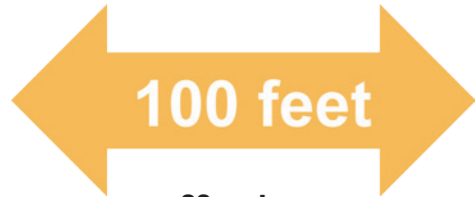


100 / 16 / 2 Rule



30 meters

Controlled area in which surface locating should be performed. This may extend to ROW boundary and include ATWS.



5 meters

No mechanical excavation within 16 feet of any buried facility until positive identification is achieved.



0.6 meters

No mechanical excavation within 2 feet of any foreign buried facility.

No mechanical excavation within 16 feet of a facility if...



There are discrepancies with the information



Positive identification is lost



Inspector leaves the area

For Enbridge Below Grade Facility, please see:

- LP/ MP Engineering refer to **Tab 6**
- Major Projects refer to **Tab 3**

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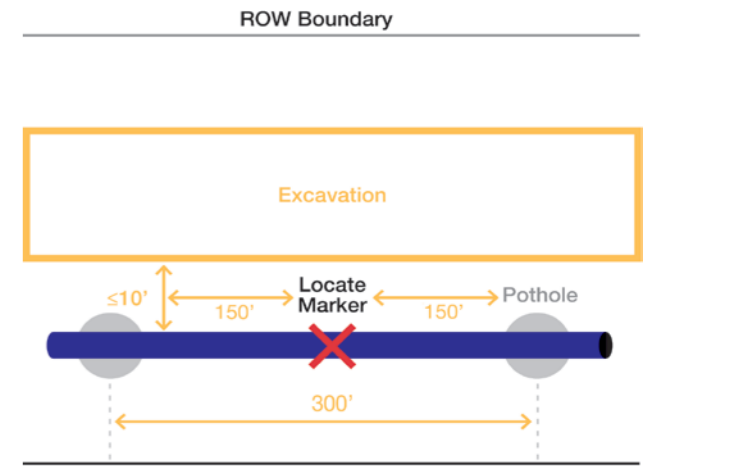
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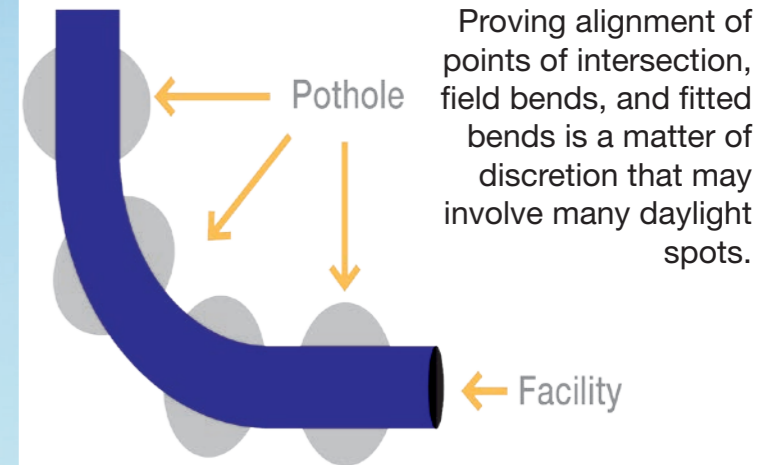
Ground Disturbance Requirements Canada



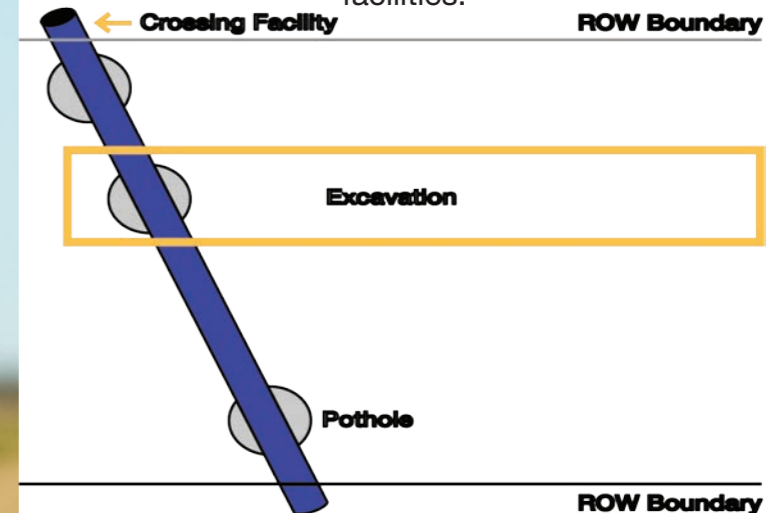
December 2015



The distance between potholes varies based on the proximity of the adjacent parallel pipelines.



Prior to excavation, know the location, depth, direction, and any elevation changes of all facilities.



ROW Boundary

Purpose of this Infoflip:

This Infoflip has been created to act as a reference guide for ground disturbance work at Enbridge.

It has been divided into two parts:

- 1. Liquids Pipelines/Major Projects (LP/MP) Ground Disturbance Standard**
- 2. Major Projects (MP) Ground Disturbance Guidelines**
 - Additional Major Projects requirements for ground disturbance.

Who should use this?

The Infoflip should be used by Enbridge representatives and contractors during the planning and execution of ground disturbance activities.

What is it for?

The Infoflip has been designed as a field guide to carry on your person, which will let you reference key requirements quickly and effectively.

It can be referenced during the planning of work or when ensuring Enbridge Ground Disturbance criteria is being met in the field.

Remember, Enbridge’s ultimate goal is for every worker to return home safely each and every day.

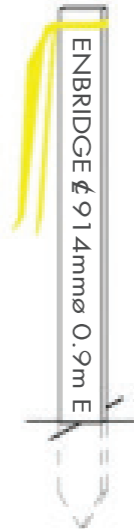
Ground Disturbance Definitions

Ground Disturbance	Any work, operation or activity that results in penetration of the earth (e.g., excavating, digging, trenching, plowing, tunneling, auguring, boring, drilling, backfilling, blasting, cultivation, topsoil stripping/leveling, stumping, peat removal, quarrying, fencing, clearing/grading, hydrovac) with the following exceptions: <ul style="list-style-type: none"> • survey staking line locating and marking • disturbance less than 30 cm (12 in.) in depth provided the location and depth of cover for all facilities is known.
Locate Boundary Area	Area in which all Below Grade Facilities shall be Surface Located within the excavation perimeter and extending 30 m (100 ft.) from that perimeter. Constraints may be made on this perimeter and the lessened area shall be marked by multiple white markers identifying all of the corners of the Locate Boundary Area.
Initial Locate	An initial locate is done to determine the location of Below Grade Facilities by One-Call members (owner/operators) inside of the area defined by the One-Call ticket, or the Locate Boundary Area as prescribed by the Ground Disturbance Standard. The Initial Locate satisfies local legislative requirements (Local Regulations).
Excavation Area	The area in which any type of excavation is expected to occur. The perimeter of the Excavation Area is to be demarcated with pink and white striped flagging.

SURVEY COLOR CODES

BURIED FACILITIES

- Yellow** GAS, OIL, STEAM, PETROLEUM OR GASEOUS MATERIALS
 - Orange** COMMUNICATION, ALARM & SIGNAL LINES, FIBRE OPTICS CABLES, CONDUIT, TELEPHONE OR CABLE TV
 - Blue** POTABLE WATER
 - Purple** RECLAIMED WATER, IRRIGATION & SLURRY LINES
 - Red** ELECTRIC POWER LINES, CABLE CONDUIT & LIGHTING & CATHODIC PROTECTION CABLES
 - Green** SANITARY SEWERS, STORM SEWERS & DRAIN LINES
 - White** LOCATE BOUNDARY AREA
 - Pink** RIGHT-OF-WAY LIMIT, TEMPORARY WORKROOM, SLASHING LIMIT & TEMPORARY SURVEY MARKERS
- NOTE:** The two flagging colour schemes indicated below are unique to Enbridge survey markers.
- SAFETY BUFFER ADJACENT TO EXISTING PARALLEL PIPELINE(S)
 - PROPOSED EXCAVATION AREA, SURVEY MONUMENTS, LEGAL SURVEY PINS, BENCH MARKS, REFERENCE BARS



NOTES

LP/MP Ground Disturbance Standard
1 Damage Prevention
2 Damage Prevention (2)
3 Damage Prevention (3)
4 Positive Identification
5 Positive Identification (2)
6 Mechanical Clearance
7 Roles and Responsibilities
8 Roles and Responsibilities (2)
9 Pile Driving, Auguring, Boring and Drilling

Major Projects Ground Disturbance Guidelines
1 Scope & Purpose / Permit & Documentation
2 Permit & Documentation (2)
3 Key Clearances & Distances
4 Personnel
5 Contractor
6 Contractor (2)
7 Ground Disturbance Coordinator / Supervisor
8 Enbridge Inspector (Permit Issuer)
9 Enbridge Inspector (Permit Issuer) (2)
10 Contractor Supervisor/Foreman (Permit Receiver)

11 Equipment Operator
12 Spotter / Excavation Competent Person
13 Below Grade Facilities Management
14 Facilities / Utilities Management Meeting / Plan
15 Facilities/Utilities Management / Job Planning
16 Surface Location of Facilities / Utilities
17 Surface Location of Facilities / Utilities (2)
18 Marking Facility / Utility Surface Locations
19 Positive Identification of Facilities / Utilities
20 Positive Identification of Facilities / Utilities (2)

21 Positive Identification of Facilities / Utilities (3)
22 Marking Exposed Facilities / Utilities
23 Hydro-Vac
24 Hydro-Vac (2) / Equipment
25 Equipment (2) / Supports for Existing & New Pipe
26 Crossing Ramp Requirements
27 Pile Driving
28 Boring Operations / Below Grade Facility Crossings
29 Below Grade Facility Crossings (2)
30 Below Grade Facility Crossings (3) / Backfill

Damage Prevention

Ground Disturbance Planning

For Ground Disturbance planning, these requirements shall be followed:

- Obtain a Ground Disturbance Permit for all Enbridge Ground Disturbance activities (Ground Disturbance Permits are not valid beyond 7 days, as long as the one-call locate remains valid.)
- The Excavator/Ground Disturber shall request a One-Call and obtain a locate ticket prior to any Ground Disturbance activities.
- All approvals, applicable records, drawings and documentation, including One-Call Tickets, shall remain on site and be accessible, as part of the Ground Disturbance Package.
- The Excavation Area shall be marked with pink and white striped flagging.

The Locate Boundary Area shall be marked with white markings, with the following exceptions:

- Other visible markings shall be used in snow conditions.
- ROW markers shall be used for Mainline Construction.

Locate Phase

After the Locate Boundary Area is defined, an Initial Locate shall be completed. When the Ground Disturbance is being conducted by a Contractor performing work for Enbridge, a Verification Locate shall also be performed.

In the Locate Boundary Area all Below Grade Facilities shall be Surface Located within the excavation perimeter and extending 30 m (100 ft.) from that perimeter.

The Locate Boundary Area may be lessened in the following situation:

- When constrained by a defined ROW boundary.
- When constrained by surface features such as:
 - improved roadway or railway
 - tree line/shrub line
 - fence (temporary or permanent)
 - building
 - cement or concrete parking area
 - other steel, concrete, or similar above ground improvement

The lessened area shall be marked by multiple white markers identifying all of the corners of the Locate Boundary Area.

Notwithstanding the above, when the Locate Boundary Area is constrained by property boundaries all Below Grade Facilities shall be identified through other means, such as historical records, One-Call services, or visual searches.

The Locate Boundary Area can include any additional temporary workspace and/or access that may be necessary. Extra workspace or access may be used for such purposes as:

- heavy equipment traffic as part of the excavation work, and/or
- a storage area for spoil, equipment, and/or materials

2 Damage Prevention (2)

Initial Locate (One-Call response)

Below Grade Facilities shall be located and marked as follows:

- Facility owners or their authorized Contractor shall conduct Initial Locates.
- Additional Locates beyond the Locate Boundary Area may be required to verify alignment or location of Below Grade Facilities.
- Within a Fenced Station/Terminal, locate markers shall be spaced no more than 3 m (10 ft.) apart, directly over the centerline of the Below Grade Facility.
- On the ROW there shall be a clear line of vision between markers used to identify a particular facility location; the markers shall be placed directly over the centerline of the Below Grade Facility at maximum intervals of 10 m (30 ft.) unless another reasonable interval is appropriate.
- Reconfirming the Initial Locate/making a new One-Call is required in the following situations:
 - when markers become dislodged, removed, unrecognizable
 - when Initial Locates expire as per the One-Call ticket
 - when a new Contractor or Subcontractor is retained to conduct Ground Disturbance work in the area as there shall be no piggybacking on existing tickets
 - if there is a change in the scope of work (i.e., change in the Excavation Area)
 - upon resumption of work at an open Excavation

If the Excavation Perimeter moves, the One-Call shall be resubmitted, unless the Excavation Perimeter remains completely within Locate Boundary Area.

Before resuming activities previously initiated by others:

- Review the location and identification of Facilities.
- Reconfirm the Initial Locate.
- Determine if a new One-Call is required.

Non Enbridge Below Grade Facilities shall be marked by their respective Facility owners.

When Below Grade Facilities are Located, compare all applicable records, drawings and documentation, and conduct a visual check to confirm that all Locates accurately reflect the location of all Below Grade Facilities in the Locate Boundary Area.

3 Damage Prevention (3)

Markings

Markings shall remain in place for the duration of the work activities. If any markers are removed, or become dislodged or unrecognizable, then immediately notify the Enbridge Site Inspector.

Markings shall:

- Be highly visible to equipment operators despite local conditions (e.g., wind, snow).
- Adhere to the American Public Works Association (APWA) uniform colour code, unless otherwise documented.

Temporary markers shall be removed upon completion of the work.

Verification Locate (Required for Contractor Ground Disturbances)

When required, the Verification Locate shall be performed over the entire Locate Boundary Area and shall follow these requirements:

- Ensure the Verification Locate is performed by a locator (operator qualifications may be required) other than the individual who performed the Initial Locate.
- Confirm the accuracy of all Initial Locates.
- Identify unknown or undocumented facilities in the Locate Boundary Area, resulting from the Initial Locate or Verification Locate.
- Report any discrepancies to the Ground Disturbance Supervisor and to the Facility owner.
- Investigate and resolve any reported discrepancies.

Provide all appropriate records, drawings and documentation to the party performing the Verification Locate. Further Verification Locates may be performed if deemed necessary by the Excavator/Ground Disturber.

4 Positive Identification

Positive Identification (Exposure) of Below Grade Facilities

These Positive Identification specifications are the minimum requirements. Additional Positive Identification may be required based on the Hazard Assessment.

Prior to beginning Mechanical Excavation or any other potentially destructive below grade activity, the location of Below Grade Facilities shall be Positively Identified by:

1. Hand Expose, or
2. Vacuum Excavating

Positive Identification shall be to a sufficient width to visually identify (Positively Identify) the location, direction/alignment, depth, size and type of all Below Grade Facilities.

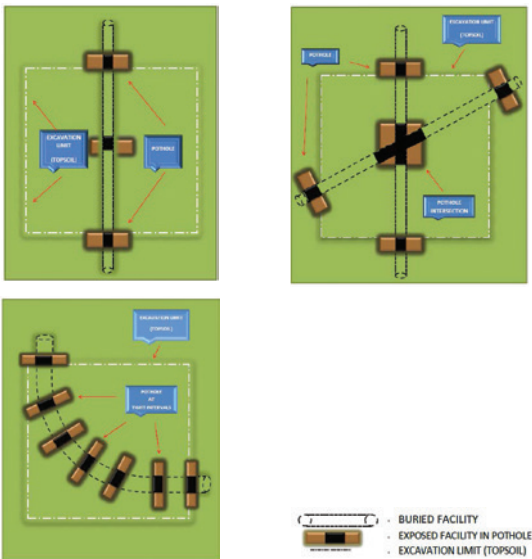
All known Appurtenances and pipe weights shall be Positively Identified prior to Mechanical Excavation.

Positive Identification shall be completed on all Below Grade Facilities within the entire Excavation perimeter and 5 m (16 ft.) outside the Excavation perimeter.

Follow these steps when identifying Below Grade Facilities:

1. Before Positive Identification begins, Facility identification markings shall be reviewed to determine if additional Positive Identification is required.
 2. Use a minimum of three Positive Identification points to verify alignment, i.e., beginning, middle and end.
 3. If a located Below Grade Facility does not intersect the excavation but is within the 5 m (16 ft.) area beyond the excavation area, determine location with a minimum of 2 exposure points.
- excavation area, determine location with a minimum of 2 exposure points.

The following diagrams are examples of positive identification:



4 Positive Identification

5 Positive Identification (2)

Positive Identification (Exposure) of Below Grade Facilities (cont'd)

Adjacent Below Grade Facilities within 5m (16 ft.) of the Excavation perimeter shall, at a minimum, be exposed on the working side, with the following exceptions for non-Station/Terminal sites:

- If Locate Boundary Area is less than 5 m (16 ft.), only Positively Identify within the Locate Boundary Area.
- On the ROW and when allowed by Applicable Legislation (not in AER regulated areas) and if multiple parallel pipelines exist; in such cases only the most adjacent Enbridge-operated pipeline/s needs to be Positively Identified providing all the pipelines on the ROW have been located.

Alternatively, when the Excavation work area is congested with Below Grade Facilities, a perimeter slot trench may be completed. It shall be dug at a minimum of 1 m (3 ft.) outside the Excavation perimeter to a depth of 0.6 m (2 ft.) deeper than the planned Excavation.

When the perimeter slot trenching method is used, follow these requirements:

- If a Below Grade Facility passes through the perimeter slot trench, a sight hole in the middle of the Excavation Area shall be performed to ensure depth, alignment, and size.
- If a Below Grade Facility does not exit the Excavation Area, it shall be Positively Identified at sufficient intervals to establish its termination point.

If the entire Excavation Area is going to be Vacuum Excavated or Hand Exposed then the Positive Identification of the Below Grade Facilities to 5 m (16 ft.) does not need to occur. If the scope changes and Mechanical Excavation is required, then Positive Identification shall be completed in accordance with all of the above-noted requirements for Mechanical Excavations.

If backfilling of the exposure hole is required once the Below Grade Facility is exposed, it shall be identified and marked with the required information (Facility owner, depth, size and type of facility) and APWA uniform colour code. Ensure the identification of Below Grade Facilities is clearly visible to all traffic and that Positive Identification can be maintained.

When Below Grade Facilities are positively identified, ensure these requirements are completed:

- Compare all records, drawings and documentation; and
- Conduct a visual check to confirm that the Positive Identification accurately reflects the location of all Below Grade Facilities.

Probing

Probing for Positive Identification is not permitted unless approved by regional management (director or designate) based on ground conditions. Approval to probe shall be documented on the Hazard Assessment.

When the use of probes is approved, probes shall have rounded or blunt tips to prevent damage to Below Grade Facilities.

Probing is acceptable in the following situations:

- maintaining mechanical clearance (provided Positive Identification has been performed and is maintained)
- depth of cover
- preliminary probe reports for crossings
- other situations that do not involve Positive Identification

Mechanical Clearance

No Mechanical Excavation shall occur within 600 mm (2 ft.) of a foreign Below Grade Facility.

No Mechanical Excavation shall occur within 600 mm (2 ft.) of an Enbridge Below Grade Facility unless the following conditions are met:

- The Below Grade Facility is exposed on the top and sides at locations sufficient to confirm alignment, and
- The Enbridge Facility owner or Enbridge Site Inspector approves and directly observes the excavating activities.

At no time shall mechanical excavating equipment be within 300 mm (1 ft.) of an Enbridge Below Grade Facility. For clarity, the final 300 mm (1 ft.) of soil around a facility shall be removed by Hand Exposure, water washing or other non-mechanical means.

Mechanical Clearance will be adjusted when the crossing agreement or Applicable Legislation is more stringent.

Before excavation begins, Site Supervisors shall review site conditions with the Equipment Operator(s) and Spotter(s). The review shall address the following:

- location and identification of Below Grade Facilities and Appurtenances
- type of Below Grade Facilities and Appurtenances
- depth of Below Grade Facilities and Appurtenances
- direction of Below Grade Facilities and Appurtenances
- any other relevant factors

7 Roles and Responsibilities

Roles and Responsibilities

Regional or Project Management shall ensure the following Ground Disturbance roles (or equivalent roles) are assigned to the appropriate Worker, as applicable to a project or work activity.

All Workers assigned to one or more of the Ground Disturbance roles noted in this sub-section shall, at a minimum, have successfully completed a Ground Disturbance course that meets Enbridge's training requirements.

The Ground Disturbance Inspector/Enbridge Representative shall ensure:

- Crossing Agreements are obtained as required.
- Activities involving mechanized equipment are adequately supervised.
- All Below Grade Facilities in the work area are Surface Located according to the One-Call ticket request and in accordance with this Standard and other applicable policies.
- Any other necessary safety controls are implemented considering the unique aspects of the work.
- That all applicable locate documentation matches a visual check of the Worksite.
- The appropriate permits and Hazard Assessments are completed prior to beginning work activities.
- Workers and Facilities are adequately protected in accordance with Enbridge requirements, Hazard Assessment processes and this manual.
- Work is stopped when there is a concern for safety, pipeline integrity, or damage to equipment or Facilities.
- Exposed pipes, conduits, and cables are not damaged, as confirmed by visual inspection in the ditch/Excavation before backfilling.
- Crossing Agreements are reviewed and maintained on site as part of the Ground Disturbance Package.
- That Below Grade Facilities are not damaged, as confirmed by visual inspection before backfilling.
- Any discrepancies for Below Grade Facility Locates are resolved.
- All Workers have the appropriate training and that records of such training are maintained and accessible.

For Contractor Excavations, the Ground Disturbance Inspector/Enbridge Representative shall:

- Be present at the side of the Excavation for any Mechanical Excavation or activity with the potential for damage.
- Ensure the appropriate parts of the Ground Disturbance Package are reviewed with the Contractor.

The Excavator/Ground Disturber shall:

- Obtain verification and review with the Ground Disturbance Inspector/Enbridge Representative that all applicable Crossing Agreements and/or Proximity Agreements have been obtained, as part of the line location and verification process.
- Ensure Excavation activities (including the Spotter and Operator) are overseen by a Supervisor/Foreman/Competent Person.
- Ensure a One-Call is placed and confirm the One-Call is valid.
- Ensure that when there is a discrepancy between the documentation and the line Locates that cannot be reconciled, that the discrepancy is resolved (note: a perimeter slot trench is the preferred method of Positively Identifying Below Grade Facilities when a discrepancy cannot be resolved.)

8 Roles and Responsibilities (2)

The Excavator/Ground Disturber shall (cont'd):

- Ensure that smaller diameter (NPS 4 or less) non-metallic pipelines (for example PVC, polyethylene, or other synthetic compounds) and all cables (electrical, communication, etc.) are exposed across the full width of the proposed trench or Excavation, by using Hand Expose or Vacuum Excavation unless a hazard assessment indicates that exposing the length of the utility creates an integrity hazard.

The Ground Disturbance Supervisor/Foreman/Competent Person shall:

- Ensure all required documents are kept on-site as part of the Ground Disturbance Package.
- Ensure required documents from the Ground Disturbance Package are provided to the party performing the Locates.
- Reconfirm the Locates if required.
- Investigate and resolve or reconcile any Locate discrepancies.
- Ensure a comparison of all applicable Locate documentation matches a visual check of the Worksite.
- Review the Excavation and the Hazard Assessment with the Ground Disturbance Inspector/Enbridge Representative.
- Ensure the appropriate permits and Hazard Assessments are completed prior to beginning work activities.
- Stop work and consult with the Ground Disturbance Inspector/Enbridge Representative upon discovery of any non-Located facility, or if there is any contact between equipment and any Below Grade Facility.

Typically the role of Ground Disturbance Supervisor/Foreman/Competent Person will be assigned to Contractor Personnel, unless the Contractor is working under the direct supervision of Pipeline Maintenance.

The Equipment Operator shall:

- know the location of all Below Grade Facilities and Appurtenances.
- discuss and agree on hand signals with the designated Spotter.
- follow all signals given by the Spotter.
- be deemed Qualified by a Enbridge Representative for hotline work.
- not excavate until a Spotter is present with the required signaling device.
- ensure Spotters understand their responsibilities.
- ensure One-Call notifications have been followed.
- review all documentation/drawings.
- maintain all required clearances.
- stop work if Positive Identification is lost.

The Ground Disturbance Spotter shall:

- check the location of all Below Grade Facilities in the work area and assist the operator in maintaining required clearances and depth of cuts.
- observe progress and use hand signals and/or verbal communication to alert the Operator to potential dangers.
- stop the work if uncontrolled hazards arise (e.g., unidentified Below Grade Facilities, contact between the excavation equipment and a facility.)
- be continually aware that not all Below Grade Facilities are marked with warning tape (or with the correct color of warning tape) or provided with proper barriers.
- possess a signaling device (e.g., an air horn is best) to alert the equipment Operator to potential dangers.
- be clearly identified by wearing high visibility apparel that meets all applicable requirements and is distinguishable from others on site.

8 Roles and Responsibilities (2)

Pile Driving, Auguring, Boring, and Drilling

All Ground Disturbance requirements and practices set out in this Standard and any associated procedures shall be met when performing these activities.

When pile driving in congested areas with high risk potential for damage to Below Grade Facilities, a pilot hole shall be Vacuum Excavated to a minimum depth of 3 m (10 ft.) and to a diameter equal to that of the pile.

All boring pathways shall be Positively Identified where the boring pathway intersects the sheeting to maintain appropriate clearances.

When a boring device is used to install a Facility across one or more Below Grade Facilities, the depth of the device shall be confirmed to ensure that a 1 m (3 ft.) separation is maintained from all Below Grade Facilities. This includes the pilot hole and the reamed path.

Minimum separations are outlined in the specific procedures for slip-boring, horizontal/directional drilling, and drilling vertical and open vertical bores.

Scope and Purpose

This guide contains:

- Requirements and procedures for operating mechanized excavation equipment and undertaking other below grade activities with the potential for damage to Enbridge or foreign facilities/utilities
- Additional requirements for ground disturbance activities related to cross country mainline construction.
- Additional requirements for ground disturbance activities related to Facility construction.
- This standard applies to contractors that are designated as “Prime Contractor” (British Columbia, Alberta, Manitoba), “Constructor” (Ontario), “Maître d’Oeuvre” (Quebec) or where the Contractor has control of the worksite whether as an “employer” (work site regulated by the Canadian Labour Code) or either an “employer” or “contractor” (Saskatchewan)
- All aspects of this guide must be reflected in the Contractor’s excavation procedure that will form part of the Contractor’s project safety plan for the awarded work.

In addition, it remains the Contractor’s sole responsibility to ensure that all applicable legal requirements and relevant industry standards have been identified and will be met by the Contractor’s excavation procedure.

The purpose of this guide is to describe Major Projects’ minimum requirements for planning and conducting ground disturbance activities for the purposes of awarded work. This guide will be attached as a schedule to the contract between Enbridge and the Contractor.

Except for where specifically noted, the Contractor is responsible for all accountabilities/responsibilities noted in this guide.

Ground Disturbance Permit and Documentation - Information and Guidelines

All workers involved in ground disturbance activities participate in the permitting process and sign on the FLHA.

Ground Disturbance Defined

Ground Disturbance (Mainline Construction)

For mainline activities, ground disturbance is defined as:

- Any work, operation, or activity that results in the penetration of the ground to any depth greater than 1 foot.
- Any penetration of the ground, to any depth, above a facility/utility whose depth is unknown.

Ground disturbance activities include, but are not limited to excavating, hand digging, trenching, plowing, tunneling, auguring, boring/drilling, backfilling, blasting, cultivation, topsoil stripping and leveling, stumping, peat removal, quarrying, fencing, and grading, ground rod installation, rutting, and hydro-vac activities.

Ground Disturbance (Facility Activities)

Any work, operation or activity that results in the penetration of the ground to any depth (excluding survey staking and line locating marking). Ground disturbance activities include, but are not limited to excavating, digging, trenching, plowing, tunneling, auguring, boring/drilling, backfilling, blasting, cultivation, topsoil stripping and leveling, stumping, peat removal, quarrying, fencing, and grading, ground rod installation, rutting, and hydro-vac activities.

Permit Requirements

Ground Disturbance Permit

A ground disturbance permit is required for ground disturbance activities and is to be used in conjunction with a safe work permit.

Permit Issuer

The Contractor shall provide a written hazard assessment, including a site walk-through, of the proposed excavation site for review by both the Enbridge Inspector and the Contractor before a permit shall be issued.

The Ground Disturbance Permit shall

- Be completed by the Enbridge Inspector or the Enbridge designated representative
- Must identify all pertinent hazards and applicable control measures by means of check boxes
- Identify person to conduct initial atmospheric testing where applicable
- Issued for specific Contractor work area in which ground disturbance shall take place for that workday (e.g. mile post to mile post, specific excavation site, controlled area etc.)

Permit Receiver

The Contractor Foreman/ Supervisor must

- Perform a hazard assessment specific to the work; review the hazards, controls, and ground disturbance package (dig folder) with the permit issuer; then conduct a review of the permit with the workers directly involved in ground disturbance activities.
- Ensure that all of the “controls required” and “hazards Identified” are clearly communicated and understood by all workers involved.
- Monitor compliance to the permit requirements.
- Return and sign off the permit upon expiry or completion of the work.

Permit Validity

- Permits shall not be valid for more than 12-hours. However, under certain circumstances, an extension may be applied for through Enbridge Inspection
- All work shall cease when permit expires unless a new permit is issued or the existing permit is extended by the issuing authority.
- All permits are suspended during emergencies and must be re-validated following any such emergency
- A new permit is needed when there is a significant change to the scope of work
- Enbridge Representative, Inspector or Safety Personnel can pull the work permit if he/she believes an unsafe condition exists

Distribution of Ground Disturbance Permits

White Copy

Person in charge of the work (permit receiver); reviewed with affected personnel; copy provided to Enbridge for retention

Yellow Copy

Retention on-site for duration of day's ground disturbance activity(s); copy provided to the Contractor for retention

Pink Copy

Retain in permit book; completed permit book returned to Enbridge

Key Clearances and Distances

The following details are provided as a convenience to Contractors and may not include all the clearance information given in this guide. **Contractors are responsible for conforming to all clearances stated in this guide, whether included in these guidelines or not.**

All Ground Disturbance Activities

Surface Location of Below Grade facilities/utilities

Surface location shall be done for all facilities/utilities within the perimeter of the proposed excavation and extending 30 meters outside the perimeter of the excavation or to the ROW boundary.

Positive Identification (Exposure) of Below Grade facilities/utilities

Positive identification shall be made for all facilities/utilities within the perimeter of the proposed excavation and extending 5 meters beyond the perimeter of the excavation. Probing is not an approved method of positive identification or determining depth-of-cover.

Hydro-vac Safe Zone

5 meter safe zone to prevent non-essential personnel from entering the hydro-vac operation. This may be established with flagging, warning tape, cones, barricades, signs or etc.

Required Mechanical Equipment Clearance

There shall be no mechanical excavation within 0.6 meters of any facility/utility at any time.

Mainline Activities

Surface Location and Positive Identification of below grade facilities

Prior to stripping and grading activities:

- All existing below grade facilities/utilities shall be surface located and exposed by qualified person a minimum of 500 meters in advance of any work (i.e. stripping, grading, ramp work, etc.)

Facility/Utility Crossing Ramps

There shall be a minimum of 2 meters of total cover between the surface of the ramp and the top of the facility/utilities being crossed, or as per the buried facility/utility Owner's written instructions and retained in the ground disturbance package (Dig Folder.)

Safety Buffers

Where possible, stakes and appropriate flagging shall be used to establish a minimum 3 meter safety buffer alongside any existing adjacent parallel pipeline.

To avoid encroachment on adjacent parallel pipeline, at all roadway, highway, and railway crossings, a minimum 3 meters safety buffer shall be established alongside any existing adjacent parallel pipeline by installing 20 meters of warning barricades running parallel to the adjacent pipeline.

Facility Activities

Staking of Below Grade Facilities

In fenced Facilities, locate the centerline of facilities/utilities at 5 meter intervals, including adjacent parallel facilities/utilities.

Personnel

All personnel directly involved in ground disturbance activities shall:

- Complete a ground disturbance course that meets the requirements of Enbridge Major Projects. For example, Ground Disturbance Level II or training that meets the requirements of Enform IRP 17.
- Have a thorough understanding of the ground disturbance procedures and their respective responsibilities

List of Required Personnel

If the Enbridge Inspector assigned to a mechanical excavation activities occurring within 5 meters of a facility/utility leaves the site, **all excavation activities shall stop immediately** and shall not resume until the Enbridge Inspector returns.

All personnel involved in ground disturbance activities shall have the following minimum qualifications, knowledge, and skills:

Qualifications

- Must have completed a ground disturbance course that meets the requirements of Enbridge Major Projects. Must provide a copy of the current certification as part of project documentation.

Knowledge

- Thorough understanding of the LP/MP Safety Manual.
- Knowledge of the right, and responsibility, to stop unsafe work.
- Familiar with all applicable legislative requirements.
- Knowledge of surface locating practices.
- Knowledge of adequately estimating and calculating the outer perimeter boundaries of the proposed excavation or trench based on the depth, width, degree of slope, and soil type.
- Knowledge of basic operator signaling.
- Knowledge of emergency plans in the event of an unplanned contact with a facility/utility.

Skills

- Ability to recognize any potential hazards of an excavation.
- Must be able to review and understand relevant construction drawings, Enbridge specifications, as-built drawings, and station photographs.

Project Management

Roles and Responsibilities

- Ensure Project Management has assigned an appropriate number of qualified personnel to conduct and monitor all ground disturbance activities.
- Ensure the Contractor(s) has assigned an appropriate number of qualified personnel to conduct and supervise all ground disturbance activities.
- Determine whether periodic or continuous monitoring at the excavation site is required, based on a hazard assessment.

Contractor

Contractors shall meet the following requirements:

Required Personnel: Ground Disturbance Supervisor

- Shall be someone other than the operator to oversee ground disturbance activities.
- Must have completed a ground disturbance course that meets the requirements of Enbridge Major Projects.
- The Contractor shall make available to Enbridge documentation to demonstrate the qualifications of the Ground Disturbance Supervisor.

Required Personnel: Excavation Competent Person

- The Contractor shall make available to Enbridge documentation to demonstrate the qualifications of the Competent Person.

Training

- Ensure that all workers involved in ground disturbance activities have completed a ground disturbance course that meets the requirements of Enbridge Major Projects.
- Provide a copy of each worker's current training as part of the project documentation.

Crossing Agreements and Proximity Agreements

The Contractor shall ensure that:

- An Enbridge Inspector has obtained all applicable crossing agreements and/or proximity/encroachment agreements and reviewed the agreements with the Contractor as part of the line location and verification process.
- Copies of these documents are kept on-site as part of the project documentation and included in the on-site ground disturbance package (dig folder).

One Call & Facility Identification

There shall be no equipment activity within the work area until the required steps have been taken to identify and confirm the location of all facilities/utilities.

The Contractor shall:

- Complete the "One Call" per provincial requirements to include the applicable timeframe necessary prior to ground disturbance activity.
- Comply with individual provincial requirements for guidelines regarding facility/utility Owner responses with subsequent actions thereafter appropriately communicated and documented.
- Provide written verifications of the "One Call" to the Enbridge Inspector and/or Ground Disturbance Coordinator.
- Make "One Call" updates as required based on construction plans, "Below Grade Facility Management Plan", and/or legislative requirements.
- Ensure that "One Call" documents, Enbridge surface locates, Contractor surface locates, survey markers, Hydro-vac logs, as-built drawings, crossing / proximity/encroachment agreements, redline drawings and other related documents are available on-site.
- Review the above documents with all workers involved in the ground disturbance prior to any ground disturbance activity.
- Verify that an Enbridge initiated independent third party line locating/ four-way sweep has completed surface locating.
- Verify that a Contractor initiated independent third party line locating/ four-way sweep has completed surface locating.

One Call & Facility Identification (cont'd)

- The most current sweep must be conducted close enough to the ground disturbance execution date to ensure that markings (stakes, flags, etc.) will still be visible in their original location by the time the ground disturbance activity is executed. If not, or if there is visible evidence that something may have been buried since the sweep was conducted, an additional four-way sweep is required.
- Refer to the “as-built” drawings (i.e. redline drawings, route sheets, station piping, instrumentation, electrical, and cathodic protection drawings) to determine the quantity, type of facilities/utilities and their general location within the work area.
- After locating facilities/utilities, compare the information with the details on the applicable “as-built” drawings (i.e. redline drawings, route sheets, station piping, instrumentation, electrical and cathodic protection drawings.)
- Notify and coordinate with the respective facility/utility Owners in the locating and exposing of all existing below grade facilities/utilities.
- Ensure that all below grade facilities/utilities within the controlled area are surface located prior to any ground disturbance activities.
- Ensure that all below grade facilities/utilities within 5 meters of the proposed excavation are positively identified prior to any excavation work.
- Ensure at minimum all facilities/utilities that enter or cross the proposed excavation site and controlled area have the top and sides identified at a minimum of three locations.
- Ensure at least one positive identification on each side of the excavation site, at a minimum of 1 meter beyond each side of the excavation and at the midpoint of the excavation. If alignment and depth can be verified by the above practice no further positive identification is needed.
- Ensure discrepancies are resolved and noted as required in **Tab 19**

Compliance and Permitting

The Contractor shall:

- Ensure that all legislative and Enbridge requirements for ground disturbance are met prior to any destructive below grade activity.
- Ensure that all ground disturbance activities are conducted under a valid ground disturbance permit for all Mainline and Facility construction activities. Ground disturbance activities in Facilities or under the direct control of Operations may also have additional requirements.

Crossings

The Contractor shall:

- Prepare a “foreign crossing”, a “crossing report”, and conduct a review with the Owner of the foreign crossing.

Ground Disturbance Coordinator (Enbridge Representative)

Roles and Responsibilities

- Ensure Enbridge Operations/PLM and/or Foreign Owner's requirements are being met.
- Ensure ground disturbance orientation training is being conducted as required.
- Ensure the project specific "Below Grade Facilities Management Plan" is developed and implemented.
- Verify resolution and ensure documentation of discrepancies.
- Verify completion of ground disturbance packages (dig folders) prior to ground disturbance activities.
- Ensure updates to ground disturbance packages (dig folders) are being completed.
- Ensure crossing agreements are obtained as required.
- Ensure communication process is in place between the project and Operations and/or PLM.

Ground Disturbance Supervisor (Contractor)

Roles and Responsibilities

- Will work closely with the Ground Disturbance Coordinator and the Enbridge Inspector.
- Ensure the "Below Grade Facilities Management Plan" is being adhered to.
- Attend the "Below Grade Facilities Management Meeting."
- Ensure that the permitting process is well understood and that all ground disturbance activities are conducted only after a ground disturbance permit has been issued.
- Coordinate Contractor's independent four-way sweep.
- Continually update the "Below Grade Facility List" (punch list/ master log /hydro-vac log.)
- Complete and maintain ground disturbance packages (dig folders) prior to ground disturbance activities.
- Ensure a process is in place to resolve all discrepancies between surface locates, construction drawings, redline drawings etc. with positive identification and document resolution of discrepancies prior to excavation.
- Ensure crossing agreements have been completed and obtained prior to any facility/utility crossing.

Enbridge Inspector (Permit Issuer)

Roles and Responsibilities

- Confirm that all required ground disturbance training has been completed by all personnel involved in ground disturbance activities.
- Participate in the daily tailgate meeting and provide feedback on any hazards related to the scope of work.
- Ensure excavation hazards and controls are identified on the Field Level Hazard Assessment (FLHA) and are reviewed by all workers directly involved in the work.
- Verify all excavation hazards are controlled in accordance with the Field Level Hazard Assessment (FLHA) and the safe work permit.
- All ground disturbance activities are conducted only after a ground disturbance permit has been issued.
- Complete a walk-through inspection of the excavation site with the Contractor (Permit Receiver) to identify hazards each day and complete a ground disturbance permit before allowing excavation to begin.
- Ensure pertinent documents are made available in the ground disturbance package (dig folder) and are used to assess and plan all ground disturbance activities (One Calls, crossing agreements, as-built drawings, survey drawings, plan drawings, written agreements, Contractor and Enbridge four-way sweep drawings, instrument and electrical drawings, and station photos, etc.)
- Verify that two independent four-way sweeps (Enbridge and Contractor initiated) have been conducted within the controlled area.
- Ensure that all below grade facilities/utilities within 5 meters of the perimeter of the proposed excavation are positively identified at a minimum of three locations.
- Ensure all discrepancies between surface locates and positive identification (mechanical excavation cannot begin until all discrepancies are resolved, documented and logged) are resolved prior to issuing ground disturbance permit.
- Ensure that key clearances are adhered to at all times.
- Ensure that a professional engineer is consulted if the total depth of the excavation exceeds 6 meters.
- Ensure a professional engineer has been consulted if the stability of any structure or foundation may be affected by an excavation or trench.
- Shall remain at the excavation site to continually monitor any mechanized excavation that takes place within 5 meters of any facility/utility, whether located above or below grade.
 - Continuous monitoring may be required at other times as determined by project management
- Required to be at the excavation site for all mechanical excavation activities within 5 meters of any buried facility/utility with the exception of hydro-vac activities.
 - Periodic monitoring of hydro-vac crews is required.
- Confirm and document that positive identification has been made.
- Prior to backfilling an operating Enbridge Pipeline, ensure that a visual corrosion inspection is completed and documented by qualified personnel.

Crossing Agreements and Proximity Agreements

- Ensure all applicable crossing agreements and/or proximity/encroachment agreements have been obtained.
- Ensure agreements are reviewed with the Contractor as part of the surface location and verification process.
- Ensure copies of these documents are located in the ground disturbance package (dig folder) on-site for reference.

One Call & Facility/Utility Identification

- Verify the Contractor has completed the “One Call” per individual provincial requirements to include the applicable timeframe necessary prior to ground disturbance activity.
- Ensure the Contractor complies with individual provincial requirements for guidelines regarding facility/utility Owner responses with subsequent actions thereafter appropriately communicated and documented.
- Verify all below grade facilities/utilities within the controlled area are surface located by both an Enbridge and Contractor initiated independent third party line locating/four-way sweep Contractor.
- Ensure all below grade facilities/utilities within 5 meters of the proposed excavation are positively identified.

Safety Supervision

- The Enbridge Inspector shall confirm that all required ground disturbance training has been completed by all personnel involved in the ground disturbance.
- Participate in the daily tailgate meeting and provide feedback on any hazards related to the scope of work.

Contractor Supervisor/Foreman (Permit Receiver)

Roles and Responsibilities

The Contractor site representative identified on the work permit as being in charge of the work shall:

- Oversee excavation activities as required in **Tab 4**.
- Be thoroughly familiar with all Enbridge requirements concerning ground disturbance and excavation activities.

Job Preparation

- Complete a ground disturbance course that meets the requirements of Enbridge Major Projects.
- Initiate a review of excavation scope and the Job hazard assessment with the Enbridge Inspector.
- Ensure that, for each location that requires a professionally engineered sheet piling installation, a detailed procedure and hazard assessment has been submitted to Enbridge for review a minimum of 48 hours before work commences.
- Ensure that equipment operators are qualified and skilled in working around below grade facilities/utilities, and that each is assigned a spotter.
- Ensure that all below grade facilities/utilities are surface located and positively identified to meet the requirements for Facility or Mainline construction as specified in this guide.

Daily Tasks and Responsibilities

- Each day before allowing excavation to begin, complete a walk-through inspection, with all parties involved in the ground disturbance activities, of the excavation site to identify hazards.
- When completing the daily safe work and ground disturbance permit, assist the Enbridge Inspector in identifying excavation hazards and controls.
- Obtain authorization to proceed with the excavation from the Enbridge Inspector.
- Hold a daily tailgate meeting with all excavation workers to review hazards.
- Stop work if there is a concern for personal injury, or damage to below grade facilities/utilities.

Stop work and consult with the Enbridge Inspector and/or Ground Disturbance Coordinator upon discovery of any un-located facility/utility, or if there is contact between equipment and a below grade facility/utility.

Inspections

- Coordinate visual inspections by the Enbridge Inspector and facility/utility Owner, prior to backfilling.

Equipment Operator

Roles and Responsibilities

- Participate in a walk-through inspection of the excavation area to identify hazards each day prior to excavation.
- Participate in the hazard assessment and ground disturbance permitting process.
- Be aware of all facilities/utilities entering and crossing the proposed excavation.
- Ensure reference documents are made available and are used to assess and plan all ground disturbance activities (crossing agreements, as-built drawings, survey drawings, plan drawings, written agreements, Contractor and Enbridge four-way sweep drawings, redline drawings, instrument and electrical drawings, and station photos, etc.)
- Ensure discrepancies have been resolved between surface locates and positive identification (mechanical excavation cannot begin until all discrepancies are resolved and documented) prior to signing ground disturbance permit.
- Review and sign the ground disturbance permit, field level hazard assessment (FLHA) and safe work permit.
- Participate in the hazard assessment associated with the work.
- Check the location of above and below grade facilities/utilities.
- Ensure safe clearances are maintained at all times.
- Use agreed upon hand signals and air horns to provide direction and potential dangers (e.g., contact with a facility/utility) from designated spotter.
- Stop excavation activity if positive identification of a below grade facility/utility has been lost.

Prior to Operating Equipment

- Review items in the ground disturbance package (dig folder), excavation checklist and ground disturbance permit.
- Verify the location of above and below grade facilities/utilities in the work area.
- Follow appropriate procedures for positive identification of below grade facilities/utilities.
- Document daily equipment inspection.

During Equipment Operation

- Immediately report to Supervision any equipment contacts with new or existing facilities/utilities.
- Ensure that a designated spotter is used for all excavating, including clean-out, trim, and backfill activities.
- Stop work if communication is lost with the spotter.
- At all times, maintain safe clearances as required by Enbridge.
- Use extreme caution when conducting mechanical excavation activities in high- risk areas containing facilities/utilities (e.g. limit the size of the lift).
- Use extreme caution if below grade flagging or planking is uncovered, as this often indicates a power cable or pipe is located below.

Spotter

Roles and Responsibilities

- Participate in a walk-through inspection of the excavation area to identify hazards each day prior to excavation.
- Participate in the hazard assessment and ground disturbance permitting process.
- Know the location and alignment of all facilities/utilities entering and crossing the proposed excavation.
- Ensure reference documents are made available and are used to assess and plan all ground disturbance activities (crossing agreements, as-built drawings, redline drawings, survey drawings, plan drawings, written agreements, Contractor and Enbridge four-way sweep drawings, instrument and electrical drawings, and station photos, etc.)
- Ensure discrepancies have been resolved between surface locates and positive identification (mechanical excavation cannot begin until all discrepancies are resolved and documented) prior to reviewing the ground disturbance permit and signing the FLHA.
- Review the ground disturbance permit, field level hazard assessment (FLHA) and safe work permit.
- Participate in the hazard assessment associated with the work.
- Check the location of above and below grade facilities.
- At all times, maintain safe clearances as required by the Enbridge.
- Use agreed upon hand signals and air horns to provide direction and potential dangers (e.g. contact with facility) from the designated spotter.
- Stop excavation activity if positive identification of a below grade facility/utility has been lost.

Excavation Competent Person

The Excavation Competent Person must be capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and has authorization to take prompt corrective measures to eliminate them.

They shall have knowledge of adequately estimating and calculating the outer perimeter boundaries of the proposed excavation or trench based on the depth, width, degree of slope, and soil type.

Roles and Responsibilities

- Must be present whenever excavation activities will result in personnel entering the excavation.
 - Is to remain at the area of excavation while excavation activities are being performed.
 - If the assigned Excavation Competent Person leaves the area, all excavation activities shall stop immediately and shall not resume until the excavation competent person returns.
- Attend the review of excavation scope and the Task hazard assessment with the Enbridge Inspector.
- Complete a walk-through inspection of the excavation area to identify hazards each day before allowing excavation to begin.
- Be present at the excavation and continuously monitor the excavation activity.
- Maintain safe clearances as required by the Company.
- Stop work when leaving the excavation site or when there is concern for personal injury or damage to below grade facilities/utilities.
- Stop work and consult with the Enbridge Inspector upon the discovery of an un-located facility/utility, or if there is any contact between equipment and any facility/utility.
- Ensure that the operator and spotter fulfill their assigned responsibilities and carry out excavation activities according to Enbridge's requirements.

Below Grade Facilities Management

The below grade facilities/utilities management guidelines in this section must be followed for all ground disturbance activities.

Definition and Scope

“Management of below grade facilities/utilities” includes all activities undertaken to confirm the presence of existing below grade facilities/utilities, and includes, but is not limited to:

- One Call
- Facility/Utility Owner contact/notifications
- Surface locating and/or sweeping
- Positive Identification of facilities/utilities (hand or hydro-vac)
- Ensure drawings, as-builts and/or alignment sheets match buried facilities/utilities discovered during the locating processes. Any discrepancies must be reconciled prior to ground disturbance activities.
- Crossing/Proximity Agreements

Personnel Requirements

For all work involving below grade facilities/utilities, the Contractor shall assign a competent individual as Ground Disturbance Supervisor, to coordinate all activities associated with the management of below grade facilities/utilities.

Enbridge will assign an individual (e.g. Inspector) to work closely with the Contractor's Ground Disturbance Supervisor. On mainline and terminal projects Enbridge will provide a Ground Disturbance Coordinator as determined by Project Management and MP Safety.

Project Below Grade Facilities/Utilities Management Meeting

Prior to any ground disturbance work, Enbridge and the Contractor shall jointly organize and conduct a meeting to discuss and implement a plan for managing facilities/utilities on the project.

The meeting shall review the basic elements in the process of identifying, locating, and confirming existing below grade facilities/utilities, and should address the following processes and procedures:

- Required personnel roles and responsibilities
- Qualifications and Training
- Surface location of facilities/utilities
- Key clearances and distances
- Positive Identification of buried facilities/utilities
- Resolution of discrepancies
- Permitting and FLHA

All personnel directly involved in the management of facilities/utilities shall attend the meeting at the beginning of the project prior to ground disturbance activities to review procedures and responsibilities. At a minimum, the following personnel may be required to attend:

Contractor Personnel

- Superintendent and/or Assistant(s)
- Safety coordinator(s)
- Ground Disturbance Supervisor
- Hydro-vac foreman
- Field engineer
- Supervisor receiving Ground Disturbance Permit

Enbridge Personnel

- Field engineer
- Chief Inspector and/or Assistant(s)
- Safety Inspector(s)
- Ground Disturbance Coordinator
- Construction Manager
- Craft Inspectors
- Hydro-vac Inspector(s) if designated
- Operations/PLM designate (if applicable)

Locator Companies

- All crews that will be doing surface locating for below grade facilities/utilities on behalf of Enbridge and the Contractor

Below Grade Facilities/Utilities Management Plan

At a minimum, the below grade facility management plan must include the following elements:

Crossing/Proximity/Easement Agreements

- The Contractor shall maintain a record/log as facility/utilities Owners are contacted.
- This record must identify the facility/utility Owner, person(s) contacted, date and time of contact, and any relevant comments or information.

Availability of Reference Data / Documents

- Throughout the duration of the project, the Contractor shall ensure that all available “reference data or documents” pertaining to the ground disturbance package (dig folder) (e.g., land titles, legal / easement plans, construction alignments drawings, As-built drawings, sweep drawings, redline drawings, survey data, crossing agreements, One Call, etc.) are reviewed and compared for discrepancies and/or any additional information that may help to determine all existing below grade facilities/utilities.

Below Grade Facility/Utility List

The Contractor must prepare a “below grade facility/utility list” (sometimes referred to as a punch list/hydro-vac log).

- The below grade facilities/utilities list must be updated regularly as below grade facilities/utilities are confirmed and discrepancies are resolved.
- Updates must be provided to those performing ground disturbance activities and submitted to the Ground Disturbance Coordinator.

Resolution of Discrepancies

- When exposing below grade facilities/utilities, if any discrepancies are found between surface locates and positive identification, further investigation is required.
- On the discovery of any discrepancies, further investigation and follow-up shall be immediately initiated, and will include but not be limited to:
 - Meeting with facility/utility Owner representatives
 - Reviewing Owner plan drawings (if any are available)
 - Asking questions about known existing or recently installed facilities/utilities that may not yet appear in Enbridge's records
 - Asking questions about facilities/utilities that may have been abandoned and removed, but still appear in Enbridge's records
 - Request that, if they haven't already done so, facility/utility Owner representatives personally locate their existing below grade facilities/utilities
 - Re-sweeping areas in question, and/or, if necessary, re-sweeping areas that could not be swept previously due to physical barriers.
 - Speak with Landowners/Occupants to see if they might offer any helpful information
 - Additional positive identification (e.g. hydro-vac slot trenching, perimeter hydro-vac, hand excavation, etc.)
 - Mechanical excavation shall not proceed in the area until all parties are confident that the discrepancies have been resolved, documented and logged.

Job Planning and General Site Preparation - All Projects

The information in this section applies to all ground disturbance activities.

Perimeter Hydro-vacing

The pre-job planning process shall determine whether perimeter hydro-vac of the entire excavation area is appropriate as an additional precaution in congested areas. Perimeter hydro-vac must be approved by Project Management (Project Manager/Construction Manager and Project Safety). If a perimeter slot trench required, it shall be 0.6 meters deeper than the proposed bottom of the trench/excavation.

Temporary Crossing Ramps

The following requirements apply to temporary crossing ramps:

- All existing facilities/utilities shall be crossed in accordance with the terms of the facility/utility crossing agreements (or as directed by the facility/utility Owner) and any letters of agreement.
- All Enbridge facilities/utilities shall be protected as directed by regional operations. Special considerations shall be taken when:
 - Ruts are likely to develop at the crossing
 - Vehicles will be continually crossing (e.g. logging trucks)
 - The pipeline to be crossed has been installed less than one year prior to crossing
 - The crossing lies in a wet area, (e.g. marsh, swamp, peat bog, etc.).

For all temporary crossing ramps, the Contractor shall:

- Contact the Regional Engineer and/or Land Agent to identify Enbridge's requirements before constructing any temporary crossing ramp.
- Maintain crossing ramps such that rutting or degradation of the ramps does not reduce the required minimum depth of cover.
- Remove all ramps prior to Contractor demobilization, unless otherwise approved in writing by Enbridge.

Surface Location of Facilities/Utilities

All Ground Disturbance Activities

The Contractor shall ensure that surface locating:

- Is conducted within the controlled area.
- Is completed prior to mechanical excavation or other potentially destructive below grade activities (e.g. heavy equipment access), surface locating shall be performed.
- When physical obstructions (i.e. Tanks, buildings, berms, fence, water ways etc.) are present the controlled area may be condensed with Enbridge approval.

Mainline Construction

In addition to the above, the Contractor shall ensure that:

- All existing below grade facilities/utilities are surface located at a minimum of 500 meters in advance of any work, including but not limited to:
 - excavation of hydro-vac slurry disposal pits
 - installing crossing ramps or bridges
 - crossing vehicles or equipment
 - stumping, stripping, grading, excavation, piling
 - boring and directional drilling activities
- Adjacent parallel pipeline(s) will be staked at approximately 50 meters (maximum) intervals, and more frequently where necessary to ensure that construction crews can readily identify the location and/or any deviation of the existing parallel pipeline(s).

Facility Construction

- Adjacent parallel pipeline(s) will be staked at approximately 5 meters (maximum) intervals, and more frequently where necessary to ensure that construction crews can readily identify the location and/or any deviation of the existing parallel pipeline(s).

Procedures for Surface Locating Facilities/Utilities

Determining the facilities/utilities to be Located

The Contractor shall:

- Review as-built drawings (i.e., latest construction mark-up drawings, route sheets, station piping, instrumentation and Cathodic protection drawings, electrical drawings, redline drawings etc.) and station photographs to determine the quantity and type of facilities/utilities and their general location in the excavation site.
- Consult Operations familiar with the site to determine whether there are any other below grade facilities/utilities that may not be documented.
- Notify the One Call service to locate and identify all foreign facilities/utilities.
- Verify the One Call service has completed their positive response (all clear).

Allowable Methods for Locating facilities/ utilities

- For third party surface locates, only Enbridge accepted surface locating Company(s) shall be used.

Enbridge and Contractor Responsibilities

Enbridge Responsibilities:

- An Enbridge initiated independent third party surface locate representing Enbridge shall surface locate all below grade facilities/utilities within 30 meters of the proposed excavation.

Contractor Responsibilities:

- Contractor shall initiate a One Call.
- The Contractor shall complete their own independent surface locates.
- The Contractor shall request a copy of the Enbridge's documented surface locate results and compare with the Contractor's results.

Check Results and Update Drawings and Field Records

The Enbridge Inspector/Ground Disturbance Coordinator and Contractor shall:

- Confirm the quantity, locations, and dimensions of surface located facilities/utilities with as-built drawings and other field records to ensure all known facilities/utilities have been located.
- Update redline drawings and field records as required where facility/utility locations differ from as-built information.

When facility/utility surface locates must be re-established

Surface Locating shall be re-established by the Contractor when:

- Identification markers become dislodged, removed, or unrecognizable, or their original location is uncertain.

Communicating Location of Below Grade facilities/utilities

The Contractor shall ensure that:

- The location and identification (type of facility/utility, depth below grade, direction, etc.) of below grade facilities/utilities shall be reviewed with all parties involved in ground disturbance activities.
- The necessary drawings shall be left at the excavation site for ongoing review.

Marking Facility / Utility Surface Locations

General Marking Requirements - All Projects

- All facilities/utilities shall be identified by stakes, flags, or highly visible paint marks on the ground.
- All markings shall follow the international color code.
- Markings shall be highly visible to equipment operators
- There shall be a clear line of sight between the consecutive markings used to locate any facility/utility.
- In congested areas, consider the size of the excavation and size and complexity of the below grade facilities/utilities to determine the spacing of markings.
- Ensure that any changes in direction or elevation are identified and adequately marked.

Staking below grade facilities/utilities - Mainline Construction

- Adjacent parallel pipeline(s) will be staked at approximately 50 meters (maximum) intervals, and more frequently where necessary, to ensure that construction crews can readily identify the location and/or any deviation of the existing parallel pipeline(s).
- Where possible, use staking and appropriate flagging to establish a minimum 3 meter safety buffer zone alongside any existing adjacent parallel pipeline.
- At all roadway, highway, and railway crossings, a minimum 1.5 meter high safety buffer shall be established alongside any existing adjacent parallel pipeline by installing 20 meters of barricade running parallel to the adjacent pipeline.

Staking below grade facilities/utilities- Facility Construction

- Within Facilities, mark the centerline of all facilities/utilities at 5 meter intervals.

Positive Identification of Facilities/ Utilities

All Ground Disturbance Activities

- Before beginning mechanical excavation or any other potentially destructive below grade activity (e.g. heavy equipment access), positive identification shall be performed within and extending 5 meters outside the perimeter of the excavation. The location, depth, and size of all below grade facilities/utilities, shall be positively identified (exposed) to verify clearances and alignment.
- For environmental or archeological hand-digging and probing activities, positive identification is not required.

Mainline Activities

- In addition to the above, the Contractor shall ensure that all existing below grade facilities/utilities are positively identified at a minimum of 500 meters in advance of any work, including but not limited to: excavation of hydro-vac slurry disposal pits, installing crossing ramps or bridges, crossing vehicles or equipment, stumping, stripping, grading, excavation, piling, boring, or directional drilling activities.

Resolving Discrepancies

When exposing below grade facilities/utilities (hydro-vac or by hand), if any discrepancies are found between positive identification results and surface locate documents further investigation is required. Mechanical Excavation shall not proceed in the area until all parties are confident that the discrepancies have been resolved, documented and logged.

Establishing Depth of Cover Over Below Grade Facilities/Utilities

Depth of cover of surface located facilities/utilities may be obtained by hand digging or hydro-vac. Probing is not an approved method for determining depth-of-cover.

Exposing Below Grade Facilities/ Utilities - All Projects

Acceptable Methods of Exposure

- Acceptable positive identification methods include hydro-vac and hand excavation of sufficient width to visually identify depth, top, sides and alignment of below grade facilities/utilities.
- Probing, GPS locating, and line sweeps are not considered to be positive identification.
- Due to the flexibility and variability of alignment of smaller diameter (NPS 4, or less) non-metallic pipelines (for example PVC, polyethylene or other synthetic compounds) and all cables (electrical, communication, etc.) shall be exposed by hand excavation or hydro-vac across the full width of the proposed trench or excavation. This is not applicable to bundled cables in a common trench with safeguards such as: boards, conduit, duct bank, etc.
- Contractor shall maintain a hydro-vac exposure log (positive identification log) and make the log available to crews and the Enbridge Inspector(s)/Ground Disturbance Coordinator upon request.

Exposing Below Grade Facilities/ Utilities - All Projects (cont'd)

Excavation Procedures

- The Contractor shall positively identify all below grade facilities/utilities (pipelines, cables, conduits, etc.) which enter or cross through an excavation, as follows:
 1. Ensure that at a minimum, existing pipelines, cables, or conduits that enter or cross the proposed excavation site and controlled area have the top and sides identified at a minimum of three locations. One on each side of the excavation site at a distance 1 meters beyond each side of the excavation and at the midpoint of the excavation. If alignment can be verified by the above practice no further positive identification is needed.
 2. Visually identify the top and sides of the facility/utility at each positive identification location.
 3. Carefully review alignment sheets/construction drawings/redline drawings to determine whether or not additional positive identification is required in areas of known or suspected Point-of-Intersection (PI's) and/or depth changes.
 4. Positively identify known appurtenances (e.g. valves, plugs, fittings, stopple fittings, welded fittings, flanges, vents, branch piping, known abandoned facilities, etc.) prior to excavation.
 5. Positively identify any changes in pipe alignment and/or elevation that can alter the depth / direction of the pipe (i.e. 90 degree and 45 degree elbows.)

Identification & Protection of Holes

- All hand digging or hydro-vac holes shall be identified using markers (i.e. 1"x4", 2"x4", fiberglass or PVC pole with flag) in the exposure holes with the below grade facility/utility information noted on the identification marker. Markers shall be covered and guarded by a suitable barricade.
- Hydrovac holes must be securely fenced on the same day as the hydro-vac holes are created.
- Fencing must remain up and in good repair until hydro-vac holes are backfilled.
- Where markers are placed in exposure holes to identify the location of an existing adjacent parallel pipeline.
- If backfill around the marker is permitted, fill around the markers must be of clean dry sand to eliminate subsidence.
- If backfill around the marker cannot be completed on the same day fencing is required until backfill is completed.
- All final backfill of hydro-vac holes must be done using clean dry sand to eliminate any subsidence potential.

Visual Confirmation of Results

- When facilities/utilities are positively identified, the Contractor shall conduct a visual check to confirm that the surface locate markings accurately reflect the location of the known facilities/utilities.

Exposing Parallel Below Grade Facilities/Utilities

Mainline construction - the Contractor shall:

- Positively identify any existing adjacent parallel facilities/utilities to verify location, depth, and facility/utility size. The minimum required interval and exact location of exposures shall be determined as indicated below:

Where the separation between ground disturbance activities (e.g. stripping, grading, ditch line, etc.) and an existing adjacent pipeline is:	Location of exposure holes
greater than 10 meters	determined by Enbridge's construction management team
is greater than 5 meters but less than 10 meters	no further than 1000 meters apart to ensure that line locating equipment remains consistent with actual below grade facility/utility locations
between 3 to 5 meters	no further apart than 400 meters maximum
When stripping, grading, or continuous excavation is required within 3 meters of an existing pipeline	no further apart than 100 meters

- Locate and expose all parallel facilities/utilities within 5 meters of ground disturbance:
 - at the beginning, center, and end of all side bends, to ensure that the profile of the bend is accurately located.
 - at equipment crossing locations, to identify depth and ensure that adequate protective measures are in place prior to any equipment crossing.
 - on each side of wet areas, sloughs, etc.
 - on each side of road, highway, railroad or other crossings at no more than 15 meters intervals for a minimum distance of 75 meters from easement edge.
 - at any other locations requested by the facility/utility Owner and/or Enbridge Inspector, where depth and location may be in doubt.

Facility construction- the Contractor shall:

- Positively identify any existing adjacent parallel facilities/utilities to verify location, depth, and facility/utility size. The minimum required interval and exact location of exposures shall be determined as indicated below:
 - At three locations, not exceeding 15 meters apart.
 - Locate and expose all parallel facilities/utilities within 5 meters of ground disturbance:
 - at the beginning, center, and end of all side bends, to ensure that the profile of the bend is accurately located.
 - at equipment crossing locations, to identify depth and ensure that adequate protective measures are in place prior to any equipment crossing.
 - at any other locations requested by the facility/utility Owner and/or Enbridge Inspector, where depth and location may be in doubt.

Marking Exposed Facilities/Utilities - Mainline Construction

The Contractor shall meet the following standards for marking exposed facilities:

- Once exposed, all below grade facilities/utilities shall be identified by placing markers (i.e. 1"x4", 2"x4", fiberglass or PVC pole with flag) in the exposure holes with the below grade facility/utility information noted on the identification marker.
- All markers shall be clearly visible for all construction activities.
- Markers shall be placed "alongside and on the work side" of the adjacent pipeline, facing the new pipeline construction right-of-way.
- Where practical, and as determined by the facility/utility Owner, such exposure holes may then be backfilled with the markers in place.
- Where livestock is present and exposure holes are not backfilled, barbed wire fencing is required.
- If livestock is not present, snow fence may be used.
- Markers shall be removed during final cleanup.
- Hydro-vac holes must be securely fenced on the same day as the hydro-vac holes are created.
- Fencing must remain up and in good repair until hydro-vac holes are backfilled.
- Where markers are placed in exposure holes to identify the location of an existing adjacent parallel pipeline.
- If backfill around the marker is permitted, fill around the markers must be of clean dry sand to eliminate subsidence.
- If backfill around the marker cannot be completed on the same day fencing is required until backfill is completed.

- All final backfill of hydro-vac holes must be done using clean dry sand to eliminate any subsidence potential.

Marking Exposed Facilities/Utilities - Facility Construction

The Contractor shall meet the following standards for marking exposed facilities:

- All facility/utility exposure holes that are left open shall be fenced and/or covered with suitable materials that will guard against persons and wildlife falling into the open excavation.
- Once exposed, all below grade facilities/utilities can be identified by placing markers (i.e. 1"x4", 2"x4", fiberglass or PVC pole with flag) in the exposure holes with the below grade facility/utility information noted on the identification marker.
- All markers shall be clearly visible for all construction activities.
- Re-establishing positive identification if the positive verification of a below grade facility/utility is lost because of material accumulation (dirt, water, snow, etc.), the below grade facility/utility must be re-confirmed by positive identification, before mechanical equipment is used in the excavation.

Hydro-Vac to Expose Below Grade Facilities/Utilities

Hydro-vac is not considered mechanical excavation but does require a Ground Disturbance Permit to be issued.

The Contractor shall meet the following requirements for all hydro-vac operations:

Worker Training and Protection

- Workers shall be trained on the equipment and procedures, and shall fully understand the hazards of the hydro-vac process and the precautions that must be taken.
- Hydro-vac operators and assistants shall wear appropriate personal protective equipment (PPE), which may include:
 - Dielectric safety boots
 - Hard hats
 - Hand protection
 - Safety glasses with side shields and face shield constructed of mesh or plastic
 - Hearing protection
 - FR Clothing when required by hazard assessment.
 - Class 2 Hi-vis vest

Hydro-vac Equipment Requirements

Hydro-vac equipment shall include:

- Hoses, fittings, and attachments rated and designed for the maximum specified operating pressures of the equipment.
- Systems capable of constant monitoring of temperature and pressure to ensure that allowed operating limits are not exceeded.
- Wands of sufficient length to prevent the operator from contacting the wand tip while the wand is in operation.
- A relief system capable of relieving the full capacity of the pump at maximum rpm, to protect the weakest component in the system.
- A shut-off valve on the wand or a water shut-off switch on a remote control that is manned by a second worker.
- Restraining devices on couplings to prevent accidental disconnection (where couplings provide for such devices).
- A neoprene or equivalent lip on the vacuum tube end to eliminate any mechanical damage to the facility/utility.

Barricades and Shields

- A 5 meter safe zone must be maintained to prevent nonessential personnel from entering the hydro-vac operation.
- Ensure that the excavation site is barricaded at the following times:
 - Before starting work.
 - Whenever an open excavation is left unattended.
 - As required, erect shields to prevent flying particles from injuring passing workers or damaging equipment.
 - The type(s) of barricade shall be identified as part of the job hazard assessment.
- Ensure that upon completion or during interruption, of work on a hydro-vac hole, the following shall apply:
 - The opening shall be immediately safeguarded with a securely attached cover designed to support an anticipated load.
 - The cover shall be marked with the words “Danger Open Hole.”
 - An additional visual marker shall be provided if vehicles or heavy equipment are, or may be, operating in the area.

Electrical Cables

- Whenever practical, any known electrical cables should be de-energized as an added precaution.

Allowable Water Pressure and Temperature

- The working water pressure must not exceed 2500 psi.
- When excavating within 0.3 meters of known or suspected below grade facility/utility, the pressure must be reduced to less than 1500 psi and the water temperature limited to 100° F.

Hydro-vac Procedures

- Build a sump below the level of facility/utility that is being exposed, to limit the amount of abrasive material impinging on the facility/utility.
- Water-wash the below grade facility/utility using a sweeping motion until the facility/utility is sighted.
- Once the facility/utility has been sighted, the facility/utility must not be continually contacted by direct spray.
- When hydro-vac is complete, remove any loose rock embedded in the sides of the excavation that could fall on pipe or cable.

EQUIPMENT

Equipment Restrictions for Specific Activities - Mainline Construction

There are equipment restrictions in place for stripping, grading, and conducting final mainline cleanup over operating (in-service) pipelines. Restrictions are as follows:

Equipment Selection and Approval

- Only low ground pressure tracked equipment such as D6 LGP 36-inch Wide Pad and lower will be used within the 3 meter established safety buffer zone below grade facilities/utilities.
- Proposed equipment must be identified by the Contractor and approved by the Enbridge prior to the start of work.
- Only equipment approved in writing by the Enbridge may be used for stripping, grading, or conducting final cleanup over operating pipelines.

Operation of Approved Equipment

- During cleanup and restoration heavy equipment shall only operate when the tracks are not running with, or parallel while within 3 meters of an existing below grade pipeline.
- Tracked equipment's travel direction must NOT be changed by turning over existing facilities/utilities.
- No work is allowed over facilities/utilities in wet or saturated soils without prior approval from Operations/Construction Management.

Excavation Equipment - Guidance Related to Teeth

See section 16.1 of LP/MP Safety Manual

Moving Equipment Across Roadways

Need for Flag Persons

- When moving equipment across a highway, station suitably trained flag-persons on each side of the crossing after installation of approved traffic signage at the correct and legislated distances.

Moving Equipment with Cleats

- When moving equipment with cleats across any hard road surface, take appropriate measures to ensure that the surface is not damaged. (For example, place tires on the surface in the path of the equipment).

Storing Crossing Material

- When not in use, crossing material shall be placed at least three meters off of the highway surface and placed securely on Enbridge property to prevent unsecured material accumulation on roadway right-of-way.

Supports for Existing and New Pipe

Exposed below grade pipe must be adequately supported to protect it from damage. The following guidelines shall apply:

Excavating an Existing Pipe and/or Installing New Pipe

- When removing bearing soil from under an existing pipe, adequately support the pipe as follows:
 - During excavations where NO additional weight is being added to the pipeline, the recommended maximum unsupported span is 7 meters, but may be reduced depending on pipe diameter and wall thickness. This distance does not take into account any appurtenances such as valves or other fittings located in the unsupported span.
 - If there are appurtenances in an unsupported section, or if a greater distance between supports is required, consult Enbridge's Regional Operations department.
 - Small diameter pipe, conduit, and cables also require adequate support that prevents damage.
- Support new pipe installation, and backfill with acceptable fill material in a manner that doesn't damage the pipe coating.

Excavating Close to an Adjacent Operating Pipeline

- Where excavating close to an adjacent operating pipeline, take extreme care that sloughing of soils does not undermine the adjacent pipeline, thereby placing its integrity at risk.
- **The Contractor shall immediately suspend trenching operations and notify the Enbridge Inspector or Designate if signs of soil instability occur** during such work. Trenching shall not resume until adequate measures, to the satisfaction of the Enbridge Inspector and/or facility/utility Owner, are taken (e.g. sheet piling installation) to protect the adjacent parallel pipeline against movement associated with the excavation.

Crossing Ramp Requirements

All existing facilities/utilities shall be crossed in accordance with the terms of the facility/utility crossing agreements (or as directed by the facility/utility Owner) and any letters of agreement, or as specified herein.

Equipment/vehicle crossing ramps shall be built and installed in accordance with this section, crossing agreements, and to the satisfaction of the Inspector.

Allowable Crossing Locations

- Crossing existing Enbridge pipeline(s) with equipment or vehicles shall be allowed only where crossing locations have been identified and approved by Enbridge.

Depth of Cover

- There shall be a minimum of 2 meters of total cover between the surface of the ramp and the top of the facility/utility being crossed or as directed by the facility/utility Owner.

Materials of Construction

- Typically, crossing ramps shall be constructed of suitable dry material (subsoil).
- During winter construction, and where approved by the Inspector, snow may be used for ramping below grade facilities/utilities. Snow ramps may need to be watered and frozen-in to ensure adequate bearing strength for heavy vehicles and/or equipment.
- The edges of the ramp should be delineated by flagging on both sides.

Ramp Maintenance and Use

- The Contractor shall maintain soil crossing-ramps such that rutting of the ramps does not reduce the required minimum depth-of-cover.

Restrictions

- Wet conditions may preclude the use of these ramps by rubber-tired vehicles/equipment.
- If wet conditions prevail and rutting prevents the Contractor from maintaining minimum cover requirements, the affected ramps shall not be used.
- The Contractor may replace the ramp with a bridge or matting satisfactory to the Enbridge Inspector.

All ramps or bridges shall be removed during cleanup, unless otherwise approved in writing by Enbridge.

Pile Driving

Pilot Holes

- Where piles are located in congested areas with high risk potential for damage to below grade facilities/utilities, a pilot hole may be hydro-vac'd to a depth and diameter determined by soil conditions and the Project Manager/Construction Manager.
- The Project Manager/Construction Manager will determine which areas have a high risk potential, depth of the pilot holes, and whether pilot holes will be required.

Pile Driving Procedures

For all pile driving activities, the Contractor shall ensure that:

- On all pile driving equipment having pressure hammers, the pressure hoses are equipped on the pressure side of all hose connections with safety chains, whip checks, or safety ropes designed to protect workers if the hose or connections should fail.
- Chain blocks, chains, hooks, cables, and slings shall be inspected before use and throughout the shift.
- The brake bands and clutches on all pile driving equipment shall be inspected at the start of each shift.
- Where inspection indicates contamination of brake bands or clutches by oil or grease, the contaminated units shall be dismantled and cleaned, or replaced, before further use.
- A crane boom used for driving piles with a vibratory hammer shall be inspected and certified by a qualified Inspector as safe for continued use at intervals no greater than 600 operating hours while in such use, and before being returned to lifting service.
- When working at heights, all work shall be done in compliance with the relevant safety legislation, and a fall protection and rescue plan shall be in place before work begins.
- A minimum safe approach distance from overhead power lines shall be maintained based on applicable legislated requirements.
- A minimum distance of 0.6m (2ft) from all overhead/adjacent pipelines shall be maintained.
- Before beginning work, the Operator of the vertical boring/pile driving equipment shall ensure that:
 - They complete a documented inspection of the equipment and surrounding area to ensure that no worker, including the Operator, is endangered by the work.
 - A copy of the inspection documentation shall be made available to Enbridge upon request.
 - The swing area shall be identified and, where possible, cordoned-off.
 - Outriggers are used at all times during equipment operation
 - When the equipment is not operating, the pile hammer is securely chocked while suspended by the hammer line.

Boring Operations

All boring activities shall comply with Enbridge specifications. Minimum separations shall be as outlined below:

Slip-Bore

(Refers to the use of a boring machine, with the auger surrounded by a casing pipe.)

- The minimum separation between the existing facility/utility and the new constructing pipeline shall be 0.6 meters, unless otherwise specified.

Drilling

(Refers to the use of a horizontal/directional drilling rig.)

- The minimum separation between the existing facility/utility and the new constructing pipeline shall be as specified by the facility/utility Owner.

Horizontal Directional Drilling (HDD)

Preparation Prior to work

The Contractor shall ensure that:

- Before boring operations begin, all below grade cables and pipelines in the excavation area shall be accurately located and positively identified by hydro-vac operations.
- All required warning signs shall be posted before drilling operations begin.
- Warning signs shall be posted at, and access limited to, the rotating tail string.

- Chain sprocket and V-belt drives on boring machines shall be guarded.
- All cables used to lift drill stems shall be in good condition and cable ends shall be free of knots.
- Equipment used in boring or pile driving operations that are in close proximity to an excavation shall be adequately secured to prevent any movement toward the excavation.
- Excavation walls, including the wall next to the road, railway, or other crossing, shall be adequately sloped to prevent collapse.
- Fire extinguishers shall be placed at the excavation.
- Where internal combustion engines are used in or near excavations, a hazard assessment shall be conducted which considers applicable confined space requirements if there is a possibility of a contaminated atmosphere.
- All personnel shall stay clear of rotating parts and drill pipe at all times.

Operator's Inspection

- Before beginning drilling operations, the Operator of the boring unit shall perform a documented inspection.

Below Grade Facility Crossings - Mainline Construction

This section applies to open cut, slip-bored, or drilled crossings of below grade facilities/utilities. The term "crossing operation" refers to the operation of boring or drilling the crossing and includes pulling the carrier pipe under/over the existing facility/utility to complete the crossing.

All existing below grade facilities/utilities shall be crossed in accordance with the drawings, all conditions of the crossing agreement(s), and all regulations of the "Authorities Having Jurisdiction".

Preparation - Below Grade Facility/Utility Crossings

Approval of Procedures

- One week prior to the start of any facility/utility crossing installations, the Contractor shall provide written procedures and a completed hazard assessment for installing the new pipeline under/over existing facilities/utilities to Enbridge for approval.
- If, for any reason, the Contractor wishes to deviate from the Enbridge-approved typical installations procedures or the approved crossing drawing, the Contractor shall re-submit a revised procedure and hazard assessment to Project Management.

Prior Notice, Approval, and Inspector's Presence

- The Enbridge Inspector shall be on site at all times during below grade facility/utility crossing operations.

Equipment and Operator Suitability

- Only equipment operators designated by the Contractor, and accepted by Enbridge as being acceptable for this type of work, shall be allowed to excavate within 5 meters of below grade facilities/utilities.
- If in the opinion of the Enbridge Inspector, a designated operator does not demonstrate the ability to excavate below grade facilities/utilities safely, that operator will no longer be allowed to do so and will be removed from the Contractor's list of designated operators.

Clearances - Below Grade Facility/Utility Crossings

Trench Depth

The trench depth necessary to achieve the minimum separation between the existing and new facilities/utilities (0.6 meters, or greater as applicable) shall be maintained as follows:

- If a right-of-way exists, trench depth shall be maintained for the full width of the existing facility/utility right-of-way.
- If a right-of-way does not exist, the trench depth shall be maintained to a minimum of 5 meters on either side of the facility/utility.

Road, Highway, and Railway Crossings

- Where other facilities/utilities (e.g. pipelines, cables, etc.) are located within the bored segment of a road, highway, or railway which will be slip-bored or drilled for the crossing, a slot trench the width of the crossing may be required to verify that sufficient depth is maintained during the boring or drilling operation and to ensure that the minimum separation will be maintained between the existing facilities/utilities and the completed pipeline.

Monitoring Below Grade Facility/Utility Crossings

Diligent monitoring of the slip-bore or drilling techniques during crossing operations is considered critical for ensuring worker safety and the integrity of the existing facility/utility. When conducting slip-bore or drilled crossings, the Contractor shall follow all requirements listed below without exception:

If Start of Bore Greater Than 5 Meters From Facility/Utility

- When boring / drilling under or over a below grade facility/utility, and the start of the bore is greater than 5 meters from the facility/utility, a slot trench the width of the crossing shall be hydro-vaced in front of the facility/utility.

Exposed Holes

- Exposed hole excavation shall be carried out to the satisfaction of the facility/utility Owner.
- All exposed holes shall meet the following requirements:
 - Be centered over the existing facility/utility at the location where it is to be bored or drilled under.
 - Expose the full circumference of the existing facility/utility.
 - Be deep enough to enable confirmation of the minimum separation requirements between the bottom of the existing facility/utility and the new pipe being installed.
 - Be kept clear of sloughed soil and debris.
 - Be unobstructed by equipment during the crossing operation.

Exposure Holes - Crossing Two or More Facilities/Utilities

- When crossing two or more existing facilities/utilities in a single operation, additional exposure holes/slot trenches shall be positioned between crossings (facilities/utilities) adequate to monitor the crossing operation to the satisfaction of the Inspector.

Sight Holes for Horizontal Bores

- When a crossing is conducted by boring or drilling, the location of the boring device shall be confirmed by excavating sight holes between each pipeline.
- A sight hole shall be excavated in front of the boring machine to ensure that the proper depth is achieved prior to boring under the other facilities/utilities.

Monitoring Crossing Operations

- An appropriate survey method shall be used to constantly monitor the direction and elevation of the bore casing or drill stem during crossing operations.

Backfill of Below Grade Facilities/Utilities - All Facilities

Checklist and or Permit Required

The Contractor shall be in possession of a ground disturbance permit and safe work permit prior to any backfilling of an existing below grade facility/utility, in accordance with the conditions of this guide.

Prior Notification of Owners

Unless the Enbridge Inspector receives facility/utility Owner approval for some other course of action, the Contractor shall ensure that the facility/utility Owner(s) have been notified as stated in the crossing agreements prior to backfilling of any existing below grade facilities/utilities, so they may be present for backfilling operations.

Clearances

The Contractor shall take appropriate measures to ensure that facilities/utilities are not damaged during backfilling operations, including but not limited to the following:

- When placing backfill material, mechanical devices (equipment) shall remain a minimum of 0.6 meters from facilities/utilities.
- When compacting; all heavy mechanized equipment shall remain one foot from the pipe.

Purpose of this Infoflip:

This Infoflip has been created to act as a reference guide for ground disturbance work at Enbridge.

It has been divided into two parts:

- 1. Liquids Pipelines/Major Projects (LP/MP) Ground Disturbance Standard**
- 2. Major Projects (MP) Ground Disturbance Guidelines**
 - Additional Major Projects requirements for ground disturbance.

Who should use this?

The Infoflip should be used by Enbridge representatives and contractors during the planning and execution of ground disturbance activities.

What is it for?

The Infoflip has been designed as a field guide to carry on your person, which will let you reference key requirements quickly and effectively.

It can be referenced during the planning of work or when ensuring Enbridge Ground Disturbance criteria is being met in the field.

Remember, Enbridge's ultimate goal is for every worker to return home safely each and every day.

Ground Disturbance Definitions

Ground Disturbance	<p>Any work, operation or activity that results in penetration of the earth (e.g., excavating, digging, trenching, plowing, tunneling, auguring, boring, drilling, backfilling, blasting, cultivation, topsoil stripping/leveling, stumping, peat removal, quarrying, fencing, clearing/grading, hydrovac) with the following exceptions:</p> <ul style="list-style-type: none">• survey staking line locating and marking• disturbance less than 30 cm (12 in.) in depth provided the location and depth of cover for all facilities is known.
Locate Boundary Area	<p>Area in which all Below Grade Facilities shall be Surface Located within the excavation perimeter and extending 30 m (100 ft.) from that perimeter. Constraints may be made on this perimeter and the lessened area shall be marked by multiple white markers identifying all of the corners of the Locate Boundary Area.</p>
Initial Locate	<p>An initial locate is done to determine the location of Below Grade Facilities by One-Call members (owner/operators) inside of the area defined by the One-Call ticket, or the Locate Boundary Area as prescribed by the Ground Disturbance Standard. The Initial Locate satisfies local legislative requirements (Local Regulations).</p>
Excavation Area	<p>The area in which any type of excavation is expected to occur. The perimeter of the Excavation Area is to be demarcated with pink and white striped flagging.</p>

SURVEY COLOR CODES BURIED FACILITIES



Yellow GAS, OIL, STEAM, PETROLEUM OR GASEOUS MATERIALS



Orange COMMUNICATION, ALARM & SIGNAL LINES, FIBRE OPTICS CABLES, CONDUIT, TELEPHONE OR CABLE TV



Blue POTABLE WATER



Purple RECLAIMED WATER, IRRIGATION & SLURRY LINES



Red ELECTRIC POWER LINES, CABLE CONDUIT & LIGHTING & CATHODIC PROTECTION CABLES



Green SANITARY SEWERS, STORM SEWERS & DRAIN LINES



White LOCATE BOUNDARY AREA



Pink RIGHT-OF-WAY LIMIT, TEMPORARY WORKROOM, SLASHING LIMIT & TEMPORARY SURVEY MARKERS

NOTE: The two flagging colour schemes indicated below are unique to Enbridge survey markers.



SAFETY BUFFER ADJACENT TO EXISTING PARALLEL PIPELINE(S)



PROPOSED EXCAVATION AREA, SURVEY MONUMENTS, LEGAL SURVEY PINS, BENCH MARKS, REFERENCE BARS



