

PART 3: QUALITY ASSURANCE

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3.1 REFERENCED DOCUMENTS

Planning and Policy

- Health and Safety at Work Act (2015) and subsequent amendments

Design

- AS/NZS ISO 9000:2016 *Quality management systems - Fundamentals and vocabulary*
- Engineering New Zealand – Te Ao Rangahau [Practice Note 1: Guidelines on Producer Statements \(2014\)](#)
- Engineering New Zealand – Te Ao Rangahau [Practice Note 2: Peer Review Version 2 \(2018\)](#)
- Engineering New Zealand – Te Ao Rangahau [Practice Note 4: Health and Safety by Design \(Draft\)](#)
- NZS 3910:2013 *Conditions of contract for building and civil engineering construction*
- Transit New Zealand *Quality Standard TQS2: Second Edition* (June 2005)
- Waka Kotahi New Zealand Transport Agency [Health and Safety in Design Minimum Standard: Version 2](#) (October 2016)

Construction

- Worksafe New Zealand – Mahi Haumarua Aotearoa [Underground services – Guide for safety with underground services](#)
- Worksafe New Zealand – Mahi Haumarua Aotearoa [Management and removal of asbestos](#)
- Worksafe New Zealand – Mahi Haumarua Aotearoa [Planning entry and working safely in a confined space](#)
- Worksafe New Zealand – Mahi Haumarua Aotearoa [Working at height](#)
- NZ Utilities Advisory Group (Inc) [National Code of Practice for Utility Operators' Access to Transport Corridors](#)

Where a conflict exists between any Standard and the specific requirements outlined in the Infrastructure Design Standard (IDS), the IDS takes preference (at the discretion of the Council).

The terms, and their definitions, used in this standard are consistent with those of AS/NZS ISO 9000:2016 and NZS 3910:2013.

3.1.1 Source document

TQS2 was used as a guide in the development of this section of the IDS. That standard was developed by Transit New Zealand (now Waka Kotahi NZ Transport Agency) as a framework for an acceptable quality management system for the suppliers of physical works on state highways and came into effect as a mandatory requirement from July 1996.

The use of that standard as a basis for this Part has been with the kind permission of Waka Kotahi NZTA.

3.1.2 Guidelines

Notes have been included in Appendix I – Guidelines and further explanation. These are intended to aid in the understanding of this section, expand on the requirements and explain the application of a project quality system in more detail. Read them in tandem with the clauses in this section.

3.2 INTRODUCTION

Timaru District Council aims to achieve well-designed and constructed assets for its ratepayers. Building and maintaining assets, regardless of whether they are created through the subdivision and development of land or the capital works process, is a partnership of developers, designers, and contractors. Where quality principles are applied to both design and construction, real benefits result.

Timaru District Council therefore requires the application of quality assurance for all physical works that result in assets being transferred to the Council. Any designer, contractor or supplier wishing to tender for capital works or any developer exercising a resource consent must implement this part.

Where the assets will be vested through subdivision, designing, and constructing assets in accordance with a Project Quality System will be a condition of subdivision consent. The developer must demonstrate compliance by providing and applying the project quality system, to substantiate the release of the subdivision compliance certificate, known as the 224(c) certificate. Similarly, a contractor engaging in capital works is required to provide and apply a Contract Quality Plan during the contract period, which provides the supporting structure for the quality system.

This Part provides a framework for a quality management system. It has been developed by a Council internal working party and has been benchmarked against best national practice. The quality management system must ensure that all quality assurance issues relevant to a subdivisional land development, or a capital works project are effectively defined, managed and communicated to ensure that all quality requirements are achieved.

3.3 PROJECT QUALITY SYSTEM

The project quality system must include documented procedures relating to all management, design and construction activities. This includes the following components:

- Project management, as described in clause 3.4;
- Management of purchasing, as described in clause 3.5;
- Control and inspection of the work, as described in clause 3.6;
- Non-conformance and quality improvement, as described in clause 3.7;
- Health and safety, as described in clause 3.8.1;
- Environmental management, as described in clause 3.8.2.

The Project Quality System consists of a document trail comprising:

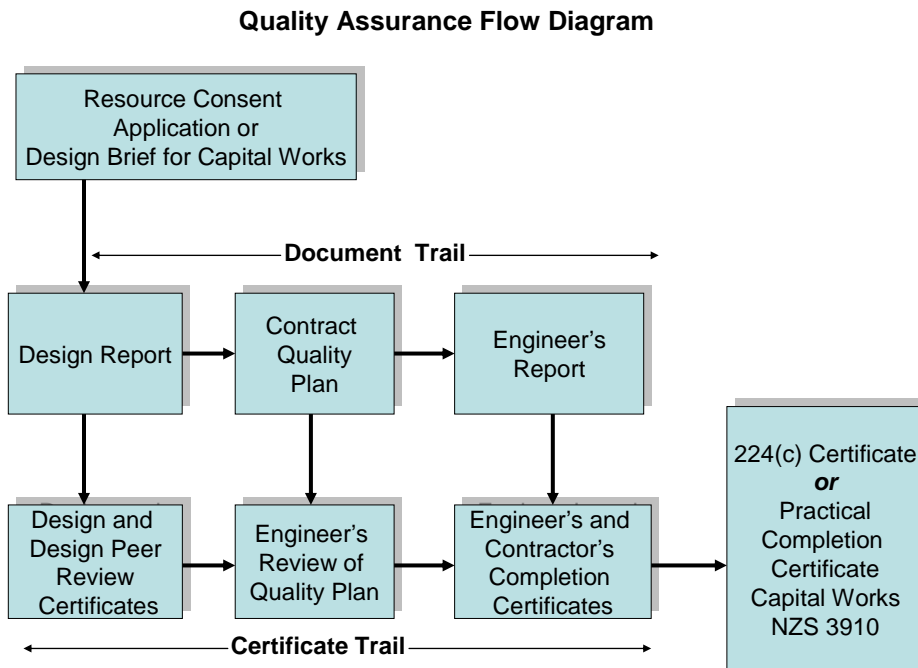
- the Design Report, as described in clause 3.3.2 and illustrated in the example in Appendix II;
- the Contract Quality Plan, as described in clause 3.3.3 and illustrated in the example in Appendix III;
- the Engineer's Report, as described in clause 3.3.4.

These three documents support the certificate trail, which establishes compliance with the Project Quality System. The certificate trail includes:

- the Design Certificate (see Appendix IV) and Design Peer Review Certificate (see Appendix V), which complete the Design Report documentation;
- the Engineer's Review Certificate (see Appendix VI), which completes the Contract Quality Plan;
- the Engineer's Completion Certificate (see Appendix VII) and the Contractor's Completion Certificate (see Appendix VIII), which complete the Engineer's Report;
- the 224(c) Certificate or Practical Completion Certificate.

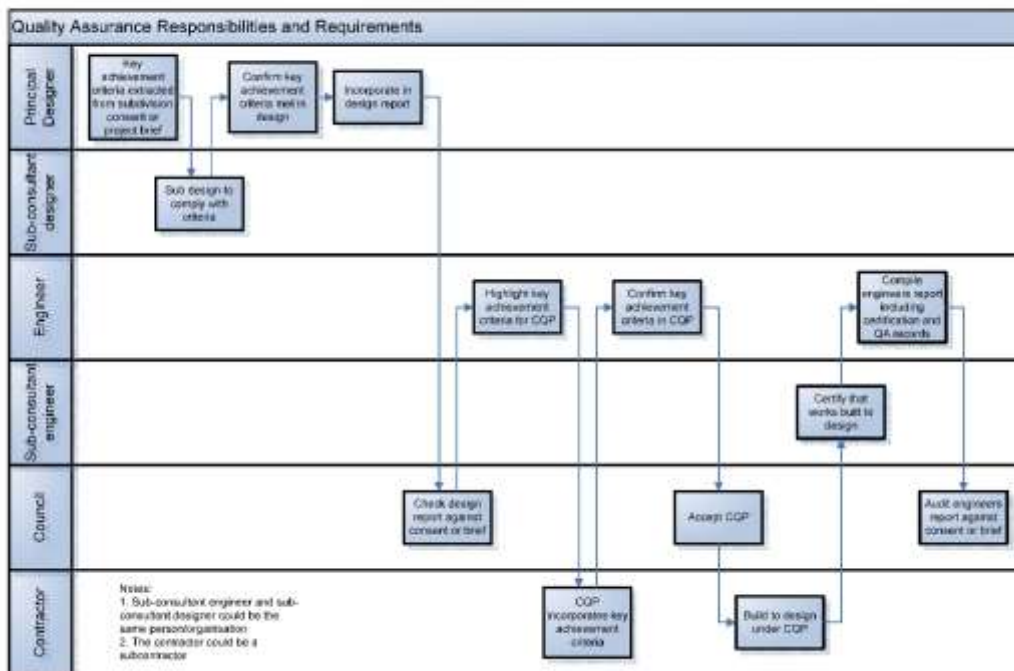
The issue of the 224(c) Certificate or Practical Completion Certificate is therefore dependent on the application of the Project Quality System and the provision of its related documentation. This interrelationship is set out in figure 1.

Figure 1 Quality Assurance Flow Diagram



Quality assurance responsibilities and requirements are a combination of relationships across the investigation, design and construction phases. Figure 2 explains those relationships and the point at which they are applicable.

Figure 2 Responsibilities and Requirements Diagram



Simplified Project Quality System procedures are acceptable where no infrastructure is to be vested in Council. Lateral connections and standard vehicle access construction will follow a simplified Project Quality System through Council's Service Consent process. Any request for simplified procedures with an Engineer Design shall accompany the Application.

3.3.1 Key achievement criteria

Key achievement criteria are defined as elements of design or construction that are critical to the quality of the asset. These are typically found in the resource consent or project brief. They may also come out of particular aspects of the design e.g. the designer may require proof of levels on a weir at a particular place in the system to support compliance with a higher level key achievement criteria.

3.3.2 Design Report

Submit a Design Report, where required as a condition of consent in respect to a subdivision land development or where specified in the project brief. Submit a Design Certificate to the Council along with the Design Report. The Design Report and subsequent Design Certificate should be completed by a suitably qualified Engineer or Licensed Surveyor holding Chartered Professional Engineer or Registered Professional and/or Licensed Cadastral Surveyor qualifications. Engineering acceptance is subject to presentation of this report.

The designer describes how they have:

- Identified and addressed the design, management, administrative and legislative requirements specific to the design;
- Included Safety in Design and Hazard and Operability (HAZOP) principles specific to the design;
- Planned the work to satisfy those requirements;
- Provide confirmation that capacity of supply for utilities is available;
- Managed communication with stakeholders and other parties to the design;
- Reviewed/tested the design to ensure compliance with the quality requirements;
- Recorded design activities and maintained records and evidence of compliance.

If required as a condition of consent, peer review the design in accordance with *Practice Note 2: Peer Review*. Submit a Design Peer Review Certificate to the Council along with the Design Report. Consultation on the suitability of the peer reviewer is to be undertaken with Council prior to organizing the review.

Where aspects of the design require expertise outside of the field of knowledge of the designer, provide a Design Certificate from a suitably qualified sub-consultant designer to support the submission of the Design Report. Ensure additional

information obtained from the sub-consultant designer regarding key achievement criteria or other matters is also incorporated in the Design Report.

3.3.3 Contract Quality Plan

Submit a Contract Quality Plan within the time frame and to the extent specified in the resource consent or contract. Submit an Engineer's Review Certificate to the Council along with the Contract Quality Plan. Where specified as a deliverable in the contract or as a requirement of resource consent, the Contract Quality Plan and Review Certificate must be subject to review and acceptance by the Council, along with any major amendments. Present the Contract Quality Plan and Review Certificate 10 working days before physical works commence.

The contractor describes how they will:

- Employ measures to eliminate or minimise hazards on and in the vicinity of the site;
- Identify and address the contract management (including health and safety, traffic management, technical and environmental issues), administration and legislative requirements specific to the contract as detailed in clause 3.4 – Project Management;
- Plan the work to satisfy those requirements;
- Control (manage) the work, including that undertaken by subcontractors, to comply with requirements – identify which PCBU is responsible for what activities and work areas;
- Manage communications with stakeholders and other parties to the contract;
- Inspect/test the materials and work to ensure compliance with the quality requirements;
- Address communication and reporting requirements;
- Manage, review and update management plans to ensure they remain relevant to the requirements of the contract and work being undertaken;
- Record contract activities and maintain records as evidence of compliance.

Provide certification upon Practical Completion through submitting a Contractor's Completion Certificate.

Where aspects of the construction require expertise outside of the field of knowledge of the contractor, the contractor must provide a Completion Certificate from a suitably qualified subcontractor to support the submission of the Contractor's Completion Certificate. Ensure additional information obtained from the subcontractor regarding key achievement criteria or other matters is also incorporated in the Contract Quality Plan.

3.3.4 Engineer's Report

Submit the Engineer's Report upon completion of physical works, where required as a condition of consent in respect to a subdivisional land development or where specified in the project brief.

The engineer describes how they have:

- Identified and addressed the quality management requirements specific to the project;
- Inspected, audited and tested the materials and work to ensure compliance with the quality requirements;
- Recorded project activities and maintained auditable records as evidence of compliance, including any non-conformance reports.

Provide certification upon Practical Completion through submitting an Engineer's Completion Certificate. Present the completed audit records with the application for 224(c) certification.

Where aspects of the construction require expertise outside of the field of knowledge of the engineer, provide a Completion Certificate from a suitably qualified sub-consultant engineer to support the submission of the Engineer's Report.

3.4 PROJECT MANAGEMENT

Clearly state the responsibility, authority, necessary qualifications and relationships of the key personnel involved in achieving quality outputs. Include these in the Design Report or Contract Quality Plan.

In the case of capital works contracts for the Council include the responsibilities for safety and environmental management programmes, in accordance with relevant legislative requirements (as set out in clause 3.8 – Safety and Environmental Management).

3.5 MANAGEMENT OF PURCHASING

3.5.1 Purchasing instructions

Purchase orders that are significant in terms of achieving the project quality requirements must be in writing. They must contain a clear specification of the requirements.

3.5.2 Material supply

Check materials purchased for the project that are significant in terms of achieving the contract quality requirements. Confirm compliance with the specified requirements prior to incorporation in the project. Note the verification of compliance either on the relevant checksheet or some other appropriate record.

3.5.3 Subcontractor quality control

The contractor is responsible for the quality of materials supplied and work performed by its subcontractors. Include appropriate quality assurance procedures in the Contract Quality Plan, to control and monitor subcontractor compliance with the contract and/or Contract Quality Plan. Conduct planned periodic audits of subcontractor activity.

These procedures do not relinquish the responsibility of the main contractor. Ensure that the subcontractor is aware of specific technical and management requirements in the contract, and that these are incorporated in the Contract Quality Plan. Ensure that the subcontractor has appropriate controls in place for the management of any specific construction risks.

3.6 CONTROL AND INSPECTION OF THE WORK

Undertake the work in a planned and controlled manner to ensure that the quality requirements are realised. Demonstrate that the following has been undertaken on all projects:

- Identify the key achievement criteria;
- Plan how these will be realised;
- Control the work in conformance with the project quality system;
- Check, inspect or test the work and verify that it conforms to the specified requirements;
- Record the results as documentary evidence of compliance.

This clause relates to both design and construction works and requires that all the processes involved are properly managed.

3.6.1 Identifying and planning

Systematically identify from the consent the key achievement criteria of the project for each discipline. Identify the key achievement criteria at each stage to satisfy all the requirements of clause 3.6.2 – Checking, inspection, testing and recording. Use these as a basis for developing the Design Report, Contract Quality Plan or Engineer’s Report. Include documentation of constraints, assumptions and base data, e.g. site investigations, in these documents.

Apply documented procedures to the extent necessary to ensure that those performing the work fully understand what is required, or where their absence could create a risk to the quality or safety of the work being undertaken.

3.6.2 Checking, inspection, testing and recording

Check, inspect or test against all the identified key achievement criteria to verify compliance during design and construction and on final completion. Specify the methods, specification references, frequency, timing, responsibilities and necessary qualifications for checking, inspection and testing in the Design Report, Contract Quality Plan and Engineer’s Report. Measure compliance against quantified acceptance criteria based on the IDS and/or specification requirements. Document the results and retain as part of the quality records.

Clearly indicate any “hold’ or “witness points” in the Design Report, Contract Quality Plan or Engineer’s Report, where the project requires checking, an inspection and/or approval to proceed (i.e. internally and/or from the Council). Establish systems to record the findings, any remedial action initiated and the final approval to proceed. Treat non-conforming work in accordance with clause 3.7 – Non-Conformance and Quality Improvement.

Where there is a requirement to use third party accredited agencies, include the details of compliance methods in the Design Report, Contract Quality Plan or

Engineer's Report.

3.7 NON-CONFORMANCE & QUALITY IMPROVEMENT

3.7.1 Control of non-conforming work

The designer must have a procedure to ensure that design work that does not conform to the specified requirements is either:

- redesigned to meet the specified requirements; or
- accepted by concession from the Council.

Record all non-conforming work on the relevant design record and/or the relevant design checksheet.

The contractor/engineer must have a procedure to ensure that construction work that does not conform to the specified requirements is either:

- reworked to meet the specified requirements;
- accepted with or without repair by concession from the Council;
- rejected and replaced.

Record all non-conforming work on the relevant construction checksheet.

If the construction non-conformance is significant in that it either:

- results in the need for written concession;
- results in delay or interference to the work or to other parties;
- indicates that the fault has occurred due to the use of incorrect work practices and/or failure of materials and could have been prevented;
- occurs sufficiently frequently as to indicate a problem in training or procedures,

produce a Non-Conformance Report (NCR) and send to the Council.

The report and supporting documentation must clearly indicate the action to be taken to rectify the non-conformance, the timeframe and responsibilities. It must be authorised by the designer or engineer. An example of a report is enclosed in Appendix IX – Non-Conformance Report.

In cases involving concessions, the designer or engineer and the Council must approve the proposed rectification (the corrective action) of the non-conforming work in writing and prior to implementation.

3.7.2 Quality improvement

Investigate the cause (as opposed to the symptom) of reported non-conforming work. Record proposals for improving the company's quality system on the Non-Conformance Report, to prevent the recurrence of a specific non-conformance. Send all corrective action proposals to the Council.

Ensure that the proposed corrective action is properly and effectively implemented.

3.8 SAFETY AND ENVIRONMENTAL MANAGEMENT

3.8.1 Health and safety

Consider "Safety in Design" and carry out a risk assessment appropriate to the scale of the project. Use these outputs to inform requirements for the project's health and safety system. Refer to *Health and Safety in Design Minimum Standard* and ensure the contractor applies the *Guide for Safety with Underground Services*. Reference shall be given to any pertinent Worksafe NZ guides, Codes of Practice and Practice Notes.

A health and safety programme is mandatory for all contract quality plans submitted as part of a capital works project. It is not a Council requirement of subdivision consents, however it is considered best practice that Engineers include this for subdivisions.

Operate a formal health and safety programme, which complies with the statutory requirements of the Health and Safety at Work Act and any subsequent revisions and associated regulations. To the extent practical and permissible by law, health and safety policies and procedures should be integrated into the engineer's and contractor's quality system.

Ensure the system addresses the following as a minimum:

- Hazard identification and assessment of control measures imposed;
- Hazard monitoring and auditing, including frequency;
- Emergency management;
- Hazard monitoring and auditing, including frequency;
- Procedures for training and supervising staff in relation to safety issues; and
- Contact details of key personnel.

3.8.2 Environmental management

Consider environmental management in the design and carry out a risk assessment appropriate to the scale of the project. Use these outputs to inform requirements for the project's environmental management system.

Operate a formal environmental management programme that complies with the statutory requirements of the Resource Management Act, any associated Regulations and any other specific requirements set out in any applicable resource consent. To the extent practical and permissible by law, integrate the programme into the quality system.

Ensure the Environmental Management Plan (EMP) within the environmental management system addresses as a minimum:

- The identification of environmental risks in clause 2.5.5 – Environmental considerations and an assessment of mitigation measures imposed;

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- Emergency response and contingency management;
- Procedures for compliance with resource consents and permitted activities;
- Environmental monitoring and auditing, including frequency;
- Corrective action, reporting on solutions and update of the EMP;
- Procedures for training and supervising staff in relation to environmental issues;
- Contact details of key personnel responsible for environmental management and compliance.

The Contract Quality Plan must identify all compliance issues relating to the Resource Management Act, including any conditions contained within the project related resource consents.

Appendix I. GUIDELINES AND FURTHER EXPLANATION

PROJECT QUALITY SYSTEM (clause 3.3)

The project quality system identifies how the requirements of the project were or will be addressed. These may include quality, safety, environmental, technical and general management requirements. This may be achieved by:

- adopting industry best practices;
- adopting or adapting documents developed for the same or similar activity on previous jobs;
- preparing new documents for those activities which are new or substantially different from anything undertaken previously.

Provide details of how all the identified requirements were or will be planned, controlled (managed), checked or inspected for compliance and the results recorded. Include provision for document control, including review and approval of the quality systems. The identified requirements will include the key achievement criteria but also those routine items which, through being achieved, will provide a quality asset.

For example, if a consent had a condition like “*The surface water management system shall rely on stormwater disposal to ground in accordance with the consent conditions of CRCXXX.1*”, the key requirement (achievement criteria) to ensure this condition was met would be to demonstrate that the design soakage rates for any infiltration system can be achieved on-site.

Each part of the IDS contains examples, for guidance, of records that can be provided to support the project quality system e.g. thrust block design calculations in clause 7.3.2 – Design records (Water Supply).

Design Report (clause 3.3.2)

A Design Report is a document specific to a design, which describes how the design was managed and administered in compliance with the requirements of the IDS and the resource consent or project brief.

Include a list of project personnel, their qualifications and their contact details. List the procedures and design checksheets that were used to effectively manage the design. These procedures should include the necessary qualifications of key personnel as they relate to particular tasks. Highlight exceptional aspects of the project that must be covered by the Contract Quality Plan.

For the example given above, information provided through the project quality system to support the assertion of compliance (which is more substantial as the condition is a key achievement criteria) might include, in the Design Report:

- Methodology to determine the design soakage rate.
- Design checksheet (see guidelines to clause 3.6.2) including the assumptions upon which the design is based (see clause 5.4.3 – Design records (Stormwater) bullets) and their source.

- Calculations leading to the design infiltration.
- Record of key achievement criteria for inclusion in the CQP.
- Design Certificate.
- Designers qualifications relevant to infiltration design.
- Design Peer Review Certificate if required.
- Specific requirements for OMM to preserve ongoing compliance.

Supporting information retained in the project quality system might include:

- Alternatives explored.
- Contractual requirements around the key achievement criteria into the CQP.
- Quick check of the design infiltration, by an alternative method if possible.

An example of a simple proforma Design Report setting out the minimum requirements of the IDS is provided in Appendix II. It is an example only and designers may develop their own format to suit their specific needs.

Contract Quality Plan (clause 3.3.3)

A Contract Quality Plan is a document specific to the project, which describes how the contract works will be managed and administered in compliance with its requirements.

Include, or otherwise reference, the procedures and the checksheets necessary to effectively manage the contract works. These procedures should include the qualifications of key personnel as they relate to key tasks particularly the key achievement criteria e.g. the connection to the Council water reticulation must be undertaken by a Timaru District Council Infrastructure Approved Contractor for water main connections. The following is a guideline of the information that should be included in the Contract Quality Plan:

- A statement of policy with respect to the timing and frequency of internal reviews and/or audits of the quality plan during the project.
- A schedule of the contractual quality records to be kept.
- A list of subcontractors.
- Procedures for auditing subcontractor compliance to the quality plan.
- A schedule of inspection and/or testing of materials and/or completed works, clearly indicating 'hold' or 'witness' points.
- Documented procedures included, or referenced, for all activities.
- Non-conformance & quality improvement procedures included, or referenced.
- Provisions for traffic management and environmental management plans included or referenced.

For the example given above, information provided through the project quality system to support the assertion of compliance (which is more substantial as the condition is a key achievement criteria) might include, in the Contract Quality Plan:
(Pre-construction)

- Engineers Review certificate.
- Inspection and test schedule highlighting the infiltration test requirement.

(Post-construction)

- Contractor's Completion Certificate.
- Inspection and test schedule proving compliance is achieved.

Supporting information retained in the project quality system might include:

- Infiltration test record sheets;
- CLEGG inspection results;
- NDM inspection results;
- Benkelmen Beam deflection test results;
- Pipeline air pressure and hydrostatic test results.

An example of a simple proforma Contract Quality Plan is provided in Appendix III. This sets out the minimum requirements the Contract Quality Plan must achieve for this standard. It is an example only and contractors may develop their own format to suit their specific needs.

Prepare site-specific Erosion and Sediment Control Plans (ESCP) in accordance with clause 4.8 – Erosion, Sediment and Dust Control (Geotechnical Requirements).

As noted above, processes and procedures for the management of subcontractors must be stipulated in the Contract Quality Plan. This is especially important where subcontractors perform a large component of the works (e.g. earthworks).

Engineers Report (clause 3.3.4)

An Engineer's Report is a document specific to a project, which describes how the project was managed and administered in compliance with the IDS, the Contract Quality Plan and the resource consent or project brief. It provides background information to the release of the 224(c) certificate.

The Engineer's Report shall be supplied to Council's Primary Engineering Contact (PEC) for an Engineering Design Acceptance or Council Project Contract. The QA Documentation shall be provided to the PEC via a cloud based sharefile system or USB, to be uploaded to Council's document management system and update Council's asset management system.

The following is a guideline of the information that should be included in the Engineer's Report:

- A schedule of the project and contractual quality records that have been kept. A summary of the quality records proving compliance is to be submitted to the Council.
Note: The summary shall come in the form of a letter report showing how conditions of consent are met. All QA documentation and reports shall be labelled to relate to each condition of consent or contract.
- What procedures were employed for auditing contractor and subcontractor compliance with the quality plans.

For the example given above, information provided through the project quality system to support the assertion of compliance (which is more substantial as the condition is a key achievement criteria) might include, in the Engineers Report:

- Engineers Completion Certificate.
- Non-conformance Reports if generated.
- O&M Manual as it relates to the ongoing achievement of this condition.
- Audit and test schedule proving compliance has been achieved.

PROJECT MANAGEMENT (clause 3.4)

The project management structure need only show the key positions or functions. In many companies an individual can hold more than one position or be responsible for more than one function. The designer and the engineer can be the same person or organisation.

Relate job descriptions to positions and named individuals. They can be quite simple and should only state the principal responsibilities of the position, any necessary qualifications and the reporting lines. Examples of a management structure and job descriptions for a typical subdivision and a small/medium contractor are enclosed in Appendix II – Design Report section 1 and Appendix III – Contract Quality Plan section 3.

Purchasing instructions (clause 3.5.1)

Ensure that purchasing instructions are precise; otherwise there is a significant risk of not getting what is needed. Include, as appropriate:

- the product type, class, and size etc;
- the quality standards;
- the quantities;
- the scope of the work;
- the delivery details;
- the completion dates.

It may not be necessary to fully describe the requirements in every case e.g. when there is a record that the supplier has previously supplied full details or a copy of the specification and that the detail is current. In this instance, it would be sufficient to order by reference to those previously supplied details.

Material supply (clause 3.5.2)

Checking for compliance should preferably be done on receipt of the materials. The "verification" referred to can be recorded when completing the relevant checksheet (refer to the examples given in Appendices XIII - XVII). Attach any supporting documentation to the checksheet, such as delivery dockets or supplier certificates of compliance, which provide evidence of the type, grade, and class etc of material used.

Keep records of material tests that are traceable to defined sections of the work e.g. seven and 28 day concrete crushing strength test results, basecourse sand equivalent tests ex-supplier.

Identifying and planning (clause 3.6.1)

Each project is unique in that it:

- has technical requirements which may vary in part or full from other projects;
- will have a different scope of work from other projects, which is also likely to alter during the course of the project;
- will be in a different location and therefore will have different external influences from other projects;
- will utilise different resources;
- will have its own programme etc.

The identification of the project requirements is therefore important and must be undertaken in some systematic and documented manner. The project must be planned and managed to suit its unique set of characteristics, either by "highlighting" the key achievement requirements in the relevant sections of the consent, project brief or contract specification, or in a more formalised manner, by listing the requirements on a form. These key requirements must also be communicated between the various parties to the project.

The procedures should follow a standard format and be "user friendly". They will describe how individual work activities are planned, controlled and inspected for compliance with the specification requirements. They will:

- describe how the activity or task will be performed;
- define key task responsibilities and required qualifications;
- describe how key design parameters which directly impact on the effectiveness of the design are communicated;
- indicate the sequence;
- specify the resources to be used;
- be written in precise and easily understandable language.

They should contain as a minimum the information outlined in the example in Appendix XII – Quality System Work Procedure.

Examples of work activities that would be covered by procedures include: surface and groundwater modelling; survey and setout; placement of unbound granular basecourse; stormwater pipework; traffic control. For work activities that are more or less standard, procedures from previous projects may be adopted or adapted.

Checking, inspection, testing and recording (clause 3.6.2)

The documentation requirements associated with checking, inspection, testing and recording need not be complex. The checksheets are useful in that they provide a breakdown of the checks that should be performed and, when completed, serve as a record. They should be developed for each key design and work activity and should contain the quality requirements as reminders.

The design checksheet should:

- include the constraints, assumptions and base data;
- identify the personnel responsible for the design;
- record that the design has been checked and the method used;
- provide for "signing-off" at the bottom of the sheet after a fully complying "design check".

The engineer's checksheet should:

- identify the personnel responsible;
- provide for "signing-off" at the bottom of the sheet.

Examples of engineer's checksheets are included in Appendices XIII – XVI and XIX.

The construction checksheet should:

- provide a checklist of the items to be inspected;
- include the acceptance criteria;
- identify the personnel responsible for doing the inspection;
- contain space for recording that compliance of the individual items has been attained;
- contain reference to further records generated by non-conformances;
- provide for "signing-off" at the bottom of the sheet after a fully complying "final inspection".

Examples of construction checksheets are included in Appendix XVII and XVIII.

An audit or inspection and test schedule should provide a full listing of all audits, inspections and tests of materials and completed works. It should clearly indicate 'hold' or 'witness' points and include signing off by the contractor, the engineer and the Council where required. A sample engineer's audit and test schedule is contained in Appendix X and a sample inspection and test schedule is contained in Appendix XI.

Control of non-conforming work (clause 3.7.1)

It is inevitable that, even with excellent practices and controls, some degree of defective workmanship or material will occur. When it does, it is important that it is properly handled to ensure that the defects are rectified in the appropriate way.

A non-conformance should be considered an opportunity for improvement, rather than to apportion blame. By adopting this philosophy, identifying a non-conformance provides an opportunity to learn from the mistake and (more importantly) prevent it happening again.

Note that there is a clear differentiation between what should be considered a "routine construction issue" or a "routine design step" and a non-conformance. Ensure this is understood by and communicated to all staff. A construction issue, such as soft subsoils, is often identified (and reasonably expected) during a project and does not therefore necessitate the raising of a Non-Conformance Report, unless procedures have not been followed. The inability to achieve the minimum grade on a

sewer design is a non-conformance and must be reported, as is the inability to achieve a passing Benkelman Beam test or infiltration test, as examples.

A non-conformance exists, and therefore a report should be raised, in all instances where a defect in the work or design occurs that indicates that the required standard or key achievement criteria prescribed in the Design Report, Contract Quality Plan or Engineer's Report has not been met, e.g. failure to achieve compaction results, pre-seal inspection etc. For this process to be successful it must be handled in a positive and constructive manner, without unnecessary recrimination.

Any non-conforming work that is subject to follow-on work by other parties must be clearly denoted as such to alert the other parties to its non-conforming status.

Quality improvement (clause 3.7.2)

The objective is to reduce, if not eliminate, the root causes of the recurring inefficiencies and errors which have caused or can cause non-conforming work, i.e. to find a permanent cure for the problem, not just a "quick-fix". This provides a formal and disciplined procedure for identifying, investigating and correcting inefficiencies and shortcomings in a company's work practices.

There can be significant benefits to the company from the positive application of quality improvement, through reducing the incidence of non-conforming work and improving efficiency, to reducing costs including those of rework. Common causes of non-conforming work that can be addressed are:

- lack of training.
- lack of resources.
- poor communication / incomplete instructions.
- inadequately defined work practices.
- inadequate supervision.

Environmental management (clause 3.8.2)

Environmental management is an integral part of project management and therefore will be most efficiently operated within the framework of the project's quality system.

Design the environmental management programme in full compliance with the Resource Management Act. Specific activities that may require resource management consents or authorisations include:

- management of stockpile material.
- selection and management of disposal areas.
- the use of chemical sprays and fertiliser.
- noise and dust nuisance.
- prevention of fuel and oil spills including the actions taken if an oil spill occurs.
- control of silt, contaminants and stormwater runoff.
- the diversion of, or taking water from, waterways.
- work around protected trees.
- redirection of groundwater.

- excavation of Hazardous Activity and Industries List (HAIL) sites and accidental discovery of contaminated material.
- discharges of dewatering water, sewage, or contaminants.
- archaeologically and culturally sensitive sites.
- disturbance of wildlife species or habitat.
- excavation over aquifers.

It is a legal requirement to maintain fish passage under the Freshwater Fisheries Regulations.

This is by no means an exhaustive list. There may also be Department of Conservation permits and Heritage New Zealand Pouhere Taonga authorities. Consider (if not contractually required to) developing a formal Environmental Effects Register. Also identify these matters in an assessment of environmental effects, for applications for subdivision consent.

Appendix II. DESIGN REPORT

(contract name/subdivision name)

(contract /subdivision consent number)

Copy No: of

Version:

Date of Issue:

CONTENTS:

1	Project Personnel and Design Management	26
2	Sub-consultant designers	26
3	Full Description of Work	27
4	Quality Control and Inspection	27
5	Environmental Management	28
6	Concessions	28
7	Design Check and Review	28
8	Design Records	28

APPENDICES: *(attach these – as applicable)*

- 1 - Design Certificate <see example in Appendix IV>
- 2 - Design Peer Review Certificate <see example in Appendix V>
- 3 - Non-Conformance Report <see example in Appendix IX>

DESIGN REPORT APPROVALS:

This Design Report has been:

Prepared by:
(Designer)

(Name/Sign/Date)

Approved by:
(Principal designer)

(Name/Sign/Date)

Part 3: QUALITY ASSURANCE

Reviewed by:
(Peer Reviewer)

(Name/Sign/Date)

1 Project Personnel and Design Management

Principal designer:

Name: _____
Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
Telephone: _____ Fax: _____

Developer:

Name: _____
Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
Telephone: _____ Fax: _____

Sub-consultant designer:

Name: _____
Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
Telephone: _____ Fax: _____

Design Peer Review (if undertaken):

Name: _____
Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
Telephone: _____ Fax: _____

The following key personnel have been involved in this design:

Name	Position Title	Responsibility
_____	_____	_____
_____	_____	_____
_____	_____	_____

This list should include details of different design specialists, internal reviewers and auditors.

2 Sub-consultant designers

Sub-consultant designers undertook the following design activities:

Activity	Name of Sub-consultant designer
.....
.....
.....
.....
.....

Sub-consultant designers were selected in accordance with company policies and procedures, and were provided with copies of the relevant project briefs and/or resource consents requirements and/or drawings prior to commencement of the work.

Sub-consultant designers were subject to monitoring and their work was subject to periodic internal audit.

3 Full Description of Work

This section contains a full description of the work included in the Design Report. It should include a description of:

- *the existing pre-development site;*
- *the proposed development;*
- *the extent of the assets to be constructed;*
- *all key design and quality requirements, from the Council and the developer e.g. key achievement criteria;*
- *evidence of consultation, if applicable;*
- *the constraints, parameters, assumptions and raw data on which the design is based;*
- *data manipulation methods e.g. computer software, methodology.*

4 Quality Control and Inspection

Procedures and design checksheets were used to control the design and verify compliance with the quality requirements. The following documents were used for this design:

Identifier	Title
.....
.....
.....
.....
.....

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

The documents can be made available for the Council’s review, if requested.

Exceptional aspects of this project to be covered by the Contract Quality Plan include:

.....
.....

5 Environmental Management

The following Resource Consents, relevant to the design, have been obtained:

.....
.....

In accordance with the resource consent/s, environmental controls relating to this particular design will be outlined in the Contract Quality Plan.

6 Concessions

If, during the process of design, work is identified which does not conform to the specified requirements and will require a concession from the Council, submit a Non-conformance Report as part of the Design Report. The concession proposed will be discussed and must be approved by the Council prior to execution.

7 Design Check and Review

Undertake internal design reviews, to verify the design outlined and/or referenced in this Design Report, in accordance with “Reviewing the work of another engineer”. Include written documentation of this review, by checklist, calculations carried out by hand or another method to check design calculations, or document here.

Undertake a peer review, to verify the compliance and effectiveness of the design, in accordance with “Reviewing the work of another engineer”. Document the review here or include as an Appendix.

This review shall be specific only to those aspects of the works in which the reviewer is competent i.e. more than one reviewer may be required where the development incorporates specialised disciplines.

Record, report and action the review findings.

8 Design Records

The following design records were produced for this design and are appended where noted:

(e.g. engineering drawings, specifications, calculations, material specifications where not detailed elsewhere, photos etc.)

.....
.....

The following completed checksheets are appended *(e.g. safety in design, risk register)*.

Checksheet No.	Title
.....
.....
.....
.....

Appendix III. CONTRACT QUALITY PLAN

(contract name/subdivision name)

(contract /subdivision consent number)

Copy No: of

Version:

Date of Issue:

CONTENTS:

1	Contract Personnel	32
2	Document Control	32
3	Contract Management	33
4	Subcontractors	34
5	Quality Control and Inspection	34
6	Environmental Control	35
7	Non-Conformance	36
8	Contract Records	36

APPENDICES: *(attach these – as applicable)*

- 1 – Construction Programme
- 2 – Inspection & Test Schedule <see example in Appendix XI>
- 3 – Site Safety Plan
- 4 – Traffic Management Plan(s)
- 5 – Erosion and Sediment Control Plan
- 6 – Non-Conformance Report – <see example in Appendix IX>
- 7 – Contractor’s Completion Certificate <see example in Appendix VIII>

CONTRACT QUALITY PLAN APPROVALS:

This Contract Quality Plan has been:

Prepared by: _____
(Name/Sign/Date)

Approved by: _____

Part 3: QUALITY ASSURANCE

(Engineer)

(Name/Sign/Date)

Approved by:
(Contractor)

(Name/Sign/Date)

1 Contract Personnel

Contractor:

Name: _____
 Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
 Telephone: _____ Fax: _____

Developer:

Name: _____
 Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
 Telephone: _____ Fax: _____

Project Manager:

Name: _____
 Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
 Telephone: _____ Fax: _____

Engineer:

Name: _____
 Address: _____

Contact Ph (Mobile): _____ Contact Ph (A/H): _____
 Telephone: _____ Fax: _____

2 Document Control

This Contract Quality Plan (CQP) has a controlled distribution as follows:

Copy No	Issued To	Date	Version No
1	<Contract Manager>	_____	_____
2	<Site Supervisor>	_____	_____
3	<All Subcontractors>	_____	_____
4	<Other>	_____	_____
5	<Engineer (for review and acceptance)>	_____	_____
6	Council (for review and acceptance)	_____	_____

This CQP will be subject to periodic review during the course of the contract. All holders of controlled copies listed above will be issued with updates to this document as and when they occur.

3 Contract Management

The following key personnel have been assigned to this contract:

Name	Title
.....
.....
.....
.....

<or insert your organisation chart here>

Key responsibilities and authorities are as follows:

- a) Overall responsibility for the management of the contract and principal contact with the developer and the engineer:

(Title)

- b) Authorised to address and resolve issues of dispute relating to compliance with the quality requirements of the contract and this quality plan and rectification of non-conforming work:

(Title)

- c) Responsible for and qualified to the required level for the day to day on-site supervision, control and inspection of the works and communicate on such matters with the developer or engineer. Authorised to receive, on behalf of the contractor, any instructions from the developer or engineer (refer NZS 3910 Clause 5.2.1):

(Title)

- d) Responsible for on-site Traffic Control activities, qualified to STMS level:

(Title)

- e) Responsible for compliance with the requirements of the Resource Management Act (Environmental Management):

_____ (Title)

- f) Preparation and amendment of this quality plan:

_____ (Title)

- g) Approval of this quality plan:

_____ (Title)

4 Subcontractors

Subcontractors will undertake the following work activities:

Activity	Name of Subcontractor
.....
.....
.....
.....
.....
.....
.....

All Subcontractors are required to operate in accordance with this Contract Quality Plan.

5 Quality Control and Inspection

Procedures, construction checksheets and inspection and test schedules will be used to control the work and verify compliance with the quality requirements. The following procedures will be adopted for this contract or will be prepared in advance and be made available on site:

Identifier	Title
.....
.....
.....
.....
.....
.....
.....

These can be made available for the Council's review, if requested.

Compliance check sheets are appended to the various parts of the CSS, which may provide initial guidance on what to consider when compiling construction check sheets.

An example of an inspection and test schedule is contained in Appendix XI. The schedule should indicate the frequency, timing, type of both inspection and/or tests required to be performed on the materials and at certain stages of construction. This schedule would be signed off as the specified activities are completed, and once completed would then serve as a Contract Record (refer clause 3.5.2 – Material supply).

In addition to the inspection and test schedule, the following key 'Hold' and 'Witness' points have been identified by the engineer as requiring inspection and approval by the engineer and/or the Council prior to further construction. They will be documented on the relevant construction check sheet.

Key achievement criteria may suggest some of these points. 'Hold' or 'witness' points could include:

- *Site establishment, including Traffic Management and Erosion and Sediment Controls;*
- *Commencement of works;*
- *Formwork or foundations prior to pouring concrete;*
- *Prepared earthworks and subsoil drainage prior to filling;*
- *Completed earthworks and prepared subgrade prior to topsoil or metal courses;*
- *Confirmation of thrust block ground conditions and design;*
- *Complying polyethylene pipe weld preconstruction joint tests;*
- *Drainage and water reticulation bends, junctions and inspection points prior to backfilling, to allow as-built;*
- *Utility reticulation prior to backfilling;*
- *Water and drainage reticulation during testing;*
- *Sterilisation of watermain;*
- *Finished subbase before the placement of basecourse;*
- *Finished basecourse before the commencement of surfacing or paving;*
- *Finished surface prior to road marking;*
- *Landscape areas formed and plants on site prior to planting;*
- *Construction safety audit;*
- *Practical Completion inspection;*
- *Defects Liability inspection for planting;*
- *Defects Liability inspection for roading etc.*

6 Environmental Control

The following Resource Consents, relevant to the works undertaken and/or materials used in this contract, have been received:

.....
.....

These have been reviewed and appropriate controls have been put in place to manage and/or mitigate the risk.

In accordance with contract requirements, *<if applicable>* environmental controls relating to this particular contract and/or the work being undertaken are outlined *<delete as applicable>* further in the attached documentation/in the site-specific Erosion and Sediment Control Plan appended. The compliance and effectiveness of management controls will be subject to periodic review.

7 Non-Conformance

If, during the process of inspection, work is identified which does not conform to the specified site requirements, a Non-Conformance Report will be prepared by the person at 3 b). The rectification proposed will be discussed and agreed with the engineer and will be stated on the NCR.

A proforma Non-Conformance Report is attached.

8 Contract Records

The following records will be produced for this contract:
(e.g. site meeting minutes, construction checksheets, photos, inspection and test schedules, test results, construction programmes, completion documentation, as-built records)

.....
.....

**Appendix IV. DESIGN CERTIFICATE
INFRASTRUCTURE/ LAND DEVELOPMENT**

ISSUED BY: (Design firm or suitably qualified design professional)

TO: (Owner/Developer)

TO BE SUPPLIED TO: (Territorial authority)

IN RESPECT OF: (Description of infrastructure/land development)

AT:
..... (Address)

.....has been engaged by..... (Design firm or suitably qualified design professional) (Owner/Developer)

to provide services in respect of the infrastructure/land development described above. I have the qualifications and experience relevant to this project as set out herein and have designed the subject works.

I on behalf of (Designer) (Design firm) confirm that the design is to current good engineering practice, and that it satisfies all relevant resource consent conditions.

The design firm issuing this statement holds a current policy of professional indemnity insurance of no less than \$..... (Minimum amount of insurance shall be commensurate with the current amounts recommended by IPENZ, ACENZ, NZTA, IPWEA.)

Qualifications and experience (including professional affiliations):
.....
.....

..... Date: (Signature of designer)

Copyright waived

**Appendix V. DESIGN PEER REVIEW CERTIFICATE
INFRASTRUCTURE/ LAND DEVELOPMENT**

ISSUED BY:
(Design peer review firm or suitably qualified design peer review professional)

TO:
(Owner/Developer)

TO BE SUPPLIED TO:
(Territorial authority)

IN RESPECT OF:
(Description of infrastructure/land development)

DESIGNED BY: *(Design firm/Designer)*

..... has been engaged by
(Design peer review firm or suitably qualified design peer review professional) (Owner/Developer)

to provide design review services in respect of
aspects of the above work, which is described in the specification and shown on the

drawings numbered to be approved by.....
(Territorial authority)

under consent number.....On
(Date)

As an independent professional, I have reviewed the design assumptions, methods, accuracy and conclusions. I have sighted the conditions of consent to the works and the specifications and drawings for approval. In my professional opinion and based upon reasonable enquiry, this review, information supplied by the designer and the designer’s certification (copy attached),

Iconfirm on behalf of
(Design peer reviewer) (Design Firm)
the acceptability of the design and that the design complies with the above consent and current good engineering practice, subject to the findings below if any.

.....Date..... *(Signature of Design peer reviewer)*

..... Member NZIS ACENZ IPENZ
(Professional qualifications and Number)

.....
(Address)

Findings
.....

**Appendix VI. ENGINEER'S REVIEW CERTIFICATE
REVIEW OF CONTRACT QUALITY PLAN**

ISSUED BY:
(Engineering consultancy firm or suitably qualified engineer)

TO:
(Owner/Developer)

TO BE SUPPLIED TO:
(Territorial authority)

IN RESPECT OF:
(Description of infrastructure/land development)

DESIGNED BY:
(Design Firm/Designer)

AT:
(Address)

I, on behalf of
(Engineer) (Engineering consultancy firm)

have reviewed the Contract Quality Plan (a copy of which is attached).

I confirm the following have been provided in accordance with IDS Part 3: Quality Assurance:

- Contract personnel and contact details listed
- Quality policy statement enclosed
- Contract management and responsibilities set out
- Subcontractors listed
- Procedures are documented and hold or witness points listed
- Site Safety and Environmental controls detailed
- Non-conformance process detailed
- Contract records listed

..... Date:
(Signature of engineer)

..... Member ACENZ IPENZ
(Professional qualifications)

.....
(Address)

**Appendix VII. ENGINEER'S COMPLETION CERTIFICATE
INFRASTRUCTURE/ LAND DEVELOPMENT**

Issued by:
(approved certifier firm)

To:
(developer / owner)

To be supplied to the **Timaru District Council**

In respect of:
(description of land development / subdivision)

At:
(address)

.....

I..... on behalf of..... has
(engineer / licensed surveyor) (design firm)

been engaged by the abovementioned developer / owner to provide observation, review and certification services for the abovementioned land development / subdivision.

I have sighted the Timaru District Council resource consent conditions that relate to the abovementioned land development / subdivision and the accepted Private Way / Engineering Design.

As an independent professional, I or personnel under my control, have carried out periodic reviews of the land development work appropriate to the nature of the work and in my professional opinion, based upon reasonable enquiry, these reviews, information supplied by the contractor during the course of the works and the contractor's certification upon completion of the works, the works, other than those outstanding works listed below, have been completed in accordance with the abovementioned consent and sound engineering practice.

My qualifications are:

.....
(professional qualifications and affiliations and experience)

I / my design firm holds professional indemnity insurance in excess of no less than

\$..... and includes runoff cover.
(minimum amount of insurance as recommended by IPENZ, ACENZ or IPWEA)

I understand that my professional opinion may be used and relied upon by Timaru District Council in determining the outcome of any approval for the abovementioned land development / subdivision.

Part 3: QUALITY ASSURANCE

This certificate is furnished to the Timaru District Council and the abovementioned developer / owner for their purposes alone.

Outstanding works (if any):.....
(details of any outstanding works)

.....

Construction approved by:
(signature of engineer / licensed surveyor)

.....
(date)

**Appendix VIII. CONTRACTOR'S COMPLETION CERTIFICATE
INFRASTRUCTURE/ LAND DEVELOPMENT**

Issued by:
(contracting firm)

To:
(principal)

To be supplied to the **Timaru District Council**

In respect of:
(description of land development / subdivision)

At:
(address)

.....
(contracting firm) was contracted to the abovementioned principal to

carry out and complete certain land development / subdivision construction in accordance with contract

number..... for
(contract number) (description of land development / subdivision)

I being a duly authorised
(duly authorised representative)

representative of the abovementioned contracting firm hereby confirm that the abovementioned contracting firm has carried out and completed the construction, other than those outstanding works as listed below, in accordance with the abovementioned contract, the requirements of the accepted Engineering Design and the Timaru District Council.

I understand that my opinion may be used and relied upon by Timaru District Council in determining the outcome of any approval for the abovementioned land development / subdivision.

This certificate is furnished to the Timaru District Council and the abovementioned principal for their purposes alone.

Outstanding works (if any):
(details of any outstanding works)

.....

Construction approved by:
(signature of duly authorised representative)

.....
(date)

Appendix IX. NON-CONFORMANCE REPORT

Contract Name/No: _____ NCR Ref No: _____

1. NON-CONFORMING WORK DETAILS:

(provide precise location, detailed description and sketches as appropriate)

Company responsible for NC _____
Contractor (sign/date) _____

2. PROPOSED CORRECTIVE ACTION or CONSESSION REQUESTED

(provide details with sketches, calculations, etc.)

3. APPROVALS:

3.1 The corrective / concession action is accepted / not accepted / accepted subject to attached conditions.

Engineer (sign/date) _____
Council (sign/date) _____

3.2 The corrective action has been completed.

Certified: (sign/date) _____
Reviewed: (sign/date) _____
Approved: (sign/date) _____

Appendix X. ENGINEER’S AUDIT & TEST SCHEDULE

Testing			Inspection		Verification																																																													
Phase	Test / Material Certificate Audit Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Acceptance Criteria		Signed / Accepted / Date																																																										
<p>Note that the below information is an example for selected phases only. Prepare audit and test plans unique to the project, incorporating that project’s quality criteria for infrastructure and materials installed on that project.</p>																																																																		
Materials																																																																		
TNZ M/4:AP20 TNZ M/4:AP40	All Suppliers Certificates All Contractors test results	TNZ M/4	Y	Y	N	<table border="1"> <thead> <tr> <th rowspan="2">Sieve Size</th> <th colspan="2">Percent Passing</th> </tr> <tr> <th>AP20</th> <th>AP40</th> </tr> </thead> <tbody> <tr> <td>37.5mm</td> <td></td> <td>100</td> </tr> <tr> <td>19.0 mm</td> <td>100</td> <td>66 - 81</td> </tr> <tr> <td>9.5 mm</td> <td>55 – 75</td> <td>43 - 57</td> </tr> <tr> <td>4.75 mm</td> <td>33 – 55</td> <td>28 - 43</td> </tr> <tr> <td>2.36 mm</td> <td>22 - 42</td> <td>19 - 33</td> </tr> <tr> <td>1.18 mm</td> <td>14 – 31</td> <td>12 - 25</td> </tr> <tr> <td>0.600 mm</td> <td>8 – 23</td> <td>7 – 19</td> </tr> <tr> <td>0.300 mm</td> <td>5 – 16</td> <td>3 – 14</td> </tr> <tr> <td>0.150 mm</td> <td>0 – 12</td> <td>0 – 10</td> </tr> <tr> <td>0.075 mm</td> <td>0 - 8</td> <td>0 - 7</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Fraction</th> <th colspan="2">Percent within</th> </tr> <tr> <th>AP20</th> <th>AP40</th> </tr> </thead> <tbody> <tr> <td>19mm – 4.75mm</td> <td></td> <td>28 – 48</td> </tr> <tr> <td>9.5mm – 2.36mm</td> <td>20 – 46</td> <td>14 – 34</td> </tr> <tr> <td>4.75mm – 1.18mm</td> <td>9 – 34</td> <td>7 – 27</td> </tr> <tr> <td>2.36mm – 0.600mm</td> <td>6 – 26</td> <td>6 – 22</td> </tr> <tr> <td>1.18mm – 0.30 mm</td> <td>3 – 21</td> <td>5 – 19</td> </tr> <tr> <td>0.600mm – 0.150mm</td> <td>2 - 17</td> <td>2 - 14</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • CBR under Vibrating hammer test over 80% • Less than 10% fines shall pass a 2.36mm sieve after a crushing resistance test with a 130kN load 		Sieve Size	Percent Passing		AP20	AP40	37.5mm		100	19.0 mm	100	66 - 81	9.5 mm	55 – 75	43 - 57	4.75 mm	33 – 55	28 - 43	2.36 mm	22 - 42	19 - 33	1.18 mm	14 – 31	12 - 25	0.600 mm	8 – 23	7 – 19	0.300 mm	5 – 16	3 – 14	0.150 mm	0 – 12	0 – 10	0.075 mm	0 - 8	0 - 7	Fraction	Percent within		AP20	AP40	19mm – 4.75mm		28 – 48	9.5mm – 2.36mm	20 – 46	14 – 34	4.75mm – 1.18mm	9 – 34	7 – 27	2.36mm – 0.600mm	6 – 26	6 – 22	1.18mm – 0.30 mm	3 – 21	5 – 19	0.600mm – 0.150mm	2 - 17	2 - 14	
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Part 3: QUALITY ASSURANCE

Testing			Inspection		Verification																										
Phase	Test / Material Certificate Audit Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Acceptance Criteria	Signed / Accepted / Date																								
						<ul style="list-style-type: none"> Shall have a quality index above CA from weathering quality index test Shall either have a sand equivalent greater than 40 or the fraction of the aggregate passing a 0.075mm sieve shall have a clay index less than 3 or the fraction of the aggregate passing a 0.425mm sieve shall have a plasticity index less than 5 70% of the aggregate by weight shall have 2 or more broken faces 																									
AP65	All Suppliers Certificates All Contractors test results	TDC Contract Drainage and Water Specifications (DWCS) – 5.4	Y	Y	N	<table border="1"> <thead> <tr> <th>Sieve Size</th> <th>Percent Passing</th> </tr> </thead> <tbody> <tr> <td>65.0 mm</td> <td>100</td> </tr> <tr> <td>37.5 mm</td> <td>60 - 90</td> </tr> <tr> <td>19.0 mm</td> <td>45 - 65</td> </tr> <tr> <td>9.5 mm</td> <td>30 - 50</td> </tr> <tr> <td>4.75 mm</td> <td>20 - 40</td> </tr> <tr> <td>2.36 mm</td> <td>10 - 28</td> </tr> <tr> <td>1.18 mm</td> <td>7 - 22</td> </tr> <tr> <td>0.600 mm</td> <td>5 - 16</td> </tr> <tr> <td>0.300 mm</td> <td>4 - 12</td> </tr> <tr> <td>0.150 mm</td> <td>3 - 8</td> </tr> <tr> <td>0.075 mm</td> <td>3 - 6</td> </tr> </tbody> </table> <ul style="list-style-type: none"> AP65 shall be free of organic matter Less than 10% fines shall pass a 2.36mm sieve after a crushing resistance test with a 130kN load AP65 shall either have a sand equivalent greater than 25 or the fraction of the aggregate passing a 0.075mm sieve shall have a clay index less than 3 or the fraction of the aggregate passing a 0.425mm sieve shall have a plasticity index less than 5 	Sieve Size	Percent Passing	65.0 mm	100	37.5 mm	60 - 90	19.0 mm	45 - 65	9.5 mm	30 - 50	4.75 mm	20 - 40	2.36 mm	10 - 28	1.18 mm	7 - 22	0.600 mm	5 - 16	0.300 mm	4 - 12	0.150 mm	3 - 8	0.075 mm	3 - 6	
Sieve Size	Percent Passing																														
65.0 mm	100																														
37.5 mm	60 - 90																														
19.0 mm	45 - 65																														
9.5 mm	30 - 50																														
4.75 mm	20 - 40																														
2.36 mm	10 - 28																														
1.18 mm	7 - 22																														
0.600 mm	5 - 16																														
0.300 mm	4 - 12																														
0.150 mm	3 - 8																														
0.075 mm	3 - 6																														
Premix concrete for kerb and channel	All Suppliers certificates	NZS 3104:2021	Y	Y	N	Concrete (Normal) strength 20 MPa at 28 days, slump 75mm, nominal maximum aggregate 19mm, water content under 170 kg/m ³ ,																									

Part 3: QUALITY ASSURANCE

Testing			Inspection		Verification		
Phase	Test / Material Certificate Audit Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Acceptance Criteria	Signed / Accepted / Date
100 dia uPVC Kerb entry	All Suppliers certificates	AS/NZS 1260: 2017	Y	Y	N	SN10, factory moulded	
100 dia uPVC SN10 pipe	All Suppliers certificates	AS/NZS 1260: 2017	Y	Y	N	SN10, 100mm uPVC	
First class topsoil	All Suppliers Certificates All Contractors test results	TDC DWCS – 5.4.3	Y	Y	N	<ul style="list-style-type: none"> • Under 5% solid detritus, under 10% stone, both under 30mm diameter • Under 25% clay, organic matter 7-20% • Loose friable, well aerated, lightly processed • pH 5.5-7.5 	
Medium grade bark mulch	All Suppliers Certificates All Contractors test results	CCC CSS Part 1: 39.2	Y	Y	N	<ul style="list-style-type: none"> • Under 25% wood chips, under 1% inorganic component, 100% between 11-40mm 	
Construction							
Subgrade strength	Penetrometer test at 50 metre intervals, all Contractors test results	Land Transport Unit Backfill and Reinstatement Requirements Guide (BRRG) – Section 4	Y	Y	Y	CBR greater than 7	
Kerb and channel stringline	Check height and location of string line at every peg on day poured	CCC CSS Part 6: 4	Y	Y	Y	String 100mm behind kerb location and at design level	
Subbasecourse density	Nuclear Densometer test every 25 metres All Contractors test results	BRRG – Section 3	Y	Y	Y	Minimum 2100 kg/m ³ , 95% of readings exceeding 2150 kg/m ³	
Subbasecourse level	Measure depth from string line every 50 metres and at all grade changes and TPs	BRRG – Section 3	Y	Y	N	Finished levels within -25mm & +5mm of design	

Part 3: QUALITY ASSURANCE

Testing			Inspection		Verification		
Phase	Test / Material Certificate Audit Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Acceptance Criteria	Signed / Accepted / Date
Concrete placement	All Contractors test results	CCC CSS Part 6: 4.3	Y	Y	N	Slump 75mm	
Kerb level	Check level of kerb every 50 metres and at all grade changes and TPs	CCC CSS Part 6: 4.5	Y	Y	N	Finished level +/- 5mm of design	
Kerb alignment and location	Check alignment and location every 50 metres and at all TPs	CCC CSS Part 6: 4.5	Y	Y	N	Location +/-10mm of design, max 5mm deviation, cumulative visible gaps 10mm over 3m straightedge	
Tree pit excavation	Check dimensions, subgrade condition in 1/5th tree pits	CCC CSS Part 2: 8.4, Part 7: 6.6	Y	Y	Y	Minimum 1000mm deep, 750mm wide, subgrade loosened for 150mm all around	
Tree pit construction	Check finished level of filling, mulch area in 1/5th tree pits	TDC SD 7424	Y	Y	N	Finished surface +0mm, -0mm design Mulch extends 150mm outside tree stakes	
Trench excavation	Check dimensions of each fifth trench	TDC SD 5301	Y	Y	N	Minimum 850mm to invert in drives, 750mm to invert in untrafficked areas without protection	
Pipe laying	Check fall to outlet of each fifth pipe	TDC SD 5301	Y	Y	N	Invert level of pipe below property gully level	
Pipe haunching	Check depth of haunching of each fifth pipe	TDC SD 5301	Y	Y	Y	150mm above and below pipe	
Trench backfill compaction	Clegg test each 1/5th trench. All Contractors test results	BRRG – Section 2 & 3	Y	Y	N	Backfill exceeds Clegg Impact value of 35 in the commercial crossing, 25 in other areas	

Appendix XI. INSPECTION & TEST SCHEDULE

Testing			Inspection		Verification		
Material / Construction Phase	Test(s) / Material Certificate(s) Required Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Contract Records	Signed / Completed / Date
Note that the below information is an example for selected phases only. Prepare inspection and test plans unique to the project, incorporating that project's quality criteria for infrastructure and materials installed on that project.							
Materials – Kerb and channel							
AP65	One sieve analysis/500m3	TDC DWCS – 5.4	Y	Y	N	Suppliers certificate Gradings	
Premix concrete for kerb and channel	Suppliers certificate/truck	NZS 3104:2021	Y	Y	N	Suppliers certificate	
100 dia uPVC SN10 kerb entry	Suppliers certificate/delivery	AS/NZS 1260: 2017	Y	Y	N	Suppliers Certificate	
Construction – Kerb and channel							
Subgrade strength	Penetrometer test at 50 metre intervals under kerb and channel	BRRG – Section 4	Y	Y	Y	Metalcourse design checksheet	
Kerb and channel stringline	Check height and location of string line at every peg on each day string line used	CCC CSS Part 6: 4.4	Y	N	N	Kerb and channel construction checksheet	
Subbasecourse density	Nuclear Densometer test every 10 metres	BRRG – Section 3	Y	Y	Y	Kerb and channel construction checksheet	
Subbasecourse level	Measure depth from string line every 20 metres and at all grade changes and TPs	BRRG – Section 3	Y	Y	N	Kerb and channel construction checksheet	
Concrete placement	Slump test where mix appears dry	CCC CSS Part 6: 4.3	Y	Y	N	Kerb and channel construction checksheet	
Kerb level	Check level of kerb every 20 metres and at all grade changes and TPs	CCC CSS Part 6: 4.4	Y	N	N	Kerb and channel construction checksheet	
Kerb profile	Check profile at all hand boxed sections immediately after pour	CCC CSS Part 6: 4.4	Y	N	N	Kerb and channel construction checksheet	

Part 3: QUALITY ASSURANCE

Testing			Inspection		Verification		
Material / Construction Phase	Test(s) / Material Certificate(s) Required Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Contract Records	Signed / Completed / Date
Kerb alignment and location	Check alignment and location every 20 metres and at all TPs	CCC CSS Part 6: 4.4	Y	N	N	Kerb and channel construction checksheet	
Stormwater outlets	Check outlets at invert after placement	CCC CSS Part 6: 4.5	Y	N	N	Kerb and channel construction checksheet	
Materials – Tree pit							
First class topsoil	One sieve analysis, nutrient content and soil pH test/50m3	CCC CSS Part 1: 34.1	Y	Y	N	Test results Suppliers certificate	
Bark mulch	One sieve analysis/50m3	CCC CSS Part 1: 35.2	Y	Y	N	Gradings Suppliers certificate	
Construction – Tree pit							
Tree pit excavation	Check dimensions, subgrade condition of each pit	CCC CSS Part 2: 8.4, CCC CSS Part 7: 6.6	Y	Y	Y	Landscape construction checksheet	
Tree pit construction	Check finished level of filling, mulch area of each pit	CCC CSS Part 2: 9.5.4 CCC CSS Part 7: 6.6	Y	N	N	Landscape construction checksheet	
Materials – Property stormwater pipes							
100 dia uPVC SN10 pipe	Suppliers certificate/delivery	DWCS	Y	Y	N	Suppliers Certificate	
TNZ M/4: AP20	One sieve analysis/50m3	TNZ M/4	Y	Y	N	Suppliers certificate Gradings	
Construction – Property stormwater pipes							
Trench excavation	Check dimensions once for each property	AS/NZS 2032:2006 and AS/NZS 2566.2:2002	Y	N	N	Property stormwater checksheet	
Pipe laying	Check fall to outlet for each line	AS/NZS 2032:2006 and AS/NZS 2566.2:2002	Y	N	N	Property stormwater checksheet	
Pipe jointing	Check each line doesn't leak	AS/NZS 2032:2006 and AS/NZS 2566.2:2002	Y	N	N	Property stormwater checksheet	
Pipe haunching	Check depth once for each property	TDC SD 5301	Y	Y	Y	Property stormwater checksheet	
Trench backfill compaction	Clegg test every 10 metres of trench, on all layers	BRRG – Section 3	Y	N	N	Property stormwater checksheet	

Part 3: QUALITY ASSURANCE

Testing			Inspection		Verification		
Material / Construction Phase	Test(s) / Material Certificate(s) Required Frequency	Specification Reference	Contractor Y/N	Engineer Y/N	Hold Point Y/N	Contract Records	Signed / Completed / Date
Property stormwaters	Check all properties connected	AS/NZS 2032:2006 and AS/NZS 2566.2:2002	Y	N	N	Property stormwater checksheet	

**Appendix XII. QUALITY SYSTEM WORK PROCEDURE
CONTROL & INSPECTION OF PIPE SUBSOIL DRAIN CONSTRUCTION**

1. Scope of this procedure

Subsoil drain construction other than perforated corrugated plastic pipe.

2. Responsibility & Actions

The site supervisor shall be an authorised drainlayer, where the pipe is laid in the legal road or shall be vested. Where the pipe is to be laid under a building consent, the site supervisor shall be a registered drainlayer.

The site supervisor shall be responsible for progressively inspecting the work to ensure it complies with the requirements.

The results of the inspection shall be recorded on the Pipe Subsoil Drain Construction Checksheet for defined sections of drain.

Inspection shall record the following:

- a) Pipe type and diameter.
- b) Trench width and depth.
- c) Bedding and filter material and depth.
- d) Measured grade.
- e) Joint details.
- f) Backfilling.
- g) Connections.

**Appendix XIII. ENGINEER'S H&S EXAMPLE CHECKSHEET
HEALTH AND SAFETY MANAGEMENT PLAN**

CONTRACTOR: _____ DATE: _____
PROJECT DESCRIPTION: _____

The following should be documented:

1. Project Description:	Requirement Met?	
	Yes	No
• Brief description of the scope of the work or services	<input type="checkbox"/>	<input type="checkbox"/>
• Summary of major activities and types of work	<input type="checkbox"/>	<input type="checkbox"/>
• Specialist tasks or procedures are documented and reference to safe work procedures and training documented	<input type="checkbox"/>	<input type="checkbox"/>
• Areas of project requiring special consideration are documented and procedural requirements are referenced: e.g. presence of public, traffic management, notifiable work, restricted work	<input type="checkbox"/>	<input type="checkbox"/>
2. Contractor's Health and Safety Structure and System:		
• Names and positions of personnel with specific health and safety responsibilities are documented	<input type="checkbox"/>	<input type="checkbox"/>
• Position and name of the senior person who will liaise with the Engineer on health and safety issues is documented	<input type="checkbox"/>	<input type="checkbox"/>
• Name and position of the on-site supervisor is documented	<input type="checkbox"/>	<input type="checkbox"/>
3. Contractor's Induction and Safety Training:		
• Outline of the contractor's induction procedures for employees and subcontractors	<input type="checkbox"/>	<input type="checkbox"/>
• Register of personnel completing the induction programme	<input type="checkbox"/>	<input type="checkbox"/>
• Details of employee health and safety training relevant to the project.	<input type="checkbox"/>	<input type="checkbox"/>
• Copies of relevant certificates attached e.g. Code of Practice for Temporary Traffic Control, Cable Location, Confined Spaces	<input type="checkbox"/>	<input type="checkbox"/>

- Register of persons holding authorisations, permits, competency certificates, licenses etc required for the project
- 4. Safe Work Practices and Procedures**
- List of company safe work procedures relevant to the project
 - Copies of safe work procedures, permits or notifiable work notices
 - Details of project operations subject to work permits
 - Work permit procedure documented
 - Distribution list of people (including subcontractors) issued with safe work procedures
- 5. Noise**
- Control measures and standards are documented with clear procedures on how to achieve the control
- 6. Hazard Management**
- All hazards (existing and potential) associated with the project are documented on the hazard register form
 - Residual risk shall be transferred to the project contractor
 - Safety in Design principals shall be incorporated into the Hazard Management system
 - The hierarchy of controls has been considered (i.e. eliminate, isolate or minimise)
 - Control measures are documented with clear procedures on how to achieve the control
 - Evidence of employee and subcontractor training on control measures is included
- 7. Workplace Health and Safety Inspections**
- Inspection team documented
 - Frequency and type of inspection defined

- Checklists to be used are included
- Procedure for actioning inspection findings included
- Hazard reporting procedures documented and form included
- Specific areas targeted for inspections documented
- 8. Emergency Procedures**
- Overall emergency plan and structure for the project
- Register of emergency equipment and locations
- Register of current qualified first-aiders
- Arrangements/coordination with other worksite occupants in event of emergency
- 9. Accident Reporting, Recording and Investigation**
- Details of accident recording, reporting and investigation system and procedures
- Details of how accidents will be notified to WorkSafe NZ and Engineer
- Details of how accident statistics are to be compiled (major projects)
- 10. Health and Safety Performance Monitoring (Major Projects)**
- Details of how health and safety performance statistics associated with the project are reviewed
- Details of how monthly health and safety performance reports will be compiled for review by Engineer
- Nature of health and safety performance information presented to employees on a regular basis
- Outline of auditing programme to evaluate the effectiveness of the Health and Safety Management Plan
- 11. Health and Safety Management Plan Review**

This Health and Safety Management Plan has been:

Reviewed by:	_____
	<i>(Name/Position/Sign)</i>
Approved by:	_____
	<i>(Sign/Date)</i>
Contractor notified:	_____
	<i>(Date)</i>
Reviewed by:	_____
<i>(Council)</i>	<i>(Name/Position/Sign)</i>

Appendix XIV. ENGINEER'S GRAVITY PIPE TEST CHECKSHEET

CONTRACTOR _____ ASSET (sewer/sw) _____
 PROJECT TITLE _____

SITE AND PIPELINE INFORMATION

Overall length (m) _____ Location _____
 Pipe material and class _____
 Nominal diameter (mm) _____

PRESSURE TEST STANDARDS (to Drainage and Water Contract Specification)

Contract document reference _____

Type of test	Visual inspection	Select test method (delete inapplicable)	
		Air test	Hydrostatic test
Reference	clause 3.14	clause 8.4	clause 8.4
Performance measure	No leaks or defects visible	Pressure drop less than 2kPa (0.2m) over test period	Water level does not drop over test period ¹

TEST CRITERIA (provide before testing)

TEST RESULTS

Section tested	Length (m)	Test pressure (kPa or m)	Test period (min)	Test Date	Pressure achieved (m) or loss (ml)	Pass / fail

- Note: 1) Hydrostatic and air testing shall be undertaken in accordance with Clause 8.4 of the Drainage and Water Contract Specification. Reference 1 and 2 below for Test Periods.
 2) For Hydrostatic test of Concrete pipe and structures, the lines shall be filled with water 24 hour prior to the inspection.
 3) For low pressure air tests, air should be bled through the line, forcing water out to achieve an airtight system. Maximum air pressure of 10kPa to be applied.

Engineer _____ Signature _____
 Contractor Rep _____ Signature _____
 Council Rep _____ Signature _____
 Date plan accepted _____
 Date and time pipe test witnessed _____ Retest required yes/no
 NCR reference _____ Pipeline accepted yes/no

1. Hydrostatic Testing

Allowable losses (ml) over a 5 minute test period

Conditions: Concrete pipe, where 30kPa hydrostatic test is required.

Pipe diameter (mm)	Length of test section (m)							
	5	10	15	20	30	40	50	100
225	28	56	84	113	169	225	281	563
300	38	75	113	150	225	300	375	750
375	47	94	141	188	281	375	469	938
450	56	113	169	225	338	450	563	1125
525	66	131	197	263	394	525	656	1313
600	75	150	225	300	450	600	750	1500

2. Air Testing

Length of air test required (min:sec)

Conditions: Maximum air pressure of 10 kPa with permissible loss in a concrete or plastic pipe of 2kPa or 0.3 PSI.

Pipe diameter (mm)	Length of test section (m)									
	10	20	30	40	50	60	70	80	90	100
150	2:00	2:00	2:00	2:00	2:00	2:00	2:00	2:00	2:00	2:00
200	2:00	2:00	2:00	2:00	2:00	2:00	2:00	2:00	2:00	2:00
225	2:00	2:00	2:00	2:00	2:00	2:00	2:10	2:10	2:10	2:10
250	2:00	2:00	2:00	2:00	2:20	2:30	2:40	2:40	2:40	2:40
300	2:00	2:00	2:00	2:20	3:00	3:00	3:00	3:00	3:00	3:00
375	2:00	2:00	2:40	3:40	3:40	3:40	3:40	3:40	3:40	3:40
450	2:00	2:30	3:50	4:20	4:20	4:20	4:20	4:20	4:20	4:20
600	2:30	4:30	5:50	5:50	5:50	5:50	5:50	5:50	5:50	5:50

Appendix XV. ENGINEER’S CONCRETE PRESSURE PIPE TEST CHECKSHEET

CONTRACTOR _____ ASSET (sewer/water) _____
 PROJECT TITLE _____

SITE AND PIPELINE INFORMATION

Overall length (m) _____ Location _____
 Test water disposed of to _____
 Pipe material and class _____ Nominal diameter (mm) _____

PRESSURE TEST STANDARDS (to CSS: Part 3)

Contract document reference _____

Type of test	Select test method (delete inapplicable)	
	Working pressure water test	Max operating pressure water test
Reference	clause 14.3.1	clause 14.3.1
Performance measure	No pressure loss	Measured loss mm/hr not to exceed 0.3 x length m x dia mm
Test period	3 hrs	5 mins

THRUST BLOCKS

Block identifier	Bearing capacity (kPa)		Redesign required	New design details
	Assumed	Site verified		
Add rows as necessary				

TEST CRITERIA (provide before testing)

TEST RESULTS

Section tested	Length (m)	Specified test pressure or allowable loss	Test Date	Pressure achieved (m) or measured loss (mm/hr)	Pass / fail
Add rows as necessary					

Engineer _____ **Contractor Rep** _____
 Signature _____ Signature _____
 Date plan accepted _____ **Council Rep** _____
 _____ Signature _____
 Date and time pipe test witnessed _____ Retest required yes/no _____
 NCR reference _____ Pipeline accepted yes/no _____

Appendix XVI. ENGINEER'S PRESSURE PIPE TEST CHECKSHEET

CONTRACTOR _____ ASSET (sewer/water) _____
 PROJECT TITLE _____

SITE AND PIPELINE INFORMATION

Overall length (m) _____ Location _____
 Test water disposed of to _____
 Pipe material and class _____ Nominal diameter (mm) _____

PRESSURE TEST STANDARDS

Contract document reference _____

Type of test	Select test method (delete inapplicable)	
	Pressure rebound method	Constant pressure method
Material	PE ≤ DN315	DI, GRP, PVC, steel
Reference	clause 6.3.4.4	clause 6.3.4.1
Performance measure	Pressure rises or remains static	Make up water $Q \leq 0.14^{LDH1}$
Test pressure (m)	Minimum of pipe rating but no more than 1.25 x pipe rating	

THRUST BLOCKS

Block identifier	Bearing capacity (kPa)		Redesign required	New design details
	Assumed	Site verified		
Add rows as necessary				

CONSTANT PRESSURE METHOD

Remove redundant test method

TEST CRITERIA (provide before testing)

TEST RESULTS

Section tested	Q (l/hr) ¹	Specified test pressure (m)	Test Date	Makeup water used (l/hr)	Pass / fail

PRESSURE REBOUND METHOD

Remove redundant test method

TEST CRITERIA (provide before testing)

TEST RESULTS

Section tested	Specified test pressure (m)	Test Date	P_{60}^2	ΔV^2	Pressure plot ²	Pass / fail

Note 1) Provide details of this calculation.

2) Provide time/pressure readings and graphed results to confirm test details, as detailed in NZS 2566.2:2022.

3) M5 Reference Test to be completed for pressure pipelines >DN315 or where specified in Contract documents.

Engineer Signature _____

Contractor Rep Signature _____

Part 3: QUALITY ASSURANCE

Date plan accepted	_____	Council Rep	—
_____		Signature	—
Date and time pipe test witnessed	_____	Retest required	yes/no
NCR reference	_____	Pipeline accepted	yes/no

Appendix XVII. CONSTRUCTION CHECKSHEET
ACTIVITY 7 PIPE SUBSOIL DRAIN CONSTRUCTION

CONTRACT/JOB: _____ DATE: _____
 DRAIN LOCATION: _____

Task	Acceptance Criteria/Test Frequency	Task/Completion Signature/Comment
1. Drawings and specifications checked for requirements		
2. Pipe material <ul style="list-style-type: none"> • type class • diameter 		
3. Filter material <ul style="list-style-type: none"> • specification • grading 		
4. Trench <ul style="list-style-type: none"> • alignment check • grade (normal min 1:100) • width • depth 		
5. Bedding <ul style="list-style-type: none"> • min depth 75mm • sockets not bearing 	Yes/No	
6. Pipe laying <ul style="list-style-type: none"> • sockets uphill • joints clean, invert flush • joints as detailed • rings required • isolated from surface water 		
7. Backfill material <ul style="list-style-type: none"> • specification • grading 		
7. Backfill placement <ul style="list-style-type: none"> • layer depth • compaction 		
8. Connections <ul style="list-style-type: none"> • as per design • location 		

Arising NCR: _____

All tasks defined above have been satisfactorily completed to the standards required:

Contractor: _____
(Sign/Date)

Appendix XVIII. CONSTRUCTION CHECKSHEET ACTIVITY 7 BASECOURSE STRINGING

CONTRACT/JOB: _____ DATE: _____
ROAD LOCATION: _____

Refer to diagram on back of this sheet for measuring diagram


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Ch.	L	C	R

Part 3: QUALITY ASSURANCE

Ch.	L	C	R

Appendix XIX. PUMP STATION OUTSTANDING WORK/DEFECT LIST

 <p>TIMARU DISTRICT COUNCIL Te Kaurihera ō Rohe o Te Tihi o Maru</p>	<p>CITY ENVIRONMENT GROUP CONSTRUCTION / COMMISSIONING WORK PACK OUTSTANDING WORK/DEFECT LIST</p>								<p>Workpack Ref:</p>					
<p>The listed Defect List items must be completed as dictated by the stated Category before the commissioning of the asset covered by this Construction Work Pack proceeds to the next phase. Phases and Categories are detailed in the Pump Station Pre-Commissioning, Commissioning and Testing Procedure.</p> <ul style="list-style-type: none"> • Category A – Complete prior to handover to CEG for Control System Commissioning • Category B – Complete prior to Clean Water Commissioning • Category C – Minor items that do not prevent commissioning • Category D – Items not part of project scope required to incorporate <p>Type refers to the following:</p> <ul style="list-style-type: none"> • Snag (S) - any defects/faults/problems/issues/actions identified prior plant handover • Defect (D) - any defects/faults/problems/issues/actions identified at plant handover and during Defect Liability Period 										<p>Station Name:</p>				
										<p>Page No.: of</p>				
ITEM NO.	ITEM REPORTED BY, CATEGORY, AND DISCIPLINE:					DETAILS	PERSON TO ACTION	PROGRESS REPORT			ITEM COMPLETED		ACCEPTED BY CEG	
	Initial	Date	Category	Discipline	Type			Initial	Date	Report	Initial	Date	Initial	Date

Discipline Codes:
 General – **Gen**; Civil – **Civ**; Mechanical – **Mech**; Electrical / Control / SCADA - **EICA**

