTROL

Clause 4.5

1. In addition to the requirements of AS/NZS ISO 9002 AS/NZS 3905.2, the Quality Plan shall specify the method of keeping Quality Registers, tracking and handling of NCRs and NNCs and site correspondence. **Records**

2. A copy of AS/NZS 3905.2 and AS/NZS 9002 shall be kept on site. **AS on Site**

CQS12 MEASURING AND TESTING EQUIPMENT

Clause 4.11

1. The Quality Plan shall include the latest NATA advice of the terms of registration and current signatories for the laboratories which will be providing the compliance test reports. **NATA Registration**

2. Inspection, testing and measuring equipment shall be capable of producing the precision and/or degree of accuracy specified in the referenced Test Methods and this shall be demonstrable by records of calibration. **Equipment Accuracy**

CQS13 PURCHASING

Clause 4.6

1. Except where the contract documents already stipulate another quality system standard for specific products or services, the quality assurance provisions detailed in this Specification shall apply to all subcontracted products or services which constitute work under the Contract. **CQS to Cover All Work**

2. The Contractor shall ensure that the requirements of AS/NZS ISO 9002, AS/NZS 3905.2 and the requirements of this clause are included in all such subcontracts. **Subcontracts**

CQS14 INSPECTION AND TEST PLANS

Clause 4.10

CQS14.1 Documentation

1. The Quality Plan shall include all inspections, tests and documentation necessary to ensure that the Works comply with Contract Documents. **General Inclusions**

CQS14.2 Sampling and Testing

1. All compliance inspections and tests shall be based on lots. **Lots**

2. The Inspection and Test Plans shall include details of the sampling methods. Sampling shall not be restricted to locations dimensioned or otherwise defined for setting out the Works in the Drawings or Specification, but shall be undertaken in a random or unbiased manner, as approved by the Superintendent, at any location within the Works to demonstrate its compliance with the Specification. **Random Sampling**

3. The maximum lot sizes and minimum testing frequencies are listed in the Annexures to the relevant Specifications and/or in Annexure CQS-C to this Specification. Where no minimum frequency of testing, or maximum lot size is stated in the Specification, the Inspection and Test Plan(s) shall nominate appropriate frequencies for the Superintendent's approval. **Lot Sizes Frequency of Testing**

4. The Inspection and Test Plans shall also uphold any time limits for testing which may be imposed by the Technical Specifications.

Time Limits

5. Where Test Methods are nominated in the Technical Specifications, sampling and testing shall be carried out by a NATA registered laboratory accredited for those test methods and sampling procedures. Sampling shall be conducted by personnel from the NATA registered laboratory which has been accredited for that sampling procedure and shall be supervised by the approved signatory from that laboratory. Test results shall be reported on NATA endorsed test documentation which shall include a statement by the approved signatory certifying that the correct sampling procedures have been followed.

Sampling and Testing

6. In special circumstances the Principal may accredit a laboratory that is not NATA registered for specific tests or inspection procedures.

Special Accreditation

7. Every testing agency or person providing written test reports for any and all testing undertaken shall use unique consecutive project specific serial numbering of the reports for identification and auditing purposes.

Consecutive Numbering

8. The Contractor shall reinstate all core holes, test holes, excavations and any other disturbance resulting from any testing activity. The reinstatement shall be to a standard which is at least equal to the specified requirements for the particular work.

Reinstatement

9. The responsibility for completion of inspections, tests and documentation shall be stated in the Quality Plan.

Testing Responsibility

CQS14.3 Hold Points

1. To assure compliance with the specified standards and requirements, mandatory Hold Points shall apply. Hold Points are those stages during the construction/manufacturing process where the Technical Specifications require "approval by the Superintendent" or where a NCR or NNC has been issued. The Contractor shall not proceed past the HP until approval has been received from the Superintendent to proceed. For ease of identification Hold Points may also be annotated on the margins of Technical Specifications.

Superintendent's Approval to Proceed

2. To obtain the approval to proceed from the Superintendent, the Contractor shall:

Requirements for Approval to Proceed

- provide the information required by the Technical Specifications
- ensure and certify that the particular lot/process is conforming;
- ensure and certify that all underlying and adjacent lots affected by the lot in question are conforming;
- submit the appropriate form (Check List, NCR or NNC) at least 24 hours prior to the time the Contractor wishes to proceed with the placement/construction of the next lot, unless some alternative arrangements have been agreed with the Superintendent.

3. If the HP has resulted from a NCR or NNC, the Superintendent's approval may be conditional on a Witness Point being included.

Witness Point

CQS14.4 Content

1. As a minimum, the Inspection and Test Plans shall contain the following information:

Information to be Provided

- item number/lot type reference(s)
- activity description
- specification requirements or where impractical: specification reference

- sampling method
- test method
- test frequency

2. Inspection and Test Plans will typically have an associated Check List which shall require completion for each particular lot.

Check List for Each Lot

CQS15 INSPECTIONS

1. Incoming inspections shall be required for deliveries of materials that will be subsequently included in one or more lots. When completing Check Lists for particular Lots the inspection status shall be cited.

Clause 4.10.2

2. In-process and compliance inspections shall be completed by a responsible officer nominated in the Check List and certified by the Contractor's QMR indicating that the work has been completed in accordance with the Contract Documents.

Clause 4.10.3

3. The Contractor shall establish and maintain a system to ensure and demonstrate that all products or parts of products requiring inspection and/or testing are so inspected and/or tested.

Clause 4.10.3

4. The Contractor shall also establish and maintain a system for identifying the inspection status for all lots of work.

Clause 4.10.4

CQS16 IDENTIFICATION

Clause 4.8

CQS16.1 Lots

1. All items of work shall be subdivided into lots.

2. Lots shall be chosen by the Contractor but shall be within the limits given in Annexure CQS-C. In general, the size of the lot shall not exceed one day's output for each work process designated for lot testing.

Lot Size

3. Lot numbers shall be used as identifiers on all Quality System data.

Lot Numbers

4. The Contractor shall determine the bounds of each lot before sampling and shall physically identify each lot clearly. The physical identification of a lot shall be maintained until the Contractor has ensured that the lot has achieved the specified quality.

Lot Identification

CQS16.2 Lot Numbering

1. Each lot shall be given a unique lot number. The allocation of lot numbers shall be carried out by the Contractor to suit the circumstances, provided the lot numbering system complies with the following requirements:

Numbering System

- the lot number shall be entered in the Quality Register which shall provide at least the following information:
 - three dimensional location of the lot (chainage of the start and finish points, lateral location and layer location) and/or the particular structure (eg. pier or abutment number, pour number)
 - indication of conformance or nonconformance
 - summary of test results (eg. characteristic value) and
 - location of test sites, test identification numbers and test results
- for nonconforming lots a new number, or numbers, shall be allocated to the resubmitted/subdivided lot(s), but reference shall be maintained to the original lot

Non-conforming

number.

**conforming
Lots**

CQS16.3 Lot Identification

1. To ensure all site personnel can readily identify where the particular lots are in the field, the Contractor shall implement a field identification system which will clearly identify the bounds of each lot and the lot number. This identification system shall be detailed in the Quality Plan and shall be maintained during all stages of construction of the lot.

**Field
Identification**

2. The boundaries of a lot may be changed if subsequent events cause the original lot to be no longer essentially homogeneous. This will require appropriate notation in the Quality Register by the QMR.

**Lot
Boundaries**

CQS17 TRACEABILITY

Clause 4.8

1. The lot identification system, site records and sample numbering system shall allow test results to be positively identified with material incorporated in the works.

2. Traceability is required for concrete loads, asphalt loads and steel plate as follows:

**Materials for
Traceability**

- (a) Concrete used in bridge components, cast-in-place box culverts, retaining walls, road pavement subbase and base. Asphalt used in wearing courses, intermediate courses and drainage layers.

The trace shall start at the batch plant and finish at the location where the concrete or asphalt is incorporated in the Works. Records shall be kept of the batch quantities, mix and despatch time, testing details and location of placement.

- (b) Steel plate in bridge girders and bridge columns.

The trace shall start at the steelworks and finish at the location of the plate in the girder or column. Records shall be kept of the steel heat number, testing details and location of the plate in the girder or column.

CQS18 SURVEYING CONTROL

1. Surveying Control shall be treated as a separate System Element and shall include all measurement, calculation and record procedures necessary to:

Requirements

- (a) set out the Works
- (b) verify conformance to the Drawings and Specification in relation to dimensions, tolerances and three dimensional position,
- (c) determine lengths, areas or volumes of materials or products, where required for measurement of work.

2. The Method Statements for Surveying Control shall address the process control parameters in AS/NZS 3905.2 for special processes which cannot be fully verified by subsequent inspection and test.

Clause 4.9

3. The Contractor shall appoint qualified surveyors who are eligible for membership of the Institution of Surveyors, Australia or the Institution of Engineering and Mining Surveyors, Australia to supervise and take responsibility for all Surveying Control.

**Surveyor
Qualifications**

4. The procedures and equipment used must be capable of attaining the tolerances nominated in the Specification.

Equipment

- | | | |
|-----------------------------|--|--|
| 5. | Sampling for conformance verification purposes shall not be restricted to the locations used to set out the Works. | Sampling Locations |
| 6. | The Contractor shall submit a Survey Conformance Report for each lot or component where design levels, position and/or tolerances have been specified. The Survey Conformance Report shall show 'specified vs actual' for position (defined by coordinates or chainage and offset), level and tolerance as appropriate and shall be certified by the qualified surveyor responsible for the verification survey. | Conformance Report |
| 7. | Where work is to be covered up after conformance has been achieved, a HOLD POINT shall apply until the Survey Conformance Report has been submitted. | Submission of Report |
| 8. | All survey records shall be included in the Quality Records and recorded in the Quality Register. Verification field book pages shall be clearly labelled, dated and signed by the surveyor with cross indexed references to equipment used, lot/component identification and associated Survey Conformance Reports. Where automatic data recording systems are used for verification surveys, a printout of both raw (field) data and reduced data shall be retained in a similar manner as conventional field books. | Quality Register |
| CQS19 RECORDS | | Clause 4.16 |
| 1. | The Contractor shall keep and maintain all Quality System records as required by AS/NZS ISO 9002, AS/NZS 3905.2 and this Specification. They shall be systematically recorded, indexed and filed so as to be retrievable and accessible to the Superintendent or an appointed Quality Auditor on a job basis within one working day of requisition. | Quality Register |
| 2. | Conformance records shall be stored and maintained such that they are readily retrievable and in facilities that provide a suitable environment to minimise deterioration or damage and to prevent loss. | Storage |
| 3. | The Contractor shall make the quality records available to the Superintendent at all reasonable times. If requested by the Superintendent, the Contractor shall provide copies of the records or test results at no cost to the Principal. | Copies of Records Contractor's Cost |
| 4. | If requested by the Principal, within one month from the date of Practical Completion, the Contractor shall provide the Superintendent with a copy of the Quality Register, or parts thereof. | Finalisation |
| CQS20 NONCONFORMANCE | | Clause 4.13 |
| 1. | All nonconforming works detected by the Contractor's Quality System shall be reported to the Superintendent via a Nonconformance Report within one working day of being detected. Nonconformance Reports shall be submitted with all records which indicate a departure from the requirements of the Contract Documents. The NCR shall indicate the proposed disposition. | NCR Within One Day |
| 2. | If the disposition of the nonconformance cannot be determined within one working day, the Contractor shall submit a partially completed NCR identifying the nonconformance. | |
| 3. | The nonconforming product shall not be covered up unless a disposition has been accepted/approved by the Superintendent and implemented by the Contractor. | Disposition |
| 4. | Where nonconformance can be overcome by simply reworking the lot with the original process, a NCR will be required but a Hold Point will not apply. | Reworking |
| 5. | With the exception of circumstances described in paragraph 3 above, a NCR will automatically create a HOLD POINT which shall apply until conformance has been | Authorisation to Proceed |

achieved and the Superintendent has signed the Authorisation to Proceed.

6. The Superintendent will issue a Corrective Action Request (CAR) when he detects nonconformance to the Contractors Quality System or Methods. Unless specifically stated, this will not create a Hold Point.

CARs

7. Where the Superintendent's inspections, surveillance or audits detect product nonconformance, he will issue a Notice of Nonconformance (NNC). This will immediately create a Hold Point and the Contractor is required to submit an NCR in accordance with this Clause.

NNCs

8. In instances where there is a discrepancy between the test results obtained by the Superintendent and those provided by the Contractor, the results from the Superintendent shall prevail except where the Superintendent may determine a specific audit test procedure to resolve the discrepancy.

Inspection and Rectification

9. The Contractor shall utilise the standard form for use as an NCR. This form is included as Annexure CQS-D to this specification. All actions shall be signed off by authorised representatives of the Contractor and Superintendent as applicable.

Standard Form

10. The Contractor shall establish a suitable numbering and registration system for all NCRs and NNCs, including cross referencing as required.

Register of NCRs & NNCs

11. The Contractor shall nominate a proposed disposition for any nonconformance within five working days or shall show cause to the Superintendent for any further delay. Under no circumstances will the deliberation on disposition of a nonconformance justify an extension of time to the Contract period.

Disposition in 5 Days

CQS21 DISPOSITION OF NONCONFORMANCE

Clause 4.13.2

1. The Contractor shall advise the Superintendent in the NCR of the proposed disposition of the particular nonconformance. This proposed disposition will constitute corrective action for the lot or lots referred to in the NCR and may comprise one of the following:

Proposed Disposition

- (a) propose additional works to bring the lot up to the specified standard; or
- (b) replace all or part of the lot to bring it up to the specified standard; or
- (c) request utilisation of a lot for a reduced level of service if such a clause exists in the relevant Technical Specification; or
- (d) for incidental defects, request that the Superintendent accept the lot without alteration as an exception with or without alteration to the respective unit rates.

2. Any proposed disposition shall be subject to the approval of the Superintendent. Reworked/replaced lots shall be verified to conform to the specified requirements.

Clause 4.14.2

CQS22 CORRECTIVE ACTION

1. The Contractor will be required to indicate on the NCR corrective action appropriate to ensure that the Quality Plan is effective in avoiding recurrence of the nonconformance and continues to be effective.

QP Corrective Action

CQS23 STATISTICAL TECHNIQUES

Clause 4.20

1. Random sampling techniques shall be used for each lot for the control of compaction of each continuous layer of earthworks, flexible pavement and asphalt.

Random Sampling

- 2. Annexure CQS-A defines the method to be used for determining test locations of random sampling in each lot. **Test Locations**
- 3. Annexure CQS-C lists the maximum lot sizes and minimum test frequencies for the specified activities. **Lot Sizes and Test Frequencies**
- 4. For compaction control of processes other than layers of earthworks, flexible pavement and asphalt, the sampling procedure will be proposed by the Contractor in his method statement and will require the approval of the Superintendent. In such cases the samples shall be each considered to be representative and all test results will be required to meet the appropriate tolerances for the lot. **Sampling Procedure for Compaction**

CQS24 QUALITY AUDITS

Clause 4.17

- 1. The Contractor's Quality Audit Schedule shall be included in the project Quality Plan. Guidance for the requirements of the auditing process is given in SAA QS5. **Audit Schedule**
- 2. The Audit Reports shall be provided for the Superintendent. **Audit Reports**

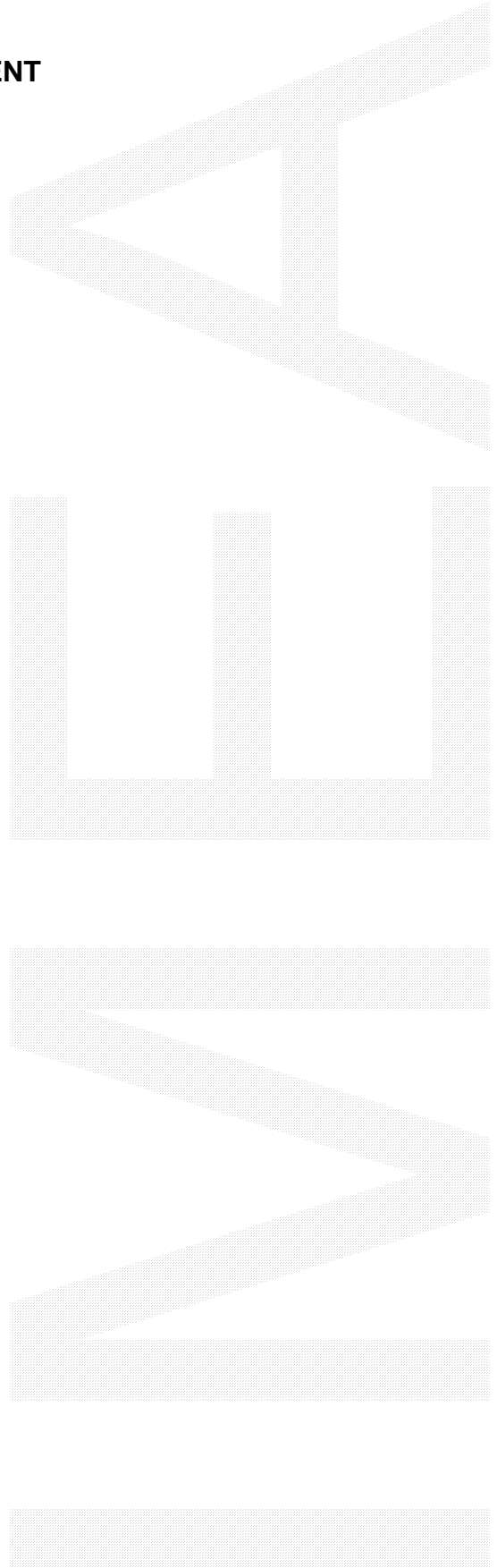
SPECIAL REQUIREMENTS

CQS25 RESERVED

CQS26 RESERVED

MEASUREMENT AND PAYMENT

CQS27 RESERVED



ANNEXURE CQS-A

RANDOM SAMPLING

CQS-A1 GENERAL

1. Random sampling of test locations shall be used to control relative compaction of each layer of:

- (i) earthworks
- (ii) selected material zone
- (iii) flexible pavement
- (iv) asphalt
- (v)
- (vi)
- (vii)

which are generally rectangular in area.

2. By arrangement with the Superintendent, areas which are not (generally) rectangular may be notionally rearranged to suit the method of determining sample locations as described in hereunder.

CQS-A2 SAMPLING RATES

1. The number of samples (n) per lot shall not be less than shown in Table CQS-A1.

LOT SIZE	MINIMUM NUMBER OF SAMPLES PER LOT	
	Each continuous layer of earthworks	Each continuous layer of selected material zone or pavement layers
> 5000m ²	The greater of: 6 samples or 1 sample per 2000m ²	The greater of: 10 samples or 1 sample per 1000m ²
1000m ² to 5000m ²	5	The greater of: 5 samples or 1 sample per 500m ²
200m ² to 1000m ²	3	3
< 200m ²	1	1

Table CQS-A1 - Sampling Rates

CQS-A3 RANDOM SAMPLING LOCATIONS

1. Sampling locations within a lot for the control of relative compaction shall be determined as follows:
 - (i) Representing the lot as a rectangle, sub-divide the lot lengthwise into equi-area sub-lots in accordance with the number of samples selected (n) in accordance with Table CQS-A1.
 - (ii) Establish six grid lines within the lot, as illustrated in Figure CQS-A2;
 - (iii) Throw a die to select a number between 1 and 6. This determines which grid line to use for the sample location in sub-lot 1;
 - (iv) Throw die to select a group (1-6) in Table CQS-A2;
 - (v) Throw die twice to select two random numbers (between 1 and 6) for row and column in Table CQS-A2 and obtain random fraction R;
 - (vi) Length co-ordinate for sample location in Sub-lot 1 = RL/n ;
 - (vii) For sample location in next sub-lot:-
 Add L/n to previous length co-ordinate.
 Add 1 (on a cycle of 6) to previous grid line.

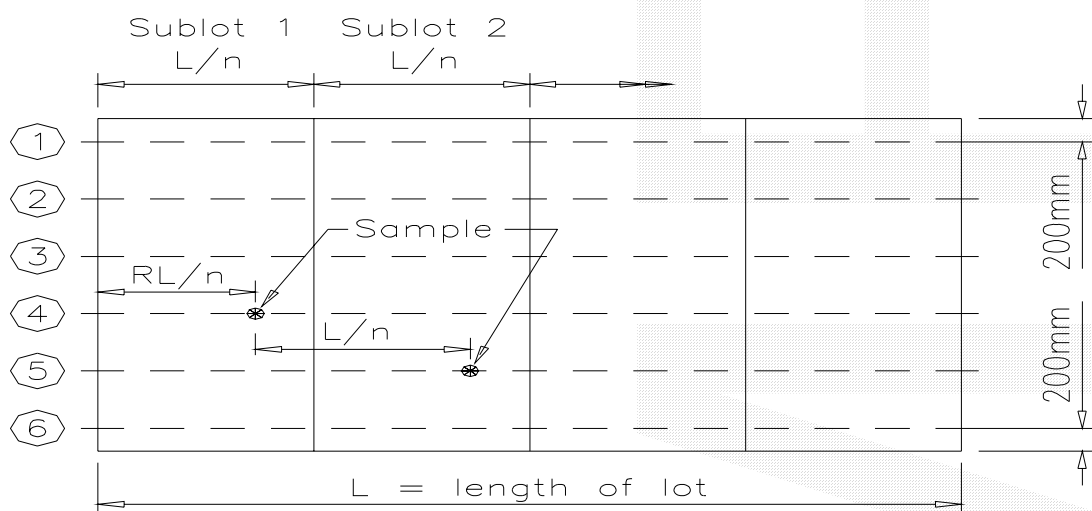


Figure CQS-A2 Sampling Locations for Rectangular Lot

GROUP	ROW	COLUMN					
		(1)	(2)	(3)	(4)	(5)	(6)
(1)	(1)	0.78178	0.45467	0.00347	0.27296	0.00020	0.36517
	(2)	0.59678	0.67931	0.25434	0.59054	0.32444	0.41504
	(3)	0.14464	0.17269	0.61154	0.18291	0.83242	0.50776
	(4)	0.89010	0.44764	0.07451	0.20428	0.49513	0.91440
	(5)	0.91941	0.47726	0.33160	0.30670	0.65114	0.36852
	(6)	0.51085	0.38148	0.22169	0.66578	0.67050	0.69559
(2)	(1)	0.81891	0.48626	0.88892	0.82994	0.16941	0.81528
	(2)	0.37410	0.60232	0.12070	0.79017	0.32981	0.34908
	(3)	0.45921	0.15648	0.58052	0.37413	0.08124	0.97145
	(4)	0.86614	0.94719	0.78872	0.91972	0.45149	0.15107
	(5)	0.26590	0.41140	0.95477	0.81267	0.24018	0.07324
	(6)	0.95205	0.39438	0.73697	0.59427	0.71146	0.00575
(3)	(1)	0.18694	0.36502	0.17828	0.84312	0.57003	0.58583
	(2)	0.91211	0.86936	0.43030	0.27672	0.47393	0.10342
	(3)	0.80714	0.34295	0.00775	0.90855	0.33368	0.21842
	(4)	0.67579	0.92686	0.18005	0.00645	0.11256	0.05278
	(5)	0.03184	0.69876	0.16676	0.43346	0.86992	0.03275
	(6)	0.15623	0.02905	0.72763	0.19095	0.80847	0.39729
(4)	(1)	0.72109	0.17970	0.22505	0.35561	0.98935	0.27818
	(2)	0.37348	0.19381	0.43331	0.75033	0.99963	0.42232
	(3)	0.12129	0.32386	0.56705	0.87165	0.84460	0.92955
	(4)	0.54948	0.08844	0.47061	0.78419	0.18731	0.93485
	(5)	0.15097	0.44967	0.48759	0.84161	0.19212	0.05146
	(6)	0.32360	0.66850	0.99382	0.94050	0.96449	0.96217
(5)	(1)	0.68091	0.54191	0.10910	0.94237	0.23161	0.15167
	(2)	0.97121	0.83626	0.70896	0.45296	0.69475	0.11264
	(3)	0.19723	0.98260	0.57429	0.94789	0.64457	0.20809
	(4)	0.84036	0.14095	0.29451	0.40256	0.34521	0.64924
	(5)	0.97500	0.98056	0.82276	0.97130	0.77329	0.89855
	(6)	0.83244	0.30828	0.06882	0.68471	0.71081	0.91649
(6)	(1)	0.75892	0.29685	0.70044	0.91238	0.53356	0.45239
	(2)	0.13229	0.19701	0.36074	0.32254	0.62045	0.26691
	(3)	0.34789	0.22179	0.91891	0.87651	0.91011	0.97469
	(4)	0.97211	0.68943	0.12831	0.50006	0.20793	0.61151
	(5)	0.24954	0.17809	0.56093	0.51524	0.69135	0.68967
	(6)	0.10062	0.11852	0.47089	0.64765	0.44644	0.35548

Table CQS-A2 - Table of Random Fractions

ANNEXURE CQS-B METHOD STATEMENT REQUIREMENTS

CQS-B1 GENERAL

1. Method Statements are required to describe the key steps and sequence in the construction activities, how and by whom each step shall be undertaken and what materials and equipment shall be used. Method Statements may include a flow chart to clarify the sequence of key steps. One or more Method Statements may address a Construction Activity.
2. Each Method Statement will be supported by a Check List which shall identify relevant inspections, test points, materials requirements and Hold Points. Each requirement on the Check List will have an officer responsible identified and will require the nominated officer to sign off the requirement so indicating its satisfactory execution.
3. Method Statements and Check Lists shall be compatible with the appropriate Inspection and Test Plan. Check Lists will be completed for each lot of work during construction and compiled with other documents to comprise the Quality Register.
4. The Contractor shall submit Method Statements and Check Lists to describe the key steps in those Construction Activities listed below that are identified with a preceding asterisk (*).

Table CQS-B1 - Construction Activities

Item	Enter * here if required	Activity	Specification Number
1		Control of Traffic	C201
2		Temporary Roadways and Detours	C201
3		Control of Erosion and Sedimentation	C211
4		Clearing and Grubbing	C212
5		Earthworks - Cut	C213
6		Earthworks - Unsuitable Material	C213
7		Earthworks - Embankment	C213
8		Compaction and Quality Control	C213
9		Siting, Excavation, Bedding, Backfilling and Compaction of Stormwater Drainage	C220
10		Installation of Pipe Drainage	C221
11		Installation of Precast Box Culverts	C222
12		Siting and Installation of Drainage Structures	C223
13		Construction of Lined Open Drains including Kerb and Gutter	C224
14		Stabilisation of Pavement or Subgrade Materials	C241
15		Provision of Subsurface Drainage as subsoil drains, pavement drains or free draining layer	C230-C233
16		Construction of Flexible Pavement Layers	C242
17		Construction of Concrete Pavement Layers	C247-C248
18		Construction of Asphaltic Concrete Pavement Layers	C245

ANNEXURE CQS-D

NONCONFORMANCE REPORT

NCR No:

EXAMPLE

Date:

CONTRACT:.....

PRODUCT OR SERVICE:

SUB-CONTRACTOR (if appropriate):.....

INSPECTION & TEST PLAN No:

LOT No & DESCRIPTION/LOCATION:.....

DETAILS OF NONCONFORMANCE:

PROPOSED DISPOSITION:

IS A SUPPLEMENTARY REPORT ATTACHED: YES NO

CLIENT APPROVED COMMENT:

REJECTED

CLIENT SIGNATURE:..... DATE:

DISPOSITION COMPLETED (CONTRACTOR)..... DATE:

RELEASE OF HOLD POINT (CLIENT)..... DATE:

CLOSE OUT OF NONCONFORMANCE REPORT:

CONTRACTOR QMR:..... DATE:

SPECIFICATION CQS - CONTRACT QUALITY SYSTEM REQUIREMENTS

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