

0161 QUALITY (CONSTRUCTION)

1 GENERAL

1.1 RESPONSIBILITIES

Objectives

General: Establish, implement and maintain a quality management system (QMS) that provides confidence to the Principal of the following:

- The product specified can be produced.
- Critical processes are under control.
- Product performance has been confirmed.

Performance

~~Requirements: [complete/delete]~~

Design

~~Designer: [complete/delete]~~

~~Authority requirements: [complete/delete]~~

1.2 CROSS REFERENCES

General

- Requirement: Conform to the following:
- *0136 General requirements (Construction).*
- *0152 Schedule of rates – supply projects.*

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS 1289	Methods of testing soils for engineering purposes
AS 1289.1.4.1-1998	Sampling and preparation of soils-Selection of sampling or test sites-Random number method
AS/NZS ISO 9000: 2006	Quality management systems-Fundamentals and vocabulary
AS/NZS ISO 9001: 2008	Quality management systems-Requirements
AS/NZS ISO 10005: 2006	Quality management systems-Guidelines for quality plans
AS ISO 10013: 2003	Guidelines for quality management system documentation
AS/NZS ISO 19011: 2003	Guidelines for quality and/or environmental management systems auditing

1.4 STANDARDS

General

Standard: To AS/NZS ISO 9001.

1.5 INTREPERTATION

Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- CAR: Corrective Action Request.
- ITP: Inspection and Test Plan.
- NATA: National Association of Testing Authorities.
- NCR: Nonconformance Report.
- NNC: Notice of Nonconformance.
- QAR: Quality Assurance Representative (Principal).
- QMR: Quality Management Representative (Contractor).
- QMS: Quality Management System.
- WAE: Work-as-executed.

Definitions

For the purpose of this worksection, the definitions given in AS/NZS ISO 9000 and the following apply:

- Certification: A written assertion of facts.
- Corrective action request: A formal advice/instruction from the Superintendent requesting action to eliminate the cause of a detected nonconformity or other undesirable situation. Unless specifically noted, it will not require raising of an NCR.
- Disposition: Action taken to resolve nonconformance. (Lot Specific)
- Hold Point: A defined position during the Contract beyond which work can not proceed without mandatory verification and acceptance by the Superintendent. The issue of an NCR or a 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.
- Lot: Any part of the works which has been constructed/manufactured under a continuous operation of uniform conditions and is essentially homogeneous with respect to material and general appearance. The whole of the work included in a lot of a uniform quality without obvious changes in attribute values.
- 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.
- Notice of nonconformance: Formal instruction from the Superintendent regarding product nonconformance from documented requirements. It automatically creates a Hold Point and requires an NCR from the Contractor.
- Performance audit (Process audit, Technical procedure audit, Methods audit): An examination to evaluate whether established methods and procedures are being adhered to in practice.
- Product: The result of a set of interrelated or interacting activities which transforms inputs into outputs.
- Product audit (Conformance audit, Service audit): An assessment of the conformity of the product with the specified technical requirements.
- Qualified surveyor: A surveyor who is eligible for membership of the Spatial Sciences Institute as a certified engineering surveyor.
- Quality assurance representative (QAR): 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.
- Quality check lists: 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.
- Quality management representative (QMR): Also known as Project quality representative, 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 QMS requirements are not subordinated to design and productivity.
- Quality register: The files containing all quality control records such as test results, completed check lists, certificates of compliance, consignment dockets for materials procured.
- Quality management system: The organisational structure, responsibilities, procedures, processes and resources for implementing quality management.
- Quality management system requirements: The administrative activities affecting quality that need to be implemented and controlled to make sure that the product or a service meets documented quality requirements.
- 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 management system represented by the quality manual, quality plan and quality register to evaluate their effectiveness in meeting the requirements of Australian Standards and the Contract documents.

- Validation: Confirmation, through the provision of objective evidence, that requirements for a specific intended use or application have been fulfilled.
- 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.
- Works: All labour, plant, equipment and materials required to complete a project in conformance with the Contract documents.

2 QUALITY MANAGEMENT SYSTEM

2.1 GENERAL REQUIREMENTS

Conformance

Work on and off-site: Conform to the QMS described within the Quality Plan including products and services for all works under the contract.

Contract documents: The QMS does not pre-empt, preclude or otherwise negate the requirements of any part of the contract documents.

Responsibility: QMS requirements do not relieve the Contractor of the responsibility to conform with the contract documents.

Subcontractors and Suppliers: Conform with this worksection and AS/NZS ISO 9001.

This can be achieved by either of the following:

- Suppliers and Subcontractors operating their own QMS, linked to and coordinated under the Contractor's QMS.
- Suppliers and Subcontractors operating under the Contractor's QMS.

System requirements

QMS: Plan, develop and maintain a documented QMS conforming to this worksection, **Annexure A** and AS/NZS ISO 9001.

System purpose: To make sure of the following:

- The proposed work method is consistent with the specification requirements.
- ITPs and checklists are adequate and complete.
- Approved work methods are followed.
- The Superintendent adequately checks Hold and Witness Points.

Format: If the format of the QMS documents differ from the format of AS/NZS ISO 9001, provide a matrix outlining how the documented requirements are addressed by the QMS.

Management responsibility

Commitment: In the development a corporate QMS in conformance with AS/NZS ISO 9001 section 5, top management must perform the following:

- Focus on customer, statutory and regulatory requirements.
- Define authorities and responsibilities.
- Appoint QMR.
- Establish internal communication and review procedures.
- Make sure resources are available.

2.2 DOCUMENTATION REQUIREMENTS

General

QMS documentation requirements: Include the following:

- Quality policy and its objectives.
- Quality manual.
- Procedure documents.
- Work instructions.
- Forms.

- Quality plans.
- Specifications.
- Relevant external documents.
- Records.

Changes: Immediately implement changes to the project Quality Plan and QMS if the following occurs:

- Specification requirements are not adequately addressed.
- Nonconformity resulting from the Quality Plan or QMS.
- Audit initiates changes to the QMS.
- Practices have changed.
- Records: Provide copies of any quality records within 14 days of request.

AS/NZS ISO 9001: Keep a copy on site at all times.

Quality manual

Requirement: To AS/NZS ISO 9001 clause 4.2.2 and AS/NZS ISO 10013 clause 4.4.

Include the following in the Quality Manual:

- Responsibility statements.
- Corporate policy.
- All applicable system requirement descriptions with reasons for those not regarded as applicable.
- Standard method statements.
- Standard ITPs.

Project Quality Plan

Requirement: Provide and maintain a Quality Plan to AS/NZS ISO 9001 and AS/NZS ISO 10005. Provide the following:

- Progressive documentation of new procedures as the work types become evident.
- Planning and control systems: Describe critical processes and activities and provide verification for product control.
- Coordination with the Contractor's corporate Quality Manual.
- Project specific quality system: Inform and direct personnel about the specific quality practices, resources, sequence of activities, controls and checks that must be implemented during the works.
- Controlled conditions: Documentation to explain how each work process will be carried out.
- Organisation structure: Include details of the specific responsibilities and authorities of the key personnel nominated for the management of the project.
- QMR: Include the person's qualifications, technical experience and present position, together with responsibilities and authorities to resolve quality matters.
- Details of 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.
- Details of the person authorised to change construction processes on site.
- ITPs to verify the works conform with the contract documents.
- Purchasing quality requirements:
 - . Critical characteristics of purchased products that affect the quality of the final product.
 - . Method of communication with suppliers.
 - . Methods used to evaluate, select and control suppliers.
 - . The facilities and services that will be outsourced.
 - . Material samples: The approved sample is the quality benchmark.
- Purchasing quality verification: Conform to the following worksections:
 - . 0162 Quality (Supply).
 - . 0163 Quality (Delivery).

~~Additional system elements: [complete/delete]~~

~~Staged quality plan: [complete/delete]~~

Control of documents

Document control: Conform to AS/NZS ISO 9001 clauses 4.2.3 and 4.2.4 and AS/NZS ISO 10005 clauses 5.6 and 5.7.

Register: Maintain a register of each part of the Quality Plan. Register the number, date and recipient(s). Reissue to all registered when the Quality Plan is changed, superseded or recalled as required.

Requirement: Document within the Quality Plan the method of keeping quality registers, tracking and handling of NCR's, NNC's and site correspondence.

Quality register: Implement and maintain systematic records, indexed and filed so they are retrievable and accessible to the Superintendent or an appointed quality auditor within one working day of request.

Register of method statements: Provide a register listing all method statements (both standard and job specific) including the title, identifier and revision status.

Location: State in the quality plan where records are to be located.

WAE: Keep records of any amendments to design details for inclusion in WAE drawings.

Quality audit schedule: Include a quality audit schedule with the project quality plan in conformance with AS/NZS ISO 19011.

Audit reports: Provide copies to the Superintendent as requested.

2.3 RESOURCE MANAGEMENT

General

Conformance: Conform to AS/NZS ISO 9001 section 6 and AS/NZS ISO 10005 section 5.8.

Provision of resources: Determine and provide resources for the successful implementation of the project Quality Plan.

Limited availability: If a resource has limited availability, identify how demand from other projects/contracts will be satisfied.

Human resources: Provide personnel with the appropriate education, training, skills and experience for the project.

Infrastructure: Identify, provide and maintain the infrastructure required to achieve product conformity.

Work environment: Establish and manage the work environment to achieve product conformity.

2.4 PRODUCT REALISATION

Planning and design

Planning: Conform to AS/NZS ISO 9001. Determine the following:

- Quality objectives and requirements for the product.
- Processes and documents specific to the product.
- Required verification, validation, monitoring, measurement, inspection, test activities and the criteria for acceptance of the product.
- Records required as evidence that the realisation processes and resulting products conform.

Design: Design and/or verify the following, to conform with the Technical Specifications and AS/NZS ISO 9001:

- Temporary structures.
- Checking of permanent structures for construction loadings.
- Lifting devices for manufactured items.
- Alternative permanent structures or structural components proposed.
- Concrete mixes for structures and pavements and asphalt mixes for permanent works.

- Traffic control, temporary roadways and detours.
- Permanent works where design is nominated in the contract.

2.5 CONSTRUCTION AND SERVICE PROVISION

Control

Method statements: Detail the construction processes for all activities scheduled in **Construction activities table**.

Content: Include the following:

- Sequence of operations.
- Documented procedures and work instructions.
- Types of equipment required, capability, maintenance and calibration.
- Any special working environment requirements.
- Personnel competency and skills required,
- Criteria for workmanship and tolerances.
- Materials required.
- Safety requirements.
- Reference documents.
- Records produced.
- Planning.
- Verification measures.
- Inspection, test and control points.
- Monitoring of continuous suitability.
- Responsibility for implementing and monitoring work process controls and rectifying any deficiencies.

Check list: Provide a checklist, including the relevant inspection and test points, surveying control points, Hold Points, Witness Points and the officer responsible to verify each check point.

System audit: Audit each method statement whilst the process is in effect.

Absence of a method statement: If a method statement for a particular activity is required and there is none submitted, this will generate a Hold Point.

Construction activities table

Worksection	Activity
0257 Landscape – roadways and street trees	Landscaping
0292 Masonry walls	Construction of masonry walls
0293 Crib retaining walls	Construction of crib retaining walls
0319 Minor concrete works	Sprayed concrete
1111 Clearing and grubbing	Selective clearing and proposed equipment Work near trees Work within 4 m of tree
1112 Earthworks (Roadways)	Excavation procedures
1113 Stabilisation	Proposed curing method
1163 Rigid concrete and road safety barrier systems	Precast barriers Installation
1341 Water supply - reticulation (Construction)	Protection of existing services Cutting and disposal of existing asbestos pipe
1361 Sewerage systems – reticulation (Construction)	Protection of existing services
1392 Trenchless conduit installation	Trenchless conduit installation Existing services
1433 Footpath and kerb ramp repairs	Safe work

Lot identification

Lots: Divide all items of work into lots as follows:

- Limits: Before sampling, choose lots within the limits given in the particular technical specification.
- Lot size: Not exceeding one day's output for each work process being testing.
- Lot numbering: Allocate unique lot numbers compatible with the construction program. Use lot numbers to be identifiers on all QMS data.
- Field identification: Physically identify each lot, clearly identify lot boundaries. Maintain identification until the lot has achieved the specified quality.

Work on a lot: Do not commence work until the field identification is established.

Lot boundaries: When boundaries of a lot change, update the quality register.

Lot identification system: Make sure all site records and sample numbering systems allow easy identification of all test results and the materials incorporated in the works.

Traceability

General: Provide and maintain records of components for audit. Include the following traceability in the records:

- Concrete: Start the trace at the batch plant and finish at the location where the concrete is incorporated in the works.
- Asphalt: Start the trace at the batch plant and finish at the location where the asphalt is incorporated in the works.
- Stabilised material: Start trace at the batch plant and finish at the location where the material is incorporated in the works.
- Steel: Start the trace at the steelworks and finish at the location where the steel is incorporated in the works. Record the steel heat number, testing details and final location of installation.
- Batch details: Record all batch quantities, mix and dispatch time, testing details and location of placement.

Control of monitoring and measuring equipment

Equipment accuracy: Maintain inspection, testing and measuring equipment capable of producing the degree of accuracy specified in the referenced test methods.

Records: Demonstrate accuracy with regular records of calibration.

2.6 MEASUREMENT AND ANALYSIS

General

Testing: Conduct testing by a NATA registered laboratory accredited for those test methods and sampling procedures. Include the latest NATA advice of the terms of registration and current signatories within the quality plan.

Sampling: Conduct by personnel from the NATA registered laboratory which has been accredited for that sampling procedure and supervised by the approved signatory from that laboratory.

Test results: Report on NATA endorsed test documentation which includes a statement by the approved signatory certifying that the correct sampling procedures have been followed.

~~Special accreditation: [complete/delete]~~

Reinstatement: Reinstate all core holes, test holes, excavations and any other disturbance resulting from any testing activity to the standard within the Technical Specification.

Lots: All conformance inspections and tests are based on lots. In all cases the samples are considered representative of the lot and all test results are required to meet the appropriate tolerances for the lot.

Sampling locations: Propose sampling locations for approval prior to proceeding.

In-process and conformance inspections: Required for all works to confirm conformance. Performed by a responsible officer nominated in the Check List and certified by the Contractor's QMR

Frequency of testing

Minimum frequency of testing: Must be not less than that stated in the relevant worksection and as listed within the Sub-annexures of **Annexure C**.

Reduced frequency of testing: Submit proposal for approval with supporting statistical analysis verifying consistent conformance to the quality requirements.

Inspection and test plans

Document: Include within the quality plan all inspections, tests and documentation necessary to demonstrate that the works conform.

ITP: Establish and progressively maintain a system to demonstrate inspection and testing in conformance with AS/NZS ISO 9001 clause 8.2.4.

Minimum information for ITP (or ITP forms): Include the following:

- Person responsible for carrying out in-progress and final inspections or testing and at what stage of works these are to be carried out.
- Proposed inspection or test methods and recording of results.
- Acceptance criteria and frequency of inspection and testing.
- Specification tolerances.
- Person responsible for reviewing inspection and test results, evaluating whether work conforms, determining future action when work does not conform and closing out work lots.
- Measures to control nonconformity.
- When statistical analysis of test results is required.
- Person responsible for performing the final review of results to confirm that all inspections and tests have been carried out to verify complete conformity for each lot.
- Time limits for testing, submission, Hold Points and Witness Points that are nominated in the specifications.
- Identification of Hold Points or Witness Points.
- Check list for each lot.

Test Register

- Lot identification register: Include the following information:
- Three dimensional surveyed location of the lot to include the chainage of the start and finish points, lateral location and layer location and/or the particular structure (eg. pier or abutment number, concrete placement number, etc).
- Indication of conformance or nonconformance.
- Summary of test results.
- Location of test sites including test identification numbers.
- For nonconforming lots, allocate a new number to the resubmitted/subdivided lot(s), ensure it also references the original lot number.

Inspection and test status: Show either on the ITP records or physically mark in the field the status of conformance for each lot.

Random sampling

Requirement: Use random sampling techniques for each lot for the control of compaction of each continuous layer of earthworks, flexible pavement and asphalt.

Test locations: Determine test locations for random sampling in conformance with AS 1289.1.4.1.

Location restrictions: Do not restrict sampling to locations dimensioned or otherwise defined for setting out the works in the drawings or specification.

2.7 MONITORING AND MEASUREMENT

Hold points

- Format: A summary of Hold Points are tabled in the **INSPECTIONS** clause of each worksection.
- Notice of inspection: Notify the Superintendent in advance of a Hold Point being reached.

Requirements for approval to proceed: In conformance with the following:

- Provide the information required by the technical specification.
- Certify that the particular lot/process is conforming.
- 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.

Witness point: If the Hold Point has resulted from an NCR or NNC, the Superintendent's approval may be conditional on a Witness Point being included. A summary of Witness Points on-site and off-site are tabled in the **INSPECTIONS** clause of each worksections.

2.8 SURVEYING CONTROL

Requirements

Survey control: A separate system requirement to include all measurement, calculation and recording procedures necessary to:

- Set out the works.
- Verify conformance with the drawings and specification in relation to dimensions, tolerances and three dimensional position.
- Determine lengths, areas or volumes of materials or products, where required for measurement of work.

Method Statement: Describe the control parameters for special processes which cannot be fully verified by inspection and testing. Address all potential errors that could be introduced by survey methods.

Surveyor qualifications: Appoint qualified surveyors to supervise and take responsibility for all surveying control.

Equipment: The procedures and equipment used must be capable of attaining the tolerances nominated in the specification.

Survey locations: Surveying for conformance verification purposes is not restricted to the locations used to set out the works.

Conformance verification surveys: Perform verification surveys as soon as practicable, but not later than one working day after the lot or component has become accessible for survey.

Control of documentation

Survey conformance report: Submit a survey conformance report for each lot or component where design levels, position and/or tolerances have been specified. Refer to the relevant worksection of the technical specification to establish if a Hold Point is generated before further works can commence.

Information required: Indicate the difference between actual and specified values for position and level (defined by co-ordinates or chainage and offset) and provide certification by the qualified surveyor responsible for the verification survey.

Survey records: Provide all survey records including equipment calibration records and nonconformity registers.

Field book pages: Include the following, clear labels, date and signature by the surveyor, cross indexed references to equipment used and lot/component identification. Survey conformance reports produced must reference the relevant field book page numbers.

Retain: Retain any automatically recorded data used for verification surveys, including a printout of both raw (field) data and reduced data.

Audit trail: Prepare procedures to describe the records system, to include, the method of storing and indexing of electronic records and the title of any computer software used for the reduction of survey measurements and calculations.

2.9 CONTROL OF NONCONFORMING WORKS

General

Detection and reporting: Report any works that depart from the documented requirements on a NCR form within two working days of detection, including the proposed disposition. A sample NCR form is included in **Annexure B**.

Extension of time: The deliberation on disposition of a nonconformance does not justify an extension of time to the contract period under any circumstances.

Proposed disposition: Include any of the following actions:

- Proposed additional works to bring the lot up to the specified standard.
- Proposed replacement of all or part of the lot to bring it up to the specified standard.
- A request to use the lot for a reduced level of service, if such a clause exists in the relevant worksection of the Technical Specification.
- For incidental defects, a request that the Superintendent accept the lot without alteration, as an exception with or without alteration to the respective unit rates.

Monitoring and measuring

NCR: Generates an automatic Hold Point until conformance has been achieved and the Superintendent has signed authorisation to proceed.

Progress: Do not cover any nonconforming works until a disposition has been accepted/approved and implemented.

Reworking: If the nonconformance can be overcome by reworking the lot with the original process, an NCR will not be required. However, maintain a record of the nonconformance to aid continual improvement.

Verification: Reworked/replaced lots to conform to the specified requirements.

Discrepancy: The Superintendent's test results will prevail where there is any discrepancy in test results.

Control of documentation

CAR: Issued by the Superintendent for nonconformance to the Contractor's quality system or methods. Unless specifically stated, this will not create a Hold Point.

NNC: Issued by the Superintendent for product nonconformance. This will immediately create a Hold Point and the Contractor is required to submit an NCR.

NCR form: Example form provided in **Annexure B**. If using alternative form it must include the following:

- Details of nonconformance.
- Proposed disposition.
- Provision for attachments.
- QAR comment/approval/rejection.
- Completion of disposition.
- Release of Hold Point.
- Corrective action to improve quality.
- Close out of NCR.

Authorised representative: All actions are to be signed off by authorised representatives of the Contractor and Superintendent as applicable (i.e. QAR and QMR).

Register: Implement and maintain a suitable numbering and registration system for all NCRs and NNCS, including cross referencing as required.

Corrective action

Requirement: Document procedure for corrective action to quality plan in conformance with AS/NZS ISO 9001 clause 8.5.2.

Proposed corrective action: Indicate on the NCR form the corrective action appropriate to ensure that the quality plan is effective in avoiding a recurrence of the nonconformance and continues to be effective.

2.10 COMPLETION**Finalisation**

WAE: Submit WAE drawings for all works upon practical completion.

Register: Submit a copy of the quality register within one month of the date of practical completion. If requested, also provide a copy of all quality records.

Defects liability period: All quality related issues must be resolved and closed out before the end of the defects liability period.

Maintenance

Documents: Provide copies of all:

- Commissioning records.
- Operation manuals.
- Maintenance manuals.
- Product warranties.

Review

Requirement: Organise meeting(s) at end of contract to review the quality system and technical issues encountered on the project and the lessons to be learned for future projects. Review to focus on:

- The identification of nonconformances and the implementation of corrective action.
- Issues arising from inspections and audits.
- Specification issues.
- Design and technical issues.
- Safety issues.

Timing: Hold meeting(s) as close to practical completion as possible, before key personnel move on, so that they are still available to participate in review process.

Documentation: Determine procedures for end of contract review within quality plan.

3 MEASUREMENT AND PAYMENT

3.1 MEASUREMENT**General**

Payments made to the Schedule of Rates: To *0152 Schedule of rates – projects*, this worksection, the drawings and **Pay items 0161.1, 0161.2**.

Unpriced items: If any item, for which a quantity of work is listed in the Schedule of Rates, is not priced, make due allowance in the prices of other items for the cost of the activity.

Methodology

The following methodology will be applied for measurement and payment:

- Progress payments for **Pay item 0161.1** are calculated on the basis of 30% of the Lump Sum when the complete Quality Plan is available and the remainder on pro rata based on the monthly value of work done.
- Progress payments for **Pay item 0161.2** are made pro rata on the monthly value of work done.
- Include any costs associated with preparing and conforming to the supply Quality Plan, see worksection *0162 Quality (Supply)*, in the unit price for product supply.

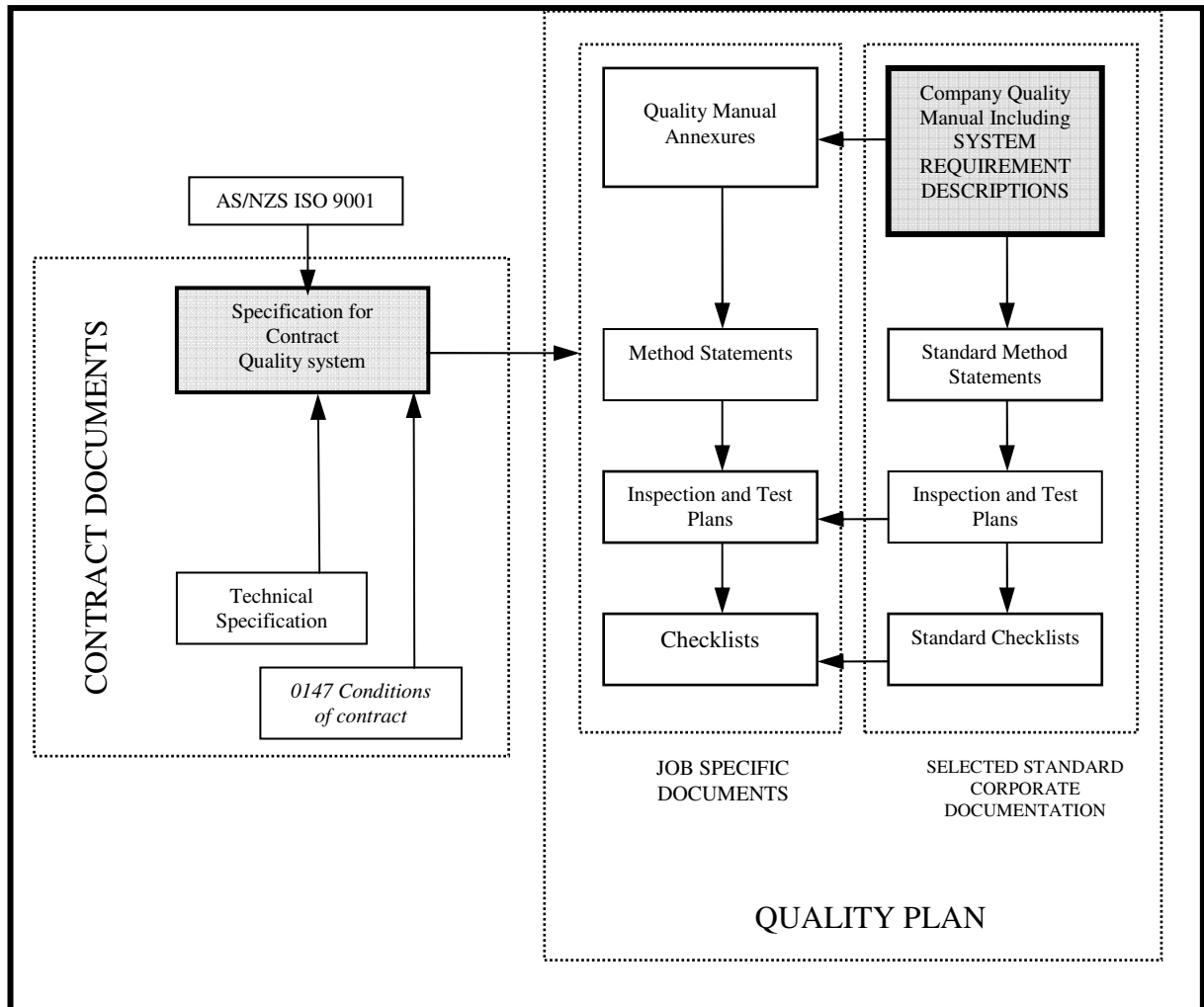
- Include any costs associated with preparing and conforming to the delivery Quality Plan, see worksection 0163 Quality (Delivery), in the unit price for product delivery.

3.2 PAY ITEMS

Pay items	Unit of measurement	Schedule rate scope
0161.1 Quality system documents and records	Lump sum	All costs associated with the preparation and submission of the Quality Plan, the provision of the QMR on site and the maintenance of the quality records during the course of the Contract.
0161.2 Quality verification and control	Lump Sum	All costs for inspections, conformance surveys and testing required to verify that all aspects of the Works conform to the quality assurance provisions of the Contract.

4 ANNEXURES

4.1 ANNEXURE A - PROJECT QMS DOCUMENTATION FLOW CHART



4.2 ANNEXURE B – SAMPLE NONCONFORMANCE REPORT

NONCONFORMANCE REPORT

NCR

No:

Date:

CONTRACT:

PRODUCT OR SERVICE:

SUB-CONTRACTOR (if appropriate):

INSPECTION & TEST PLAN (ITP) No:

LOT No AND DESCRIPTION/LOCATION:

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.....
.....
.....

DETAILS OF

NONCONFORMANCE:

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.....
.....

PROPOSED

DISPOSITION:

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.....

IS A SUPPLEMENTARY REPORT ATTACHED?:

YES NO

PRINCIPAL: APPROVED REJECTED

COMMENT:

.....
.....
.....
.....

PRINCIPAL

SIGNATURE:DATE:

DISPOSITION COMPLETED

(Contractor)DATE:

RELEASE OF HOLD POINT

(Superintendent)DATE:

CLOSE OUT OF NONCONFORMANCE REPORT

(Contractor
QMR)DATE:

4.3 ANNEXURE C - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES

General

Lot sizes and test frequency: To the following **Sub-annexures**.

Contract requirements summary: To the **Contract requirements summary table**.

Certification: If material/product quality certification can be obtained from the supplier, documented tests need not be repeated.

Large projects: The Superintendent may relax the testing frequency after the Contractor has demonstrated consistent conformance to the quality requirements.

Contract requirements summary table

Sub-annexure	Reference Worksection
C1 Earthworks (Roadways)	1112 Earthworks (Roadways)
C2 Water cycle management	1121 Open drains, including kerb and gutter 1122 Kerb and channel (gutter) replacement 1351 Stormwater drainage (Construction) 1352 Pipe drainage 1353 Precast box culverts 1354 Drainage structures
C3 Pavement moisture control	1171 Subsurface drainage 1172 Subsoil and foundation drains 1173 Pavement drains 1174 Drainage mats
C4 Stabilisation	1113 Stabilisation
C5 Flexible pavement base and subbase	1141 Flexible pavement base and subbase
C6 Bituminous cold mix	1142 Bituminous cold mix
C7 Sprayed bituminous surfacing	1143 Sprayed bituminous surfacing
C8 Asphaltic concrete	1144 Asphaltic concrete
C9 Placement rolled concrete subbase	1131 Rolled concrete subbase
C10 Placement of lean mix concrete subbase	1132 Lean mix concrete subbase
C11 Placement of plain and reinforced concrete base	1133 Plain and reinforced concrete base
C12 Placement of steel fibre reinforced concrete base	1134 Steel fibre reinforced concrete base
C13 Placement of continuously reinforced concrete base	1135 Continuously reinforced concrete base
C14 Ready mixed concrete production and supply	0319 Minor concrete works 1131 Rolled concrete subbase 1132 Lean mix concrete subbase 1133 Plain and reinforced concrete base 1134 Steel fibre reinforced concrete base 1135 Continuously reinforced concrete base
C15 Segmental paving	1145 Segmental paving
C16 Bituminous slurry surfacing	1146 Bituminous slurry surfacing
C17 Pavement markings	1191 Pavement markings
C18 Signposting	1192 Signposting
C19 Minor concrete works	0319 Minor concrete works
C20 Landscape – roadways and street trees	0257 Landscape – roadways and street trees
C21 Masonry walls	0292 Masonry walls
C22 Crib retaining walls	0293 Crib retaining walls
C23 Water supply - reticulation	1341 Water supply - reticulation (Construction)
C24 Sewerage systems - reticulation	1361 Sewerage systems - reticulation

Sub-annexure	Reference Worksection
	(Construction)
C25 Water supply - pump stations	1342 Water supply – pump stations (Construction)
C26 Sewerage systems - pump stations	1362 Sewerage systems – pump stations (Construction)
C27 Pathways and cycleways	0282 Pathways and cycleways (Construction)

Sub-annexure C1 Earthworks (Roadways)
(1112 Earthworks (Roadways))

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Stripping topsoil	Surface levels	10,000 m ²	1 Cross Section per 25 m	Survey
Excavation	Geometry	10,000 m ²	1 Cross Section per 25 m	Survey
Floor of cuttings	Material quality: - CBR	5,000 m ²	1 per 1,000 m ² *	AS 1289.6.1.1
	Compaction	10,000 m ²	1 per 500 m ²	AS 1289.5.4.1 or AS 1289.5.7.1
Blasting	Ground vibration/noise control	1 day's blasting	Continuous monitoring	
Foundation for Embankments	Compaction	5,000 m ²	1 per 500 m ²	AS 1289.5.4.1 or AS 1289.5.7.1
Embankments -General	Geometry	One layer 10,000 m ²	1 Cross Section per 25 m	Survey
	Material quality: -CBR	One layer 5,000 m ²	1 per 800 m ³	AS 1289.6.1.1
	Compaction/Moisture content	One layer 5,000 m ²	1 per 250 m ³	AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
Embankments -Select zone	Geometry	One layer 10,000 m ²	1 Cross Section per 25 m	Survey
	Material quality: - Particle size distribution - CBR	10,000 m ² 10,000 m ²	1 per 1,000 m ³ * 1 per 500 m ³ *	AS 1289.6.1.1
	Compaction/moisture content	One layer 5,000 m ²	1 per 250 m ³ *	AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
Fill adjacent to bridges, wingwalls, retaining walls and culverts	Material quality: - Particle size distribution - Plasticity index	1 Structure 1 Structure	1 per 200 m ³ * 1 per 200 m ³ *	AS 1289.3.3.1
	Compaction/moisture content	1 Structure	1 per layer	AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
* Note: or part thereof, per lot.				

Sub-annexure C2 Water cycle management
(1351 Stormwater drainage, 1325 Pipe drainage, 1353 Precast box culverts, 1354 Drainage structures, 1121 Open drains including kerb and channel (gutter), 1122 Kerb and channel (gutter) replacement)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Supply of precast units	Precast quality: Suppliers documentary evidence and certification	1 batch	1 per type/size/ class per batch	
Siting and Excavation	Geometry	1 drainage line/structure	1 per drainage line/structure	Survey
Excavation by Blasting	Peak particle velocity	1 drainage line/structure	1 per drainage line/structure	Measure
Foundation	Compaction	1 drainage line/structure	1 per 20 lin m *	AS 1289.5.4.1
Material surrounding steel structures	Material quality: -pH/Electrical resistivity	1 drainage line/structure	1 per material	AS 1289.4.3.1 AS 1289.4.4.1
Bedding	Material quality:			
	- Particle size distribution	1 contract	1 per 200 m ³ *	AS 1141.11.1
	Compaction/moisture content	1 drainage line/structure	1 per layer, per 20 lin m	AS 1289.5.4.1 AS 1289.5.7.1
Concrete bedding or lining	Geometry		1 Cross Section per 25 m	Survey and 3 m Straight Edge
Installation of precast units	Geometry	1 drainage line/structure	1 per drainage line/structure	Survey
Selected backfill	Material quality: - Maximum particle size - Plasticity index Compaction/moisture content	1 contract 1 contract 1 drainage line/structure	1 per 100 m ³ * 1 per 100 m ³ * 1 per 2 layers per 50 m ²	AS 1289.3.3.1 AS 1289.5.4.1 AS 1289.5.7.1
Rock fill for gabions/ wire mattresses	Material quality:			
	- Wet strength	1 contract	1 per contract	AS 1141.22
	- Wet/dry strength variation	1 contract	1 per contract	AS 1141.22
Kerb and gutter	Geometry	1 contract	1 Cross section per 25 m	Survey and 3 m straight edge

* Note: or part thereof, per lot

Sub-annexure C3 Pavement Moisture Control
(1171 Subsurface drainage, 1172 Subsoil and foundation drains, 1173 Pavement drains, 1174 Drainage mats)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Material supply	Material quality—Supplier's documentary evidence and certification of:			
	Pipe	1 contract/size	1 per type/size	
	Filter material:			
	-Grading (Type A, B, C, D)	1 contract/size	1 per type	AS 1141.11.1

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	- Coefficient of permeability (Type B)	1 contract/size	1 per type	AS 1289.5.1.1 ASTM-D2434-68
	- Grading variation after Treatment (Type B)	1 contract/size	1 per type	AS 1141.11.1
	- Wet Strength (Type C, D)	1 contract/size	1 per type	AS 1141.22
	- 10% Fines Wet/Dry (Type C, D)	1 contract/size	1 per type	AS 1141.22
	Geotextile	1 contract	1 per type	
Excavation – Trench base	Line and Grade	1 drainage line	1 per 200 lin m	Survey
	Compaction	1 drainage line	1 per 200 lin m*	AS 1289.5.4.1
Bedding and backfill: - Filter material	Compaction	1 drainage line	1 per drainage line	AS 1289.5.4.1
- Selected backfill	Compaction	1 drainage line	1 per 200lin m*	AS 1289.5.4.1
- Earth backfill	Compaction	1 drainage line	1 per 200lin m*	AS 1289.5.4.1
Drainage mat	Geometry	2000m ²	1 Cross Section per 25 m	Survey

* Note: or part thereof, per lot

Sub-annexure C4 Stabilisation (1113 Stabilisation)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Material supply	Material quality – Supplier's documentary evidence and certification of:			
	- Cement	1 contract	1 per 100t	AS 3972 and AS 2350 (various)
	- Quicklime			
	Available lime (CaO content)	1 contract	1 per 100t	AS 3583.12
	Slaking rate	1 contract	1 per 100t	T432
	Particle size Dist'n	1 contract	1 per contract	AS 1141.11.1
	- Hydrated lime			
	Available Lime (CaOH ₂)	1 contract	1 per 100t	AS 3583.12
	Residue on sieving	1 contract	1 per contract	AS 3583.14
	- Ground blast furnace slag	1 contract	1 per month	AS 3583.2 and AS 3582.2
	- Flyash	1 contract	1 per month	AS 3583.1 and AS 3582.1
	- Blended stabilising agent	1 contract	1 per month	AS 2350.4
	- Water			
	Chloride ion content	1 contract	1 per contract	AS 3583.13
	Sulphate ion content	1 contract	1 per contract	AS 1289.4.2.1

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	Undissolved solids	1 contract	1 per contract	
Mix design	NATA certification— Supplier's documentary evidence and certification	1 mix	1 per mix	
Stationary mixing plant	Application rate of stabilising agent	1 day's production	1 per 100t	
	Compressive strength of product	1 day's production	1 per 100t	AS 1289.6.1.1
In-situ spreading	Spread rate	1 layer 1,000 m ²	1 per lot or 1 per 500m ²	
	Mix uniformity	1 layer 1,000 m ²	1 per 500m ²	Visual
Trimming and compaction	Geometry	1 layer 2,000 m ² , max 1 day's placement	One cross section per 25 m	Survey
	Surface quality	1 layer 2,000 m ² , max 1 day's placement	10 per 200 m lane length *	3 m straight edge
	Average layer thickness	1 layer 2,000 m ² , max 1 day's placement	1 per lot	Survey
	Average width	1 layer 2,000 m ² , max 1 day's placement	1 per lot	Measure/survey
	Relative compaction/moisture content	1 layer 2,000 m ² , max 1 day's placement	3 per lot	AS 1289.5.7.1 AS 1289.5.8.1

* Note: or part thereof, per lot.

**Sub-annexure C5 Flexible pavement base and subbase
(1141 Flexible pavement base and subbase)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Base and subbase supply	Material quality— Supplier's documentary evidence and certification	1 Contract		
	-Particle size distribution		1 per 1,000t	AS 1289.3.6.1
	-Liquid Limit		1 per 1,000t	AS 1289.3.1.1
	-Plasticity Index		1 per 1,000t	AS 1289.3.3.1
	-Linear shrinkage		1 per 1,000t	AS 1289.3.4.1
	-Maximum dry compressive strength		1 per 5,000t	AS 1141.52
	-Particle shape		1 per 1,000t	AS 1141.14
	-Aggregate wet strength		1 per 5,000t	AS 1141.22
	-Wet/Dry strength variation		1 per 5,000t	AS 1141.22
	-Los Angeles value		1 per 1,000t	AS 1141.23
-CBR		1 per 5,000t	AS 1289.6.1.1	

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	-Modified Texas Triaxial classification		1 per contract	T171
	-Unconfined compressive strength		1 per 5,000t	AS 5101.4
	-Unconfined compressive strength (Bound)	1 Contract	1 per mix design	AS 5101.4
	Geometry: Alignment & level -Width and Surface Trim	One layer 2,000 m ² or max 1 day's placement	1 Cross Section per 15 m 10 per selected 200 lin. m	Survey Measure & 3 m Straight Edge
	Compaction/moisture content / dry density testing	One layer 5,000 m ² or max 1 day's placement	10 per 5,000 m ² layer or 3 per lot if less	T130 AS 1289.5.2.1 AS 1289.5.3.2A S 1289.5.4.1 AS 1289.5.8.1
Placement				

**Sub-annexure C6 Bituminous cold mix
(1142 Bituminous cold mix)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material Quality— Supplier's documentary evidence and certification of:			
	- Coarse aggregates	1 contract or 1 mth's prod'n	1 per month 1 per contract or change in material	AS 2758.5 AS 1141.11.1 AS 1141.22 AS 1141.15 AS 1141.18
	Grading Wet strength Wet/dry strength Flakiness index Fractured faces	1 contract "		
	- Fine aggregates	1 contract or 1 mth's prod'n	1 per month	AS 1141.11.1
	Grading			
	- Mineral filler	1 contract or 1 mth's prod'n	1 per month	AS 2150
	- Class 170 or 320 bitumen binder	1 contract or 1 mth's prod'n	1 per month	AS 2008
	Cutback bitumen	1 delivery/ tanker	1 per delivery/ tanker	AS 2157
Flux Oil and Cutter Oil	1 delivery/ tanker	1 per delivery/ tanker	AS 3568	
Mix design	Approval of mix and NATA documentation. Supplier's documentary evidence and certification.	1 mix per contract (less than 12 months old)	1 per mix	Approval

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Production mix	Grading Binder	Each production lot or 1 day's production (whichever is the lesser)	1 per contract or as requested by Superintendent (sampling by production lot)	AS 1141.11.1 AS/NZS 2891.3.1

**Sub-annexure C7 Sprayed bituminous surfacing
(1143 Sprayed bituminous surfacing)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material Quality - Suppliers documentary evidence and certification of:			
	-Class 170 bitumen	1 tanker load	1 per tanker load	AS 2008
	-Refinery cutback bitumen	1 tanker load	1 per tanker load	AS 2157
	-Polymer modified binder	1 tanker load	1 per tanker load	AS 2341.21
	-Bitumen Adhesion agent	1 delivery	1 per delivery	
	-Cutback oils	1 delivery/ tanker	1 per delivery/tanker	AS 3568
	-Aggregate precoating agent	1 delivery/ tanker	1 per delivery/ tanker	
Application rates	-Aggregate	1 contract	1 per 400 m ³	AS 2758.2
	Binder	1 day's operation	Calculate per spray run	
	Aggregate	1 day's operation	Calculate per spray run	
* Note: or part thereof, per lot				

**Sub-Annexure C8 Asphaltic concrete
(1144 Asphaltic concrete (Roadways))**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material quality— Supplier's documentary evidence and certification of:			
	-Coarse and fine aggregates			AS 2758.5 AS 1141.11.1
	Grading Moisture content Wet strength Wet/dry strength variation Particle shape Fractured faces Polishing agg friction value	1 wk's prod'n 1 wk's prod'n 1 contract 1 contract 1 contract 1 contract	1 per day 1 per day)) 1 per) contract) or change in) material	AS 1289.2.1.1 AS 1141.22 AS 1141.22 AS 1141.14 AS 1141.18 AS 1141.42
	-Mineral filler	1 contract or 1 month's production	contract or 1 per month's production	AS 2150

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	-Bitumen binder	1 refinery batching	1 per tanker load	AS 2008
	- Polymer modified bitumen			
	Elasticity recovery at 60 °C Viscosity on ER at 60 °C Torsional recovery at 25 °C Viscosity at 180 °C	1 production batch by supplier	1 per tanker load	AG:PT/T121 AG:PT/T121 AG:PT/T122 AG:PT/T111
	-Bitumen adhesion agent	1 contract	1 per contract or change in material	T230 or nominated equivalent
	Resistance to stripping			
	- Reclaimed asphalt pavement (RAP)	1 stockpile	1 per stockpile	AS 1141.11.1
-Bitumen emulsion	1 contract	1 per contract or change in material	AS 1160	
Mix design – Nominated mix	Approval of mix and NATA certification. Supplier's documentary evidence and certification	1 mix per contract	1 per mix	
Production mix	Temperature		1 per truck load	Measure
	Moisture content Grading Binder content	1144 7 from Spec 1144 Asphaltic concrete as included as separate table below. Additionally, max lot size one 12 hr shift's production.		AS/NZS 2891.10 AS/NZS 2891.3.3 AS/NZS 2891.3.1
	Resistance to stripping	1 production mix	1 per mix per 5000 t or once per month (whichever is the most frequent)	T640
Laying and compaction	Temperature	1 day's laying per site	1 per truck load	Measure
	Levels	1 day's laying per site	1 cross section per 25 m	Survey
	Shape	1 day's laying	10 per 200 m* lane length	3 m Straight Edge
	Relative compaction/layer thickness	1 day's laying	6 cores per lot or 10 nuclear density tests per lot	AS 2891.9.3 or Nuclear Density Meter
* Note: or part thereof, per lot.				

Minimum Testing Frequencies For Asphalt Production

Quantity of asphalt in production lot	Minimum frequency of testing
Less than 100 tonnes	One per 50 tonnes or part thereof
101 to 300 tonnes	One per 100 tonnes or part thereof
301 to 600 tonnes	One per 150 tonnes or part thereof

Over 600 tonnes	One per 200 tonnes or part thereof
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**Sub-annexure C9 Placement of rolled concrete subbase
(1131 Rolled concrete subbase)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Concrete supply	Refer Sub-Annexure C14:			
	Ready-mixed concrete production and supply			
	Flyash	Contract	1 per contract	AS 3582.1
	Consistency (Index of compactibility)	1 day's production	1 per day's production per mix type	AS 1012.3.4
	Drying shrinkage	Contract	1 per contract per mix design	AS 1012.13
	Compressive strength of mix designs	Contract	3 per contract per mix design	AS 1012.9
Placement	Compressive strength (7 day and/or 28 day)	1 layer 2000 m ² or 1 day's production	1 per 50 m ³ of each mix type	AS 1012.8.1 AS 1012.9
	Field density	1 layer 2000 m ² or 1 day's production	3 per 1000 m ² layer or 3 per lot if less	AS 1289.5.8.1
	Thickness and surface level	1 layer 2000 m ² or 1 day's production	10 stations per 1000 m ² or minimum of 4 for smaller lots	Survey
	Profile factor (straight edge tolerance)	1 layer 2000 m ² or 1 day's production	10 stations per 1000 m ² or minimum of 4 for smaller lots	3 m straight edge

**Sub-annexure C10 Placement of lean mix concrete subbase
(1132 Lean mix concrete subbase)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Concrete supply	Refer Sub-Annexure C14: Ready-mixed concrete Production and supply			
	Concrete/air temperature	50 m ³	1 per 50 m ³	Measure
	Air content	50 m ³	1 per 50 m ³	AS 1012.4.2
	Consistency—Slump	50 m ³	1 per load	AS 1012.3.1
	Compressive strength (7 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
	Compressive strength (28 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
Placement	Thickness	50 m ³	5 m grid on plan area	Survey and check with subgrade survey

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	Geometry	50 m ³	1 cross section per 15 m	Survey 3 m straight edge
Curing	Material quality— Supplier's documentary evidence and certification	1 contract	1 per production batch	AS 3799 AS 1160
	Application rate	1 day's work	1 per 1000 m ²	
Joints	Geometry	50 m ³	All joints	Survey

**Sub-annexure C11 Placement of plain and reinforced concrete base
(1133 Plain and reinforced concrete base)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Concrete supply	Refer Sub-Annexure C14: Ready-Mixed Concrete Production and Supply			
	Concrete/Air Temperature	50 m ³	1 per 50 m ³	Measure
	Air Content	50 m ³	1 per 50 m ³	AS 1012.4.2 Method 2
	Consistency - Slump	50 m ³	1 per load	AS 1012.3.1
	Compressive Strength (7 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
	Compressive Strength (28 day)	50m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
Placement	Relative Compaction			
	- Machine placed	50 m ³	1 per 50 m ³ *	AS 1012.14
	- Hand placed	Area between 2 consecutive const. joints or 50 m ³ (whichever is the lesser)	2 per lot	AS 1012.14
	Thickness	50 m ³	5 m grid on plan area	Survey
	Geometry	50 m ³	1 cross section per 15 m	Survey and 3 m straight edge
Ride Quality	Profile factor	1000 m ²	10/lane/lot	3 m straight edge
Surface Texture	Texture depth	1000 m ²	2 per lot	Survey
Curing	Material quality - supplier's documentary evidence and certification	1 contract	1 per production batch	AS 3799 AS 1160
	Application rate	1 day's work	1 per 1000 m ² *	
Joints	Sealant material quality supplier's documentary evidence and certification	1 contract	1 per prod'n batch	
	Geometry	50 m ³	All joints	Survey

* Note: or part thereof, per lot.

**Sub-annexure C12 Placement of steel fibre reinforced concrete base
(1134 Steel fibre reinforced concrete base)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Concrete supply	Refer Sub-Annexure C14: Ready-mixed concrete production and supply			
	Concrete/air temperature	A production lot	As required by Superintendent	Measure
	Air content	1 contract	1 per contract	AS 1012.4.2 Method 2
	Consistency—Slump	50 m ³	1 per load	AS 1012.3.1
	Compressive strength (7 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
	Compressive strength (28 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
	Drying shrinkage	1 day's production or 150 m ³ (whichever is the lesser)	3 per lot	AS 1012.13
Placement	Relative compaction			
	-Machine placed	50 m ³	1 per 50 m ³	AS 1012.14
	-Hand placed	Area between 2 consecutive const. joints	2 per lot	AS 1012.14
	Thickness	50 m ³	5 m grid on plan area	Survey
	Geometry	50 m ³	1 cross section per 15 m	Survey 3 m straight edge
Ride Quality	Profile factor	50 m ³	All lanes	3 m str. edge
Surface Texture	Texture depth	50 m ³	2 per 50 m ³	Survey
Curing	Material quality—Supplier's documentary evidence and certification	1 contract	1 per production batch	AS 3799 AS 1160
	Application Rate	1 day's work	1 per 1000 m ²	
Joints	Material quality—Sealant supplier's documentary evidence and certification	1 contract	1 per production batch	
	Geometry	50 m ³	All joints	Survey and 3 m straight edge
Steel supply	Material quality—Supplier's documentary evidence and certification	1 Contract	1 per contract	AS/NZS 4671
	Steel reinforcement	1 Contract	1 per contract	AS/NZS 4671
	Steel fibre	1 Contract	1 per contract	ASTM A 820/820m

**Sub-Annexure C13 Placement of continuously reinforced concrete base
(1135 Continuously reinforced concrete base)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Steel supply	Material quality – Supplier's documentary evidence and certification	1 Contract	1 per contract	AS/NZS 4671
Concrete supply	Refer Sub-Annexure C14: Ready-mixed concrete production and supply			
	Concrete/air temperature	A production lot	As required by Superintendent	Measure
	Air content	1 Contract	1 per contract	AS 1012.4.2 Method 2
	Consistency - Slump	50 m ³	1 per load	AS 1012.3.1 AS 1012.3.3
	Compressive strength (7 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
	Compressive strength (28 day)	50 m ³	1 pair per 50 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
	Drying shrinkage	1 day's production or 150 m ³ (whichever is the lesser)	3 per lot	AS 1012.13
Placement	Relative compaction			
	-Machine placed	50 m ³	1 per 50 m ³	AS 1012.14
	-Hand placed	Area between 2 consecutive const. joints	2 per lot	AS 1012.14
	Thickness	50 m ³	5 m grid on plan area	Survey
	Geometry	50 m ³	1 cross section per 15 m	Survey 3 m Straight Edge
Ride quality	Profile factor	50 m ³	All lanes	3 m Str.Edge
Surface texture	Texture depth	1 day's work	1 per 2000 m ²	T240
Curing	Material quality— Supplier's documentary evidence and certification	1 contract	1 per production batch	AS 3799 AS 1160
	Application rate	1 day's work	1 per 1000 m ²	
Joints	Material quality—Sealant supplier's documentary evidence and certification	1 contract	1 per production batch	
	Geometry	1 day's work	All joints	Survey & 3 m Straight edge

Sub-annexure C14 Ready-mixed concrete production & supply
(0319 Minor concrete works, 1131 Rolled concrete subbase, 1132 Lean mix concrete subbase, 1133 Plain and reinforced concrete base, 1134 Steel fibre reinforced concrete base, 1135 Continuously reinforced concrete base)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Raw materials supply	Material quality— Supplier's documentary evidence and certification of:			
	Cement	1 mth's prod'n	1 per week	AS 3972
	Flyash	1 mth's prod'n	1 per month	AS 3582.1
	Water	1 contract	1 per contract	AS 3583.13, AS 1289.4.2.1
	Admixtures	1 mth's prod'n	1 per month	AS 1478.1
	Fine aggregates			
	-Grading	1 wk's prod'n	1 per 200 m ³ concrete*	AS 1141.11.1
	-Moisture content	N/A	1 per day	
	-Sulphate soundness	1 contract	1 per contract	AS 1141.24
	-Bulk density	1 contract	1 per contract	AS 2758.1
	-Unit mass (Particle density)	1 contract	1 per contract	AS 2758.1
	-Water absorption	1 contract	1 per contract	AS 2758.1
	-Material finer 2 µm	1 contract	1 per contract	AS 2758.1
	-Deleterious material (Impurities/reactive)	1 contract	1 per contract	AS 2758.1
	Coarse aggregates:			
	-Grading	1 wk's prod'n	1 per 200 m ³ concrete*	AS 1141.11.1
	-Moisture content	N/A	1 per day	
	-Wet strength	1 contract	1 per contract	AS 1141.22
	-Wet/dry strength variation	1 contract	1 per contract	AS 1141.22
	-Sulphate soundness	1 contract	1 per contract	AS 1141.24
	- Particle shape	1 contract	1 per contract	AS 1141.14
	-Fractured faces	1 contract	1 per contract	AS 1141.18
	-Bulk density	1 contract	1 per contract	AS 2758.1
	-Unit mass (Particle density)	1 contract	1 per contract	AS 2758.1
	-Water absorption	1 contract	1 per contract	AS 2758.1
	-Material finer 75 µm	1 contract	1 per contract	AS 2758.1
	-Weak particles	1 contract	1 per contract	AS 2758.1
	-Light particles	1 contract	1 per contract	AS 2758.1
	-Deleterious materials (impurities/reactive)	1 contract	1 per contract	AS 2758.1
	-Iron unsoundness	1 contract	1 per contract	AS 2758.1
-Falling/dusting unsoundness	1 contract	1 per contract	AS 2758.1	
Mix design	Compressive strength	1 contract mix	1 per mix per	AS 1012.9

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
			contract	
	Aggregate moisture content	1 contract mix	1 per mix per contract	
	Consistency—Slump	1 contract mix	1 per mix per contract	AS 1012.3.1
	Air content	1 contract mix	1 per mix per contract	AS 1012.4.2 Method 2
	Shrinkage	1 contract mix	1 per mix per contract	AS 1012.13

* Note: or part thereof, per lot.

**Sub-annexure C15 Segmental paving
(1145 Segmental paving)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material quality—Supplier's documentary evidence and certification of:			
	-Concrete segmental paving units	1 contract	1 per contract	
	-Clay segmental paving units	1 contract	1 per contract	
	-Bedding sand	1 contract	1 per contract or change in material	AS 1141.11.1
	Grading			
	-Joint filling sand	1 contract	1 per contract or change in material	AS 1141.11.1
Grading				
Base	Geometry	One layer 5000 m ² , max 1 day's placement	One cross section per 25 m	Survey
	Surface quality	One layer 5000 m ² , max 1 day's placement	10 per 200 m ² or lot	3 m Straight Edge
Edge restraints	Refer ' <i>Minor concrete works</i> '	1 day's placement	1 per 10 lin m	Measure/Survey
Laying paver units	Joint width	1 day's placement	All joints	Measure
	Geometry	1 day's placement	One cross section per 15 m	Survey
	Surface quality	1 day's placement	10 per 200 m ² or lot	3 m Straight Edge

Sub-annexure C16 Bituminous slurry surfacing
(1146 Bituminous slurry surfacing)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material Quality— Supplier's documentary evidence and certification of:			
	-Bitumen (prior to emulsification)	1 contract	1 per contract or change in material	AS 2008
	-Bitumen Emulsion			
	Residual Binder Content (Residue from Evaporation)	1 contract	2 per bulk delivery	AS 1160, App.D
	-Mineral aggregates			
	Degradation factor	1 contract	1 per contract or 6 month period	AS 1141.25.3
	Los Angeles value	1 contract	1 per contract or 6 month period	AS 1141.23
	Aggregate wet strength	1 contract	1 per contract or 6 month period	AS 1141.22
	Wet/dry strength variation	1 contract	1 per contract or 6 month period	AS 1141.22
	Polished aggregate friction value	1 contract	1 per contract or 6 month period	AS 1141.42
	Sand equivalent	1 contract	1 per contract or 6 month period	AS 1289.3.7.1
	-Mineral filler	1 month's prod'n	1 per contract or 6 month period	AS 2150
	-Combined aggregate grading	1 contract	1 per contract or 6 month period	AS 1141.11.1 AS 1141.12
Mix design – Nominated mix	Approval of mix and NATA certification — Supplier's documentary evidence and certification	1 contract	1 per mix	
Mix properties	Wear loss Traffic time Adhesion	1 contract 1 contract 1 contract	1 per mix 1 per mix 1 per mix	ISSA TB 100 ISSA TB 139 ISSA TB 114 or ISSA TB 144
Production mix	Grading Residual binder content	1 day's prod'n or 50 m ³ (whichever is the lesser)	2 per 50 m ³ * 2 per 50 m ³ *	AS/NZS 2891.3 .1 AS 1160
Laying	Levels	1 layer, max 200 m ³	1 cross section per 15 m	Survey

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	Surface quality	1 layer, max 200 m ³	10 per 100 m* lane length	3 m Straight Edge

* Note: or part thereof, per lot.

**Sub-annexure C17 Pavement markings
(1191 Pavement markings)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material Quality— Supplier's documentary evidence and certification of:			
	- Paint	1 contract	1 per contract or change in material	AS 4049.3
	- Glass beads	1 contract	1 per contract or change in material	AS 2009
	- Thermoplastic material	1 contract	1 per contract or change in material	AS 4049.2
Paint application	- Raised pavement markers	1 contract	1 per contract or change in material	AS 1906.3
	Wet film thickness	1 contract	1 per site visit or change in pressure settings	AS/NZS 1580.1 07.3
Thermoplastic Application	Application rate of glass beads	1 contract	1 per site visit or change in pressure settings	1191 Pavement markings Annexure A
	Cold film thickness	1 contract	1 per site visit or change in pressure settings	Measure by micrometer
	Application rate of glass beads	1 contract	1 per site visit or change in pressure settings	1911 Pavement markings Annexure A

**Sub-annexure C18 Signposting
(1192 Signposting)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material quality— Supplier's documentary evidence and certification of:			
	- Sign blanks	1 contract	1 per contract, or change in material	AS 1743

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	-Aluminium extrusion backing	1 contract	1 per contract, or change in material	AS 1866
	-Retro-reflective material	1 contract	1 per contract, or change in material	AS 1743
	-Non-reflective paint	1 contract	1 per contract, or change in material	AS 2311
	-Non-reflective sheet material		1 per contract, or change in material	
	-Steel sign support structures		1 per contract, or change in material	
	-Grade	1 contract	1 per contract, or change in material	AS 1627.9
	-Protective treatment	1 contract	1 per contract, or change in material	AS 4680 and AS 1214
Concrete foundations	Refer 'Minor concrete works'			

**Sub-annexure C19 Minor concrete works
(0319 Minor concrete works)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Subgrade	Compaction	1000 lin m or 1000 m ²	1 per 200 lin m or 200 m ²	AS 1289.5.4.1
Gravel subbase construction	Compaction	1 day's placement	1 per 100 lin m or 100 m ²	AS 1289.5.4.1
	Subbase geometry	1 day's placement	1 per 25 lin m	3 m straight edge
Steel supply	Material quality— Suppliers documentary evidence and certification	1 delivery	1 per production batch	
Concrete supply	Refer Sub-Annexure C14: Ready-mixed concrete production and supply			
	Consistency—Slump	15 m ³	1 per load	AS 1012.3.1
	Compressive strength (7 and 28 day)	15 m ³	2 pairs per 15 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
Concrete placement	Finished Levels	15 m ³	1 cross section per 15 m	Survey and 3 m straight edge
	Surface dimensions	Single fabrication	As required to confirm design dimensions	measure
Backfilling	Material quality:			
	-Maximum particle size	1 contract/ material type	1 per 200 m ³ or lot	
	-Plasticity index	1 contract/	1 per 200 m ³	AS 1289.3.3.1

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
		material type	or lot	
	Compaction	1 day's work or max 200 m ²	1 per 200 m ² or lot	AS 1289.5.4.1
Sprayed concrete	Test panels and cores	1 contract	3 test panels and 4 cores per mix design	AS 1012.4.2 AS 1012.9 AS 1012.14
	Compressive strength cores	15 m ³	2 per 15 m ³	AS 1012.4.2 AS 1012.9 AS 1012.14
	Curing material quality—Supplier's documentary evidence and certification	1 contract	1 per production batch	

Sub-annexure C20 Landscape – roadways and street trees

0257 Landscape – roadways and street trees

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Seed	Certification of authenticity for the prescribed mix	1 contract	Certification for each production batch delivered	
Imported topsoil	Material quality:			AS 4419
	-pH	10,000 m ²	1 per 500 m ³ *	
	-Organic content	10,000 m ²	1 per 500 m ³ *	
	-Soluble salt content	10,000 m ²	1 per 500 m ³ *	
Mulch for planting	Material quality	1 Contract	1 Contract	AS 4454
* Note: or part thereof, per lot.				

Sub-annexure C21 Masonry walls

(0292 Masonry walls)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Alignment	Set out	Contract	25 m sections	Survey
Footing	Concrete slump	Contract	1 per load	AS 1012.3.1
	Concrete strength	Contract	1 per contract or 100 m ³ (whichever is the lesser)	AS 1012.9
Concrete grout	Strength	Contract	As required by Superintendent	AS 1012.9
Backfilling	Drainage layer grading	Contract	1 per contract	AS 1141.11.1
Foundations and backfill	Compaction	Contract or 200 lineal metres (whichever is the lesser)	3 per 200 lineal metres	AS 1289.5.4.1

**Sub-annexure C22 Crib retaining walls
(0293 Crib retaining walls)**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Alignment	Set out	Contract	25 m sections	Survey
Footing	Concrete slump	Contract	1 per load	AS 1012.3.1
	Concrete strength	Contract	1 per contract or 100 m ³ (whichever is the lesser)	AS 1012.9
Backfilling	Quality and plasticity	Contract	1 per contract	AS 1289.3.3.1
	Drainage layer grading	Concrete	1 per contract	AS 1141.11.1
Foundations and backfill	Compaction	Contract or 200 lineal metres (whichever is the lesser)	3 per 200 lineal metres	AS 1289.5.4.1

**Sub-annexure C23 Water supply - reticulation
(1341 Water supply - reticulation (Construction))**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material quality—Supplier's documentary evidence and certification of:			
	-uPVC pipes	1 contract	1 per contract	AS 1477
	-Ductile iron pipes	1 contract	1 per contract	AS 2280 and AS 2129
	-Copper pipe	1 contract	1 per contract	AS 1432
	-Polyethylene pipe	1 contract	1 per contract	AS/NZS 4130
	-Stop valves material	1 contract	1 per contract	AS/NZS 2638.1, AS/NZS 2638.2 and AS 2129
	-Non return valves	1 contract	1 per contract	AS 4794
-Spring hydrants	1 contract	1 per contract	AS 3952	
Siting and excavation	Geometry	1 line	1 per line	Survey
Bedding	Material quality -Grading	1 contract	1 per contract per source	AS/NZS 2032
Thrust and anchor blocks	Refer sub-annexure C13			
Concrete encasement	Refer sub-annexure C13			
Chamber covers and frames	Geometry	1 cover/frame	1 per cover/frame	survey
Testing of pipelines	Pressure testing	1 line	1 per line	As specified 1341 Water supply – reticulation clause 4.8
Backfill and compaction	Compaction	1 line	1 per 2 layers max 100 m ²	AS 1289.5.6.1 or AS 1289.5.7.1

**Sub-annexure C24 Sewerage system - reticulation
(1361 Sewerage system - reticulation (Construction))**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material quality— Supplier's documentary evidence and certification of:			
	- uPVC pipes	1 contract	1 per contract	AS/NZS 1477
	- Ductile iron pipes	1 contract	1 per contract	AS/NZS 2280 and AS 2129
	- Vitrified clay pipes	1 contract	1 per contract	AS 1741
	- Precast access chambers	1 contract	1 per contract	AS 4198
Siting and excavation	Geometry	1 line/ structure	1 per line/ structure	Survey
Bedding	Material quality— Grading	1 contract	1 per contract per source	AS 1152
Concrete bedding	Refer Sub-Annexure C13			
Laying and jointing of pipes, access chambers, structures	Geometry	1 line	1 per line	Survey
Thrust and anchor blocks	Refer Sub-Annexure C13			
Concrete encasement	Refer Sub-Annexure C13			
Cast in situ access chambers	Material quality:			
	- Tri-calcium aluminate content	1 contract	1 per contract per source	AS 3972
	- Fineness index	1 contract	1 per contract per source	AS 3972
	- Minimum cement content	1 contract	1 per contract per source	AS 3972
Acceptance test of gravitation mains & access chambers	- Compressed air testing	1 line	1 per line	As specified <i>1361 Sewerage systems – reticulation</i> clause 4.9.
	- Hydrostatic testing	1 per test length Test length = 1370 m pipeline dia.(mm)	1 per line	<i>1361 Sewerage systems – reticulation</i> clause 4.9
Backfill and compaction	Compaction	1 line	1 per 2 layers max 100 m ²	AS 1289.5.7.1

**Sub-annexure C25 Water supply - pump stations
(1342 Water supply – pump stations (Construction))**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Switchgear and controlgear assembly	Electrical function	each installation	1 test per installation	As specified <i>1342 Water supply– pump stations</i> clause 4.6
Commissioning of pumping station	Certification testing of electrical installation in accordance with relevant Australian Standards	1 installation	1 per installation	As specified <i>1342 Water supply – pump stations</i> clause 4.9

**Sub-annexure C26 Sewerage systems - pump stations
(1362 Sewerage systems – pump stations (Construction))**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Switchgear and controlgear assembly	Electrical compliance	each installation	1 test per installation	AS/NZS 3439
Commissioning of pumping station	Certification testing of electrical installation in accordance with relevant Australian Standards	1 installation	1 per installation	As specified <i>1362 Sewerage systems – pump stations</i> clause 4.8

**Sub-annexure C27 Construction of pathways and cycleways
(0282 Pathways and cycleways (Construction))**

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Subgrade	Compaction	1000 lin m or 1000 m ²	1 per 200 lin m or 200 m ²	AS 1289.5.4.1
Subbase/ Granular base placement	Compaction	1 day's placement	1 per 100 lin m or 100 m ²	AS 1289.5.4.1
	Geometry	1 day's placement	1 per 25 lin m	3 m straight edge
Steel supply	Material quality— Suppliers documentary evidence and certification	1 delivery	1 per production batch	
Concrete supply	Refer Sub-Annexure C14: Ready-mixed concrete production and supply			
	Consistency—Slump	15 m ³	1 per load	AS 1012.3.1
	Compressive strength (28 days)	15 m ³	2 pairs per 15 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Concrete placement	Finished Levels	15 m ³	1 cross section per 15 m	Survey and 3 m straight edge
	Surface dimensions	Single fabrication	As required to confirm design dimensions	Measure

Annexure D – Matrix for compliance with AS/NZS ISO 9001 and this specification.

Clause	AS/NZS ISO 9001	Records	Project quality plan
2.1	QMS.	- Project quality plan. - Quality manual.	- QMS and procedures. - Matrix for QMS. - Subcontractor and supply/deliver Contractors compliance.
2.2	Control of documents	- List of who holds issued documents. - Register of current document issued/revision.	- Description of how quality records will be stored and maintained.
2.3	Management responsibility	- Corporate QMS.	- List of responsibilities and authorities for Quality Assurance activities.
2.4	Resource management	- Provision of resources.	-
2.5	Design and development	- Design records.	
2.5, 2.11 and 2.12	Purchasing	- Evaluation of Subcontractors and Suppliers. - Surveillance, audit of Subcontractors. - Subcontractor supplied documentation. - Certificate of testing by Suppliers.	- Method and results of Subcontractor evaluation for process validation. - Supply/delivery/ Subcontractor quality plan.
2.6	Control of production and service provision	- Procedures describing how to control work processes. - Records demonstrating effectiveness of work process controls. - Records of process validation when applicable.	
2.6	Identification and traceability	- Product batch/traceability records. - Lot identification register.	- Method of maintaining traceability. - Method of subdividing the work into lots and allocating lot numbers.
2.6 and 2.9	Control of	- Calibration certificates.	

Clause	AS/NZS ISO 9001	Records	Project quality plan
	monitoring and measuring devices	- Survey control.	
2.7	Inspection and test planning	- ITP's. - Records/checklists of inspection and testing. - Conformity reports for each completed lot.	- Procedure for inspections, testing and closing out work lots. - How to keep records of inspection and test results. - ITP and forms. - Method for identifying, controlling and verifying inspection and test status.
2.8	Monitoring and measurement	- Hold Point and Witness Point schedule. - Inspection and test records.	- Method for release of Hold Points.
2.10	Control of nonconforming product	- Nonconformity reports. - Notifications of nonconformity register.	- Method of registering and closing nonconformance.
	Corrective action	- Corrective action reports and register. - Corrective action requests.	- Method of ensuring against corrective action.