EXCAVATING WITH HYDROVACS IN THE VICINITY OF UNDERGROUND ELECTRICAL PLANT

Safe Practice Guide

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Infrastructure Health & Safety Association

Safe Practice Guide
Excavating with Hydrovacs in the Vicinity of Underground Electrical Plant

Foreword

This Guide designates the practices that should be followed by the member firms of the Infrastructure Health & Safety Association (IHSA) when using hydrovacuum excavation equipment in the vicinity of underground electrical plant. This Guide is not designed as a training manual, but contains information, best practices and general recommendations deemed appropriate to perform a job in a responsible and safe manner.

The contents of this Safe Practice Guide, including all advice, recommendations and procedures, are provided as a service by the Infrastructure Health & Safety Association. No representation of any kind is made to any persons whatsoever with regard to the accuracy, completeness or sufficiency of the information contained herein. Any and all use of or reliance on this Safe Practice Guide and the information contained herein is solely and entirely at the user’s risk. The user also acknowledges that the safe practices described herein may not satisfy all requirements of Ontario law.

The Infrastructure Health & Safety Association wishes to express its appreciation to those who assisted in the preparation of this Guide.

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# Table of Contents

Introduction ............................................. 5
Purpose .................................................. 5
Definitions ............................................. 6

## Section I

### General

100 Hydro Excavation in Lieu of Hand Digging .......... 12
101 Hydrovac Operator Competency and Training Requirements ................. 13

## Section II

### Health and Safety Policy

200 Safety Policy and Program ......................... 18
201 Personal Protective Equipment ...................... 18
202 Job Planning .................................. 18
203 Public and Worker Protection ....................... 20

## Section III

### Protection

300 Isolated or Isolated and De-Energized ............... 23
301 Hold-off Protection ................................ 23
302 Equipotential Bonding ............................. 24
303 Equipotential Bonded Work Zones .................. 24
304 Equipotential Bonding with Use of Temporary Grounds ................. 32
305 Energized Overhead Conductors ..................... 36
    – Safe Limits of Approach
<table>
<thead>
<tr>
<th>Section IV</th>
<th>Locates</th>
<th>400</th>
<th>Locating Buried Utilities</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section V</td>
<td>System</td>
<td>500</td>
<td>Hydrovac Operating Requirements</td>
<td>42</td>
</tr>
</tbody>
</table>
INTRODUCTION
This Guide has been compiled to familiarize personnel with the specialized techniques, work practices, and equipment to work safely while using hydrovac equipment in the vicinity of underground electrical plant.

PURPOSE
The purpose of this guide is to:

1. *Educate workers on general hazard recognition, assessment, and control practices.*

2. *Assist in providing a safe work zone for workers in vicinity of energized underground electrical plant.*

3. *Transfer knowledge regarding these procedures to workers, employers, and contractors.*
DEFINITIONS

Alive – See Energized

Approved: A device or method that has been evaluated and selected from alternatives that meet the specific requirements of the job.

Approved Work Procedure: An approved, documented, step-by-step method that ensures the task can be performed safely.

Apparatus: All equipment pertaining to the generation, transmission, distribution, and use of electricity.

Arc Rating/Flame Resistant: The value attributed to materials that describes their performance on exposure to an electrical arc discharge.

Bond: Electrical connection that causes conductive parts to be at an equal potential.

Bonding: (electrical) Making a mechanically secure connection between two or more objects to ensure they are at the same potential

Competent Person: A person who is,

a) qualified because of knowledge, training and experience to organize work and its performance

b) familiar with the provisions of the Occupational Health and Safety Act and the Regulations that apply to the work

c) knowledgeable of any potential or actual danger to health or safety in the workplace.

Competent Worker: In relation to specific work, means a worker who is,

a) is qualified because of knowledge, training and experience to perform the work
b) is familiar with the provisions of the *Occupational Health and Safety Act* and the Regulations that apply to the work

c) knowledgeable of any potential or actual danger to health or safety in the work.

**Conductor:** That part of a cable, overhead line, or apparatus intended to conduct the flow of electrical energy.

**Confined Space:** A fully or partially enclosed space

a) that is not both designed and constructed for continuous human occupancy, and

b) in which atmospheric hazards may occur because of its construction, location or contents or because of work that is done in it;

**Controlling Authority:** The person(s) who occupies a position responsible for performing, directing or authorizing changes in conditions or position of the specific apparatus or devices.

**De-energized:** Where electrical energy has been discharged through a mechanically secure connection to an effective ground potential.

**Energized:** Capable of delivering energy by reason of being dynamically alive or charged.

**Electrical Plant:** Includes all components that are part of an Electrical Distribution System both overhead and underground that are part of the delivery and supply of electricity. Examples of Electrical Plant Components would be poles, guy wires, anchor rods, overhead and underground cables/conductors, meter bases, transformers, switch gear, pedestals, handholes, and transformer vaults.
**Equipotential**: The state of having all objects in a work area at the same potential.

**Equipotential Bonding**: Provision of electrical connections between conductive parts, intended to ensure they are equipotential.

**Equipotential Zone**: A work area, the bounds of which are set by the outermost point of conductive parts that are connected by an equipotential bonding or grounding system.

**Flame Resistant**: The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source. Flame resistance can be an inherent property of a material, or it can be imparted by a specific treatment applied to the material.

**Ground**: Reference for zero potential, also referred to as "earth" potential.

**Grounding**:

Provision of a continuous conductive path to the earth that

1. has sufficient ampacity to carry any fault current that may be imposed on it
2. has a sufficiently low impedance to limit the voltage rise above ground potential
3. facilitates the operation of the protective devices in the circuit as quickly as possible
4. bleeds any excess energies induced by electric and magnetic fields or static sources.

**Ground Rod**: A metallic electrode (rod or plate) inserted into the earth that, based on its resistance, effectively allows the flow of electrons into the surrounding soil.
Hazard: Potential source of harm.  
NOTE: The term hazard can be qualified in order to define its origin or the nature of the expected harm (i.e., electric shock hazard, arc-flash hazard, crushing hazard, cutting hazard, toxic hazard, fire hazard, downing hazard).

Hazardous Energy: Any electrical, mechanical, hydraulic, pneumatic, chemical, or thermal energy, or force such as gravity, that could potentially harm workers.

Hold-off: A device having its operation restricted to previously agreed limits by the placement of a hold off tag. Hold offs are most commonly used to block the auto reclosing and the manual re-energization of a line following an automatic trip.

Hydrovac: Equipment that has been originally designed and built for the function of excavating near or exposing underground utilities.

Isolated: Separated from all sources of dynamic energy.

Job Plan: A work plan agreed to by all workers involved, that identifies all known hazards, the associated barrier(s) to control each hazard, and identifies each worker’s responsibilities in the performance of the work.

Personal Protective Equipment: Safety equipment worn and used to reduce risk of personal injury.

Portable Bond Mat: A mat that creates an equipotential zone for the worker to stand on during various energized and de-energized work practices.

Rated: A qualifying term that is applied to an operating characteristic to indicate the designated limit or limits of the characteristic for an application under specified conditions.
**Risk:** Combination of the probability of occurrence of harm and severity of that harm.

**Safe Work Area:** A specifically identified area for work where all known hazards have been eliminated or are controlled.

**TSSA:** Technical Standards & Safety Authority.

**Utility Work Protection Code:** The written procedures to establish an isolated tagged and/or locked out condition for work. The Utility Work Protection Code has been approved and adopted by the Infrastructure Health & Safety Association and Hydro One Inc.
SECTION I
GENERAL

100  HYDRO EXCAVATION EQUIPMENT
     IN LIEU OF HAND DIGGING

101  HYDROVAC OPERATOR COMPETENCY
     AND TRAINING REQUIREMENTS
SECTION I
GENERAL

100 HYDRO EXCAVATION EQUIPMENT
IN LIEU OF HAND DIGGING

Many utilities use hydrovac equipment in place of hand-digging due to restrictions in certain work environments. For example, when excavating within one metre of energized underground conductors, utilities require that further excavations to expose these conductors be done by hand only.

Hydrovac equipment can be used as an alternate method to hand digging provided that the following requirements have been met:

• Hydrovac equipment/vehicles used in lieu of hand digging have been originally designed and built for the function of excavating near or exposing underground utilities. If this is not the case, the owner of the equipment should seek engineering consultation in order to determine that the equipment in question can be used for this purpose.

• The equipment/vehicle is used only for its designed purpose using manufacturer’s recommended practices. If practices are unavailable, the owner of the equipment/vehicle should develop practices in accordance with current regulations, manufacturer’s recommendations and this guideline. These practices should be documented and communicated to all workers involved in the work and be readily available at the worksite.
• Workers using the hydrovac equipment/vehicle are competent to operate it safely and have received written and oral instructions for any new or modified equipment and/or work procedures.

• Safe work practices for working within one metre of energized underground conductors are documented and all workers involved understand them. Instructions (both written and oral) should be provided by a competent person for new workers or for those who do not perform the work on a regular basis.

• Additional safe work practices involving hydrovac equipment/vehicles are documented.

101 HYDROVAC OPERATOR COMPETENCY AND TRAINING REQUIREMENTS

Every worker should have a basic understanding of electrical theory, energy flow and barriers, grounding, bonding, induction, effects of electricity on the human body, system protection, step and touch potential, and safe limits of approach.

Any worker operating hydrovac equipment should be trained on how to use the equipment and how to excavate safely. All hydrovac equipment should be used in accordance with any operating manuals issued by the manufacturer.

Knowledge of any potential or actual danger to health and safety is part of being a competent worker or competent person. Hazards should be identified during the pre-start hazard assessment. Hazards can include
working around trenches and excavations, falls, traffic, electricity, and confined spaces. Hydrovac tanks should be considered a confined space. A person with adequate knowledge, training, and experience should test and evaluate a confined space before a worker enters it.

Workers should be properly trained to use and inspect all equipment required to perform the work, including the hydrovac equipment, personal protective equipment, fall protection equipment, and equipotential bonding and grounding system.

The minimum training courses to be considered should include:

1. The Occupational Health and Safety Act (OHSA) and applicable Regulations – Workers should be aware of their duties and safety responsibilities.

2. First Aid and CPR – All employers covered by the Workplace Safety and Insurance Act are required to have first aid equipment, facilities, and trained personnel in all workplaces.

3. WHMIS – WHMIS training is required in all workplaces that may have controlled products.

4. Traffic Control – For workers required to set up or remove traffic control measures. It should include training on using the Ontario Traffic Manual (Book 7) – Temporary Conditions.

5. Fall Protection – For workers exposed to a fall of three metres or any situation that could reasonably cause injury to a worker, including falls from the top of the vehicle and dangerous excavations.

7. Confined Spaces – For any worker entering a confined space.

8. Hydrovac Operation and Equipment Training – All operators and personnel using hydrovac equipment must be trained in the operation of the equipment.

9. Personal Protective Equipment – For workers who are required to wear personal protective equipment.

10. Trenching Safety – For workers and supervisors who are involved trenching or shoring.
SECTION II
HEALTH AND SAFETY POLICY

200 SAFETY POLICY AND PROGRAM
201 PERSONAL PROTECTIVE EQUIPMENT
202 JOB PLANNING
203 PUBLIC AND WORKER PROTECTION
SECTION II
HEALTH AND SAFETY POLICY

200 SAFETY POLICY AND PROGRAM

Every hydrovac company should have a comprehensive health and safety policy and program. The program should explain how the supervisors and workers will be properly trained to use the equipment. Job procedures should be developed for excavating any type of utility expected to be encountered so that all hazards associated with the work are taken into account.

201 PERSONAL PROTECTIVE EQUIPMENT

The minimum requirement for safety equipment to be used by workers should include:

• CSA-approved head protection
• CSA-approved foot protection
• CSA-approved eye protection
• CSA-approved hearing protection
• Approved arc-rated/flame-resistant clothing
• Suitable hand protection

202 JOB PLANNING

1. Communication of Hazards

Establish and document communication protocols prior to the start of any vacuum excavation projects. These protocols should be communicated again (and documented again if altered) whenever changes occur with work procedures and whenever new workers are
receiving orientation at the jobsite. Do not begin work until all workers at the jobsite have agreed to and have signed this documentation.

Additions to these minimum guidelines for communication can be made when necessary by the facility owner.

2. Hazard Identification – Risk Assessment

Establish and maintain procedures and safe work practices for ongoing hazard identification, risk assessment, and implementation of controls. The procedures and practices should include considerations for routine and non-routine activities for all personnel with access to the workplace. They should be communicated to all interested parties and reviewed/updated periodically.

3. Work Interruption

All excavation activities should stop immediately if damaged underground plant is seen or suspected. Perform a worker reassessment and notify the employer or supervisor if it is outside the scope of the worker. This work restriction should be carried out under the communications and emergency protocols previously determined and agreed to by both the excavator and facility owner.

In the event of a work restriction, the facility owner should be notified and work should not continue until facility personnel have inspected the worksite and approved continuation of the work.
PUBLIC AND WORKER PROTECTION

Hydrovac excavation operations may be carried out along busy thoroughfares. Personnel and equipment may be situated in various locations along the route and require adequate work area protection for the safe execution of the job.

Work area protection legislation is found in the *Ontario Traffic Manual (Book 7)* or the *Ontario Highway Traffic Act* and local bylaws. Follow the legislation whenever you are working near traffic.

Barricades should be placed so that the public cannot inadvertently come into contact with the established equipotential work environment. A non-conductive perimeter barrier that is sufficient to protect the public should be installed. This barrier should be designed and installed in such a way as to prohibit public entry into the work area. The public should be protected from touching or approaching equipment inside the barriers to avoid touch potential situations.

Appropriate warning signs should be conspicuously displayed on this outer barrier.

Hydrovac equipment is used in a variety of work settings, so the arrangements of the barriers, mats, etc., should be determined by the specific needs of the work environment.
SECTION III
PROTECTION

300 ISOLATED OR ISOLATED AND DE-ENERGIZED

301 HOLD-OFF PROTECTION

302 EQUIPOTENTIAL BONDING

303 EQUIPOTENTIAL BONDED WORK ZONES

304 EQUIPOTENTIAL BONDING WITH USE OF TEMPORARY GROUNDS

305 ENERGIZED OVERHEAD CONDUCTORS – SAFE LIMITS OF APPROACH
SECTION III
PROTECTION

300  ISOLATED OR ISOLATED AND DE-ENERGIZED

The preferred work method when using hydrovac equipment in the vicinity of an electrical plant is to work with the plant isolated or isolated and de-energized.

**Damaged or Suspect Cables:**

When the electrical plant is damaged or suspected to be damaged, the plant in the vicinity of the excavation should be isolated and de-energized prior to the excavation process.

Any damage to the electrical plant from the excavation process or discovered during the process shall be reported to the owner prior to any backfilling.

**WORKING IN THE VICINITY OF ENERGIZED PLANT**

301  HOLD-OFF PROTECTION

Where isolated or isolated and de-energized is not practical and work is being performed in the vicinity of an overhead conductor and/or an underground energized electrical apparatus, a hold-off should be established when deemed necessary by the controlling authority or worker(s).

Hold-off devices are primarily designed for system protection in the event of inadvertent electrical contact and are not designed to protect workers from electrical contact. The controlling authority determines the availability of hold-off protection.
302 EQUIPOTENTIAL BONDING

When working with an energized electrical apparatus, equipotential bonding is the preferred method of protecting workers from injuries due to electrical contact. Equipotential bonding is intended to keep all bonded equipment and personnel at the same potential to mitigate the risk of current flow.

303 EQUIPOTENTIAL BONDED WORK ZONES

The equipotential bonded work zone incorporates a system of conductive bonding clamps and conductors capable of maintaining the work zone at an equalized potential at all times. These connections include but are not limited to the bonding of all conductive objects or equipment such as the gun/wand, the dig tube, the truck chassis, and the ground gradient control mat(s).

Before moving out of the equipotential work zone, water must be turned off and any conductive equipment and/or bonded parts of the equipotential system removed from the excavation leaving the end of the dig tube and the gun/wand visible. This is required when repositioning the mats or when one of the operators needs to step off the mat; hydrovac personnel must stay on the mats during the work procedure.

Do not touch other non-bonded objects in the immediate work area when the dig tube or gun/wand is in the excavation because they are considered to be at a different potential. Examples include a spud bar in the excavation or a nearby hydro pole or similar equipment. Communication between operators is an essential safety component.
Equipotential Set-Ups

This guide is not intended to provide specific equipotential set-ups but may help to ensure that essential pieces of equipment are properly bonded together. The cables and connecters/clamps used to create the equipotential zone are not considered to be grounding components and as a result, various-sized cables and approved clamps may be used. As a minimum, #2-type grounding cable with approved connecters rated for continuous current are recommended for bonding cables.

The key points to remember are that all bonded equipment be properly inspected and that personnel involved with the hydrovac operation stay on the mats when work is taking place.

Diagrams 1, 2, and 3 are recommended set-ups using equipotential bonding equipment based on the hazard of energized apparatus in or near the dig area. In the diagrams, individual bonding cables are used to create the equipotential zone, but there are other cable systems that incorporate a splitter. A single mat may be used instead of the two mats shown in the diagrams. Whatever set-up is used, ensure that the equipment that is part of the equipotential zone is properly bonded.
A touch potential hazard exists if contact is made with an energized conductor and one of the operators on the mats makes contact with the truck.
Diagram 1: This set-up has the excavation work or mats within 2 metres of the truck. The following pieces of equipment should be bonded:

1. the mat(s)  
2. the gun/wand  
3. the dig tube  
4. the truck.

This is based on a truck bin that may be open or there is some form of inadvertent contact with the truck. The gun/wand is connected to the truck by means of the metal braid in the high-pressure water hose. However, since there is no means of properly proving or testing this as a conductive path, a separate bonding cable is recommended for any set-up requiring the truck to be part of the bonded zone.
A different potential hazard exists if electrical contact is made and the cord-connected light or wired pendant was not part of the Bonded Equipment, potentially allowing for current to flow through the operator back to the truck.
Diagram 2: Similar to Diagram 1, except that this set-up requires the mat(s), the gun/wand, the dig tube, and the truck to be part of the bonded system. This equipotential set-up is required when there is some form of conductive connection between the bonded work area and the truck. Primarily, this would include a hard-wired light being used during the excavation activity or the use of a wired pendant. In both cases, the cord connected to the equipment provides a possible current path through the operator and back to the truck if electrical contact is made. Another consideration could be the use of a conductive “connecting device/lanyard” if the truck is being used as an anchor point for fall protection.
A hazard exists if electrical contact is made with an energized apparatus. Using this work method keeps the operators at the same potential.
Diagram 3: Similar to Diagram 1, except that the truck is not required to be a bonded component. This set-up is used when the following criteria are met:

1) the truck is greater than 2 metres from the bonded work area

2) there is no conductive connection back to the truck such as a light or pendant. This does not include the water hose with a metal braid as it is already part of the bonded system.
Diagram 3: This set-up allows for situations where the distance from the truck to the bonded work area would make it difficult to have a cable long enough to connect the truck to the bonded work zone. The key point is to ensure that there is an equipotential bonded zone for all equipment used in the immediate hydrovac area.

304 EQUIPOTENTIAL BONDING WITH THE USE OF TEMPORARY GROUNDS

Equipotential bonding in conjunction with maintaining safe limits of approach is the recommended method for protecting workers from injuries due to electrical contact with an energized electrical apparatus. As a result, temporary grounding should only be used for specific situations.

Equipment grounding is the process of mechanically connecting electrical equipment to the earth or system neutral to allow current flow to ground or earth potential. When grounding for worker protection, the capacity of such grounding equipment should be capable of carrying available fault current levels of the particular electrical system.

There have been requests (primarily by Hydro Utilities) to ground the bonded mats and equipment to some form of ground connection. There are two major concerns with that.

First is that connecting equipment to an effective ground will cause current to flow should contact be made with an energized conductor. Equipotential bonding is intended to equalize voltage, not to support any significant amount of current flow. Unless it can be proven that the ground connection is indeed an effective ground, a false sense of security is could be created. An example is using a driven or screwed-in ground probe
and connecting the equipotential bonding equipment to it. Second is that a possible step potential hazard has now been created for anyone standing near the probe if the ground probe becomes energized.

**It is NOT RECOMMENDED that temporary ground probes be used because they are extremely difficult to properly test and verify as an effective ground.**

Grounding the truck may sometimes be a requirement if it is requested by the Hydro Utility (Controlling Authority) or based on the hazards identified during the job planning process. Because temporary grounding allows a low impedance current path through the grounding equipment significant enough to clear a circuit, the resistance rating of the grounding component becomes key. The system neutral is the preferred location because the multi-grounded system offers the best method of clearing a circuit by either blowing a fuse or tripping a breaker should electrical contact be made. This would most likely occur due to contact with an overhead powerline.

Grounding the truck will be done in conjunction with the use of equipotential bonding regardless of the work activity. If there is electrical contact, especially with a high-voltage powerline, ensure there is a path for the current to flow from the truck to the ground connection, which is intended to cause the circuit to clear.

**Hydrovac operators are not qualified to connect any form of bonding or grounding cables to the system neutral. If grounding becomes a requirement, it must be done in conjunction with the Controlling Authority.**
If this set-up meets the criteria covered in Diagram 1 or 2, a bonding cable should be connected from the bonded work area to the truck.
Diagram 4: This set-up shows an equipotential-bonded system with an additional grounding cable connected from the truck to an effective ground. This grounding component needs to be sized accordingly with properly rated grounding clamps. A 1/0 grounding cable is the recommended minimum. If there is a need to ground the truck, it must be connected to an effective ground with the ability to clear the circuit should electrical contact be made. This work method should be used at the request of the Controlling Authority or based on the hazards identified during job planning. If temporary grounding of the truck or equipment is required, it should be connected to the system neutral or equivalent.
ENERGIZED OVERHEAD CONDUCTORS – SAFE LIMITS OF APPROACH

The table below sets out the minimum distance objects can come to an energized overhead electrical conductor on the nominal phase-to-phase voltage rating.

<table>
<thead>
<tr>
<th>Nominal phase-to-phase voltage rating</th>
<th>Minimum distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>750 or more volts, but no more than 150,000 volts</td>
<td>3 metres</td>
</tr>
<tr>
<td>more than 150,000 volts, but no more than 250,000 volts</td>
<td>4.5 metres</td>
</tr>
<tr>
<td>more than 250,000 volts</td>
<td>6 metres</td>
</tr>
</tbody>
</table>

EQUIPMENT AND OVERHEAD POWERLINES

Boom Movement and Maintaining Safe Limits from Powerlines

Boom movement must be monitored to ensure that safe distances are maintained as required by the Occupational Health & Safety Act (O.Reg. 213/91, s. 188). It is the responsibility of all those involved with hydrovac operations to communicate with one another when any boom movement is required in the vicinity of overhead powerlines. This includes during initial set-up or to reposition the boom.

Boom Position when Setting Up or Moving the Truck

Take special care to ensure that the boom has been properly stored in the cradle. The boom may not need to be stored when moving the truck very short distances.
or removing the boom from the cradle prior to getting the truck into a working position. Take all necessary precautions such as inspecting the surrounding area prior to moving the truck and positioning the boom so that its height is equal to or lower than it would be if it was in the stored position.

Communication between the person moving the truck and the signaller must be established and the signaller needs to be in the best position possible to monitor the truck and boom while maintaining visual contact with the driver.

**Blockages or Removing the Dig Tube**

Periodically, rocks or other pieces of debris can become lodged in the dig tube and need to be removed to allow for a proper vacuum. Take special care if the dig tube needs to be elevated for removal of the blockage. Remove sections of the dig tube if required, but in all cases, have the signaller observe the boom movement, giving consideration to safe limits of approach.

This same consideration needs to be taken when removing the dig tube from the excavation, especially when additional sections have been added because of the depth.

**Induction Hazards**

Energized electrical conductors generate electrostatic and electromagnetic fields. As result, working under some high-voltage lines can cause vehicles and metal objects to become electrically energized to a voltage greater than ground/earth.

Review this hazard during the job planning process and establish a means to control induction. This could be by using bonding techniques or combining bonding with a method of draining the induced voltage by using a connection to an effective ground.
SECTION IV
LOCATES

400 LOCATING BURIED UTILITIES
SECTION IV
LOCATES

400 LOCATING BURIED UTILITIES

400 Locate Requirements

Section 228(1) (a) of the Regulations for Construction Projects 213/91 requires an employer, prior to starting an excavation, to “ensure that all gas, electrical and other services in and near the area to be excavated are located and marked.

However, instead of waiting for traditional locates and markings, a service owner and excavation contractor can enter into an “Alternate Locate Agreement”. ALAs, as referred to in clause 3-19 of the Ontario Regional Common Ground Alliance’s (ORCGA) Best Practices, allows a service owner to set terms and conditions for the excavation contractor to follow. ALAs must provide the same level of protection as traditional locates for the health and safety of the workers involved in or around the excavation.

When an ALA agreement is in place and when permitted by a utility service owner, the employer/excavator will be deemed to have fulfilled the requirements of section 228(1) (a) of the construction regulations.

Prior to starting the work, the excavator must have accurate locates and markings from all other service owners in the area being excavated. More than one ALA may be permitted to be used on any project.
SECTION V
SYSTEM

500 HYDROVAC OPERATING REQUIREMENTS
SECTION V
SYSTEM

500 HYDROVAC OPERATING REQUIREMENTS

Follow these procedures when excavating with hydroexcavation technology within 1 metre of underground electrical plant.

1. Have a documented company safety and maintenance program in place that is available for review by a facility owner representative.

2. Have vacuum excavation job procedures in place that meet or exceed the manufacturer’s equipment specifications and are available for review by a facility owner representative.

3. Develop additional job procedures in conjunction with facility owners and hydro-excavators to establish minimum standards relating to safe work performed in the vicinity of their plant. This may include, standards relating to water pressure, water volume, water temperature controls, and specific personal protective equipment minimums.

4. Document operator competencies including operator training certificates. These may be requested by a facility owner representative.

5. Use approved equipotential bonding equipment and procedures when excavating within 1 metre of underground electrical plant.

6. Have a valid locate on site before starting the excavation.
7. The gun/wand should always be in motion while excavating. Avoid aiming directly at the plant.

8. Only use hydro-excavation equipment and nozzles specifically engineered and designed for use around buried lines or other underground plant that is reasonably expected to be on site.

9. Have a way to shut off the water at the excavation.

10. Have a way to measure temperatures and pressures at all times (e.g., calibrated gauges)

11. Be aware that the excavator must contact the utility if damage to underground electrical plant occurs while hydro-excavating.
Available Safe Practice Guides

- Bare Hand Live Line Techniques
- Conductor Stringing
- Entry and Work in a Confined Space
- Excavating with Hydrovacs in the Vicinity of Underground Electrical Plant
- High Voltage Rubber Techniques up to 36 kV
- Hydraulics
- Ladder Safety
- Line Clearing Operations
- Live Line Tool Techniques
- Low Voltage Applications
- Pole Handling
- Ropes, Rigging and Slinging Hardware
- Temporary Grounding and Bonding Techniques
- Underground Electrical Systems