



# Identification of Underground Cables using the VCI-3

Standard  
Operating  
Procedure

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## 1.0 Persons Affected

This Standard Operating Procedure (SOP) affects:

All qualified Power Line Technicians required to identify and phase de-energized underground cables during installation or maintenance purposes on de-energized 3-phase electrical networks.

## 2.0 Purpose

This SOP provides:

This SOP is intended to provide and reinforce the safe work procedure for testing de-energized underground cables when using the VCI-3.

## 3.0 Rationale

This SOP ensures the following:

- This SOP will support the safety of Personnel by ensuring safe work methods are consistently used when using the VCI-3 for testing underground cables.
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## 4.0 Scope

### In-the-Scope of the Procedure

- The procedure includes the following:
  - The approved method to follow when using the VCI-3

### Out-of-the-Scope of the Procedure

- The procedure does not include the following:
  - The approved method to follow for confined space protection.

## 5.0 Policies and Regulatory Requirements

This SOP is a result of the following policies, regulations, industry standards, and corporate directives and standards:

### Policies:

- Personal Protective Equipment Policy
- Job Hazard Assessment Policy
- Arc Flash Standard

### Regulatory Requirement(s)

Saskatchewan Occupational Health & Safety Regulations

- Part XVIII, Sections 266 - 274

### Other

- Standard Protection Code
- Regional Confined space Work Procedure



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### 6.0 Roles, Responsibilities and Prerequisites

In-the-Scope of the Procedure Role(s)	Quantity Required	Responsibilities	Prerequisites
Power Line Technician	1	<ol style="list-style-type: none"><li>1. Inspect tools and equipment</li><li>2. Test for absence of potential</li><li>3. Use appropriate bonding and grounding application</li></ol>	<ol style="list-style-type: none"><li>1. Standard Protection Code Distribution Course</li><li>2. PLT</li><li>3. Bonding and Grounding course</li></ol>
Issuing Authority	1	<ol style="list-style-type: none"><li>1. Follow standard protection code permit requirements.</li></ol>	<ol style="list-style-type: none"><li>1. Successful completion of Standard Protection Code training.</li></ol>

### 7.0 Tools and Equipment

#### Tools and Equipment and Quantity Required:

- FR clothing as required.
- VCI-3 (Voice Cable Identification System)

### 8.0 Planning and Preparation Checklist

#### Things to Check Before Starting the Procedure:

Preparation to work on primary underground cable will include:

- Following the safety absolutes:
  - Conduct a Hazard and Risk assessment prior to any work focusing on confined space safety and environmental impacts and the required barriers.
  - Wear appropriate PPE as determined by the Hazard and Risk assessment.
  - Follow SaskPower Standard Protection Code and other related permits.
  - Follow all accepted work practices including limits of approach, testing for absence of potential and proper grounding procedures.
  - Report all incidents or near misses immediately.

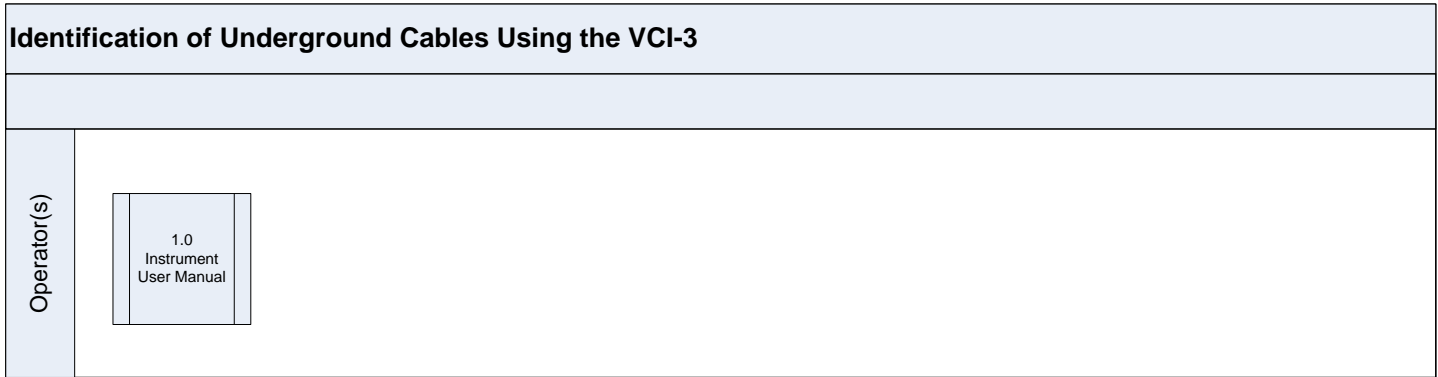


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## 9.0 Procedure

### High Level Flowchart



### The Procedure

**NOTE:** The VCI-3 principle is based on current injection by direct connection using the power cable conductors or using magnetic sensors. It requires grounding at both ends of the 3-phase circuit and this grounding may remain in place for the duration of the shutdown in order to achieve maximum workers' safety. The detector possesses a unique tone detection system in order to assure a safe error-free tracking and identification.

Current injection is only possible if power cables are grounded at a common location. **It is of most importance to consider** short-circuits of same resistance values in order to achieve proper balancing of the injected currents as currents vary according to the global resistance of the cable.

The VCI-3 works by sending extremely low voltage through the cable toward the detector, a huge advantage to this is that it is a one man operation. Grounds must be installed at both ends to provide a return path for the signal. As long as there is a good ground the machine will work with no interference.

### 1.0 Instrument User Manual

#### 1.1 Review the VCI-3 User Manual

1.1.1 The Operator shall understand how to use the instrument by reviewing the following areas of instructions provided in the VCI-3 manual;

- Installation of the Transmitter using magnetic sensor clamps
- Installation of the Transmitter in Direct Mode
- Operation of the Detector
- Transmitter Operation Mode
- Operation with the Straight External Sensor
- Operation with a V-shaped Sensor on Shielded Tripolar Cables
- Maintenance



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## 10.0 Acronyms, Definitions and Symbols

### Acronyms and Abbreviations

N/A

### Definitions

N/A

### Symbols

N/A

## 11.0 Components

The following is a list of components for this SOP which can be accessed through the SOP System:

Component Name	Component Type	Component Description	Location of Component
Identification of Underground Cables Using the VCI-3 User Manual	Job Aid	Manual to be used to complete the Identification of Underground Cables using the VCI-3	Identification of Underground Cables Using the VCI-3
Identification of Underground Cables Using the VCI-3	Job Aid	A Step by Step document used to perform a task	Identification of Underground Cables Using the VCI-3
Identification of Underground Cables Using the VCI-3 Flowchart	Flowchart	A High level and mid-level flowchart for this procedure	Identification of Underground Cables Using the VCI-3
VCI-3 Clamp Injection - Dual Ground - Cable & Phase ID sequence	Video	A video to show how the task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Clamp Injection - Dual Ground Setup	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Compass probe	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Demo Kit	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3



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VCI-3 Direct Injection - Cable ID	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Direct Injection - Phase ID	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Injection set up	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Ground quality check	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Detector	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3
VCI-3 Transmitter	Video	A video to show how a task within the procedure is done	Identification of Underground Cables Using the VCI-3

## 12.0 Owner

**Owner**

Operations and Maintenance Director - Kevin Schwing

## 13.0 References

References	Location of Resource
<ul style="list-style-type: none"> <li>- Directive Testing for absence of potential</li> <li>- VCI User's Manual</li> </ul>	<ul style="list-style-type: none"> <li>- Safety Net</li> <li>- In the VCI-3 carry case or call NDB Technologie Inc.</li> </ul>