

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

SCIRT minimum standard for working around services

Story: Utilities Location and Protection

Theme: Programme Management

A document which stipulates SCIRT's minimum standard for managing the risks arising from working around services.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



This work is licensed under a [Creative Commons Attribution 3.0 New Zealand License](https://creativecommons.org/licenses/by/3.0/nz/).

The authors, and Stronger Christchurch Infrastructure Rebuild Team (SCIRT) have taken all reasonable care to ensure the accuracy of the information supplied in this legacy document. However, neither the authors nor SCIRT, warrant that the information contained in this legacy document will be complete or free of errors or inaccuracies. By using this legacy document you accept all liability arising from your use of it. Neither the authors nor SCIRT, will be liable for any loss or damage suffered by any person arising from the use of this legacy document, however caused.

Subject: **SCIRT Minimum Standard for “Working around Services”**

Updated by : Safety Leadership Group

Approved: David Hanham

Keywords:

Utilities, Services, Power, Telecommunication, Gas, Safety, Standards

Background

In January 2014, the SCIRT Safety Leadership Group identified “Working around Services” as one of the top 8 Critical Risks for SCIRT personnel. The agreed minimum standard to address this risk on SCIRT’s programme of work was updated in August 2016 and should be considered as part of BAU.

1. Scope and Application

- A. Set the minimum standard for managing the risks from working around live services on SCIRT projects.
- B. For clarity, the following requirements apply to:
 - (a) A service = any non-redundant pipe, duct, cable, used to convey a utility or commodity needed or required by the public (such as water, waste water, storm water, electricity, gas, telecom, etc.)
 - (b) Services located underground and above ground Includes services public and residential property

2. Hazards and Injury Descriptions Involved

- A. The following Hazards can result in serious harm injuries:
 - (a) Underground services when excavating
 - (b) Overhead services when moving, operating, placing mobile plant
- B. This can result in fatality through electrocution or explosions, and traumatic body injuries including burns, fractures, paralysis.

3. Concept Design

- A. Together, the Delivery Team ECI Representative and the Design Team :
- B. Define possible situations involving work around live services;
- C. Identify and evaluate the risks relating to work around live services, including the fragility, age and type of existing infrastructure;

- D. Document the Risk Assessment in the Project Risk Register;
- E. Consider early options to eliminate or substitute working around services, (ie: replace open excavation work by trenchless methods), or remove the interface with employees.

4. Detailed design and TOC Stage

- A. Delivery Team ECI Representative builds the Work methodology and reduces the risk to the lowest practicable level using the hierarchy of control. In particular:
 - (a) Where the probability of services are identified by the Design Team, then in conjunction with the utility location providers, locations must be confirmed to positively identify the type of utility and provide specific locations accurate to a minimum of Level B (*refer Design Guideline 05 "Utilities coordination & subsurface utilities information"*)
 - (b) Utility location providers to provide information on any potentially relevant features or unidentified services
 - (c) Engage directly with affected Utility(s) companies and gain agreement on the design requirements and construction methodology required protecting or relocating the affected utility, the utility's agreement to this protection or relocation must be detailed on the UDA form in Project Centre.
 - (d) If a utility chooses to extend or upgrade their network as part of a SCIRT project then a commercial agreement for this work must be negotiated and agreed by the IST Utility Coordinator, who is accountable for ensuring a Management of Change Process is undertaken, and changes to risks formally reflected in the risk assessment.
- B. Emergency Response procedures are considered
- C. The Project Risk Register is reviewed in consultation with a person knowledgeable in Risk Assessment and the subject matter.
- D. Management of change process to align the Risk Assessment with the final scope of work and TOC
- E. The costs for temporary protection measures and controls, described in the Methodology, are budgeted and included in the TOC (Total Outturn Cost) for the relevant Project.

5. Pre-construction/ mobilisation stage

- A. The construction crews are involved in the formulation of the Risk Assessment (E.g.: SWMS, JSEA, etc.). Controls and responsibilities are documented prior to work start
- B. The Risk Assessment is reviewed and authorised by a person knowledgeable in Risk Assessment and the subject matter.

- C. To ensure best practice and to provide a focus for reducing strikes on utility networks, the following service location and protection procedures should be applied by all Delivery Teams and subcontractors:
 - (a) Delivery Team Project Engineer to contact affected utilities and confirm their approval of detailed design
 - (b) Delivery Team Project Engineer must obtain “as built” service plans from each utility using the contact details below
 - (c) Do not use “as-built” that were issued by the utility more than 30 days ago.
 - (d) Delivery Team to complete Permit to Excavate, and include the signature of the accountable person in the formal record in permit register
 - (e) Locations to be marked out to SCIRT approved standards (*refer to NOR 23 “Utilities coordination & sub surface utilities information*)
- D. The Risk Assessment and Permits are communicated to those involved in the operation, and authorised by a person accountable.

6. Training and Competency

- A. Employees on site have a clear understanding of responsibilities, expectations, and Safety Risks relating to their role or task
- B. No Licenses & Endorsements required
- C. Evidence of minimum level of training for Project Managers, site engineers, supervisors, operators, foremen and spotters:
 - (a) Unit Standards (E.g.: SCIRT on-site training in reading service plans and locating services,) or a National Certificate and/ or Company training that illustrates a history of Company procedures, and
 - (b) detailed Instruction for the operation and maintenance of the equipment used in accordance with the Manufacturer’s Instructions, and Industry best practice
 - (c) As a minimum, employees are trained to the standard for work within the Minimum Approach Distance (MAD) for overhead power lines, where applicable
- D. As a minimum, a training record is maintained on site. As Best Practice, a competency register is maintained on site.
- E. Supervision on site can demonstrate skills and expertise for the task performed on site, and a knowledge of the ACOP or Best Practice Guidelines, and OEM guidelines

7. Fitness for use plant, equipment and tools

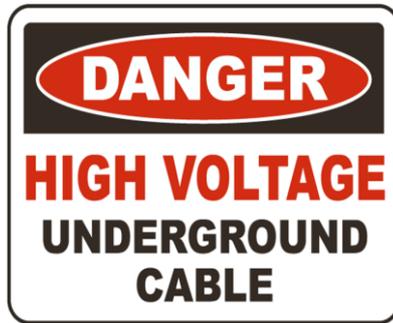
- A. The construction crew, led by the project engineer shall ensure the appropriate tools and methodology for locating services are applied on their project.
- B. Use engineered standard support and protection solutions for services which are exposed, particularly those that span across trenches. This includes the replacement requirements for AC pipes

8. Management of Change

- A. A process is in place to ensure that the methodology is reviewed when there is a change in the work site environment or machinery involved in the operation,
 - (a) in consultation with the construction crew and
 - (b) includes the signature of an authorised accountable person for the operation

9. Safe Operation

- A. Appropriate signage used where required
- B. Agreed, documented and effective means of communication are in place
- C. The Risk assessment completed and available, and determines need for a Permit to excavate
- D. Permit to Excavate:
 - (a) A Permit to Excavate is in place to allow machinery or hand digging within 1.5 metres of a service that is indicated on a drawing and/ or marked out.
 - (b) GPR or RF Cable and Pipe Tracers* are to be used to locate the service indicated.
 - (c) Hydro or vacuum excavation is the default method for positively identifying services on all SCIRT sites. (Ref: SCIRT Best Practice Guidelines for Hydro Excavation and Subsurface Utility Location). Where this method is not practicable, the reasons are documented in the risk assessment by the Project Engineer
 - (d) The service must be positively identified and its attributes recorded before excavation as specified in the pre dig documentation is commenced within 1.5 metre of that service.
 - (e) The minimum number of potholes/slot trenches required each day must be specified by the Site Engineer and recorded on the daily Pre Dig documentation. When deciding on where to slot trench or pothole and the frequency of slot trenches or potholes, consideration must be given to local conditions and the potential for crossovers and deviations from standard alignments.
 - (f) Employees signing permits have accountability for the safety of the task and must have formal approval to sign permits.
Site pre start meetings must include a daily process for working around services.
- E. Work around Overheads:
 - (a) A "Close approach consent " from the asset owner is required for work near electric overhead lines
 - (b) Use of "goalposts", Orion approved measuring poles, or cone sleeves to visually alert operators from coming into contact with overhead lines.
- F. Where 11 KV (or above) cables are in a SCIRT work site the following is required:
 - (a) High Voltage signs are attached to perimeter fencing
E.g.



or



- (b) Each day the beginning of the shift a minimum of two people (Supervisor, Spotter or Excavator Operator) undertake a walkover to:
- Ensure all underground services are clearly marked and their location easily identifiable (e.g. fluoro / dazzle)
 - Physically reconfirm the location of all 11KV (or above) cables in the total work area (eg Cat and Genny and/or specific physical marking of the location (eg. Service depth marker) are in place.
 - The Permit to Excavate is to be authorised daily by all involved before the starting work and ONLY after the physical walkover has taken place and discussed with the workers directly involved.
- (c) Discuss in prestart any changes from previous day / shift.
- G. SCIRT approved Spotter mandatory for all operations around services, both underground and overhead.

10. Emergency Management

- Emergency and evacuation procedures for relevant emergency situations are communicated
- As Best Practice, Emergency drills are carried out at job start and recorded every 6 months
- Awareness of employees on appropriate response in the event of striking live electric strikes

11. Incident Management Reporting and Investigation

- The Return to Work Process following a Recordable Service Strike or a Reportable Service Incident, must include the Project Manager or his representative authorising return to work when satisfied that remedial action has been taken and investigation has been initiated.
- A process is in place to report and investigate incidents and Near Misses.
- A process is in place to close off corrective and preventive actions.

- D. Post incident D&A testing as required by the current SCIRT D&A policy of Delivery Team and Sub-Contractor employees involved in the immediate event if a service was hit or compromised...
- E. All employees involved in the operation are held accountable to Delivery Team processes.

12. Useful Documents

- A. Guide for Safety with underground services (OSH – latest version)
- B. WorkSafe factsheet : Safe digging practices – underground services

13. SCIRT Resources

- A. Design Guideline 05 “Utilities coordination & subsurface utilities information”.
- B. NOR 23 “Utilities coordination & sub surface utilities information”
- C. Utility marking standards requirement

14. Acronyms and Definitions

<u>Term</u>	<u>Acronym</u>	<u>Definition</u>	<u>Source</u>
Approved Code Of Practice	ACOP	Approved Codes of Practice are documents that offer an approved method of achieving compliance with regulatory requirements. A code of practice will tell you how to meet the regulation requirements and controls in a way that is legally defensible. They are not mandatory and other ways of meeting the requirements can be adopted instead.	Department of Labour, NZ. http://www.dol.govt.nz/workplace/knowledgebase/item/1469 Environmental Protection Agency, NZ http://www.epa.govt.nz/publications-resources/publications/codes-of-practice/pages/default.aspx
Authorised Accountable person		Employee trained and given the means and delegated authority to assume accountability for a task.	SCIRT internal
Close approach consent		A Consent issued by the Electricity Asset Owner which will set out the minimum safe approach distances and any other safety measures for working near overhead lines.	Orion. http://www.oriongroup.co.nz/your-network/safety/close-approach-consents.aspx
Code of Practice for Temporary Traffic Management	CoPTTM	The NZ Transport Agency (NZTA) Traffic control devices manual Part 8 Code of practice for temporary traffic management describes best practice for the safe and efficient management and operation of temporary traffic management (TTM) on all roads in New Zealand.	NZTA http://www.nzta.govt.nz/resources/traffic-control-devices-manual/definitions.html#r
Competent		Means a person who has acquired, through a	WorkSafe NZ

person		combination of training and qualification or experience, the knowledge and skills to perform the task required	
Construction crew		Crew of employees working for a contractor to construct SCIRT work	SCIRT internal
Critical Risk (Safety)		Circumstances under our control that may be Immediately Dangerous to Life or Health (IDLH) for our staff, contractors or the public. If not managed, these circumstances could cause traumatic injuries or death. The term immediately dangerous excludes circumstances from critical risk that are chronic or cumulatively harmful in nature. These non-critical risks are not immediately Dangerous to Life or Health and therefore managed through our normal risk management and mitigation processes.	SCIRT internal
Delivery Team ECI representative		Generally a Project Engineer, Project Manager or ECI coordinator knowledgeable in the subject matter and involved in the ECI process on behalf of his/ her delivery team	SCIRT internal
Design Team		SCIRT Team in charge of producing the design for projects	SCIRT internal
Dogman		Trained according to Unite standard for lifting	SCIRT internal
Employees		Personnel conducting work on or for SCIRT projects, as opposed to the general public. Includes Delivery Team and subcontractor staff.	SCIRT internal
Early Contractor Involvement	ECI	SCIRT process by which Delivery Teams get involved and contribute to the design and constructability of a Project.	SCIRT internal
Job Safety and Environmental Analysis	JSEA	Job Safety Analysis (JSA) simply means looking at the work task and considering what is the safest way to complete it. It is a way of becoming aware of the hazards involved in doing the job and taking action to prevent an injury. The JSA process is suitable for different trades do different tasks, and need not require enormous amounts of time or use endless pieces of paper.	Work Safe Victoria http://www.worksafe.vic.gov.au/safety-and-prevention/health-and-safety-topics/job-safety-analysis
Minimum Approach Distance	MAD	Means the minimum distances when approaching live conductors that shall apply to any person who is not a competent live line line-worker, and include conductive material carried by them, vehicles, and mobile plant.	New Zealand Electrical Code of Practice for High voltage live line work http://www.med.govt.nz/energysafety/documents/legislation-policy/electricity-act-regulations-codes/standards-and-codes-of-practice/
Mobile Plant		Self-propelled mobile plant and equipment that is used for transport, operation and maintenance.	SCIRT internal
Operator		Employee whose role is to operate mobile plant, machinery, vehicles, powered plant.	SCIRT internal
Permit to Work	PTW	Where proposed work is identified as having a high risk, strict controls are required. The permit-to-work is a documented procedure that authorises certain people to carry out specific work within a specified time frame. It sets out the precautions required to complete the work safely, based on a risk assessment. It describes what work will be done and how it will be done; the latter can be detailed in a 'method statement'.	HSE UK http://www.hse.gov.uk/coshh/basics/permits.htm

		Note: The Christchurch City Council has introduced the Permit to Work (PtW) system for works on the water supply and wastewater networks. See more information : http://www.ccc.govt.nz/business/constructiondevelopment/permittowork.aspx	
Project Engineer		Employee whose role is Project Engineer. Generally in SCIR, this involves the planning and management of a Project from ECI to construction	SCIRT internal
Safety Leadership Group	SLG	Internal SCIRT operational group comprising IST and Delivery Teams H&S Advisors.	SCIRT internal
Safety in Design		Safety in Design is a process that integrates hazard identification and risk assessment methods early in the design process, to eliminate, isolate or minimise the risks of injury to those who will construct, operate, maintain, decommission and demolish the asset.	"SCIRT Safety in Design Strategy" document. (Project Centre)
Safe Work Method Statement	SWMS	A Safe Work Method Statement (SWMS) is a document that: (a) lists the types of high risk construction work being done (b) states the health and safety hazards and risks arising from that work (c) describes how the risks will be controlled, and (d) Describes how the risk control measures will be put in place.	Work Safe Victoria http://www.worksafe.vic.gov.au/safety-and-prevention/health-and-safety-topics/safe-work-method-statements/what-is-a-safe-work-method-statement
Service		Any non-redundant pipe, duct, cable, used to convey a utility or commodity needed or required by the public (such as water, waste water, storm water, electricity, gas, telecom, etc..).	SCIRT internal
Spotter		(also loosely termed "Observer", "Dogman", "Banks man") Employee given the task to assist the operator of Mobile Plant in the safe operation of machinery. For example: reversing, working near overheads, digging near underground services, etc.	SCIRT internal
Tactical Leadership Group	TLG	Internal SCIRT operational group comprising IST Delivery Managers and Delivery Team Leaders.	SCIRT internal
Total Outturn Cost	TOC	The budget allocated to a SCIRT Project at the end of the ECI phase	SCIRT internal
Trench excavations		Trench excavations are those where the horizontal width at ground level is less than the vertical depth of the deeper side	ACOP for Safety in Excavations and Shafts for Foundations
Utilities Design Approval	UDA	SCIRT internal document used to record discussions between Design Teams and Utility(s) companies regarding agreement on the design requirements and construction methodology required to protect or relocate the affected utility.	SCIRT internal
Work site manager		Employee trained and given the means and responsibility to manage a work site. The Work Site Manager is responsible for managing the safe activities within the inside of the worksite. (i.e.. behind the 1.8 metre fencing), as opposed to the	SCIRT internal

		<i>Traffic Management Contractor who is responsible for managing the safe and efficient movement of road users adjacent to the worksite in addition to managing the movement of site related mobile plant on and off site.</i>	
--	--	--	--