Traffic Signal Controller Safety Programme

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Good morning/ Good afternoon everyone,

We both introduce ourselves.

We are here to discuss the recent Christchurch Traffic Signal Controller Safety Audit Programme.
We want this presentation to be an open discussion and anyone who has any questions throughout feel free to raise your hand or shout out.

Sensitivity: General

Problem Statement/ Project Background

Independent traffic signal controller audits were undertaken at several sites in Christchurch CBD.

- Electrical deficiencies
- Non-conformances

Traffic signal controllers appeared to be consistent with their age.

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Richard's Slide

Following the safety audit, Christchurch Transport Operations Centre (CTOC) developed a detailed list of electrical and Non-conformance deficiencies of each cabinet, all 359 sites.

These deficiencies had occurred over a number of years and are a result of both ongoing changes to existing cabinets over time and deficiencies introduced in new installations.

In some cases the fact that installation requirements and standards have changed over time and some installations that may look non-compliant now were compliant when they were installed.

Any cabinets presenting an immediate risk to the public at the time of auditing were repaired. Post-repairs, no cabinets presented a safety risk to the public in November-December 2019 (i.e. no possible live cabinet metal work or related infrastructure exist on the network). However, some risk remains that, at some point in the future, under certain circumstances, a cabinet could become live due to the nature of the defects which currently existed.

Christchurch Transport Operations Centre (CTOC) developed a detailed list of defects of each cabinet and graded all 359 cabinets into

1 - 3 (most urgent). There were 69 cabinets in this category at the time of auditing.

4 - 6 (moderately urgent). There were 94 cabinets in this category at the time of auditing.

7 - 9 (least urgent). There were 196 cabinets in this category at the time of auditing.

10 (fully compliant, no action required). At the time of auditing, there were no installations in this category.

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Initial High Level Programme

CCC prepared a list of 93 sites which were highlighted for potential works. The sites were put into risk categories:

- High risk (red)
- Medium risk (orange)

Site ID	Intersection Name	RCA	ESR Pha	Controller Date	Controller Age	Round
240	Tramway/Truscotts	CCC	B	4/12/2007	13	2
260	Cranford/Main North	CCC	B	21/02/2005	16	1
271	Mairehau/Marshland	CCC	D	10/06/2015	5	2
299	Glandovey/Xing	CCC	D	11/04/2017	3	2
300	Carlton/Xing	CCC	B	15/04/1992	28	1
302	Wairakei/Xing	CCC	D	12/04/2017	3	1
303	Idris/Wairakei	CCC	B	4/03/1994	26	2
305	Greers/Wairakei	CCC	B	24/03/1992	28	2
309	Greers/Xing (Bishopdale P School)	CCC	B	16/07/2010	10	1
320	Northcote/Vagues	CCC	B	10/03/2010	10	1
348	Fendalton/Glandovey	CCC	B	1/08/2003	17	2
352	Clyde/Fendalton/Memorial	CCC	D	20/03/2015	5	2
353	Ilam/Memorial	CCC	B	16/03/2004	16	1
358	Creyke/Ilam/Maidstone	CCC	D	25/02/2016	5	2
359	Maidstone/Waimairi	CCC	B	1/01/2009	12	2
397	Hospital/Riccarton	CCC	B	4/11/1993	27	1

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Richard's Slide

From the list of 359 cabinets CCC staff went through all the cabinets and came up with a high priority list of cabinets.

From this list staff then DE conflicted any repair work with current of near future projects and past projects. Examples – Victoria Street and Hereford Street upgrade projects, CNC downstream effects project and others.

This then left us with 93 cabinet sites that required electrical safety work to be completed.

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How did CCC deliver the programme…

- On-time (tight timeframes)
- To budget
- Experience with traffic signal controllers
- Undertaken safety audits at traffic signals
- Electrical installation experts

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Richard's Slide

- Time frame – was tight. Need action asap. 3 months for contractors to investigate, plan and repair each site.
- Each site was given a estimated budget of $10,500. For the full 93 cabinets to be repaired the estimate was $976,500.
- We need to have teams that had the relevant experience on the network to deliver to budget and with in the tight time frame.
- We need to get this program moving quickly. So we had to look into how we procure the work for fast delivery to mitigate the risk to council.
- The project needed work in a collaborative way that allows maximum solution for best value.
- Openness and transparency of work and costings from the contractor will be critical to the success of the project.
- Value for money will be ensured by providing a clear audit and parallel estimate process through the works with clearly documented work sheets/invoices per-site.

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Procurement Strategy

The work was procured by CCC and 3 contractors were engaged.

- 3 separate NZS 3910 Contracts (cost reimbursable)

Approved signal contractors involved shown alphabetically below:

Downer Relationships creating success

Fulton Hogan

traffic control systems

Each contractor received 31 sites each.

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Richard's Slide

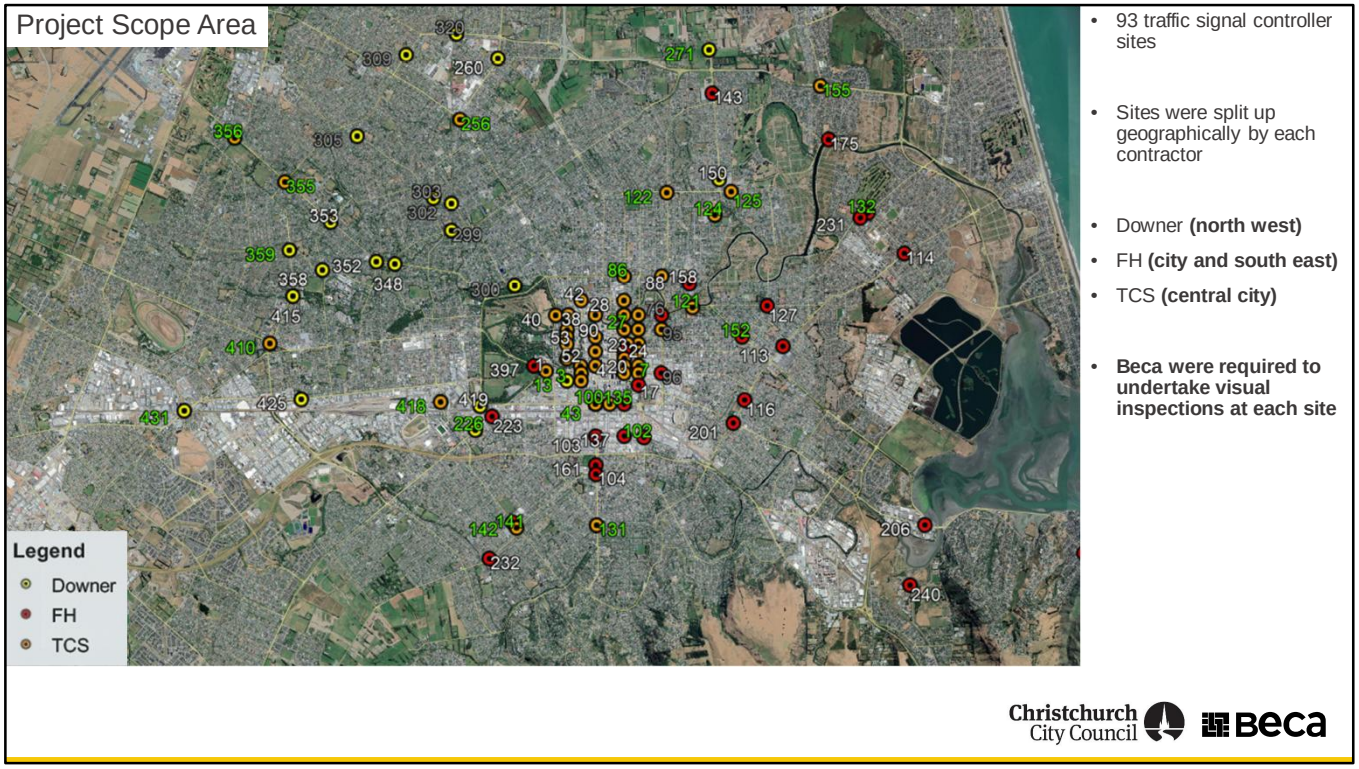
CCC needed to deliver a snap programme do deliver the works.
This was able to be done under the CCC procurement rules. We used Rule 5 – emergency procurement - Emergency operational expenditure is where preparatory work is required to combat the threat of emergency.

A significant health and safety issue has been identified. The majority of the cabinets are not electrically compliant and in a number of cases they were electrically unsafe. The audit has determined that there is no immediate risk to the general public, however should someone access a cabinet their risk exposure is significantly increased.

The priority is to complete all the urgent cabinet electrical safety repairs as soon as practicable. This mitigates the current extreme risk to Council.

The intention is to depart from the market approach in the procurement manual and directly appoint these three contractors. Each contractor will initially be provided with a package of work that is roughly equal ($200k). The aim is to address the highest risk sites initially.

The three nominated contractors are CTOC-approved traffic signal installers available locally and with proven track records.



Alex' Slide

Beca were commissioned by CCC to undertake independent site audits within Christchurch City.

- A programme of 93 traffic signal controller sites were initially sent to Beca in an excel spreadsheet ranging from various category risks.

There were a significant amount of sites in the scope Area
The map shows the sites programmed for site visit geographically.

Downer were given sites north west of the city.
FH were given site located south of city and the eastern suburbs.
TCS were given central city sites.

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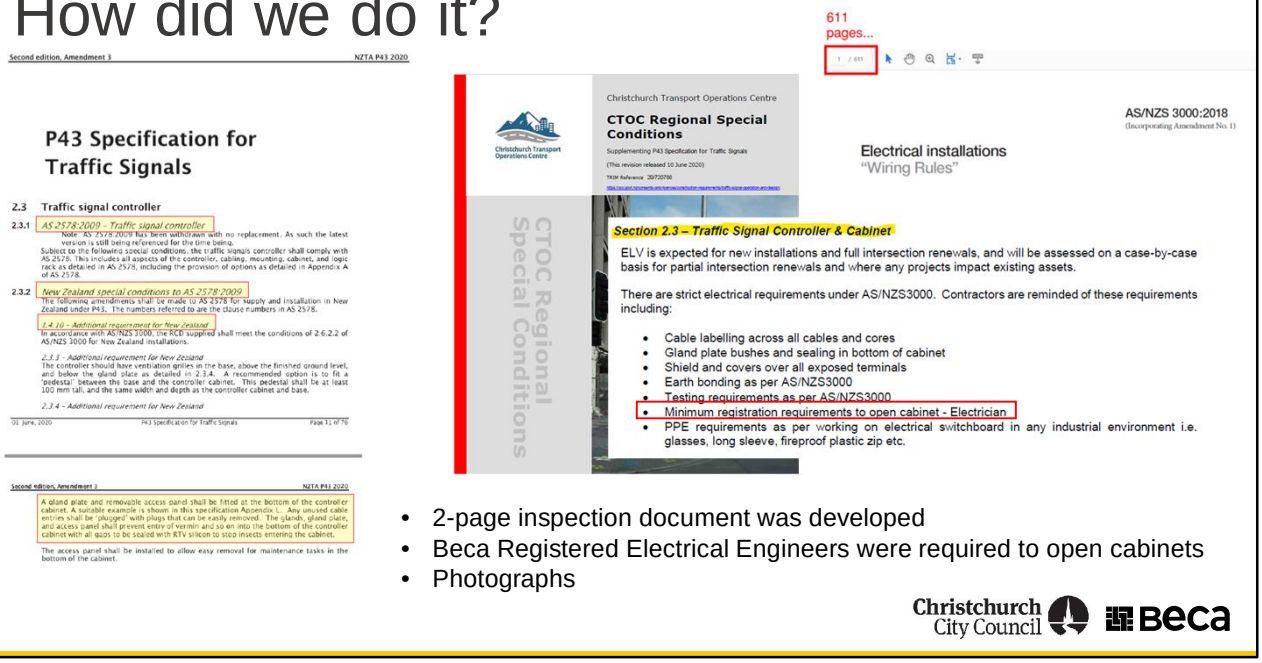
How did we do it?



- 2-page inspection document was developed
- Beca Registered Electrical Engineers were required to open cabinets
- Photographs

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Alex' Slide

The programme was fairly extensive, given the timescales to complete and deliver the programme we knew it was going to be very tight.
I needed to think of a way to undertake the programme efficiently without spending a whole heap of time at the individual sites.

Myself and the Beca Electrical Engineers initially got together to discuss the inputs and standards required to undertake the project i.e. what we were looking for and the key electrical safety fundamentals at signal controllers.

Initially we looked at P43 Specification for traffic signals 2020 and there was a lot of pointing back to various different standards rather than having something that was clear and concise. It did however state that silicone can be used to seal any gaps with the gland plate to reduce the potential for insects to enter the cabinet. I will touch more on this later in the presentation.

The electrical engineers reviewed NZS 3000: Wiring Rules – this was more focused on the installation of electrical components and the required installation standard.

The CTOC regional specification provided more information on the requirements and noted that only registered electricians could access the signal cabinet. This meant that

additional support was needed which included either myself and the registered electrical engineer at each site.

Based on the information available, we needed to develop a checklist for the site visits.

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Checklist

SITE ACCEPTANCE TEST – Modification of Appendix G Site Acceptance Test Chart NZTA P43 Specification for Traffic Signals (Second Edition 2020) & Appendix G – CTOC Commissioning Sheet CTOC Regional Special Conditions (10 June 2020).

Intersection Name:	Date / Time:
Intersection Number:	Contractor:

The below checklist has been generated for the purpose of the Christchurch City Council Traffic Signal Remediation Programme. This checklist is a supplement from Appendix G – Site Acceptance Test Chart.
Please write in the boxes where necessary for evidence of testing on completion of the work(s).

Operations	Yes / No or N / A	Comments
E-PROM labelled (check sum)		
Lamps off, controller ops		
Copy RAM to controller		
Check fault log, clear		
Full start up: (if required)		
Flash test each signal group		
Flashing ambers working		
Check all red (SPT = 10 seconds)		
Revision on correct phases		
All default phases call		
Monitor operation in HHT		
After full start up: (if required)		
Other phases call (xsf / flags)		
Ped protection checked / OK?		
Main off-on, controller ops OK?		
Last gasp (PF in SCATS Log)		
Controller		
Make, type and size		
Signal group size / No. of		8 12 16 24 32
Detector card size / No. of		8 12 16 24 32
DP number		
ICP number		
Detector card operation check		
Gland plate labels (on top)		
Cable loom labels (under)		
Detector switches labelled		
Signal groups numbered		
Detector blocks numbered		
All circuit breakers labelled		
Live power warning sign on cabinet		
Separate circuit breaker labelled for street light label		
Main switch label check / OK?		

Items relating to electrical connections, electrical protection i.e. Perspex shrouding, cabinet structural integrity, cable and earthing were items which we had to review and document on the checklist.

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Alex' Slide

A 2-page inspection document was developed with Mark Hinton at CTOC to formalise the procedure and highlight any safety and compliance issues at the site. The checklist was similar to Appendix G – Site Acceptance Test Chart which is normally used to commission new traffic signals. An example of the format has been shown in the slide.

Beca were also required to check controller documentation and check that electrical certificates had been completed to the correct standard.
Photographs were taken for each site to confirm the works undertaken by the contractor.

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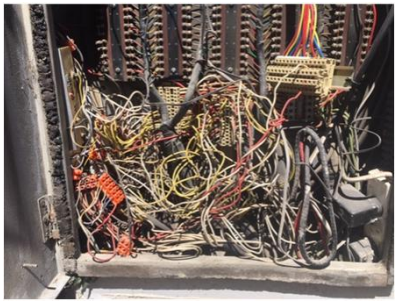
What did we find?

Before



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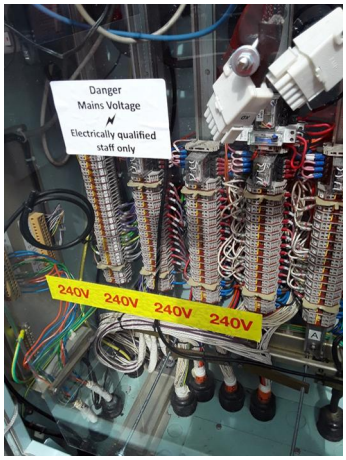

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All of the contractors working on the project did a fantastic job and delivered the works to a very high standard at their subject sites.

Having three different contractors undertaking the work meant that there was some variance in the way in which the work was undertaken. However a good opportunity for some innovative ideas for cabinet safety? The following slides are to provide context around some the things we had picked up on throughout the audits.

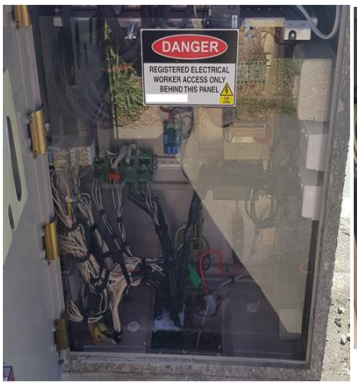
Before and after photographs
Discuss some examples

Sensitivity: General

Types of Perspex Screening

Hinged Door

Steel Rods



Full Perspex for controller replacement

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Types of Perspex Screening

1. Door hinged Perspex (preferred method)
2. Small steel rods – we requested the contractor to add protection to remove the potential conflict with the eye.
3. Full Perspex screening – this was when the controller wasn't worth upgrading and scheduled for replacement (make it safe)

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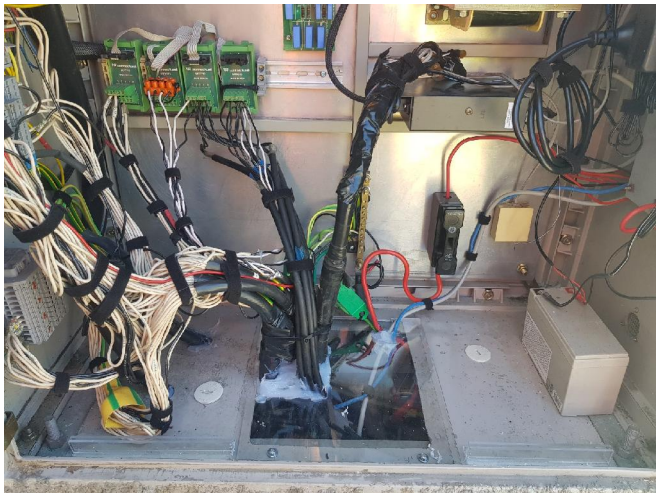
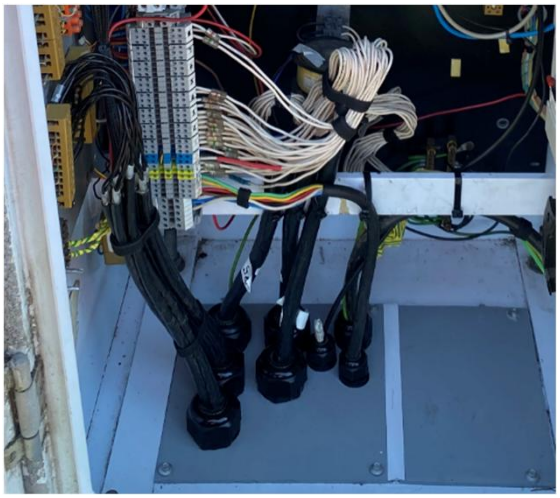
Silicone vs Sealed Glands





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Silicone vs Sealed Glands

Although Silicone is approved to be used in P43 Traffic Signal Spec, we didn't think that this would support signal cables long-term or protect against insects or vermin. To install sealed glands signal cables were required to be disconnected, which was a significant TM cost if this was required.

Sensitivity: General

Key Outcomes

- Minor remedial works were required by each contractor to complete the programme.
- Delivered on time and to budget.
- Electrical Safety Certificates and testing requirements.
- The project has changed the way contractors now undertake signal controller installations.
- Keeps the contractor and members of the public safe!

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Alex' Slide

Each contractor has minor remedials works to undertake at each site. This did involve some post chasing around, however the contractors worked hard to undertake any remedial items.

The project was delivered on time and to budget which was a great result for Christchurch City Council.

Improvements could be made on the way in which testing and electrical certificates are undertaken.

All of works undertaken on this project are a testament to how traffic signal controllers are now built. A lot of the new signal commissions I have recently been too in Christchurch now adopt this approach.

Conclusion

Do we need to update P43 Specification for traffic signals…

- Provide installation guidance for controller safety?
- Who can access traffic signal controllers?
- How much protection is required for signal controllers?
- Is there an asset management approach required for signals?
- Do we need to undertake more regular audits?

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Any questions?