

PART SEVEN

QUALITY ASSURANCE

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7.1 QUALITY ASSURANCE

This part of the code details the roles, responsibilities and relationships between the Principal Provider, the Contractor, and the RCA. It further details the processes for the auditing of construction, materials, safety and traffic management.

7.2 RELATIONSHIP FRAME WORK

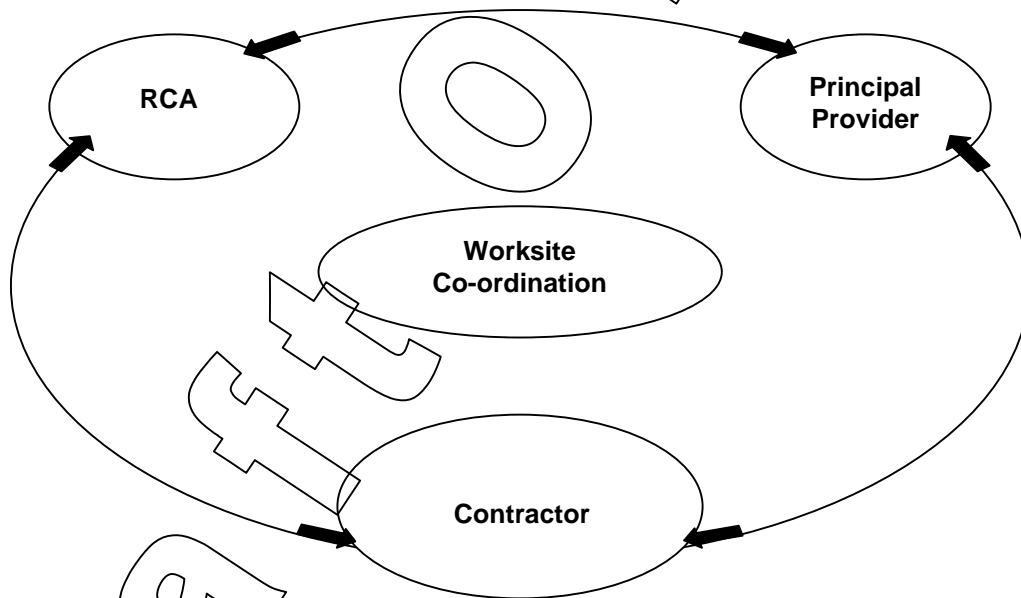
7.2.1 Key Stakeholder Over view

The following diagram shows the formal and informal communication lines available between all the parties involved in any works.

The formal relationship flows from the RCA to the Principal Provider to the Contractor and vice versa.

The informal may flow in either direction particularly where the Principal Provider has delegated some responsibility to the Contractor and / or all parties have agreed on this. Such agreement should be on a job by job basis.

The formal and informal relationships shall be set out in the Quality Management Systems of both the Principal Provider and the Contractor. Appendix 7.10 sets out the general requirements for the Contract Quality Plan. It should be particularly noted in 7.10.4 (Contract Review) and 7.10.5 (Document and Record Control).



7.2.2 Formal Roles, Responsibilities and Relationships

ROLE	RESPONSIBILITY	RELATIONSHIP
RCA	Liaison & code compliance during construction, maintenance & warranty. Appoints RCA Representative	Principal Providers Representative
Principal Provider	Specifies that all work shall be undertaken in accordance with a minimum QA level of TQS1 or as set out in Appendix 7.10.2.1. Approval of Contract Quality Plan. Appoints Principals Providers Representative.	RCA Representative Contractor
Contractor	Appoints Contract / Project Manager and Quality Representative to manage operations as set out in 7.10.2.2 – Organisation.	Principal Providers Representative

7.2.3 Contract Quality Plan (Refer Appendix 7.10.7.1)

The Principal Providers Representative shall approve the Contract Quality Plan and on request from the RCA's Representative shall make available those parts of the approved Contract Quality Plan that relate to this Code.

The contractor shall undertake the work in a planned and controlled manner to ensure that the quality requirements are achieved. The contractor must be able to demonstrate that the following has been undertaken on all contracts:

- Identify the quality requirements of both the Principal Provider and the RCA;
- Plan how these will be achieved;
- Control the work in compliance with the plan;
- Inspect the work and verify that it conforms to the specified requirements; and
- Record the results as documentary evidence.

7.2.4 Pre-Construction Meeting

The Principal Provider, the Contractor, or the RCA may request a pre-construction meeting.

The purpose of this meeting is to discuss implementation issues after all necessary consents have been obtained. A copy of the Contract Quality Plan should be made available to the RCA's Representative at this time. It also provides the opportunity for the Representatives of all parties to meet and establish lines of communication. Other issues that should be considered include:

- Public relations communication strategy – Code reference 6.3.
- All necessary consents have been obtained – Code reference 6.1

7.3 AUDIT FRAMEWORK

7.3.1 Quality Assurance Requirements (QA)

- Auditing by the RCA covers only a small percentage of the work. The Principal / Contractor Representatives are responsible for ensuring that regular Quality Assurance checks are carried out and documented until the commencement of the maintenance period.
- Checklists covering all items associated with Quality Assurance must be completed for all work. These may be completed by the Contractors Representative/Site Manager but shall be certified only by the Principals Representative unless the contractor has an independent Quality Manager. Appendix 7.2 details the items that are required to be covered and whilst this checklist will be used by the RCA to rate QA, it may also be used by the Principal/Contractor.
- For Minor and Major works the Contractor shall submit the checklists to the RCA Representative on request.
- For Project works the Principals Representative shall submit all the checklists to the RCA Representative weekly.
- A checklist covering the items associated with temporary traffic management must be completed for a minimum of 10% of all work sites and must be completed by an STMS qualified to the appropriate level. Appendix 7.4 details the items required to be checked. This checklist (or the TNZ equivalent) is to be used by the Principals representative and the RCA.
- RAMM Data may be required by some RCA's for some works. Information regarding this will be advised at the RON approval stage and the relevant forms provided.

7.3.2 Audit Process

The audit process (Appendix 7.1) is a continuous one from the start date, as advised to the RCA by the Principals Representative, (see 6.2.4) until the expiry of the warranty period. It is however divided into four distinct phases.

a) Phase One – Works in Progress

Five days prior to the commencement of work, the Principals Representative shall advise the RCA of that fact. The RCA shall then schedule site audits based on the principles outlined in Audit Principles (7.3.3)

b) **Phase Two – Final Walkover**

On completion of the work, or at an agreed stage, the RCA Auditor and the Principals Representative will carry out a final walkover audit of the complete project (or stage). It is desirable that the contractor's representative is present.

Subject to an acceptable audit, the RCA and Principal shall sign Phase Two of the Works Completion Advice (Appendix 7.7). The 12-month maintenance period commences from this date.

c) **Phase Three – Maintenance Expiry**

Prior to the end of the maintenance period (after 11 months) a joint audit of the project site shall take place.

Subject to an acceptable audit, the RCA and Principal shall sign Phase Three of the Works Completion Advice (Appendix 7.7). The 12-month warranty period commences from this date.

d) **Phase Four – Warranty Expiry**

Prior to the end of the warranty period (after 11 months) a joint audit of the project site shall take place.

Subject to an acceptable audit, the RCA and Principal shall sign Phase Four of the Works Completion Advice (Appendix 7.7).

7.3.3 Audit Principles

It is expected that the Principals Representative and the Site Manager will continually audit the work site on all QA matters including Temporary Traffic Management.

The RCA may conduct additional site audits for a variety of reasons, but generally these are based on the following.

- a) Pre-determined - all Project sites audited weekly unless otherwise agreed by the RCA
- b) Performance based - encourages and rewards good performance by reducing the percentage of audits on Major and Minor work sites. The assessment and application may vary between individual TA's.
- c) Random - resulting from non-selective site visits and incurring no cost to the Principal or Contractor unless a non-conformance notice is issued.
- d) Incidents - can be generated in a number of ways including
 - by a member of the public
 - during routine RCA site audits
 - by the Principal Provider

7.3.4 Performance Evaluation

Results of all site audits will be collated and reported to the Principal Provider by the RCA on a monthly basis.

There is also provision for this information to be shared amongst RCA's within the region. The information from each RCA would be collated to a central database with the information being available to RCA's, Principal Providers and Contractors.

Examples of typical reports are attached as Appendices 7.8 and 7.9.

7.4 NON-CONFORMANCE

7.4.1 Questionable Work

When the RCA is of the opinion that material or workmanship may not meet the required standards, the RCA may request information from the Principal Provider to demonstrate that compliance has been achieved to meet the requirements of the Code.

In the event of this information not being to the satisfaction of the RCA, the RCA may initiate an independent Quality Assurance Audit.

The independent Quality Assurance Audit may include more extensive sampling or testing and any additional investigation required.

The RCA may from time to time collect samples of materials from the construction site for laboratory testing. Should the materials not meet specified standards, the RCA may require the material to be replaced. The Principal Provider shall be responsible for all associated costs. Should the materials meet the required standards the RCA shall be responsible for the audit costs.

7.4.2 Non Conformance Notices

Work undertaken for or by the Principal Provider that does not conform to the required standards may be classified into two types, each of which requires a specific response. These are:

- a) Health and Safety including traffic management - In the event of the RCA being of the opinion that in order to prevent injury to persons or damage to property urgent action is required, the RCA may -
 - without notification, engage a contractor to remedy in order to make it safe and recover all associated costs from the Principal Provider, and/or
 - issue a Non Conformance Notice (Appendix 7.5) to remedy within two hours.
- b) Other - where other issues e.g. reinstatements do not conform to the required standards a Non Conformance Notice will be issued for action within a specified timeframe.

7.4.3 Stop Work Notices

Failure to meet any of the requirements of the Code and / or RON may result in a Stop Work Notice being issued by the RCA. The Notice must be further signed by the RCA acknowledging that the issues have been resolved before work may re-commence. See Appendix 7.6.

7.4.4 Non-Actioned Notices

Should a notice not be actioned by the Principal Provider within the specified timeframe and alternative arrangements not have been made with the RCA, the RCA may engage a contractor to complete the work and recover all associated costs from the Principal Provider.

7.4.5 Unidentified Work

Should the RCA be unable to establish responsibility for damage to the road due to works, the RCA may carry out investigations and repairs and recover all associated costs from the Principal Provider, if and when identified. This cost may be apportioned between a number of Principal Providers as considered appropriate by the RCA. Where practical the RCA should produce evidence of the services located, e.g. photographs.

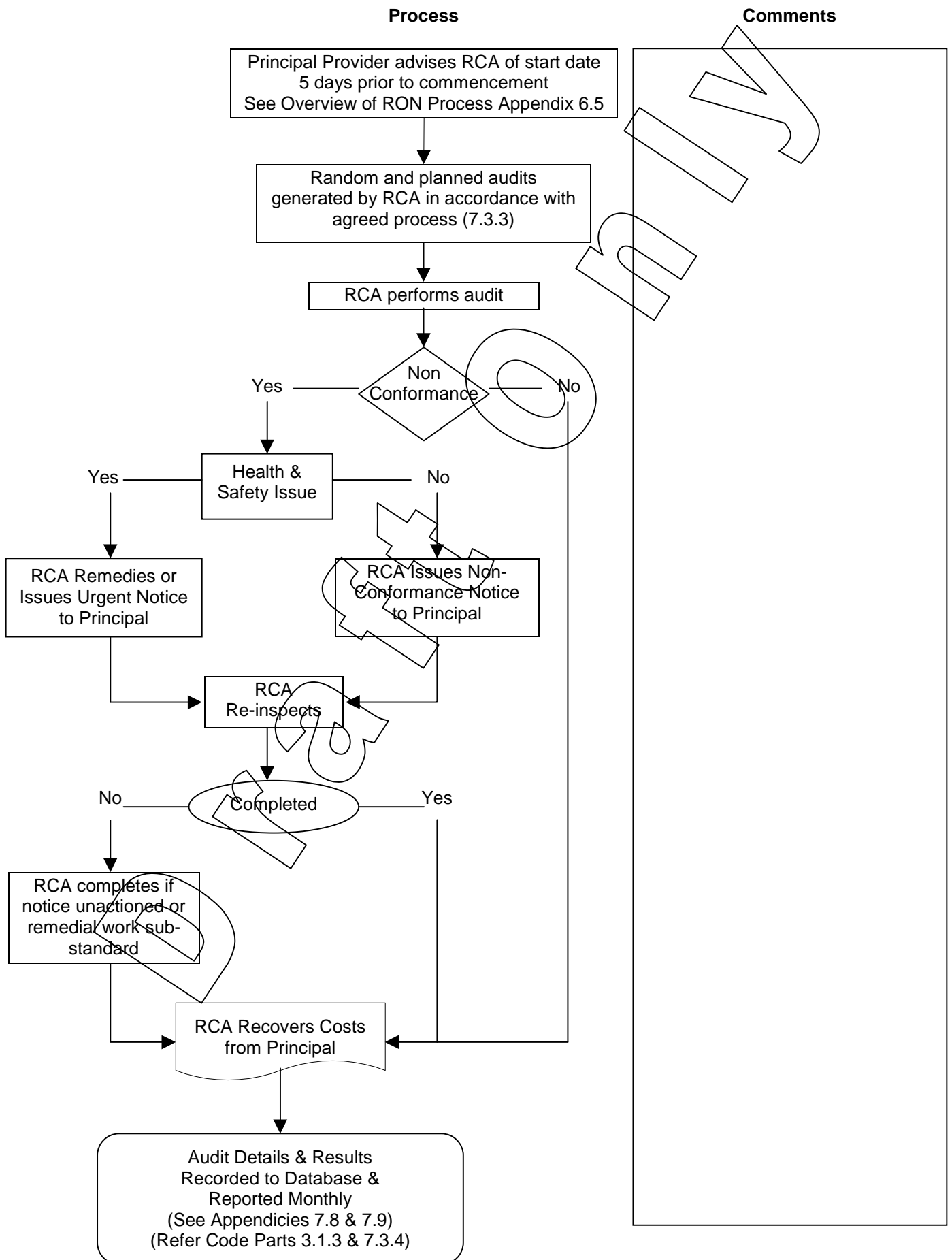
7.5 COST RECOVERY

All reasonable costs associated with the audit process and/or carrying out remedial work incurred by the RCA may be claimed against the Principal by the RCA. Please contact the relevant RCA for the applicable charges.

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7.1 Appendix RON Audit Process Flowchart



7.2 Appendix Q.A. Rating Form

Principal:	Contractor:	Road:			
RON No:	Audit Date:	Location:			
Auditor:	Audit Type: Project	Maj/Min	Other	Incident No.	
Activity	Yes	No	NA	Non Conformance	Corrective Action
Competence					
Qualified Contractor					
Pre-commencement meeting with RCA					
Other services located - marked - pilot holes					
Incident response times acceptable					
Stakeholders					
Pre-commencement communication verified					
Pre-commencement signage in place					
Communication updates sighted					
Approved operating times adhered to					
Dust levels acceptable					
Noise levels acceptable					
Storm water contamination controls in place					
Trees – Arborists notified					
Construction					
Approved RON & TMP on site					
TMP Conforms					TTM Rating Form attached
Site set up as approved - Vehicles - Material - Equipment - Containers/Sheds					
Stability Measures					
Health & Safety - Site Personnel - General Public					
Pre-trench sawcutting					
Minimum service cover					
Backfill material to spec - Main - Upper Level					
Compactions - In layers - Contractor results - RCA results					
Pre-seal sawcutting - 1m rule applied - Straight/Parallel - Shoulders					
Surface Reinstatement - Matches existing type - Matches existing level - Thickness to spec - Full panel/width - Joint sealing - Clean topsoil - Seeded to spec					
Concrete - Dowels to spec - 2m rule applied - Construction joints - Broom finish					
Kerb & Channel reinstated to match existing					
Street furniture & signs - Reinstated - Undamaged					
Road marking reinstated - Thermoplastic - Standard					
Signal Detector Loops Reinstated					
Final clean up - Site swept/hosed - TMP equip removed					
Overall Rating					
Total Yes	=	_____	=	_____ %	80% Plus - Pass
Possible (total Yes + total No)					60% - 79% - Needs Improvement
					Less than 60% - Failed

7.3 Appendix Q.A. Rating Form Example

Principal:	Contractor:	Road:		
RON No:	Audit Date:	Location:		
Auditor:	Audit Type: Project	Maj/Min	Other	Incident No.
Activity	Yes	No	NA	Non Conformance Corrective Action
Competence				
Qualified Contractor	✓			
Pre-commencement meeting with RCA		✓		Required for next stage & future projects
Other services located - marked - pilot holes	✓		✓	Not required by Utility in this location
Incident response times acceptable			✓	
Stakeholders				
Pre-commencement communication verified	✓			
Pre-commencement signage in place	✓			
Communication updates sighted			✓	
Approved operating times adhered to		✓		No work 7-9 am & 4-6pm
Dust levels acceptable	✓			
Noise levels acceptable	✓			
Storm water contamination controls in place			✓	
Trees – Arborists notified	✓			
Construction				
Approved RON & TMP on site		✓		Must be on site at all times
TMP Conforms	✓			RTM Rating Form attached
Site set up as approved - Vehicles	✓			
- Material	✓			
- Equipment	✓			
- Containers/Sheds	✓			
Stability Measures				
Health & Safety - Site Personnel	✓			
- General Public	✓			
Pre-trench sawcutting				Ensure overbreak corrected
Minimum service cover	✓			
Backfill material to spec - Main	✓			
- Upper Level			✓	
Compactions - In layers		✓		Re-excavate & compact in 200mm layers
- Contractor results		✓		Record results by layer & location
- RCA results			✓	To be re-checked
Pre-seal sawcutting - 1m rule applied			✓	
- Straight/Parallel			✓	
- Shoulders			✓	
Surface Reinstatement - Matches existing type			✓	
- Matches existing level			✓	
- Thickness to spec			✓	
- Full panel/width			✓	
- Joint sealing			✓	
- Clean topsoil			✓	
- Seeded to spec			✓	
Concrete - Dowels to spec			✓	
- 2m rule applied			✓	
- Construction joints			✓	
- Broom finish			✓	
Kerb & Channel reinstated to match existing			✓	
Street furniture & signs - Reinstated			✓	
- Undamaged			✓	
Road marking reinstated - Thermoplastic			✓	
- Standard			✓	
Signal Detector Loops Reinstated			✓	
Final clean up - Site swept/hosed			✓	
- TMP equip removed			✓	
Overall Rating				
Total Yes	=	16		80% Plus - Pass
Possible (total Yes + total No)		22	= 73 %	60% - 79% - Needs Improvement
				Less than 60% - Failed

7.4 Appendix TTM Rating Form

Auditor	Location _____		
Name _____	Activity _____	Level of TTM _____	
Qualification _____	RCA _____	Client _____	
ID No _____	Date _____	Time _____	
	TMP Sighted Yes/No _____		
Rating Standard			
Contractor	High Standard	Acceptable	Needs Improvement
Name _____	0-10	11-25	26-50
STMS _____	Audit Result – Final Rating Score _____		
Qualification _____	Action / Comment _____		
ID No _____			

Signs	Points	Tally Box	Total
Missing (including side road)	5 for each sign		
Spacing (too close/far)	2 for each sign		
Not visible	3 for each sign		
Condition Marginal	1 for each sign		
Condition unacceptable	4 for each sign		
Order incorrect	2 for each set of signs out of order		
Permanent signs not covered	2 for each sign		
Unapproved signs used/too small	4 for each sign		
Sign on wrong side	2 for each sign		
Sign too Low	1 for each sign		
Speed restrictions/derestriction not appropriate/inconsistent	4 for each occasion		
Speed limit not correctly aligned	2 for each occasion		
Sign not upright	1 for each sign		
Non-compliance support	2 for each support		
Wrong sign	5 for each sign		
Lateral location	1 for each sign		
		Sub Total	
Delineation Devices	Points	Tally Box	Total
Missing	30 where delineation is missing and required		
Tapers to short	5 for each taper		
Spacing in tapers	3 for each taper where spacing too great to be effective		
Spacing in lanes	2 where spacing in lanes/around work area is too great		
Condition Marginal	1 for each device where classified in marginal condition		
Condition Unacceptable	3 for each device where classified in unacceptable condition		
Using non-approved device	4 for each non-approved device		
Used Incorrectly	2 for each device		
Road Marking incorrect	5 where not adjusted at long term sites on Level 2 or Level 3 roads		
Chicane	10 for each missing or installed incorrectly		
		Sub Total	
Miscellaneous	Points	Tally Box	Total
Working in Live Lanes	20 for each occasion		
Flashing Beacons not Used/Ineffective	1 for each vehicle		
High Visibility	5 for each individual		
No provision for pedestrians	10 where no provision made and required		
No provision for cyclists	5 where no provision made and required		
Parking/stopping features not relocated	5 where location of feature is required but has not been made		
Safety (long) zone compromised	2 for unacceptable or no safety zone		
Safety (Lateral) zone compromised	2 for unacceptable or no safety zone		
High visibility garment marginal	3 for each garment classified in marginal condition		
High visibility garment unacceptable	5 for each garment classified in unacceptable condition		
Excavation not protected	10 for excavation not protected by acceptable method		
VMS message incorrect	10 for displaying incorrect information		
Barrier defects	10 for each incorrect or missing barrier component		
		Subtotal	
Mobile & Semi Static Operations	Points	Tally Box	Total
Tail pilot vehicle omitted	20 for missing or incorrect location		
Lead pilot vehicle omitted	20 for missing or incorrect location		
Shadow vehicle omitted	20 for missing or incorrect location		
Vehicle mounted signs	5 for missing or incorrect signs		
TMA missing	20 for TMA missing when required		
TMA non-compliant	5 for TMA in use but not of acceptable standard		
Arrowboard missing	20 for arrowboard missing when required		
Arrowboard message	20 for no message or incorrect message		
		Subtotal	
		TOTAL	



AUCKLAND CITY

Traffic and Roading Services

To
CC.
FROM
DATE
RON / CONSENT No
RFS No
SUBJECT

FAX No
FAX No

Please note if receipt of this transmission is not acknowledged within 24 hours it may be re-sent.

A site visit shows the following issues require your attention at the above location.

- Bulleted list of issues

You are required to remedy the above by: [redacted] (time) [redacted] (date)

Should this not be done by the due date, Auckland City will have no choice but to take appropriate action to remedy the situation and bill [redacted] for all costs incurred.

You are also advised that Auckland City will bill for any inspections required.

This notice is issued under Section 20 of the Consolidated By-law.

Should you have any queries regarding this matter please do not hesitate in contacting the writer.

Response

- 1. I / we have inspected the issues outlined above and advise this is / is not as a result of works carried out on behalf of our organisation.
2. The issues outlined will be / were completed on
3. We request an extension to the remedial date because

NAME [redacted] CONTACT NO [redacted] DATE [redacted]



AUCKLAND CITY

Traffic and Rooding Services

STOP WORKS NOTICE

To (PRINCIPAL)

FAX No.

CC

FAX No.

FROM

DATE

RON No

SUBJECT

We hereby require (name) to stop working at the above location for the following reasons:

- ◆ Your lawful authority to work on the roads is dependent on compliance with the Councils conditions

The following conditions have not been adhered to:

Digging or excavating the road without the appropriate consent from Council. The condition of the Road Opening Notice clearly states that no trenching is permitted until a site specific Traffic Management Plan is approved by the Council.

- ◆ You are required to cease any further works immediately, backfill the trench and seal by 4.00pm today(date)
- ◆ No further works are permitted until the following has been addressed.
 1. A Site Specific Traffic Management Plan is approved by this office.
 2. All other conditions outlined in the Conditions for this Road Opening Notice are complied with in full.

Yours sincerely

Received by:

Name

Company

Signature

Date

Time

7.7 Appendix Works Completion Advice

To be completed by Principal Providers Representative following final walkover and immediately prior to the expiry of the 12 month maintenance and 12 month warranty periods.

Ron No:	Project Name:	Date: / /
Final Walkover Date: / /	Details/Comments:	Remedial Action/ Agreed date:
Non-Complying Work: (Detail or attach separate report)		
Follow up on Non Compliance:	Date:	
Quality Control Inspection & Testwork (Reports indicated below are attached.)	Comments	N/A Yes No
Compaction Test Results		
Lay Position Variations Summary		
Incoming Materials Certification Summary		
Other		

The Principals Representative certifies the above works have been constructed in accordance with sound and accepted principles and in accordance with the approved Road Opening Notice. All works comply with the provisions of the Code of Practice for Working in the Road.

The Principal shall be responsible for the repair of all defects until the expiry of the warranty period.

Phase Two - Final Walkover

Principals Representative	Date: / /	Print Name:	Signature:
RCA Acceptance	Date:	Print Name:	Signature:
Works comply and 12 month maintenance commences: Date: / /	End of Maintenance Inspection Due Date: / /		

Phase Three - Maintenance Expiry

Principals Representative	Date: / /	Print Name:	Signature:
RCA Acceptance	Date:	Print Name:	Signature:
Works comply and 12 month warranty period commences: Date: / /	End of Warranty Inspection Due Date: / /		

Phase Four - Warranty Expiry

Principals Representative	Date: / /	Print Name:	Signature:
RCA Acceptance	Date: / /	Print Name:	Signature:
Comments			

7.8 Appendix Utility Works Standards Report Example

Utility	Visits	No to Std	% to Std
Projects, General, Incidents			
Beca Carter	46	43	93.48
CityLink	7	3	42.86
Metrowater	198	98	49.49
Tangent	60	45	75.00
Telecom	83	46	55.42
TelstraClear	31	23	74.19
UNL Comms	4	4	100.00
UNL Gas	49	20	40.82
Vector	108	67	62.04
Vodafone	10	9	90.00
Watercare	17	15	88.24
Others	63	23	36.51
Total	676	396	58.58

Utility	Visits	No to Std	% to Std
Minor / Major Audits			
Beca Carter	0	0	#DIV/0!
CityLink	3	3	100.00
Metrowater	21	12	57.14
Tangent	11	11	100.00
Telecom	64	47	73.44
TelstraClear	13	9	69.23
UNL Comms	8	8	100.00
UNL Gas	137	113	82.48
Vector	40	25	62.50
Vodafone	0	0	#DIV/0!
Watercare	1	1	100.00
Others	12	10	83.33
Total	310	239	77.10

Utility	Visits	No to Std	% to Std
Combined			
Beca Carter	46	43	93.48
CityLink	10	6	60.00
Metrowater	219	110	50.23
Tangent	71	56	78.87
Telecom	147	93	63.27
TelstraClear	44	32	72.73
UNL Comms	12	12	100.00
UNL Gas	186	133	71.51
Vector	148	92	62.16
Vodafone	10	9	90.00
Watercare	18	16	88.89
Others	75	33	44.00
Total	986	635	64.40

UNL Comms	4	4	100.00
Beca Carter	46	43	93.48
Vodafone	10	9	90.00
Watercare	17	15	88.24
Target Pass Rate			80.00
Tangent	60	45	75.00
TelstraClear	31	23	74.19
Vector	108	67	62.04
YTD Median Pass Rate			58.58
Telecom	83	46	55.42
Metrowater	198	98	49.49
CityLink	7	3	42.86
UNL Gas	49	20	40.82
Others	63	23	36.51
Total	676	396	58.58

Beca Carter	0	0	#DIV/0!
Vodafone	0	0	#DIV/0!
CityLink	3	3	100.00
Tangent	11	11	100.00
UNL Comms	8	8	100.00
Watercare	1	1	100.00
Others	12	10	83.33
UNL Gas	137	113	82.48
Target Pass Rate			80.00
YTD Median Pass Rate			77.10
Telecom	64	47	73.44
TelstraClear	13	9	69.23
Vector	40	25	62.50
Metrowater	21	12	57.14
Total	310	239	77.10

UNL Comms	12	12	100.00
Beca Carter	46	43	93.48
Vodafone	10	9	90.00
Watercare	18	16	88.89
Target Pass Rate			80.00
Tangent	71	56	78.87
TelstraClear	44	32	72.73
UNL Gas	186	133	71.51
YTD Median Pass Rate			64.40
Telecom	147	93	63.27
Vector	148	92	62.16
CityLink	10	6	60.00
Metrowater	219	110	50.23
Others	75	33	44.00
Total	986	635	64.40

7.9 Appendix Contractor Standards Report Example

Contractor	Total Site Visits	Sites To Standard	% Sites to Standard	Target Standard	Notices Issued
Mayland	9	9	100.00	80.00	0
Stockman Gen	10	10	100.00	80.00	0
JB Pipeline	25	23	92.00	80.00	0
M Keoghans	8	7	87.50	80.00	0
Mainworks	8	7	87.50	80.00	1
Warren Fowler	7	6	85.71	80.00	0
Northpower	11	9	81.82	80.00	0
Alstom	108	88	81.48	80.00	8
March Cato	68	52	76.47	80.00	4
Works Infrastructure	20	14	70.00	80.00	1
Miscellaneous	97	61	62.89	80.00	14
Downers	35	22	62.86	80.00	6
GDC	40	22	55.00	80.00	12
Siemens	37	17	45.95	80.00	16
Flowmotion	9	4	44.44	80.00	1
Telecom	9	1	33.33	80.00	3
UNL Gas	3	1	33.33	80.00	2
Watercare	3	1	33.33	80.00	0
Vector	13	4	30.77	80.00	6
Metrowater	27	7	25.93	80.00	8
Abi Group	80	20	25.00	80.00	33
Unknowns	36	7	19.44	80.00	2
Transfield	25	12	11.11	80.00	10
Total	688	404	58.72%		127

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To be covered in the Contract Quality Management System and/or Contract Quality Plan (CQP). Documentation should demonstrate the contractors quality system, work practices and procedures that will assure the RCA of compliance with the Code of Practice.

7.10.1 Work Site Co-ordination and Code Requirements

<p>1. Construction Site Management</p> <ul style="list-style-type: none"> • Introduction • Partnership Principles & Work Co-ordination • Contractor performance • Lay positions • Consents & Work Approvals • Pollution control • Emergency responses 	<ul style="list-style-type: none"> • Drawings • Specifications • Working in the vicinity of trees • Choice of construction methods • Public relations • Location of existing services • Code compliance 	<ul style="list-style-type: none"> • Communication strategy • Contractor pre-qualification • Temporary traffic management • Health & safety • Nuisance control • Site tidy up
<p>2. Standard Cross Section Drawings</p> <ul style="list-style-type: none"> • Asphalt carriageways – 9.2 • Concrete vehicle crossings – 9.5 • Asphalt footpaths (back berm) – 9.8 • Grass berm (front) – 9.11 	<ul style="list-style-type: none"> • Chipseal carriageways – 9.3 • Asphalt vehicle crossings – 9.6 • Concrete footpaths (front berm) – 9.9 • Grass berm (back) – 9.12 	<ul style="list-style-type: none"> • Concrete carriageways – 9.4 • Asphalt footpaths (front berm) – 9.7 • Concrete footpaths (back berm) – 9.10
<p>3. Temporary Works (8.4.2)</p> <ul style="list-style-type: none"> • Geotechnical Investigations • Unstable Ground Conditions • Qualified design personnel • Supervised installation • Stability of adjacent property & structures 		<p>6. Surface Reinstatement</p> <ul style="list-style-type: none"> • Overriding principles – 9.1 • Temporary surfacing • Steel plates • Surface types (9.2 – 9.12) • Joint sealing • Road marking and signs – 8.7.12 • Service covers • Kerb & channel – 8.7.11 • Signal detector loops reinstated
<p>4. Trench Construction</p> <ul style="list-style-type: none"> • Working in the Vicinity of Trees • Placement of Structures • Pre-excavation saw cuts • Excavation • Compaction & testing • Material re-use • Material removal • Sub soil drainage 		<p>5. Utility Installation</p> <ul style="list-style-type: none"> • Lay positions to plan • Minimum cover requirements – 8.5.1 • Principal provider requirements • Cushion materials
<p>7. Trenchless Construction</p> <ul style="list-style-type: none"> • Directional drilling • Thrusting 		<p>8. Quality Assurance</p> <ul style="list-style-type: none"> • Materials • Workmanship • Records

7.10.2 Management Responsibility

7.10.2.1 Quality Policy

The contractor shall define and document its policy and objectives for, and commitment to, quality and shall ensure that these are understood, implemented and maintained throughout the organisation. A Quality Policy Statement is important as a means of conveying and reinforcing to both employees and clients the company's commitment to achieving quality and providing quality assurance. Therefore, it is important that it clearly reflects the company's **own** objectives, policies and intentions with regard to its **own** unique business activities and operation. ie. not just copied from someone else. It should be brief and crisp and written in clear, precise language so that it is easily read, understood and retained. It warrants spending some time to develop and debate amongst the senior people in the company so that it truly reflects their quality philosophy. It is best written and signed by the chief executive/company owner so that it conveys commitment from the very top. The policy should contain brief statements on the following issues:

- the company's commitment to quality;
- the company's objective for adopting a formal quality management system eg to improve performance and efficiency; to provide a product or service which meets client's specific quality requirements; maintain or enhance reputation or position in the market; be more cost competitive through improvement in efficiency; offer clients value for money; raise competency and performance of employees. **Shall also include a commitment to the Code of Practice for Working in the Road**
- how the objectives are to be achieved in broad terms eg development and implementation of a formalised quality system; ongoing staff education and training; documentation of standard company procedures and good work practices, etc.

Adoption of standardised procedures as detailed in 7.9.3, The Quality System.

- the level and scope of the quality system operated by the company and whether or not certified eg The company operates a quality management system in compliance with the Transit Quality Standard TQS1 and has certification by a Transit approved third party auditor for the following activities – road pavement construction; drainage; concrete work.

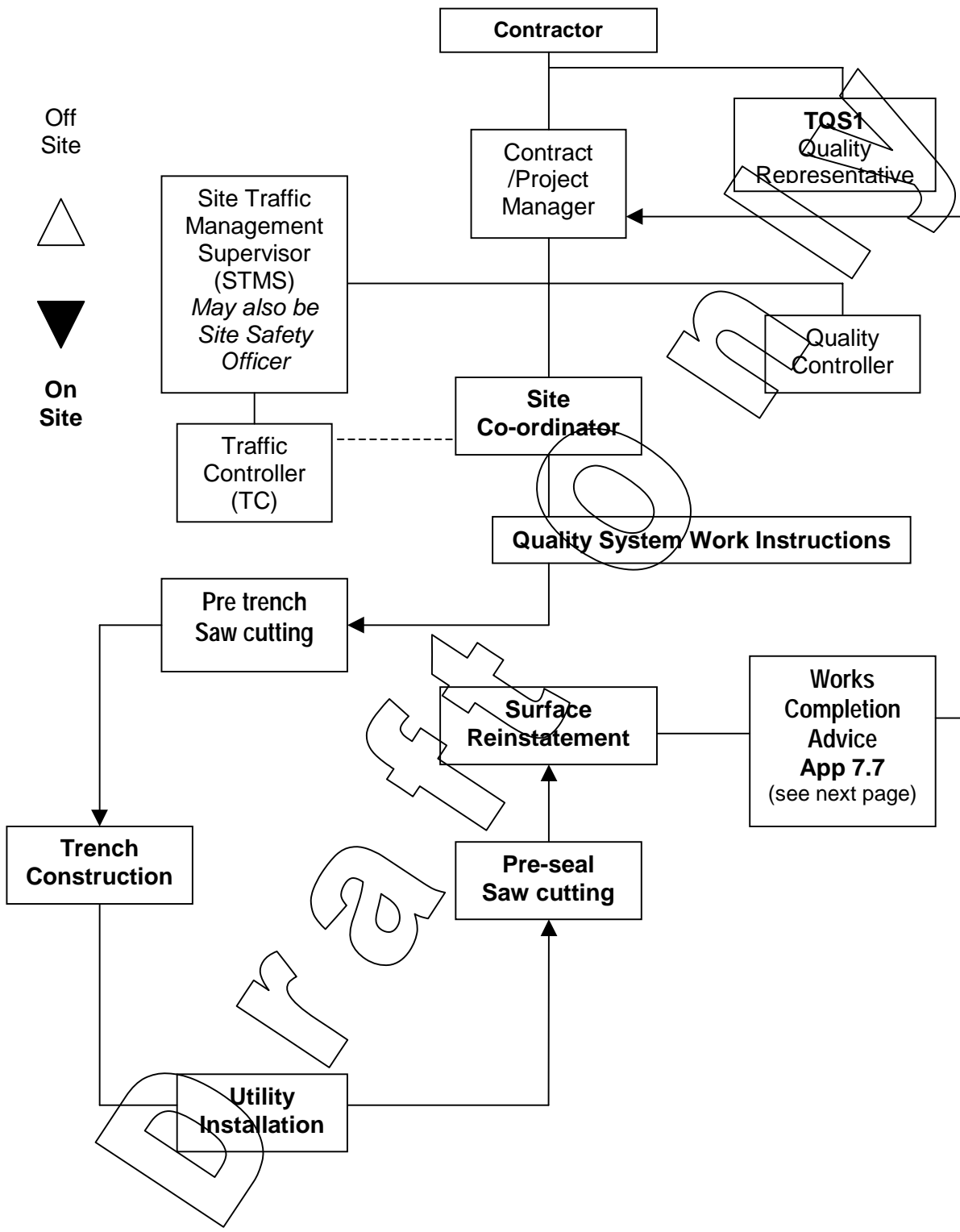
Or The company operates a quality management system based on the format recommended by Transit Quality Standard TQS1. Whilst not certified, the system meets the standards required by the Code of Practice for Working in the Road.

It makes a better impression if it is written on a company letterhead and is well laid out and presented, as it will be displayed on office, smoko room and site shed walls and included in presentations to clients.

7.10.2.2 Organisation

The range of responsibility, authority and interrelationship of the key staff actively involved in achieving the quality objectives shall be clearly defined by producing job descriptions and organisation charts at both a company and if appropriate project (or contract) level. An example of an organisation chart appears on the following page and examples of job descriptions appear in 7.9.2.3.

The contractor shall appoint a Quality Representative to be responsible for maintaining the system in conformance with TQS1:1995 and for the internal audits **prescribed in 7.9.9, Internal Quality Audits.**



7.10.2.3 Works Completion Advice (copy of appendix 7.7)

To be completed by Principal Providers Representative following final walkover and immediately prior to the expiry of the 12 month maintenance and 12 month warranty periods.

Ron No:	Project Name:	Date: / /
Final Walkover Date: / /	Details/Comments:	Remedial Action/ Agreed date:
Non-Complying Work: (Detail or attach separate report)		
Follow up on Non Compliance:	Date:	
Quality Control Inspection & Testwork (Reports indicated below are attached.)	Comments	N/A Yes No
Compaction Test Results		
Lay Position Variations Summary		
Incoming Materials Certification Summary		
Other		

The Principals Representative certifies the above works have been constructed in accordance with sound and accepted principles and in accordance with the approved Road Opening Notice. All works comply with the provisions of the Code of Practice for Working in the Road.

The Principal shall be responsible for the repair of all defects until the expiry of the warranty period.

Phase Two - Final Walkover

Principals Representative	Date:	Print Name:	Signature:
RCA Acceptance	Date:	Print Name:	Signature:
Works comply and 12 month maintenance commences: Date: / /	End of Maintenance Inspection Due Date: / /		

Phase Three - Maintenance Expiry

Principals Representative	Date:	Print Name:	Signature:
RCA Acceptance	Date: / /	Print Name:	Signature:
Works comply and 12 month warranty period commences: Date: / /	End of Warranty Inspection Due Date: / /		

Phase Four - Warranty Expiry

Principals Representative	Date: / /	Print Name:	Signature:
RCA Acceptance	Date: / /	Print Name:	Signature:
Comments			

7.10.2.4 Job Descriptions

- a) Example for TQS1 Quality Representative responsible to the contractor for:
- maintaining the system in conformance with TQS1:1995
 - for the internal audits prescribed in Element 8
- b) Example for Contract/Project Manager responsible to the contractor for:
- organising and managing all construction activities on site
 - resolving technical and dispute queries and authorising NCR and Quality Improvement actions
 - financial control
 - development of the Contract Quality plan and ensuring that all QA requirements are complied with
 - ensuring that all construction activities comply with the technical specification and other contractual conditions
 - liaison with the Principal on contractual, commercial and dispute matters
- c) Example for Site Co-ordinator responsible to the Contract/Project Manager for:
- the supervision of quality and workmanship during construction
 - the recruitment, development and supervision of the work force
 - control of plant and equipment
 - supervision of subcontractors
- d) Example for Site Traffic Management Supervisor (STMS) who must be suitably trained in accordance with the appropriate code of practice and is responsible to the Contract Manager for:
- preparing the temporary traffic management plan (TMP) in accordance with the appropriate code of practice
 - submitting the TMP plan to the RCA for acceptance
 - ensuring the TMP plan is set up in accordance with the RCA's conditions
- e) Example for Traffic Controller (TC) responsible to the STMS for:
- maintaining the TMP set up in accordance with the plan
 - advising the STMS of any traffic management problems that arise on site
 - advising the Site Co-ordinator regarding any traffic management problems that arise on site
 - the TC may have other responsibilities in which the line of reporting is to the Site Co-ordinator
- f) Example for Quality Controller responsible to the Contract Manager for:
- ensuring the Contract Quality Plan is properly understood and implemented by those involved
 - maintaining all QA records
 - assisting with and approving subcontractors quality control procedures or plans
 - site survey and setting out
 - liaising with the Principal on a day-to-day basis to resolve all queries other than those in dispute
 - measuring the work and submitting progress claims and price variations
 - reporting monthly on work progress - time, quality and cost issues
 - procurement of materials and ensuring correct ordering, handling, and use
 - letting and administration of subcontracts

7.10.2.5 Management Review

The contractor's senior management shall review at regular intervals the quality system to ensure that it is operating effectively and meeting the company's quality objectives. The review intervals shall be not more than 12 monthly and shall be 6 monthly or less as appropriate during periods of development or change or when significant numbers of non-conformances are occurring.

As a basis for the review, the Quality Representative shall present a report on the system to the senior management. This shall include detail of all internal audits and non-conformance reports and the resultant quality improvement actions. Any customer feedback relating to quality shall be collated and included in the report.

Deficiencies in the Quality System shall be identified and a plan for improvement agreed to. The review shall be minuted with action requirements noted.

This forms part of the quarterly business review as outlined in Partnership in Action (CoP Part 2).

7.10.3 The Quality System

The contractor's quality system shall be documented and maintained, and shall contain as a minimum the following components:

- a) **Quality Policy** as described in 7.9.2.1.
- b) **Work Instructions (Methodologies)** describe how individual work activities are to be planned, controlled and inspected for compliance with the specification requirements. **Work instructions in relation to the CoP for Working in the Road should refer to the technical drawings in Part 9 of the CoP, Reinstatement.**
- c) **Inspection Checklists** list the features of the work which require inspection and/or test to ensure compliance with the specification requirements. Shall include quantifiable acceptance criteria based on specification requirements wherever possible and provision for recording inspection and test results. **A standardised inspection checklist in relation to the CoP for Working in the Road is set out in 7.9.13. This will form part of the QA audit process covered in Part 7 of the Code.**
- d) **Standard Procedures** describe how the company complies with the system elements not otherwise covered by Work Instructions.
- e) **Contract Quality Plans** are required within the time frame to the extent specified in the contract. They shall describe those aspects of the contractor's quality system which will be adapted on the contract including how the contractor will:
 - identify the quality requirements specific to the contract;
 - plan the work to satisfy those requirements;
 - control (manage) the work to comply with the planning;
 - inspect/test the work to ensure compliance with the quality requirements; and
 - record the results as evidence of compliance.

7.10.4 Contract Review

The contractor shall establish procedures to provide the following:

- a) that the tender documents are reviewed for consistency and clarity such that the contractor can prepare and submit a tender which meets the Principal's **and the Code** requirements;
 - b) that the Principal is notified in writing of any unclear or inconsistent requirements identified by the contractor. **If such inconsistencies relate to the Code, the Principal is responsible for notifying these to the RCA. All resolutions are to be documented and become part of the tender document. (Code reference 6.2.2 Preliminary Consultation)**
 - c) that the contractor reviews the contract prior to executing it, identifies any inconsistencies with the tender documents or pre-award negotiations, and resolves them with the Principal;
 - d) that the contractor has available sufficient skills and resources to fulfil the requirements of the contract.
- The contractor and Principal shall formally meet prior to contract award (unless both parties specifically agree otherwise) to review the contract and the contractor's tender proposal to:
- ensure that both parties have a like understanding of their respective contractual obligations;
 - to resolve any differences, queries or anomalies in the contract documentation; and
 - to review the contractor's resources and capabilities to undertake the work.

The meeting(s) shall be minuted and these shall form part of the contract documents

7.10.5 Document and Record Control

The contractor shall control all documents and records as follows:

- a) **Drawings** A register showing the current revision of all drawings shall be maintained and displayed at the work site to ensure that only up-to-date issues are used. Changes not involving a drawing reissue shall be clearly noted on the drawings with a cross reference to the instructing document (eg site instruction, hand sketch etc). Superseded drawings shall be marked as such and removed from use. Drawings shall be stored in a manner that minimises deterioration and allows access to and use by all who need them;
- b) **Correspondence** which relates to the efficient running of the contract such as letters, memos, instructions, orders, and meeting minutes, plus all the quality control records shall be filed in a manner which prevents loss and minimises deterioration and shall be easily accessible by those who need to use them;
- c) **Distribution** of the quality system documentation prescribed in 7.9.3 shall be controlled by the contractor's Quality Representative. Distribution lists shall be maintained to ensure that holders of original documents receive any revisions. Superseded issues shall be marked as such and removed from use.
- d) **On completion** of the contract all such documents and records shall be archived in a manner which prevents loss, minimises deterioration and allows retrieval for the period specified in the contract document or as required by legislation, whichever is the greater.
- e) **Contractual** quality records shall either be available for inspection and audit by the Principal, or copies shall be supplied to the Principal to the extent specified in the contract.

The documentation must include a communication plan to the RCA for all resource consent, road opening notice and temporary traffic management plan amendments. Responsibility for the operation of the communication plan is also to be documented in the plan.

7.10.6 Purchasing and Subcontracting

7.10.6.1 General

The contractor shall have procedures to ensure that materials purchased from suppliers and services from subcontractors meet the specified requirements.

7.10.6.2 Assessment

When a purchase (significant in terms of achieving the quality requirements) is to be made from a supplier or subcontractor with whom the contractor has not dealt in the previous two years in relation to products or activities similar to those being sought, a prior assessment shall be made and recorded to verify their ability to meet the quality and programme requirements.

Where the contract requires that supplies or services be provided by a company or person with specific qualifications, proof of such shall be obtained and kept as a quality record.

7.10.6.3 Purchasing Instructions

Responsibility for the purchasing of materials and services which relate to achieving a client's quality requirements shall be formally authorised in each Contract Quality Plan.

All purchase orders and subcontract agreements which are significant in terms of achieving the quality requirements shall be in writing. They shall contain a clear specification of the requirements including the product type, class, size etc, the quality standards, the quantities, the scope of the work and the delivery details and completion dates.

7.10.6.4 Incoming Materials

All materials purchased by the contractor or alternatively supplied by the Principal shall be checked for compliance with the specified requirements prior to incorporation in the works (preferably on receipt) and verification shall be noted on the relevant "Inspection Checklist". **Refer 7.9.7.3, 7.9.14 Test Schedule and Part 10 Material Specification of the Code of Practice for Working in the Road.**

All materials shall be handled and stored in a manner that prevents damage or deterioration and verification that none has occurred shall be noted on the relevant "Inspection Checklist".

7.10.6.5 Subcontractor Quality Control

The contractor shall be responsible for the quality of materials supplied and work performed by its subcontractors, and shall plan for appropriate quality assurance procedures in the Contract Quality Plan to control and verify compliance with the appropriate quality requirements.

Contractors “nominated” by the RCA, Principal Provider (as defined in the Code of Practice for Working in the Road) and/or the Principal (as defined in NZS 3910:1998) are to be treated exactly the same as “subcontractors”.

7.10.6.6 Product Identification and Traceability

Procedures for identifying and providing traceability of materials shall be established when, and to the extent, specified. **The RCA may require access at any time to the product identification docket etc.**

7.10.7 Control and Inspection of the Work

7.10.7.1 General (Code reference 7.2.3 – Contract Quality Plan)

The contractor shall undertake the work in a planned and controlled manner to ensure that the quality requirements are achieved. The contractor must be able to demonstrate that the following has been undertaken on all contracts:

- **Identify** the quality requirements of both the Principal Provider and the RCA;
- **Plan** how these will be achieved;
- **Control** the work in compliance with the plan;
- **Inspect** the work and verify that it conforms to the specified requirements; and
- **Record** the results as documentary evidence.

7.10.7.2 Identify and Plan (Code reference 7.2.4 – Pre-construction Meeting)

The contractor shall systematically identify the principal specific quality requirements of the contract for each work section or trade. This shall be used as a basis for developing the Contract Quality Plan. To the extent necessary to ensure that those performing the work fully understand what is required, documented "Work Instructions" or "Methodologies" will be adopted. These shall describe how the activity or task is to be performed; define key task responsibilities; indicate the sequence; and specify the resources to be used.

7.10.7.3 Inspection and Recording

All the key quality requirements identified in 7.9.7.2 shall be inspected and/or tested by the contractor to verify compliance, both during construction and on final completion. Compliance should, wherever possible, be measured against quantified acceptance criteria based on the specification requirements. The results shall be documented and retained as part of the quality records.

Where there is a contractual requirement to use third party accredited inspecting or testing agencies, details of how the contractor intends to comply will be included in the Contract Quality Plan.

7.10.7.4 Measuring and Test Equipment

The contractor shall maintain a register of all measuring and test equipment, other than that which has no direct bearing on the quality of the work. Every registered item shall be physically labelled or otherwise unambiguously identified and shall be calibrated at appropriate intervals. The register shall indicate the frequency of calibration and/or checking for all items. On the register each item shall be identified as either "Special" or "Routine". "Routine" items are those whose accuracy and precision do not vary significantly and which are not used for primary control of the work, which can be readily checked by the operator, and for which checking routines form part of the operating instructions, or are items which cannot move significantly out of calibration except by obvious physical damage. Records of such checks shall be maintained. All other measurement and inspection equipment shall be "Special", and the contractor shall maintain procedures for the regular and appropriate calibration and maintenance of such equipment. Copies of calibration certificates, maintenance reports and the like shall be retained as part of the quality records. **The RCA may require access at any time to the measuring and test equipment records.**

7.10.8 Control of Non-conforming Work and Quality System Improvement

7.10.8.1 Control of Non-conforming Work

The contractor shall have a procedure to ensure that work which does not conform to the specified requirements is either:

- reworked to meet the specified requirements; or
- accepted with or without repair by concession from the Principal; or
- regraded for alternative use; or
- rejected and replaced.

The identification of all non-conforming work shall be recorded on the relevant "Inspection Checklist".

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

- results in the need for a concession as per b) above; or
- results in delay or interference to the work or to other parties; or
- will not be rectified by the end of the following work shift; or
- occurs sufficiently frequently as to indicate a problem in training or the work procedures,

Then more formal documentation is required and a Non-conformance Report (NCR) shall be raised using the form enclosed in Appendix G or an equivalent.

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

Detail of how it is intended to rectify the non-conforming work must be provided on the NCR and approved by the contractor's contract manager, and the Principal in cases involving concessions, prior to implementing the rectification work.

The RCA shall be advised immediately of any non conforming work identified by the Principal Provider (this needs to link clearly with the RCA's audit process – to deal with the issue as a partnership).

7.10.8.2 Quality Improvement

The cause (as opposed to the symptom) of NCR-recorded non-conforming work shall be investigated by the contractor's contract manager and/or quality representative. The findings shall be noted on the NCR along with proposals for improving the Quality System (the corrective action) to prevent recurrence of the non-conformance.

The contractor's quality representative shall be responsible for ensuring that the proposed corrective action is properly and effectively implemented.

Discussion at co-ordination meetings on a monthly basis to address all quality improvement issues. This key principle needs to be developed between the RCA and he AUOG and incorporated in Part 3 Contractor Performance.

7.10.9 Internal Quality Audits

Internal audits shall be undertaken to measure the effectiveness of the quality system and to check that it is being operated as documented. All elements of the contractors system shall be internally audited at least annually.

Internal audits of the quality system applying to individual contracts / projects shall be undertaken at critical stages and to the extent pertinent in relation to the contractual risk; overall duration; and the technical complexity. A schedule of planned internal audits shall be stated in the Contract Quality Plan.

The contractor's quality representative shall be responsible for the internal audits and shall keep records of the areas or activities audited as well as the results including any "Non-conformance Reports" which may arise. These shall be transmitted to the person responsible for the activity or function being audited for their action and shall be included in the report required to precede the management review (refer 7.9.2.4).

Terminology to align with the RCA's audit process as defined in Part 7.

7.10.10 Training

The contractor shall identify and provide for the training needs of all employees through a documented training programme. A senior manager in the company shall be assigned the responsibility for managing the programme. Training reviews shall be undertaken at not more than 12 month intervals, at which each employee's performance and training since the previous review shall be evaluated and the training needs assessed and programmed for the next period. This review shall be documented and records kept.

The contractor shall maintain a documented procedure for checking that prospective employees have sufficient skills to perform the intended tasks to the quality standards required. Records shall be kept.

An alignment between Part 4 of the Code of Practice setting out requirements for training and this part of TQS1 needs to be developed during 2004.

7.10.11 Safety and Resource Management

The contractor shall operate a formal Health and Safety programme which complies with the statutory requirements of the Health and Safety in Employment Act 1992 and any subsequent revisions and associated Regulations. To the extent practical and permissible by law, it should be integrated into the contractor's quality system.

The Contract Quality Plan for each contract shall identify all issues relating to compliance with the Resource Management Act 1991 and provide a statement as to how they will be complied with.

Note Code of Practice references

6.1.5 Auckland Regional Council Pollution Control

6.4 Site Control including temporary traffic management requirements.

7.10.12 Quality System Work Instruction (Example)

Control & Inspection of Underground Services Installation & Maintenance in the Road

7.10.12.1 Scope of Work Instruction

This work instruction (WI) covers all aspects of the installation and/or maintenance of publicly or privately owned underground services in respect of trenching in the road, from the preparation for excavation to the final reinstatement. It should be read in conjunction with the Code of Practice for Working in the Road, Auckland Region.

The objectives are:

- To safeguard the network
- To ensure safety of the public
- To restore the site to its original condition that meets the requirements of the Code of Practice.

7.10.12.2 Responsibilities and Actions

The Contract/Project Manager shall review both the contract drawing and specifications to identify the specific requirements of the Principal Provider, **ensuring these also comply with the requirements of the Code of Practice for Working in the Road with specific reference to the technical drawings, 9.2 to 9.12. These shall be noted on the inspection checklist.**

The checklists should include those activities shown on the generic inspection forms:

- **7.9.13 Standard Inspection Checklist for Code of Practice Requirements**
- **7.9.14 Test Work Schedule**
- **Appendix 7.3 TTM Rating Form**

The Site Co-ordinator 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 checklist for defined sections (locations) of the work. An inspection checklist must not cover more than one days work.

7.10.13 Standard Inspection Checklist for Code of Practice Requirements

Principal:	Contractor:	Road:
RON No:	Date:	Location:

Activity	Special Requirements	Task / Completion Site Co-ordinator Signature / Comment
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Site Specific Requirements

Road Opening Notice Conditions		
TMP Conditions & Set up		
RMA Conditions		
Stability Measures		

Element 10

Dust levels acceptable		
Noise levels acceptable		
Storm water controls in place		

Construction –

Circle Technical Drawing Reference No 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12

Pre-trench Saw Cutting		
Trench Construction		
Main backfill material to spec		
Upper backfill material to spec		
Compactions in layers		
Contractor results		See separate report
Utility Installation		
Minimum service cover		
Principal Provider requirements		See separate checklist
Bedding material quality		
Bedding material cover over service		
Pre-seal Saw Cutting		
1m rule applied		
Straight/Parallel		
Shoulders		
Surface Reinstatement		
Matches existing type		
Matches existing level		
Thickness to spec		
Full panel/width		
Joint sealing		
Clean topsoil		
Seeded to spec		
Concrete		
Dowels to spec		
2m rule applied		
Construction joints		
Broom finish		

All activities defined above have been satisfactorily completed to the standards required.

Contract / Project Manager

(Name)	(Signature)	(Date)

Principal Representative (when appropriate)

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7.10.14 Test Work Schedule

DRAFT Appendix (Note – may be duplicated in Part 10)

Product	Test	Frequency	Telarc Lab Req'd Y / N	Specification Reference CoP Part 10	Carried Out By <ul style="list-style-type: none"> • Supplier • Contractor • RCA 	Tests Req'd By	Comments
Utility Installation	Filter material grading	1 per 150m ³ (loose)	Y				
	Bedding material grading	1 per 150m ³ (loose)	Y				
Backfill Subbase	Grading	1 per 250m ³ (loose)	Y				
	Sand Equivalent	1 per 500m ³ (loose)	Y				
	Crushing Resistance	1 per 4000m ³ (loose)	Y				
	Heavy compaction to establish densities	2 sets (5 points each)	Y				
	In situ density	1 per 250m ³ (placed)	Y				
	Surface finish levels	1 per 60m ² (max 20m intervals)	N				
Backfill Basecourse	Grading	1 per 250m ³ (loose)	Y				
	Sand equivalent	1 per 500m ³ (loose)	Y				
	Crushing resistance	1 per 4000m ³ (loose)	Y				
	Weathering resistance	1 per 4000m ³ (loose)	Y				
	Proportion of broken faces	1 per 1000m ³ (loose)	Y				
	Heavy compaction to establish densities	2 sets (5 points each)	Y				
	In situ density	1 per 200m ³ (placed)	Y				
	Surface finish levels	1 per 60m ² (max 20m intervals)	N				

Surface Chip Seal	Size and shape	1 per 250m ³ (loose)	Y				
	Grading	1 per 250m ³ (loose)	Y				
	Crushing resistance	1 per 500m ³ (loose)	Y				
	Weathering resistance	1 per 500m ³ (loose)	Y				
	Bitumen – Refer P3 & P/4	As required by P/3 & P/4					
Surface Asphaltic Concrete	Refer P/9P						
Surface Concrete (Grade 1 concrete)	Aggregate grading	1 per 200m ³ (loose)	Y				
	Slump	Every truck	Y				
	28 day crushing strength	6 cylinders per pour	Y				
	Non-destructive strength testing	As directed	Y				

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