



**THERMAL DISTRICT ENERGY SYSTEM
CALGARY**

**GUIDELINES FOR SAFE
CONSTRUCTION IN THE
PROXIMITY
OF THE
THERMAL DISTRIBUTION PIPING
SYSTEM**

PREPARED BY



**Final - Issued for Use
January 27, 2016
Rev. 5**

DOC #: DE-9A-00-EMP-HEH-VD-0008

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SAFETY NOTICE

The ENMAX District Energy Distribution Piping conveys hot water at temperatures that can cause serious skin burns. Under certain conditions the hot water can flash to steam when released to atmosphere.

**District Energy water is NON-POTABLE.
DO NOT CONSUME.**

Read this guideline carefully and treat the piping with due caution.

ALWAYS CALL BEFORE YOU DIG !!

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1 PURPOSE

This document is intended to be a practical working instruction that identifies: planned and emergency procedures, safety precautions, and general guidelines for construction work in the proximity of the ENMAX thermal Distribution Piping System (DPS).

2 INTRODUCTION

ENMAX owns and operates a thermal Distribution Piping System that forms an integral part of their thermal District Energy system. The DPS provides heating to ENMAX's District Energy customers, and in some cases; domestic hot water. The DPS conveys hot water, NOT steam; and is constructed to ASME B31.1 – Power Piping. The system operates at temperatures between 50°C and 117°C and pressures up to 1600 kPag (232 psig).

The DPS is comprised of steel supply and return pipes that are both insulated and HDPE jacketed. The pipes vary in diameter from 350 mm (nominal) for main lines down to 50 mm for branches to buildings. In addition to the hot water distribution pipes, the DPS also includes communication conduits with **fiber-optic** cables to facilitate communication between each customer's building and the central power plant. There may be 1 to 4 conduits (50 mm to 100 mm diameter) common to the trench with the conduits being HDPE or PVC DB2.

Both the supply and return hot water temperatures in the system will vary throughout the year. Summer time will see the system operating temperatures at approximately 65°C supply and 50°C return. Winter time will see the system operating temperatures between 90°C and 117°C supply and between 75°C and 80°C return. The external HDPE jacket will feel warm to the touch.

The pipes are installed in a trench that is backfilled with an engineered fill to maintain a proper envelope of approximately 200 mm around the pipes. This engineered fill provides the proper friction anchorage between the pipe and the ground around it. Typically the piping and engineered fill is surrounded by a geotextile fabric to prevent wash-away of the engineered fill. The communication conduits are laid above or within the geotextile fabric wrap. At certain select locations piping is contained within steel or plastic casing pipe or is encased in non-shrink fill.

If you are planning construction that will disturb the ground around the DPS please **read these guidelines carefully and provide required documentation.**

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2.1 CONTACT INFORMATION

Scheduled Construction Contacts:

Primary Contact: (DE-9 On-call Operator) 403-689-2457
 Alternate Contact: (DE-9 Plant Control Room)..... 403-514-3121

Emergency Contacts:

Primary Contact: After Hours (DE-9 On-call Operator)..... 403-689-2457
 Alternate Contact: (DE-9 Plant Control Room)..... 403-514-3121
 Tertiary Contact (Operations Supervisor) 403-689-7021

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3 GENERAL GUIDELINES

The following are general guidelines for construction in the proximity of the DPS piping.

3.1 Locate Information

Alberta One-Call will process the locate request and dispatch it to ENMAX's contracted locator if the DPS is found within five (5) meters of the proposed construction area.

Refer to Drawing D-001 for paint marking details.

Locates for the DPS pipes will be indicated by **PURPLE** paint lines sprayed at ground level above each pipe to indicate clearly the location of the two (2) heating pipes, below grade. The letters **DE** will also be marked at each pipe chevron, signifying **DISTRICT ENERGY**.

A third **ORANGE** line will also be marked near the two purple lines. The orange paint mark denotes the location of the DPS communication conduits. The communication conduits generally run **central** and **above** the two district heating pipes. In certain instances, for example where the DPS piping takes a sharp bend; the communication conduit locations could be outside the pipe bedding. Refer to Drawing D-002 for a typical trench arrangement showing the conduit orientation.

3.2 Exposure Guidelines

The hand exposure zone extends for **1 m** on either side of the outer most paint lines and **1m** below the pipes. Refer to Drawing D-001. **Note:** Depending on the orientation of the communication conduit at a particular location, the outer most paint line may be purple or orange.

Hand exposure is to be completed by non-destructive means (ex: hydrovac). Use of picks, motorized digging equipment, etc., is not acceptable in the hand exposure zone.

Hydrovac Requirements:

- Wand tip and suction hose end to be covered with Teflon or rubber to prevent damage to the DPS piping and communication conduits.
- Wand to remain in a circular motion at all times when in use.
- Wand tip to remain a minimum of 300 mm from the DPS lines (pipe or conduit)

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- Do not exceed pressures of 10,300 kPag (1,500 psig) or temperature of 38°C (100°F)
- Wand tip to be an agitating spinner assembly or a three-jet tip.

3.3 Parallel Guidelines

As the DPS piping operates at a temperature significantly above ambient temperatures, the pipe itself is continually in a state of compression. Due to this compression the piping has the capacity to shift laterally or vertically if it not restrained by the ground around it.

Drawing D-003 shows the limits of pipe length that can be exposed at a given time. Note that the limits are dependent on the pipe diameter. Should longer lengths of pipe be exposed, the Contractor must work with ENMAX to develop a suitable exposure strategy for bracing the pipes. These limits apply to piping that is operating at a temperature of 117°C. Limits may be relaxed when the piping is operating at a temperature of less than 117°C. ENMAX encourages work that may impact DPS piping be executed during the warmer months in order to facilitate proper compaction of bedding and backfill materials, and/or placement and curing of non-shrink fill; if required.

In all cases when the limits cannot be met, the contractor must contact ENMAX.

3.4 Crossing Guidelines

The width of the trench crossing the DPS must adhere to limits indicated on Drawing D-003. The crossing utility must maintain a minimum of 300 mm vertically (edge to edge) from the DPS pipes or conduits. For further information refer to Section 3.3 above.

In all cases when the limits cannot be met, the Contractor must contact ENMAX.

3.5 Reinstatement Guidelines

In general, the bedding material surrounding the pipes and conduits should be reinstalled and compacted to a **minimum** 95% SPD (Refer to Dwg. D-002). When reinstatement of granular bedding is not possible, a non-shrink fill material meeting the City of Calgary Road Construction Specifications; shall be used. Please refer to Section 4 – Construction Guidelines.

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4 CONSTRUCTION GUIDELINES

4.1 Utility Locate

Those involved in construction that will disturb the ground must contact Alberta One-Call to check if DE facilities are located within the area of the proposed construction. Should DPS piping fall within 5m of the proposed work, Alberta One-Call will notify ENMAX's authorized locator to complete locates for DPS piping. Please note that locate slips issued by the locator are only valid for 14 calendar days, however; they can be extended if the procedures that are in the Best Practices Guidelines on the Alberta One-Call website are adhered to.

4.2 Inspection

Those working near the DPS will also have to make arrangements with ENMAX a minimum of three (3) working days prior to any exposure locating and prior to the start of construction. An ENMAX authorized Inspector will be onsite during construction to assist/direct activities that may affect the DPS.

4.3 During Construction

The ENMAX authorized Inspector shall have free and uninterrupted access to work areas for the purpose of carrying out inspections.

Copies of the following documentation shall be provided to the Inspector:

- Excavation Permit (contact City of Calgary Roads at 403-268-4936).
- Valid locate slip. Locate slip must be kept on site.
- Utility Line Assignment (contact City of Calgary Land Info and Mapping at 403-268-5794), where applicable.
- Bedding and backfill compaction test reports and/or mix design for non-shrink fill, as required.

During excavation, Drawing D-003 should be used as a general guideline for maximum limits of unsupported pipe length and minimum required cover when digging parallel to the pipes. Contact ENMAX if these limits cannot be met. Communication conduits located above the DPS piping should be supported during construction, as required.

All lines and pipe jacketing are to be carefully inspected by the ENMAX authorized Inspector prior to pipe bedding placement and backfilling operations. The cost of inspection will be at ENMAX's expense. Any DPS facilities damaged by the construction work are to be repaired by an ENMAX approved Contractor. All repair

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work to the DPS facility is to be completed to the satisfaction of ENMAX, at the construction Contractor's expense.

All exposed DPS piping and conduits are to be backfilled in accordance with Drawing D-002. The ENMAX authorized Inspector must be notified in advance prior to backfilling. The inspector reserves the right to be present during backfilling operations. The backfill compaction and testing must meet a minimum 95% SPD. Copies of the compaction test results are required by the ENMAX Inspector. Where non-shrink fill is used around the DPS in lieu of granular bedding, a copy of the mix design from the supplier is required. The non-shrink fill must meet the City of Calgary Road Construction Standards.

4.4 Emergency Construction

Emergency construction is work that must occur immediately to remedy damage to utilities in the proximity of the DPS. The following applies for emergency construction.

- Immediately contact Alberta One-Call **and** the ENMAX Emergency contact number **403-689-2457**.
- When contacting ENMAX, clearly state that the work is being performed as the result of an emergency situation.
- The minimum notification of three (3) working days outlined in Section 4.2 does not apply to emergency work. ENMAX will co-ordinate efforts with the Contractor to expedite DPS locates and inspection requirements, as needed.

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5 EMERGENCY RESPONSE PROCEDURE

An emergency situation is one in which the DPS steel pressure piping (that is under the insulation) has been punctured. In this case, the hot water will escape the pipe with significant pressure. Depending on the operating temperature at the time of puncture, the hot water may flash to steam. Even if the water does not flash to steam, it will still have the ability to cause serious skin burns.

Emergency Procedures:

- **STOP WORK** and clear all people from the vicinity of the hot water leak.
- **Immediately phone** the ENMAX Emergency number **403-689-2457** and report the location of the rupture.
- Keep workers and the travelling public a safe distance from the leak until ENMAX arrives on site.

Non-Emergency Conditions:

A non-emergency condition includes, but is not limited to, the following:

- Damage to the HDPE outer pipe casing that exposes underlying insulation;
- Damage to the communication conduit and fiber optic cable; and
- Damage to a valve chamber (no visible leaking).
- Any other minor damage to the DPS not mentioned above.

In the event of a non-emergency event immediately contact ENMAX DE-9 Plant Control Room at **403-514-3121**.

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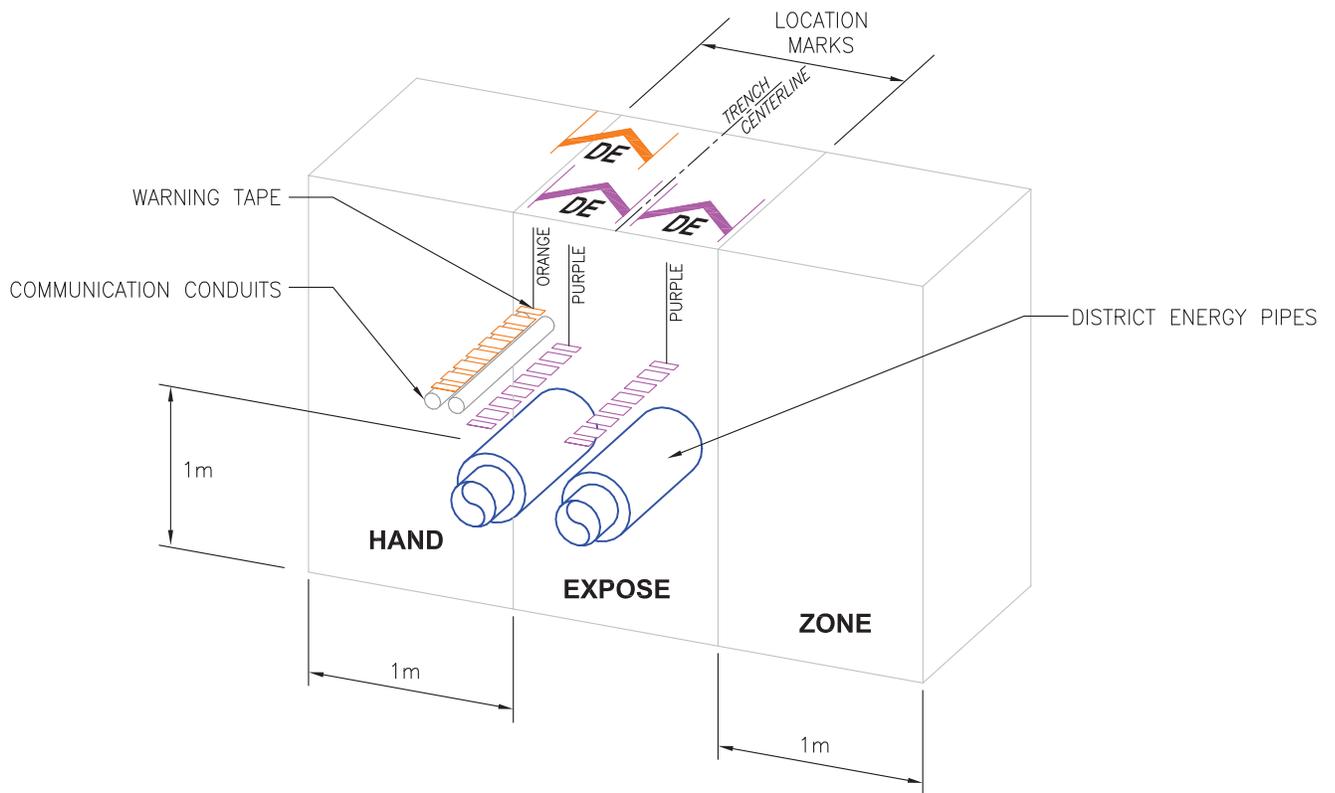
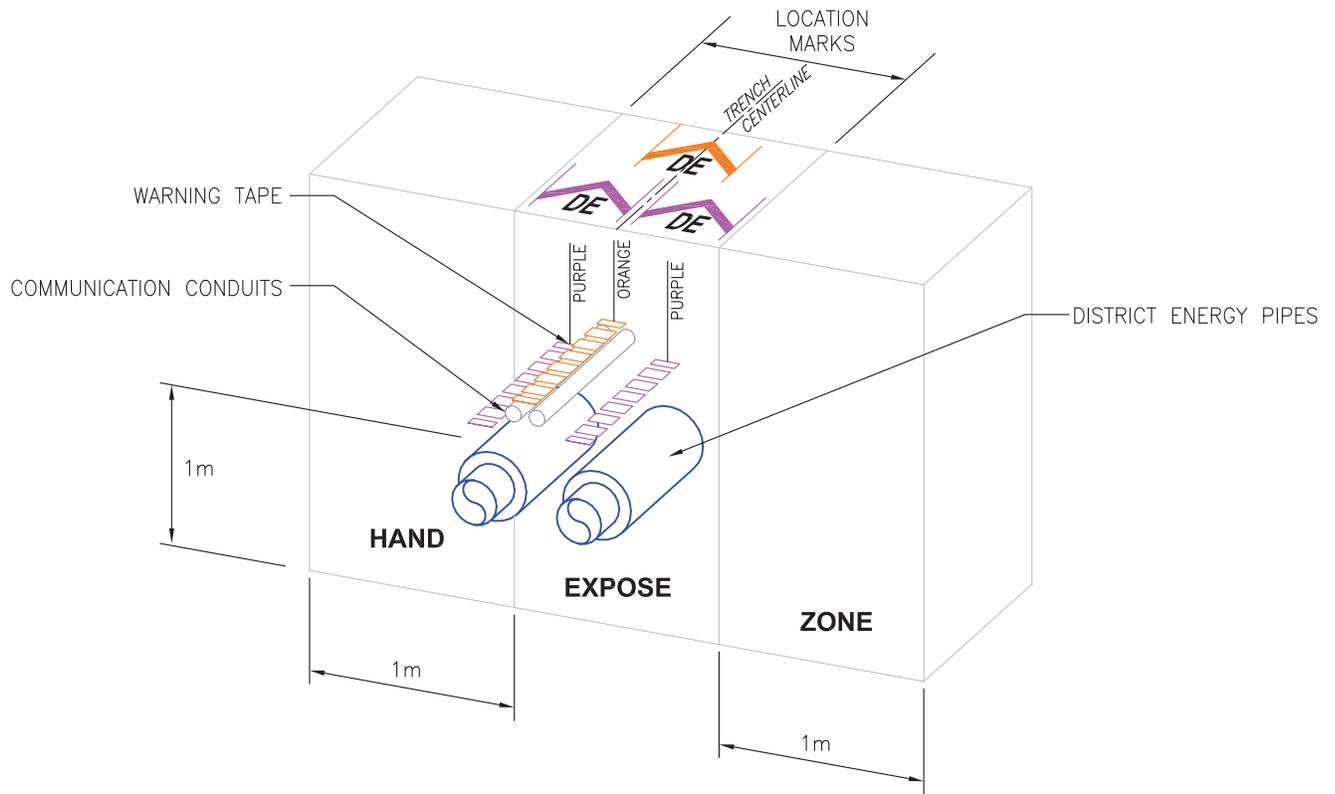
6 *DPS DETAIL DRAWINGS*

Attached Detail Drawings:

- D-001 – Utility Marking & Hand Expose Zone
(DE-9A-00-EMP-HEH-SD-0001-001)
- D-002 – Trench Cross Section Typical Detail
(DE-9A-00-EMP-HEH-SD-0001-002)
- D-003 – Parallel Excavation Guideline Detail
(DE-9A-00-EMP-HEH-SD-0001-003)
- D-004 – Trench Reinstatement & Crossing Detail
(DE-9A-00-EMP-HEH-SD-0001-004)

END

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SHEET TITLE:

**UTILITY MARKING &
HAND EXPOSE ZONE**

ENMAX DOCUMENT NUMBER:
DE-9A-00-EMP-HEH-SD-0001-001

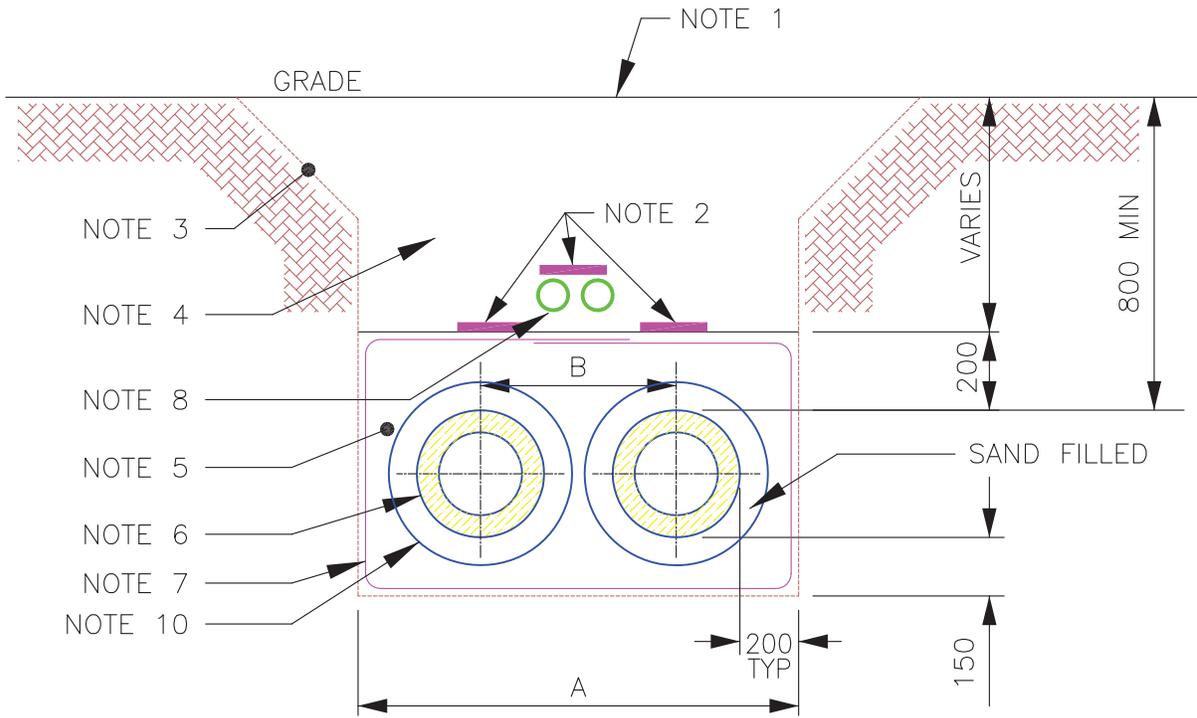
SCALE: NTS

DATE: 2013/05/16

SHT NO.: **D-001**

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TRENCH NOTES:

1. -ALL RE-INSTATEMENT TO MEET SPECIFICATION OR LOCAL AUTHORITY REQUIREMENTS.
-RE-INSTATE GRADE TO MATCH EXISTING CONDITIONS.
-ASPHALTIC CONCRETE SURFACES PROVIDE STRAIGHT SAW CUT EDGE, 300mm MIN. OUTSIDE EXCAVATED AREA.
2. WARNING TAPE ABOVE ALL PIPE AND CONDUIT, AS PER ON PLAN PROFILE.
3. TRENCH SIDE SLOPES TO LOCAL OR PROVINCIAL REGULATORY AGENCY.
4. APPROVED SELECTED BACKFILL MATERIAL FROM EXCAVATION OR OTHER SOURCES.
5. PIPING BEDDING:
 - 5.1. APPROVED BEDDING AND SURROUND COMPACTED TO 95% SPD.
 - 5.2. NON SHRINK FILL USED AS BEDDING AT SOME LOCATIONS.
 - 5.3. CONTACT ENMAX TO DETERMINE BACKFILL METHOD FOR TRENCH REINSTATEMENT.
6. PRE-INSULATED DISTRICT HEATING PIPES.
7. GEOTEXTILE WRAPPED AROUND SAND BEDDING.
8. COMMUNICATION CONDUITS (MIN. 600 BELOW GRADE) WITH WARNING TAPE, INSTALLED OUTSIDE OF GEOTEXTILE WRAP.
9. ALL TRENCH DIMENSIONS ARE RECOMMENDED MINIMUMS. AS-BUILT CONDITIONS MAY VARY.
10. SOME DISTRICT HEATING PIPES MAY BE LOCATED INSIDE HDPE OR STEEL CASING PIPES.

**TYPICAL TRENCH DIMENSIONS
(RECOMMENDED MINIMUMS)**

PIPE SIZE	NPS(mm)	A(mm)	B(mm)
48.3/110	40 ϕ	800	300
60.3/125	50 ϕ	825	325
76.1/140	65 ϕ	850	325
88.9/160	80 ϕ	900	350
114.3/200	100 ϕ	975	400
139.7/225	125 ϕ	1025	425
168.3/250	150 ϕ	1075	450
219.1/315	200 ϕ	1200	500
273/400	250 ϕ	1375	600
323.9/450	300 ϕ	1475	650
355.6/500	350 ϕ	1600	700

NOTE:

114.3/200 - REFERS TO: OD OF PIPE / OD OF INSULATION JACKET



SHEET TITLE:

**TRENCH CROSS-SECTION
TYPICAL DETAIL**

ENMAX DOCUMENT NUMBER:

DE-9A-00-EMP-HEH-SD-0001-002

SCALE: NTS

DATE: 2013/05/16

SHT
NO.:

D-002

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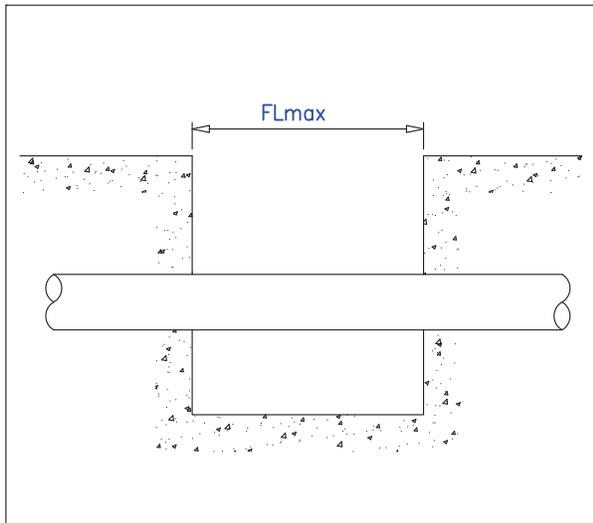
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DISTRICT HEATING PIPES INSTALLED IN THE GROUND ARE SUBJECTED TO CONSIDERABLE AXIAL STRESSES.

WHEN A PIPE IS DUG OUT OR IF THE SOIL IS REMOVED FROM ONE SIDE OF THE PIPE IT MAY BEND. TO AVOID THIS THE BELOW RULES HAVE TO BE OBSERVED:

1. WHEN CROSSING PIPES:

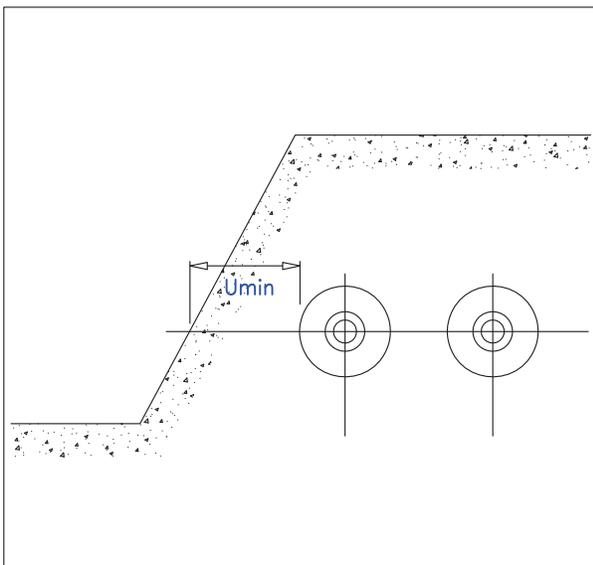
THE ALLOWABLE LENGTH OF UNCOVERING A LIVE PIPE IS FL_{max} .



STEEL PIPE DIA.	JACKET OD	FL_{max}	U_{min}
[mm]	[mm]	[m]	[m]
50	125	1.3	0.4
65	140	1.6	0.5
80	160	1.9	0.5
100	200	2.4	0.6
125	225	3.0	0.6
150	250	3.6	0.8
200	315	4.7	0.8
250	400	5.9	1.0
300	450	7.0	1.1
350	500	7.7	1.1

2. DIGGING PARALLEL TO THE PIPES:

IF IT IS NECESSARY TO DIG OUT PARALLEL TO THE DISTRICT ENERGY PIPES THE DISTANCE TO THE PIPES MUST BE MINIMUM U_{min} .



THERMAL DISTRIBUTION SYSTEM

SHEET TITLE:

**EXCAVATION
GUIDELINE DETAIL**

ENMAX DOCUMENT NUMBER:
DE-9A-00-EMP-HEH-SD-0001-003

SCALE: NTS

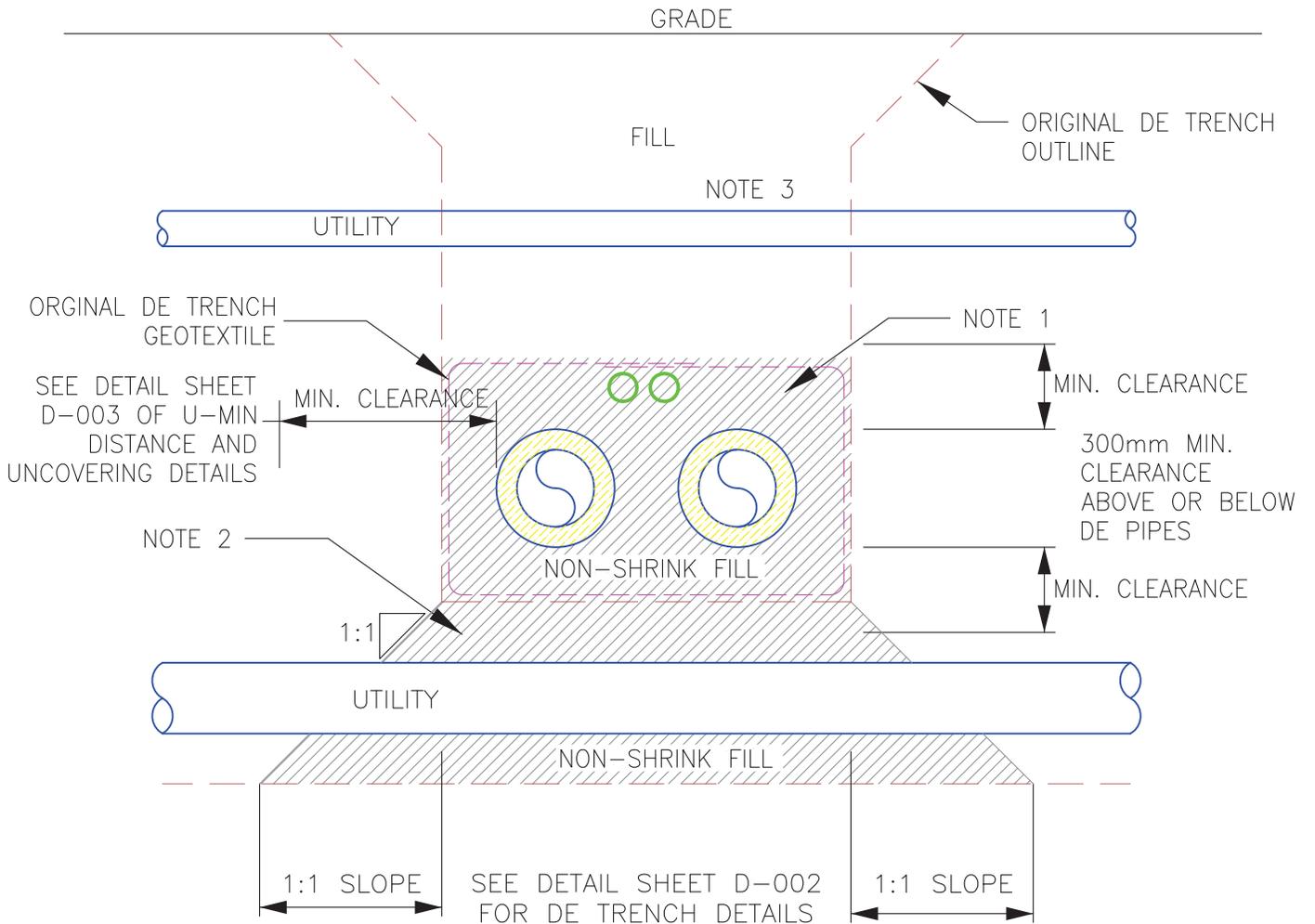
DATE: 2013/05/16

SHT NO.:

D-003

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NOTES:

1. PIPE BEDDING AREA, IF DISTURBED FILL WITH NON-SHRINK FILL.
2. BELOW DE TRENCH NON-SHRINK FILL TO BE EXTENDED DOWN AT 1:1 SLOPE WIDER THAN ORIGINAL TRENCH DOWN TO UNDISTURBED SOIL.
3. ABOVE DE TRENCH REGULAR FILL CAN BE USED.
4. NON-SHRINK FILL AS PER CITY OF CALGARY STANDARDS.
5. SUPPORT & PROTECT DE PIPING AND CONDUITS.



THERMAL DISTRIBUTION SYSTEM

SHEET TITLE:

**TRENCH REINSTATEMENT
& CROSSING DETAIL**

ENMAX DOCUMENT NUMBER:

DE-9A-00-EMP-HEH-SD-0001-004

SCALE: NTS

DATE: 2013/05/16

SHT
NO.:

D-004

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