


	<b>ENMAX CORPORATION</b>		
	<b>GROUND DISTURBANCE GUIDELINES</b>		
	Effective Date: June 15, 2023	Rev.5.2	Page 1 of 21
			Verify revision is current prior to use.





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<b>Approved By:</b>	<b>Title</b>	<b>Date Approved</b>
Chris Smith	Director, Safety and Environment	December 22, 2022
Kevin Eckstadt	Safety Specialist	December 22, 2022

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## REVISION HISTORY

This document is reviewed a minimum of **every year** or as required.

Rev.	Date	Revision History
1.0	October 11, 2017	New document
2.0	March 30, 2020	Reviewed by stakeholders; updated format
3.0	January 15, 2021	<ul style="list-style-type: none"> <li>Added reference to <a href="#">Primary Switch Disconnect Reconnect Form</a></li> <li>Minor edits</li> </ul>
3.1	June 15, 2021	<ul style="list-style-type: none"> <li>Updated Section 2.5</li> <li>Replaced Senior Line Inspector with Damage Prevention Dept.</li> <li>Added QR Code</li> <li>Updated “Pole tie-back vendors”</li> </ul>
4.0	February 1, 2022	<ul style="list-style-type: none"> <li>Updated references in Appendix B section “Overhead electrical lines”</li> <li>Added a link to AEUC</li> </ul>
5.0	December 22, 2022	<ul style="list-style-type: none"> <li>Stakeholder review November 10<sup>th</sup>, 2022</li> <li>Updated Alberta One-call to Utility Safety Partners</li> <li>Updated the term <a href="#">Conflict zone</a> to include “...of any ENMAX Underground Transmission 69-kV or 138-kV cables”</li> <li>Updated the <a href="#">Primary Switch Disconnect Reconnect Form</a> to <a href="#">Temporary Disconnect/Reconnect Form</a></li> <li>Updated <a href="#">NOTE</a> in Section 2.1.</li> <li>Updated <a href="#">CAUTION</a> in Section 2.1.</li> <li>Added <a href="#">Step i</a> to Section 2.4 to notify <a href="mailto:lineinspection@enmax.com">lineinspection@enmax.com</a></li> <li>Added Step #6 to <a href="#">2.7 PROCEDURE – IF DAMAGE OCCURS</a></li> <li>Added a requirement to <a href="#">safety glasses</a> - minimum IR rating of 1.7</li> <li>Updated <a href="#">WARNING</a> in Appendix B Conflict Zones</li> <li>Removed Allteck from the Pole tie back vendors list</li> <li>Added <a href="#">APPENDIX E - ENMAX CONSTRUCTION STANDARDS</a></li> </ul>
5.1	February 2, 2023	<ul style="list-style-type: none"> <li>Updated <a href="#">Section 2.4</a> (shown highlighted for this revision only)</li> <li>Updated Section 2.6 replaced “During business hours” with <a href="#">specific days and hours</a></li> </ul>
5.2	June 15, 2023	<ul style="list-style-type: none"> <li>Removed Liam Preston &amp; added new contact for Iconic Pole tie back</li> </ul>

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## 1.0 INTRODUCTION

### 1.1 PURPOSE

Ground disturbance, or excavations, poses significant hazards to workers, the public, and the environment. This document provides requirements companies and individuals **MUST** comply with when exposing buried ENMAX facilities. Other sources to comply with include provincial legislation, codes, bylaws, and other utility requirements.



**WARNING:** Use extreme caution when working near energized cables; consider ALL power cables energized. Contact with cables may cause injury or death; therefore, excavators **MUST** contact their project inspector or access the [Temporary Disconnect/Reconnect Form](#) to schedule switching and isolation of energized cables if cable support is needed.



**NOTE:** If energized cables cannot be isolated and grounded, companies must adhere to their own hand exposure and hydrovac safe work practices.

### 1.2 KEY CONTACTS



The following must be readily available when conducting ground disturbance near ENMAX facilities.

Key Contacts	Contact	Phone Number	Email
	Utility Safety Partners	1-800-242-3447	<a href="http://www.utilitysafety.ca">www.utilitysafety.ca</a>
	ENMAX Customer Projects		<a href="mailto:getconnected@enmax.com">getconnected@enmax.com</a>
	ENMAX Field Services (MSO, and anchor and guy removal)		<a href="mailto:EPCFieldServicesMSOs@enmax.com">EPCFieldServicesMSOs@enmax.com</a>
	ENMAX Hot Digs		<a href="mailto:HotDigs@enmax.com">HotDigs@enmax.com</a>
	ENMAX Line Inspection		<a href="mailto:lineinspection@enmax.com">lineinspection@enmax.com</a>
	ENMAX Transmission	403-514-3679	
	ENMAX Trouble Dispatch	403-514-6100	
<b>NOTE</b>	The <a href="#">Temporary Disconnect/Reconnect Form</a> must also be readily available.		

### 1.3 REFERENCES

All work must be carried out in accordance with the following:

<b>Legislation</b>	<a href="#">Alberta Occupational Health and Safety Code</a> <ul style="list-style-type: none"> <li>Part 17 Overhead Power Lines</li> <li>Part 18 Personal Protective Equipment</li> <li>Part 32 Excavating and Tunneling</li> </ul> <a href="#">Alberta Electrical Utility Code</a> <ul style="list-style-type: none"> <li>Section 2- 014 Activities near Overhead Power Lines</li> <li>Section 2- 018 Moving Equipment or Buildings</li> <li>Section 2- 020 Excavation Activities in the Vicinity of Underground Power Lines</li> </ul> CAN/CSA Standard C22.3 No. 7-10 Underground Systems CAN/ULC-S801-(7.15.6) Standard on Electric Utility Workplace Electrical Safety
<b>ENMAX form</b>	<a href="#">Temporary Disconnect/Reconnect Form</a>
<b>ENMAX training</b>	ENMAX Hazardous Electrical Awareness Tutorial NOTE: Available upon request at <a href="mailto:hotdigs@enmax.com">hotdigs@enmax.com</a> or <a href="mailto:safety@enmax.com">safety@enmax.com</a> .
<b>Other resources</b>	<ul style="list-style-type: none"> <li><a href="#">Canadian Common Ground Alliance</a></li> <li><a href="#">Utility Safety Partners</a></li> </ul>

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## 1.4 GLOSSARY

### Acronyms

AEUC	Alberta Electrical Utility Code	MSO	Minor Service Order
CSA	Canadian Standards Association	PPE	Personal protective equipment
HRC	Hazard Risk Category	QUE	Qualified Utility Employee
LOA	Limits of Approach (Safety Code)	SWP	Safe Work Practice

### Terms

Air excavation / hydrovac equipment	A non-destructive process using pressurized water or air and a vacuum truck to remove earth cover (soil, gravel, stones, rubble, mud).
Competent worker	A worker who is adequately qualified, suitably trained, and with sufficient experience to safely perform work without supervision or with only a minimal degree of supervision.
Conflict zone	At risk locations within the work area for any of the following: <ul style="list-style-type: none"> <li>• Listed on the locate slip by the Locator</li> <li>• Within <b>1 m (3'-3")</b> of any locate marks</li> <li>• Within <b>2 m (6'-6")</b> of any ENMAX at-grade facility</li> <li>• Within <b>5 m</b> of any ENMAX Underground Transmission 69-kV or 138-kV cables</li> <li>• As described in <a href="#">Appendix B - Conflict Zone</a></li> </ul>
Destructive excavation	An operation using equipment or explosives to move earth, rock, or other material below existing grade.
ENMAX facilities	ENMAX facilities include: <ul style="list-style-type: none"> <li>• Cables and ducts</li> <li>• Concrete duct banks</li> <li>• Guy wire w/pole anchors</li> <li>• Manholes</li> <li>• Poles</li> <li>• Pull boxes</li> <li>• Switches</li> <li>• Transformers</li> <li>• Transformer vault</li> <li>• Transmission infrastructure</li> <li>• Secondary pedestals and tubs</li> </ul>
Excavator	Any contractor, developer, property owner, or other individual performing any work, operation or activity that results in a disturbance of the ground, regardless of depth.
Ground disturbance	Any work, operation, or activity that results in a disturbance of the ground, regardless of depth.
Hot dig	Process of exposing energized cables and facilities using non-destructive methods.
Locate marks	Temporary markings to identify the approximate location of underground infrastructure (buried facility). Examples include pin flags, coloured paint, stake chasers, coloured chalk, chevron.
Non-destructive buffer zone	One (1) metre (3'-3") from either side of the locate marks.
Non-destructive excavation	Hand exposure (provided there is a non-conductive handle on shovel), air vacuum or hydrovac equipment.
Qualified Utility Employee (QUE)	A power line or station utility employee trained and experienced to work safely on energized electrical equipment or lines.

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## 2.0 GROUND DISTURBANCE PROCESS

### 2.1 LOCATES

#### ENMAX underground facilities

**Submit** an online locate request at [Utility Safety Partners](#) **PRIOR** to any ground disturbance near ENMAX facilities.

**Call** Utility Safety Partners directly at **1-800-242-3447** for the following:

- Request emergency locates
- Provide damage information



**NOTE:** Inside property-private owners; includes commercial lots, multi-dwelling, provincial highways/roadways, and utility corridors (streetlighting and fibre) must obtain locates for secondary conductors via private utility locating service provider of choice.

#### At grade facilities

System ground wires and ground rods are not locatable. They are typically buried below the final grade and encompass a **1 m (3'-3")** area around or adjacent to ENMAX facilities.



**CAUTION:** Contacting the ground system may cause damage to the adjacent structures or equipment and/or personal injury or death. Only Non-destructive excavation in accordance with this Guideline may be performed when disturbing the ground within **2 m (6'-6")** of equipment.

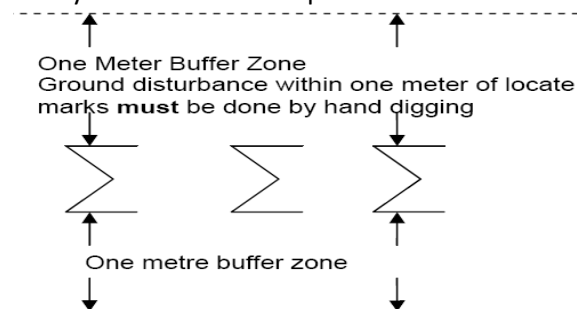
### 2.2 BUFFER ZONE

#### Within the buffer zone

Locate marks (chevron), shown below, depict the location of underground facilities.

The buffer zone (non-destructive) extends **1 m (3'-3")** beyond the locate marks.



Contact information for **OTHER facility owners** can be found on the **back of the locate** slip provided by the locate service provider.



**NOTE:** Locate marks are valid for **30 days** from the date provided.

#### Outside the buffer zone

If the ground disturbance occurs **OUTSIDE** the buffer zone, ENMAX has no restrictions on the ground disturbance. Excavation may proceed (subject to requirements of provincial legislation, codes, bylaws, and other utilities).

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## 2.3 ENMAX PERMISSION LETTER

**Permission Letter** Obtain an ENMAX Permission Letter PRIOR to performing ground disturbance near ENMAX facilities. The Letter MUST remain on site while exposing ENMAX facilities. Email [HotDigs@enmax.com](mailto:HotDigs@enmax.com) to obtain an ENMAX Permission Letter.

**Excavator requirements** Excavators MUST comply with the following requirements:

- Create and adhere to own SWPs for ground disturbance (reference [Appendix A – Safe Work Practices](#) for minimum requirements)
- Ensure all personnel involved in any ground disturbance are competent workers
- Ensure SWP and procedures comply with this guideline, legislation, bylaws, codes
- Ensure a cell phone or other means of contacting ENMAX Trouble Dispatch is always available while at the worksite
- Comply with all requirements contained in the ENMAX Permission Letter

## 2.4 NOTIFICATIONS FOR EXCAVATION ACTIVITIES

**ENMAX Projects – contract in place** Contact the ENMAX Project Inspector when performing work for ENMAX and a contract exists between ENMAX and the contractor.

**Non-ENMAX projects** Notifications for non-ENMAX projects are outlined below.

If...	Then...
Damage to ENMAX Infrastructure	Call Trouble Dispatch at 403-514-6100 or Project Inspector Reference <a href="#">Section 2.7 Procedure - If Damage Occurs</a> .
Engineering supports are required for pull boxes, transformers, duct banks, cables, and cables in duct	Submit stamped engineering drawings to <a href="mailto:hotdigs@enmax.com">hotdigs@enmax.com</a> a minimum of 14 days prior to planned excavation facility support approval. Reference <a href="#">Section 2.3</a> and <a href="#">Appendix D</a>
Work is within <b>2 m (6'-6")</b> of ENMAX facilities	Complete the steps below a minimum of <b>5 days prior</b> to planned excavation. <ul style="list-style-type: none"> <li>i. Notify <a href="mailto:lineinspection@enmax.com">lineinspection@enmax.com</a> for intent to excavate.</li> <li>ii. <b>If deemed necessary</b>, complete the ENMAX <a href="#">Temporary Disconnect/Reconnect Form</a> for ground grid protection around transformers, rigging and slinging of cables, or isolation and grounding where practicable.</li> <li>iii. <b>If required</b>, request a Minor Service order to schedule ENMAX personnel to complete the request.</li> </ul>
Anchor and guy removal	Request a Minor Service Order (MSO) to schedule ENMAX personnel to complete the request. Email the following: <ul style="list-style-type: none"> <li>• <a href="mailto:lineinspection@enmax.com">lineinspection@enmax.com</a></li> <li>• <a href="mailto:EPCFieldServicesMSOs@enmax.com">EPCFieldServicesMSOs@enmax.com</a></li> </ul>
Backfill inspection	Follow the process in <a href="#">Section 2.6 Backfill</a> .





**NOTE:** Call 9-1-1 for emergencies!

## 2.5 COMPLETE GROUND DISTURBANCE

**Perform ground disturbance** Complete ground disturbance in accordance with this Guideline; requirements include:

- [Appendix A – Safe Work Practices](#)
- [Appendix B – Conflict Zone](#)
- [Appendix C – Excavation Methods](#)
- ENMAX Permission Letter - instructions and restrictions conveyed by ENMAX

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## 2.6 BACKFILL

### Notifications

Notify the following PRIOR to backfilling the site.

If work is for		Then contact the following PRIOR to backfilling...	
ENMAX		Project Inspector to arrange for inspection	
Other	MON-FRI between 06:00 and 16:00	Damage Prevention Dept. at <a href="mailto:LineInspection@enmax.com">LineInspection@enmax.com</a>	
		After hours	Trouble Dispatch at <b>403-514-6100</b> to arrange inspection

### Specifications

After the work is completed, pad exposed facilities with the following.

Reference the following ENMAX standards in [Appendix E](#) for additional information:

- [6033 Cable-Duct Bank Support Civil Associated Notes](#)
- [6038 Support System and Backfill Requirements for EPC Cables](#)

Material	Requirements
Bedding sand	Covers the facilities to a minimum depth of 200 mm (8"), and free from: <ul style="list-style-type: none"> <li>• Snow and ice</li> <li>• Organic material</li> <li>• Loam</li> <li>• Stones larger than 5 mm (1/5")</li> </ul> NOTE: Excavators are required to provide compaction test results to ENMAX, if requested.
Common backfill	Placed on top of the bedding sand. Material must be free from: <ul style="list-style-type: none"> <li>• Snow and ice</li> <li>• Organic material</li> <li>• Loam</li> <li>• Boulders larger than 200 mm (8")</li> </ul> NOTE: Common backfill compaction must comply with The City of Calgary specifications to a minimum of 95% proctor dry density.

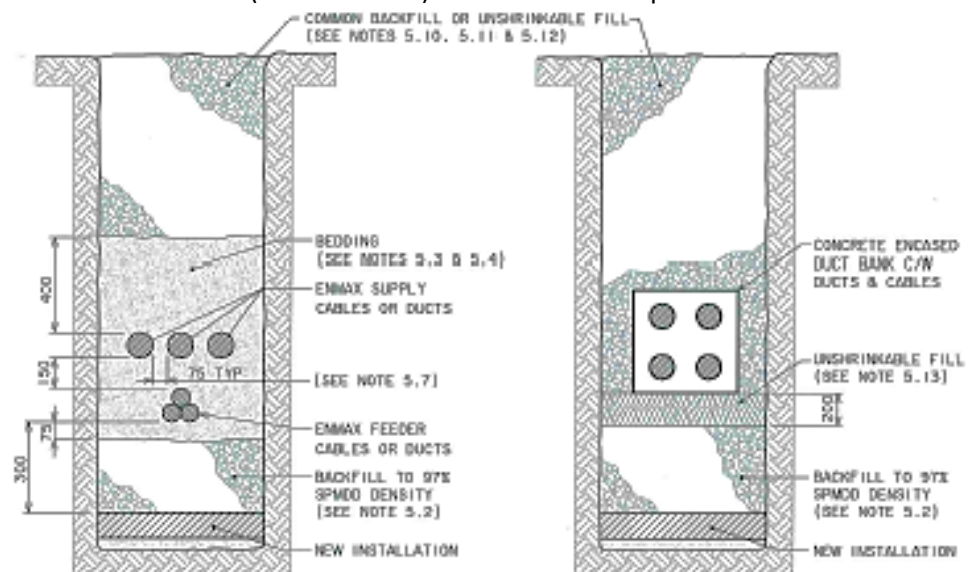


**NOTE:** Restore final grade to ensure the burial depth of ENMAX cables has not changed. Contact your ENMAX Inspector if a rise or fall in the final grade exists **PRIOR** to excavation and backfill to record the new grade. For all others, call 403-514-6100



### Spacing

Backfill requirements for cables and ducts are shown below. See [Appendix E](#) for NOTES referenced below.

**NOTE:** All dimensions (in millimetres) are MINIMUM requirements.





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**CABLES AND DUCTS**

**CONCRETE ENCASED DUCT BANK**

## 2.7 PROCEDURE – IF DAMAGE OCCURS



### Procedure

Excavators must complete the following steps if there is any damage to an ENMAX facility.

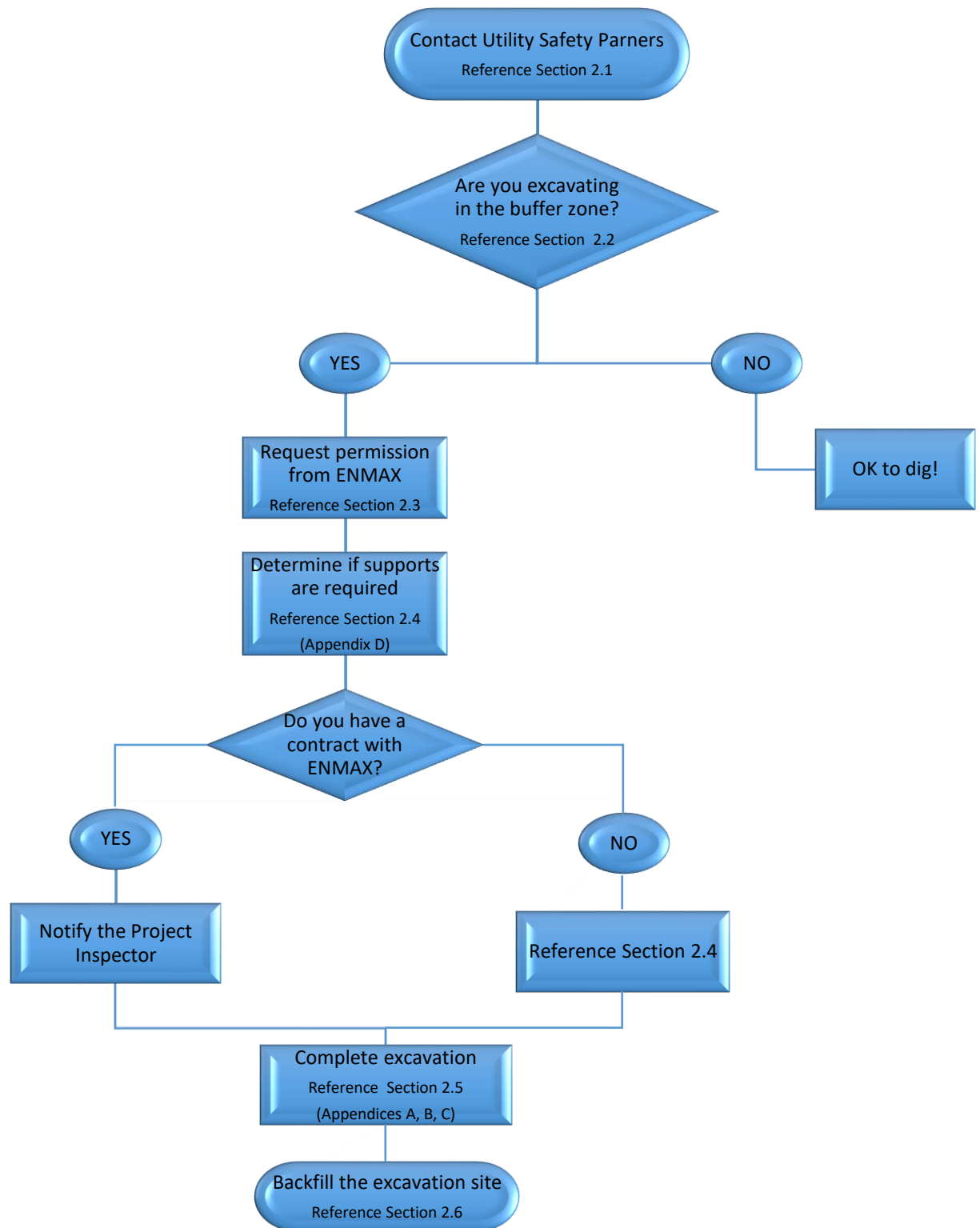
Step	Action
1.	<b>STOP WORK!</b>
2.	<b>Exit</b> the excavation site immediately.
3.	<b>Call 911</b> if an injury has occurred.
4.	<b>Secure</b> the site; use appropriate signs, barriers, or barricades.
5.	<b>Contact</b> ENMAX Trouble Dispatch at 403-514-6100, and the Project Inspector if required.
6.	<b>Call</b> 1-800-242-3447 or <a href="#">Utility Safety - Damage Reporting</a> to complete online reporting.





**WARNING:** Do **NOT** re-enter the excavation site until clearance has been given and repairs have been completed by an ENMAX QUE.  
Repairs can **ONLY** be completed by ENMAX personnel and approved ENMAX contractors.

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## 2.8 GROUND DISTURBANCE PROCESS FLOWCHART



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## APPENDIX A – SAFE WORK PRACTICES

### Barriers and barricades


Excavators are responsible for the following:

- **Prevent** exposed energized equipment and cables from public contact
- **Restrict** access to all open excavations during periods of inactivity (unsupervised); may include a cover, barricade, **1.8 m (6') rigid fence**

### Personal protective equipment (PPE)

A minimum of the following PPE is required for all ground disturbance activities within the buffer zone; for hand exposing only.

Reference AB OH&S Part 18.

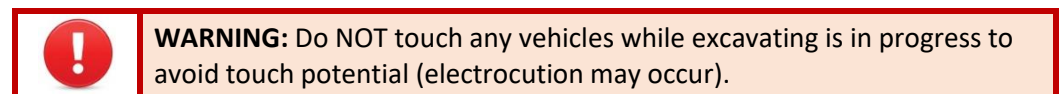
Protective clothing	Fire resistant outer layer clothing, ankle to cuff <b>NOTE:</b> HRC 2 (8 Cal/ cm2) minimum
Safety glasses	CSA Z94.3 Eye and Face Protectors with a minimum IR rating of 1.7
Rubber gloves	Tested - Class 3 high voltage rubber insulated gloves (rated at 30,000 volts) with outside leather protectors.
Head protection	CSA Approved Class E Hard Hat
Hearing protection	CSA approved hearing protection (if required)
Footwear	CSA approved dielectric footwear with the following symbols: 



### Warning signs

If the job site and equipment are left unsupervised, signs in accordance with the excavator's procedures **MUST** be visible. Minimum information to include:

- Caution or Warning of open excavation
- Name of ground disturber
- Emergency contact number

**"DANGER HIGH VOLTAGE"** sign must be located a minimum of **3 m (9'-10")** from the truck to reduce the risk of injury from step and/or touch potential.



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## APPENDIX B – CONFLICT ZONE

### Shallow primary and secondary cables



Mechanical excavation is **NOT** permitted within the **1 m (3'-3")** buffer zone until the underground facilities have been fully exposed to sight and a minimum of **600 mm (24")** separation above, below, and parallel to the facility or desired depth using non-destructive excavation techniques.



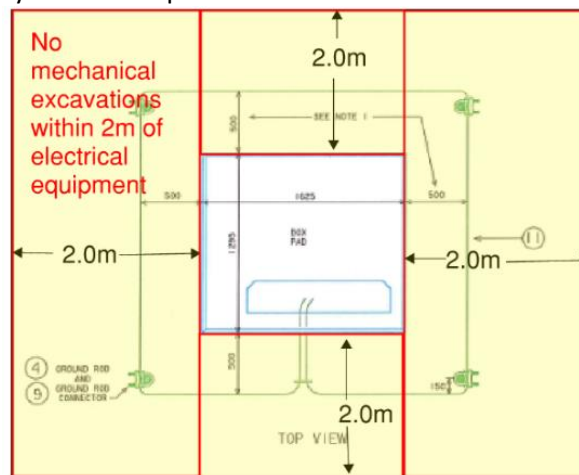
**WARNING:** Shallow duct banks may exist directly underneath the asphalt; therefore, asphalt cutting and removal directly over a marked facility is **NOT PERMITTED** until the depth of the facility is exposed to sight. Confirm the depth and position under the asphalt **PRIOR** to saw cutting across the facility. See [2.1 Asphalt Removal](#).

### Underground transmission equipment and cables

If an ENMAX **"NO CLEARANCE TO DIG"** sticker exists on the locate slip, then mechanical excavation work is **NOT** permitted within **5 m (16'-5")** on either side of the locate mark. Contact **ENMAX Transmission Inspector at 403-514-3679**. Reference ENMAX note located on the back of the Utility Safety Partners ticket for direction.

### Distribution facilities

Mechanical excavation is **NOT** permitted within **2 m (6'-6")** of any ENMAX facilities; use non-destructive methods **ONLY**. Reference ENMAX note located on the back of the Utility Safety Partners slip for direction and notification. Refer to 2.4.



### Overhead electrical lines

Ground disturbance may occur near overhead electrical lines. The excavator must ensure safe distances to electrical lines and equipment are adhered to; reference [AEUC Table 1 - Safe Limits of Approach Distances from Overhead Power Lines for Persons and Equipment](#) for additional information. This table is also referenced in the following:



- AB OH&S Code - Schedule 4
- AB OH&S Code Explanation Guide - Part 17 Overhead Power Lines, Table 17.1



**NOTE:** Personnel and equipment must stay a minimum of **7 m (~23')** from all overhead lines.

Contact one of the following if work is required closer than **7 m (~23')** for LOA:

If...	Then contact the following to arrange an inspection
ENMAX Project	Project Inspector
Mon thru Fri 6 AM to 4 PM	Damage Prevention Dept. at <a href="mailto:LineInspection@enmax.com">LineInspection@enmax.com</a>
After hours/weekends	Trouble Dispatch at <b>403-514-6100</b>

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## APPENDIX C – EXCAVATION METHODS

### 1. AIR EXCAVATION METHOD

#### Minimum equipment specifications

Air excavation uses pressurized air that is used to slough away soil and is subsequently collected by a vacuum tool such as an Air Spade.

At a minimum, when using air excavation ensure that:

- Air pressure does **NOT exceed 100 psi**
- Vacuum dig tube end has a neoprene lip or equivalent
- Non-conductive wand, tube, and hose extensions



**CAUTION:** Any air pressure above the listed values is considered a destructive means of excavating.

#### Potential risks to facilities

Cable damage may occur if falling rocks or sloughing material contact exposed cables or ducts. If damage is suspected, reference [Section 2.7 Procedure - If Damage Occurs](#).

#### Minimum safety precautions

Ensure the following minimum safety precautions when exposing cables using air excavation:

- Do **NOT** allow the wand to become stationary
- Make a sweeping motion during use perpendicular to the cables (vs. lengthways); this eliminates stationary contact with the cable at the end of each sweep
- After the buried facility is exposed, maintain a minimum distance of **175 mm (7")** between the cable and the wand nozzle
- Avoid positioning the vacuum tube directly over exposed facilities



**WARNING:** The air wand and vacuum pipe may become energized if faulted conditions exist.

### 2. HAND EXPOSURE METHOD

#### Minimum equipment specifications

Ensure the following **minimum** requirements when using shovels to hand expose underground cables:

- Shovels have dry, non-conductive handle
- Pointed probes that may pierce the cables are not used

#### Potential risks to facilities

Cable damage may occur if the shovel hits the cable. If damage is suspected, reference [Section 2.7 Procedure - If Damage Occurs](#).



#### Minimum safety precautions

Ensure the following minimum safety precautions when exposing cables with a shovel:

- Use PPE as per [APPENDIX A](#)
- Expose cables to sight at regular intervals (minimum of 5 m)
- No mechanical means within 600 mm (24") once line is exposed
- Use extreme caution when working within **1.5 m (≈5')** of any cable splices.
- During business hours notify [Lineinspection@enmax.com](mailto:Lineinspection@enmax.com) or Project Inspector to arrange for inspection prior to backfilling.
- After hours contact ENMAX Trouble Dispatch at **403-514-6100**.



**WARNING:** Do not move, walk on, or disturb cable splices while hand exposing cables.

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### 3. HYDROVAC METHOD

#### Minimum equipment specifications

At a minimum, when using hydrovac, ensure:

- Water pressure does **not exceed 1500 psi**
- Water temperature does **not exceed 37.8 °C (100 °F)**
- Vacuum pipe end has a neoprene lip or equivalent to protect the cable/facilities
- There is a single oscillating tip nozzle
- The wand is always moving



**CAUTION:** Any pressure or temperature variances above the listed values is considered a destructive means of excavating.

#### Potential risks to facilities

A combination of the water temperature and pressure may damage cables. Damage may appear as a slice in the cable sheath of an unknown depth, or as though the outer sheath has been torn and pulled outward. If damage is suspected, reference [Section 2.7 Procedure - If Damage Occurs](#).



#### Minimum safety precautions

Ensure the following minimum safety precautions when exposing cables with hydrovac:

- Expose cables to sight at a minimum of **5 m (~16')** intervals
- Direct the high-pressure nozzles in a circular motion
- Do NOT allow the wand to become stationary
- Make a sweeping motion during use perpendicular to the cables (vs. lengthways); this eliminates stationary contact with the cable at the end of each sweep
- After the buried facility has been exposed, maintain a distance of at least **175 mm (7")** between the cable and the oscillating head of the water wand
- Avoid positioning the vacuum tube directly over exposed facilities
- Avoid leaving excess water in the trench



**WARNING:** The water, wand, and vacuum pipe may become energized if faulted conditions exist.

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#### 4. DESTRUCTIVE EXCAVATION AND DIRECTIONAL CORING

##### Equipment

Includes the following equipment after a facility has been exposed to sight:

- Auger
- Directional drills
- Ditch witch
- Dozer, grader
- Hammer (electric, hydraulic)
- Plows
- Pneumatic jack hammers
- Post pounders
- Saw (asphalt, concrete)
- Scrapers
- Skid steers
- Track or rubber tire hoe

##### Potential risks to facilities

Destructive excavation methods have the potential to damage underground equipment and buried facilities. If damage is suspected, reference [Section 2.7 Procedure](#).



**WARNING:** If any part of the equipment contacts an energized cable, the equipment operator **MUST** remain on the machine (if safe to do so) until given a clearance from an ENMAX QUE.



##### Minimum safety precautions

Ensure the following minimum safety precautions when directional coring or using other destructive excavation methods:

- Observe the payload when pulling back through the excavation
- Ensure there is ample clearance and separation above or below the facility
- Maintain **1 meter** of separation above, below, and parallel to the cable
- Expose cables to sight at regular intervals (minimum of 5 m)
- Spotters **MUST** always be present when using excavation equipment
- Calibrate all tools and ensure strike indicator is operational



**CAUTION:** When crossing all facilities expose the facilities to sight **AND** a minimum of **1 m (3'-3")** exposed on the drill side **PRIOR** to mechanical excavation or drilling. This allows the operator time to stop the task if the drill head approaches the cable/duct.

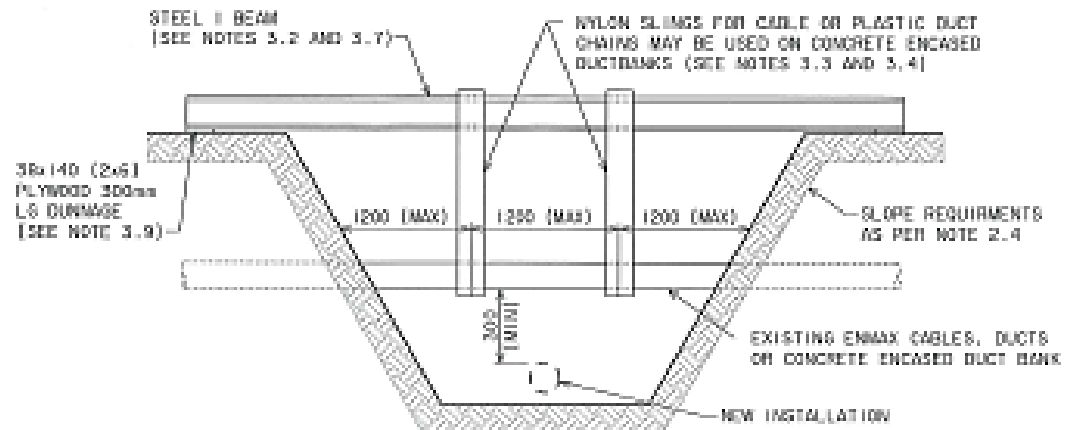
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## APPENDIX D – ENGINEERED SUPPORTS

### Cable/duct bank support

The ENMAX Standards 6033 and 6038 - SUPPORT SYSTEM AND BACKFILL REQUIREMENTS FOR ENMAX CABLES is shown below. See [Appendix E](#) for NOTES referenced below.

**NOTE:** All dimensions are in millimeters.





**NOTE:** The maximum distance between supports (beams/chains/slugs) is 1200 mm (~ 4').

### Underground facilities

Excavators supply the following to support cables and duct banks in underground facilities subject to ENMAX's approval.

Supports	Requirements
Beams and poles	<ul style="list-style-type: none"> <li>Steel "I" beam or wood pole (excavator to determine the size)</li> <li>NOTE: Submit stamped engineering drawings to <a href="mailto:Hotdigs@enmax.com">Hotdigs@enmax.com</a> and <a href="mailto:lineinspection@enmax.com">lineinspection@enmax.com</a></li> <li>Place across the excavation parallel with the undermined facility</li> <li>Design to prevent sag, bending, and deflection</li> <li>Sufficient length to reach a minimum of 3 m (9'-10") beyond the edge of the excavation (on both sides)</li> <li>Supporting structure will not slough into the excavation due to unstable soil conditions</li> </ul>
Chains	<ul style="list-style-type: none"> <li>Support concrete encased duct banks</li> </ul>
Slings	<ul style="list-style-type: none"> <li>Direct buried cable or ducts must be supported by nylon slings</li> <li>Must be properly rated to hold the structure</li> </ul>
Transformers, switches, and pull boxes	<ul style="list-style-type: none"> <li>Must NOT be undermined and must be supported</li> <li>Contact <a href="mailto:lineinspection@enmax.com">lineinspection@enmax.com</a> to determine next steps.</li> </ul>



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## Power poles

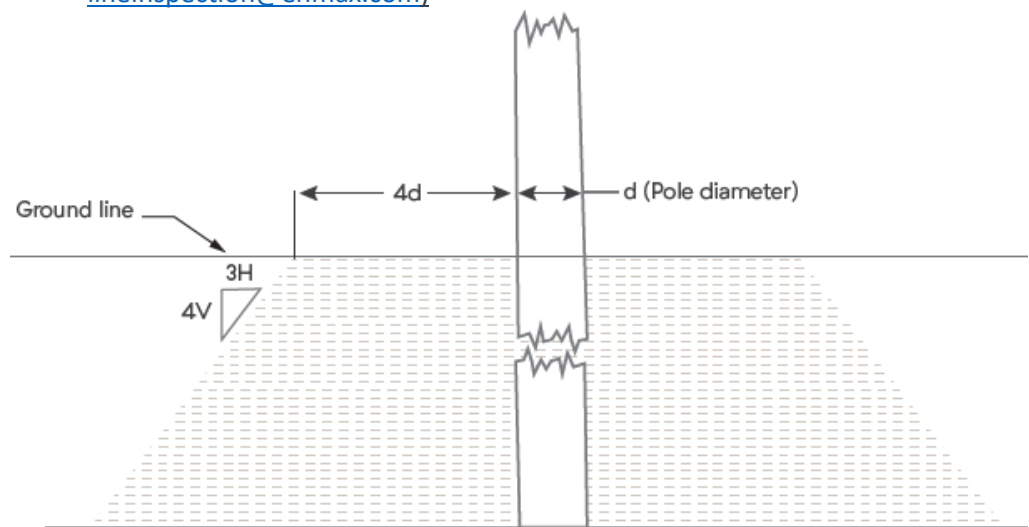
ENMAX requires excavators to stabilize poles and associated equipment, where required below, prior to any ground disturbance.



**WARNING:** The collapse of a power pole could expose individuals to a crush hazard or electrocution.

Poles must be supported if:

- The soil is not firm
- Excavation occurs within the **shaded protected zone** shown in the illustration below
- Guys and/or anchors need to be temporarily removed and replaced (contact [lineinspection@enmax.com](mailto:lineinspection@enmax.com))



**NOTE:** The **shaded protected zone** encompasses the following area:

- At grade: 4d (4 times the pole diameter) away from the pole
- Below grade (cut angle): **3 m (9'-10")** horizontal to every **4 m (~13')** depth

All excavations and slope cuts must be in accordance with the following AB OH&S Code:

- Part 17 Limits of Approach
- Part 32 Pole Support

## Requirements

Excavators must contact the following:



- ENMAX approved pole tie back vendor for availability and cost
- Damage Prevention Dept. at [lineinspection@enmax.com](mailto:lineinspection@enmax.com) during business hours
- For after hours - Trouble Dispatch at **403-514-6100** if questions/concerns arise

**NOTE: A QUE must complete all pole tie backs.**

## Pole tie back vendors

ENMAX approved pole tie back vendors with an ENMAX approved QUE are listed below.

Tie-back Vendor	Phone Number	Email
Iconic Power Systems	403-899-8318 403-542-4670	<a href="mailto:info@iconicpowersystems.ca">info@iconicpowersystems.ca</a> ; <a href="mailto:jmackay@iconicpowersystems.com">jmackay@iconicpowersystems.com</a>
Primary Engineering	403-333-7099	<a href="mailto:RCoulter@primaryeng.com">RCoulter@primaryeng.com</a>
Somerville	780-228-7479	<a href="mailto:corey@prolinepower.ca">corey@prolinepower.ca</a>
Valard Construction	403-700-0982 403-710-7099	<a href="mailto:KRyan@Valard.com">KRyan@Valard.com</a> ; <a href="mailto:mchappell@valard.com">mchappell@valard.com</a>

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## APPENDIX E – ENMAX CONSTRUCTION STANDARDS



CORRELATED DRAWING: FILE NO: 6038



### 1.0 GENERAL REQUIREMENTS

- 1.1 OBTAIN UTILITY LOCATIONS BY CONTACTING ALBERTA ONE CALL AT 1-800-242-3447 A MINIMUM OF 48 HOURS PRIOR TO ACTUAL LOCATION REQUIREMENT.
- 1.2 ALL EXCAVATION AND BACKFILL OPERATIONS SHALL BE DONE IN ACCORDANCE WITH THE LATEST ISSUE OF THE ELECTRICAL AND COMMUNICATION UTILITY SYSTEMS REGULATIONS (AEUC) AND OCCUPATIONAL HEALTH AND SAFETY ACT.
- 1.3 IN THE CASE WHERE A ENMAX CABLE OR DUCT HAS BEEN DAMAGED, NOTIFY THE ENMAX INSPECTOR AT THE SITE OR IF HE IS NOT PRESENT, CONTACT ENMAX INSPECTOR OR TROUBLE DISPATCH IMMEDIATELY AT 403-514-6100 TO OBTAIN DIRECTION, SHUT DOWN WORK AND BARRICADE THE SITE UNTIL DIRECTED OTHERWISE BY THE ENMAX INSPECTOR.
- 1.4 IF A CONTRADICTION ARISES BETWEEN THIS STANDARD AND THE AEUC OR OCCUPATIONAL HEALTH AND SAFETY ACT, CONSULT THE ENMAX INSPECTOR OR TROUBLE DISPATCH FOR DIRECTION. THE INSPECTOR'S INTERPRETATION AND DECISION SHALL BE FINAL.
- 1.5 THE FOLLOWING ACTIVITIES SHALL REQUIRE ENMAX INSPECTION:
  - 1.5.1 LOCATION OF CABLES
  - 1.5.2 EXCAVATION EXPOSING CABLES
  - 1.5.3 INSTALLATION OF SUPPORT SYSTEM
  - 1.5.4 PRIOR TO BACKFILL COMMENCEMENT
  - 1.5.5 REMOVAL OF SUPPORT SYSTEM
  - 1.5.6 BACKFILL TO UNDERSIDE OF CABLES
  - 1.5.7 BEDDING BACKFILL COMPLETION
  - 1.5.8 BACKFILL COMPLETION
- 1.6 THE CONTRACTOR IS RESPONSIBLE FOR ACQUIRING ALL NECESSARY CONSTRUCTION PERMITS.
- 1.7 IF THE CONTRACTOR WISHES TO UTILIZE AN ALTERNATE SUPPORT SYSTEM FOR CABLES, DUCTS OR CONCRETE DUCT BANKS OTHER THAN IS OUTLINED IN THIS STANDARD, HE MUST RECEIVE PREAPPROVAL FROM THE ENMAX INSPECTOR PRIOR TO COMMENCEMENT OF EXCAVATION.

### 2.0 EXCAVATION

- 2.1 PRIOR TO EXCAVATION, ACTUAL LOCATION OF POWER CABLE SHALL BE VERIFIED BY EXPOSING CABLE BY NON-DESTRUCTIVE MEANS (E.G. HAND EXPOSE OR HYDROVAC).
- 2.2 IF THE CABLE, DUCT OR CONCRETE BANK SHOULD BE DAMAGED, WORK SHALL STOP AND THE DAMAGE REPORTED TO THE ENMAX INSPECTOR IMMEDIATELY. NO FURTHER ACTION SHALL BE TAKEN UNTIL DIRECTION HAS BEEN RECEIVED FROM THE ENMAX INSPECTOR.
- 2.3 TAPE OR WOOD PLANKS THAT ARE DISTURBED DURING EXCAVATION SHALL BE RETURNED TO THE SAME LOCATION AND DEPTH DURING BACKFILL OPERATIONS.
- 2.4 EXCAVATION SHALL BE ADEQUATELY SHORED OR HAVE A SIDE SLOPE CUT BACK AT 30° FROM THE VERTICAL FOR COHESIVE SOILS AND 45° FROM THE VERTICAL FOR NON-COHESIVE SOILS.

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### 3.0 SUPPORT SYSTEM



- 3.1 PRIOR TO UNDERMINING CABLES OR DUCT BANKS, A SUPPORT BEAM OR BEAMS FOR CABLES AND DUCT BANKS SHALL BE EMPLOYED.
- 3.2 THE ACTUAL SIZING OF SUPPORT BEAMS AND SLINGS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE SUPPORT SYSTEM SHALL BE DESIGNED TO PREVENT SAG, BENDING OR DEFLECTION IN CABLES OR DUCT BANKS.
- 3.3 THE BEAM SHALL BE IN THE FORM OF A STEEL "I" BEAM OR WOOD POLE, SET ACROSS THE EXCAVATION RUNNING PARALLEL WITH ENMAX CABLES OR DUCTS. THE BEAM MUST ADEQUATELY SUPPORT THE CABLE OR DUCT BANK. BEAM SHALL NOT BEAR WITHIN 1m OF EXCAVATION EDGE. ANY COUNTERWEIGHT OR MECHANICAL FASTENING TO PREVENT TRANSLATIONAL MOVEMENT OF THE BEAM IS THE RESPONSIBILITY OF THE CONTRACTOR.
- 3.4 THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLYING ALL MATERIAL, LABOUR AND EQUIPMENT REQUIRED TO IMPLEMENT AN ADEQUATE SUPPORT SYSTEM.
- 3.5 ENMAX CABLES DUCTS AND DUCT BANKS NOT ENCASED IN CONCRETE SHALL BE SUPPORTED WITH NYLON SLINGS. ENMAX CABLES, DUCTS AND DUCT BANKS SHALL BE SUPPORTED WITH SLINGS AT INTERVALS NOT GREATER THAN 1.2m AND ATTACHED TO THE SUPPORT BEAM (SEE STANDARD 6038 FIGURE 1). EXPOSE THE MINIMUM AMOUNT OF THE FACILITY NEEDED TO PLACE THE FIRST SLING UNDERNEATH, THEN ATTACH THE SLING TO THE SUPPORT BEAM. FOLLOW THE SAME PROCESS FOR EACH SUBSEQUENT SLINGS REQUIRED. ONCE ALL THE SLINGS ARE IN PLACE, FINISH EXCAVATING UNDER THE FACILITY.
- 3.6 CONCRETE ENCASED DUCT BANKS MAY BE SUPPORTED WITH CHAIN SLINGS OR NYLON SLINGS.
- 3.7 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING NO DAMAGE TO CABLES, DUCTS OR DUCT BANKS TAKES PLACE WHILE EMPLOYING THE SUPPORT SYSTEM. ANY DAMAGE SHALL BE REPORTED TO THE ENMAX INSPECTOR IMMEDIATELY. WORK WILL NOT CONTINUE UNTIL THE ENMAX INSPECTOR HAS GIVEN APPROVAL.
- 3.8 THE CONTRACTOR SHALL RECEIVE THE ENMAX INSPECTOR'S APPROVAL OF SUPPORT SYSTEM BEFORE UNDERMINING CABLES OR DUCT BANK.
- 3.9 THE BEAM SHALL NOT BEAR WITHIN 3m OF THE EXCAVATION EDGE. THIS CAN BE REDUCED AS NECESSARY BASED ON A QUALIFIED ASSESSMENT OF THE EXCAVATION. CONTRACTOR SHALL UTILIZE 2-PLY THICK MEMBER TO ACT AS A SUPPORT POINT TO ENSURE BEAM DOES NOT BEAR ON EXCAVATION EDGE.

### 4.0 TRENCH PREPARATION



- 4.1 UNSTABLE MATERIAL SUCH AS FROZEN SOIL, LOAM, CONSTRUCTION OR ORGANIC MATERIAL SHALL BE REMOVED FROM BASE OF TRENCH AND REPLACED WITH GOOD GRANULAR FILL.
- 4.2 BASE OF TRENCH SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY.

### 5.0 BACKFILL

- 5.1 NEW INSTALLATIONS SHALL HAVE A MINIMUM CLEARANCE OF 300mm FROM ANY ENMAX CABLES.
- 5.2 BACKFILL MATERIAL OVER NEW INSTALLATION SHALL BE COMPACTED TO 97% OF MAX DENSITY.
- 5.3 WHEN GRAVEL IS USED AS BACKFILL OVER THE NEW INSTALLTION, FILTER FABRIC SHALL BE PLACED OVER THE GRAVEL PROVIDING SEPARATION BETWEEN GRAVEL AND SAND BEDDING.
- 5.4 MINIMUM BEDDING COVER AND SEPARATION BETWEEN DIRECT BURIED CABLES SHALL BE MAINTAINED IN ACCORDANCE WITH STANDARD 6038 (FIGURE 2).
- 5.5 BEDDING SAND SHALL BE WELL GRADED, FREE OF ICE, FROZEN MATERIAL, LOAM, ORGANIC MATERIAL AND STONES LARGER THAN 5mm.
- 5.6 SAND SHALL BE PLACED AND COMPACTED EQUALLY BETWEEN AND ON BOTH SIDES OF DUCT OR CABLE TO PREVENT DISPLACEMENT.

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- 5.7 SAND SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 300mm.
- 5.8 SAND SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY OR 70% RELATIVE DENSITY AS PER ASTM D2922 OR D4254 RESPECTIVELY.
- 5.9 COMMON FILL MAY BE MATERIAL REMOVED FROM EXCAVATION BUT MUST BE FREE OF SNOW, ICE, LOAM, ORGANIC MATERIAL AND BOULDERS LARGER THAN 200mm.
- 5.10 COMMON FILL SHALL BE COMPACTED TO 97% OF MAXIMUM DENSITY, IN UNIFORM LAYERS NOT EXCEEDING 300mm WHEN COMPACTING WITH HAND TAMPING EQUIPMENT AND 600mm WHEN USING HYDRAULIC EQUIPMENT.
- 5.11 UNSHRINKABLE FILL MAY BE USED AS A SUBSTITUTE FOR COMMON FILL BUT MUST MEET THE FOLLOWING REQUIREMENTS:
- 5.11.1 MAXIMUM 28 DAY STRENGTH 0.5 MPA (70 PSI)
  - 5.11.2 5% AIR ENTRAINMENT  $\pm 1\%$
  - 5.11.3 SLUMP - 175mm  $\pm 25$ mm
  - 5.11.4 MAXIMUM SET TIME - THREE HOURS (BEFORE ADDITIONAL BACKFILL AND COMPACTION).
  - 5.11.5 UNSHRINKABLE FILL TEMPERATURE SHALL BE MAINTAINED BETWEEN 10°C AND 25°C FOR A PERIOD OF THREE HOURS AFTER PLACEMENT.
- 5.12 SAND BEDDING IS NOT REQUIRED AROUND CONCRETE ENCASED DUCT BANKS.
- 5.13 CONCRETE ENCASED DUCT BANKS SHALL BE SUPPORTED BY A 200mm LIFT OF UNSHRINKABLE FILL.
- 5.14 CARE SHALL BE TAKEN NOT TO DISTURB ANY MARKINGS, GROUND RODS OR LEGAL SURVEY EVIDENCE.
- 5.15 THE FINAL GRADE SHALL BE RESTORED TO A LEVEL THAT ENSURES ENMAX CABLES COMPLY WITH THE AEUC FOR BURIAL DEPTHS.
- 5.16 ALL EXPOSED ENMAX CABLES MUST BE INSPECTED BEFORE BACKFILLING. ARRANGE WITH ENMAX INSPECTOR TO ARRANGE INSPECTION. CALL 403-514-6100 IF AN INSPECTOR HAS NOT BEEN ASSIGNED.

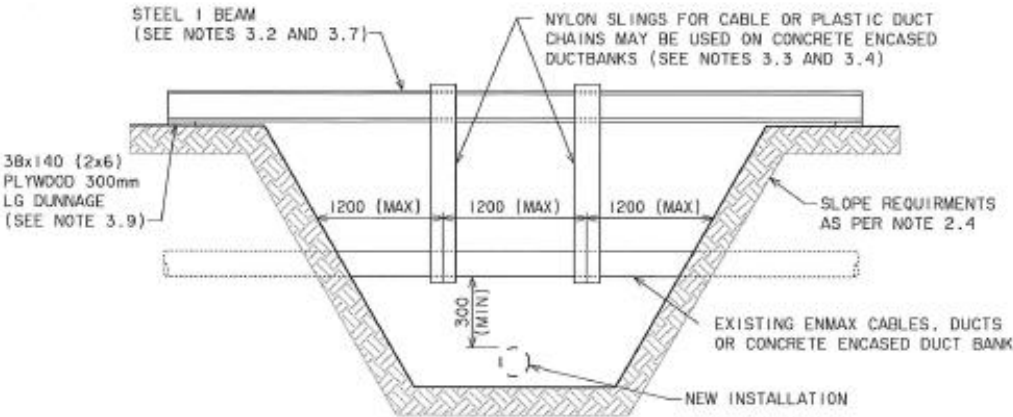
#### 6.0 TESTING

- 6.1 THE CONTRACTOR SHALL RETAIN AN INDEPENDENT CONSULTANT FOR FIELD COMPACTION TESTS.
- 6.2 THE CONTRACTOR SHALL ARRANGE AND PAY FOR ONE (1) FIELD COMPACTION TEST FOR EACH LAYER OF SOIL COMPACTED.
- 6.3 EACH LAYER OF SOIL SHALL RECEIVE THE MINIMUM REQUIRED COMPACTION RATE BEFORE A SUBSEQUENT LAYER IS PLACED.
- 6.4 THE CONTRACTOR SHALL INCLUDE ALL COMPACTION SLIPS WITH THE MINIMUM COMPACTION RATE IN THE PACKAGE PROVIDED TO THE ENMAX INSPECTOR UPON JOB COMPLETION.

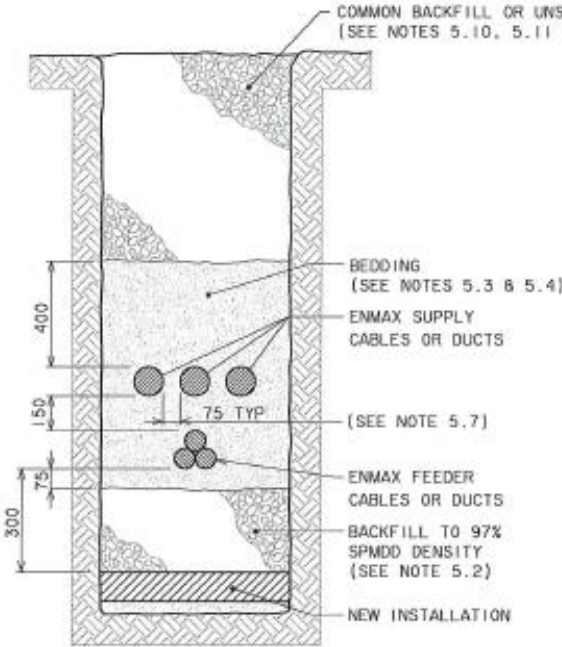
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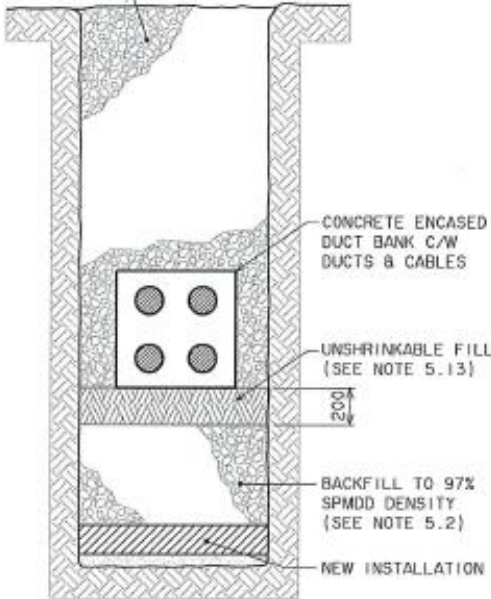
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**FIGURE 1  
CABLE & DUCTBANK SUPPORT**




**FIGURE 2  
BACKFILL REQUIREMENTS FOR  
CABLES AND DUCTS**



**FIGURE 3  
BACKFILL REQUIREMENTS FOR  
CONCRETE ENCASED DUCT BANK**


NOTE: ALL DIMENSIONS ARE MINIMUM REQUIREMENTS

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