

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.

# Critical Risk 5 Health and Safety Toolbox – trenches and excavations

Story: Health and Safety

Theme: Programme Management

A document which outlines how to work safely in trenches and excavations, created to discuss with site staff at on-site "toolbox talks".

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.

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.



Programme funded by
New Zealand Government







Fulton Hogan







## Critical risk- Trenches and Excavations

Trenches and Excavations are our number 5 critical **risk** because of the potential consequences:

- Entrapment- suffocation, death during trench  $\Rightarrow$ collapse
- Become unwell due to contaminated ground  $\Rightarrow$ and toxic gases and fumes
- Being stuck overhead by falling equipment or  $\Rightarrow$ debris in the excavation-resulting in concussion, cuts or lacerations
- Exposure when working next to exposed live  $\Rightarrow$ services- electric, shock or burns

## Fatal accident records relating to Trench Collapses highlight the need for workers to be protected against such failures

## **Complete a Risk Assessment:**

Taking into account factors around (modes of failure):

- The depth  $\Rightarrow$
- The soil type or types if layered  $\Rightarrow$
- **Bedding planes**  $\Rightarrow$
- Vibration  $\Rightarrow$
- The presence of moisture, rain or a high water table  $\Rightarrow$
- Any superimposed loading close to the edge of the  $\Rightarrow$ excavation
- The time the excavation is open and the any previous  $\Rightarrow$ disturbance of the soil i.e. aftershocks
- Any toxic or explosive gases present  $\Rightarrow$

While some types of soil often looks stable and may stand for guite a long time, a false sense of security can build up. Indeed, experienced employees have been the victims of trench collapses

## national

## Man buried alive in ditch

#### Last updated 12:09 28/05/2014



FATAL SLIP: Michael Kevin Haines, 34, died after he was buried alive in a drainage ditch near Matamata.

"The combined efforts of the workers managed to free the man who was by now unconscious. An ambulance arrived at the scene about this time and CPR was carried out until such time as an air ambulance helicopter arrived to fly him to Waikato Hospital but he was unable to be revived."

A WorkSafe NZ team attended the scene and police were assisting them in their inquiries into what happened. The matter has been reported to the corone

- Waikato Times





Ads by Google Bridgestone Tyre Sale sale.bridgestonetyrecentre.co.nz Buy 1 Tyre Get 1 Half Price! Bridgestone Sale - Car & 4x4 Tyres

man has died after being buried alive in a drainage ditch near Matamata and a WorkSafe NZ investigation is under way

Emergency services were called to a rural Te Poi property about 12.30pm yesterday, Sergeant Graham McGurk, of the Matamata

Rapurapu Rd property. He had gone down into a trench dug by a digger to work on a pipe join.

"As he was bent over a large slip occurred and he was buried." McGurk said

"The digger operator saw what had happened and managed to dig the victim out to the point where his head was clear before he ra to get assistance from nearby farm and construction workers."

Haines was conscious and able to breathe but his condition deteriorated, McGurk said



Crime Politics Science Education Health Quizzes Blogs Weather Environment La

# Excavations shallower than 1.4 metres- do we have to protect it?

The answer is YES! If required they have been known to collapse. If an employee is in the trench and bending over at the time of the collapse, he or she may suffer serious injury. Everyone needs to consider such excavations and determine if special precautions or work methods are necessary.

- ⇒ Access the ground conditions and possible modes of failure
- ⇒ Remove any loose unstable ground with a machine
- $\Rightarrow$  Do not enter any unprotected trenches

In March 2014, a worker epoxying pipe in a 1.4 metre trench had it collapse onto the back of his legs. The following day the same thing happened again to another worker, before any protection was installed.



Before

After

## Excavations over 1.4 metres or deeper

Must be shored unless:

- ⇒ The face is cut back to a safe slope and the material in the face will remain stable under all anticipated conditions of work or modes of failure
- ⇒ Shoring is impractical or unreasonable and safety precautions certified by a registered engineer are adequate and have been taken
- $\Rightarrow$  The type of work and location of employees means there is no actual danger

# **Options to be considered**

## Excavation faces benched and battered to a safe slope



Excavation with shored faces



Excavation with shoring designed for surcharge loads



designed to carry soil, vehicle and material loads





## How can we prevent this?

1. Has a Hazard Assessment of the site been completed by a competent person?

2. Site Assessment has taken into account factors around modes of failure i.e. depth, soil types, water tables

3. If services are present has "before you dig" been completed?

4. All underground and overhead services positively identified?

5. Does it meet the Confined Space definition? Has a permit been issued?

6. Ground movement controlled and collapse is prevented by systematically shoring, sloping benching as appropriate? 7. If underground services are known or likely to exist-

- A. a spotter has been assigned
- B. No excavation is within 500mm

8. Shield and shoring equipment is checked and maintained within certification where applicable?

9. Robust access and egress is provided? i.e. ladder, footed and secure at 1:4 ratio

10. Are ground and environmental conditions being continually monitored for change?

11. Does the site emergency procedure consider excavation from a trench/excavation?