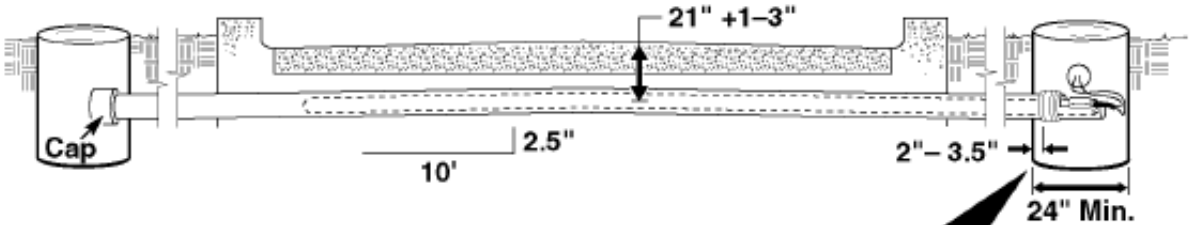
Global Traffic Technologies

Technical Bulletin July 2008

Canoga™ Traffic Sensing System: Directional Boring for Installing Conduit for 702 Non-invasive Traffic Sensors

Introduction

Using Canoga™ 702 Non-Invasive Traffic Sensors requires installation of 3 inch non-magnetic conduit, typically SDR 11 HDPE or Schedule 80 PVC, with the bottom of the conduit at a nominal dimension of 21 inches (53 centimeters) below the pavement surface.



This conduit is frequently installed under existing pavements – concrete, asphalt, gravel, dirt – using directional boring. This application note presents information based on field experience in installing this conduit using directional boring.

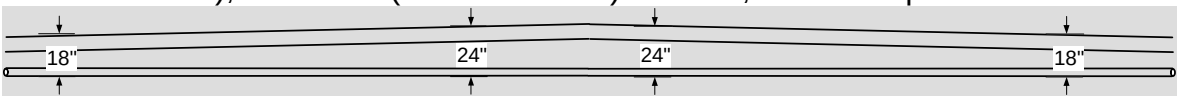
IMPORTANT: *The directional boring contractor is responsible for the boring and conduit installation results. In preparation for the directional boring project, GTT recommends that the boring contractor determine the composition of the roadbed through which the bore must be made (including all utilities and other underground structures at the boring site), determine the traffic control requirements during the boring process and then consult with the boring equipment manufacturer for recommendations on exactly what equipment will best meet the needs of the boring task.*

702 System Requirements:

1. **Conduit type (non-magnetic):** Schedule 80 PVC (polyvinyl chloride) or SDR 11 HDPE (high density polyethylene) HDPE conduit must not have any welds that reduce the interior diameter.

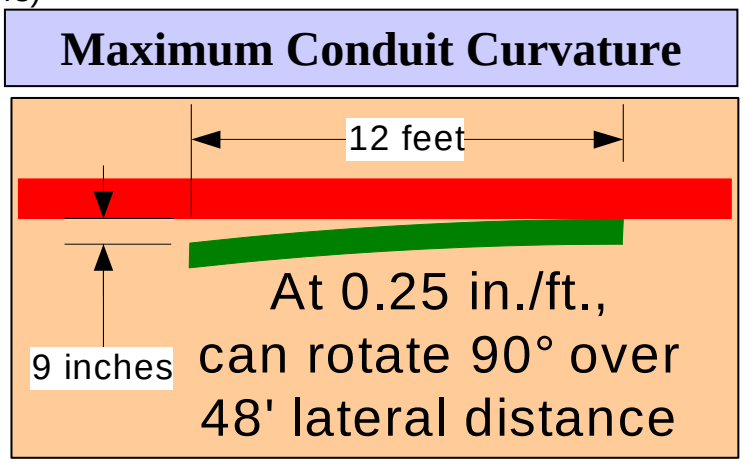
Typical Conduit Specifications											
Type	Size	OD		ID		Minimum Wall		Length		Weight	
		in.	mm.	in.	mm.	in.	mm.	ft.	m.	lb./ft.	kg./m.
Schedule 80 PVC	3 in. 80 mm	3.500	88.9	2.864	73.66	0.300	7.62	10 20	3.05 6.10	2.1	3.125
SDR 11 HDPE	3 in. 80 mm	3.500	88.9	2.826	71.78	0.318	8.08	1650	500	1.398	2.08

2. **Conduit depth:** conduit bottom at 18 inches (46 centimeters) to 24 inches (61 centimeters), 21 inches (53 centimeters) nominal, below the pavement surface

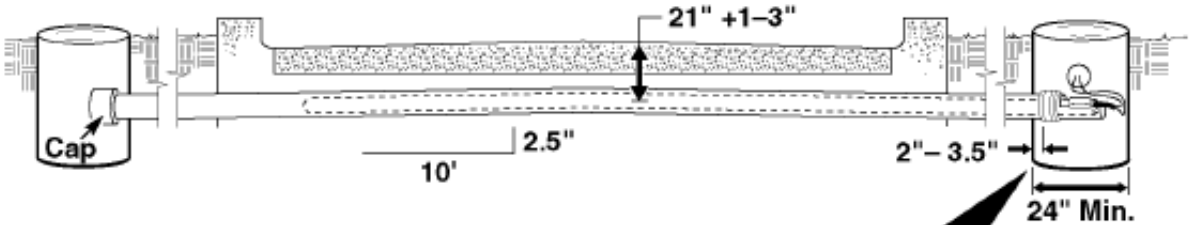


If it is not practical to install the conduit at the recommended depth, experience indicates that installation at shallower depths typically provides better overall results than installation at deeper depths, e.g. 12 inches (30.5 centimeters) is better than 30 inches (76.2 centimeters). <u>When speed is being measured, it is important that the upstream (lead) and downstream (lag) conduits be at the same depth (a depth variance of less than 6 inches/15 centimeters).</u>

3. **Conduit curvature:** must be less than 0.25 inches (0.64 centimeter) per foot (30.5 centimeters)



4. **Conduit slope:** slight slope to drain is desired



5. **Insertion access box:** must have an interior space of at least 24 inches (61 centimeters) in the direction of the conduit axis.
6. **Far end box:** leave accessible for future service simplification. Slide on cap (furnished with 702 Installation Kit) with drain (weep) hole down.
7. **Greater than 300 feet from high current power lines:** System setup is much easier when sensors are more than 300 feet from power lines.
8. **Sensor position in conduit is spaced from steel structures further than ½ the steel structure height:** Steel structures near sensors can create unacceptable ambient magnetic field and/or can rob changes in magnetic field from the sensor.
9. **Very few vehicles change lanes at conduit location:** System accuracy is reduced as the number of vehicles changing lanes at the sensors increases.

Equipment to Consider:

1. **Boring machine:** Medium HDD (medium horizontal directional drilling) boring machine
   Vermeer 24X40 Series II or equivalent
   Ditch Witch JT2720 All Terrain or equivalent

2. **Drill Head:** assortment of bits or a bit capable of drilling in hard pack, cobble and soft/medium rock
   Vermeer TriHawk® V drill head with TriHawk® sonde housing on SplineLok® II starter rod or, for harder rock situations, the RS6 assembly with Soft/Medium Formation Bit or Hard Formation Bit on SplineLok® II starter rod
   Ditch Witch: Mill Tooth Tri-cone Bit (Steep Taper Tuff Bit may be used in less severe situations)

3. **Locating Electronics:** must be capable of guiding head across road without walking onto road
   Vermeer DCI DigiTrak® Eclipse® Remote System with Datalog plus EDF Dual Frequency Transmitter
   Ditch Witch: DCI DigiTrak® Eclipse® Remote System with Datalog plus EDF Dual Frequency Transmitter

4. **Reamer:** assortment of reamers for hard pack, cobble and soft/medium rock
   Vermeer 6” Fluted Shark Reamer with 24K Swivel or other reamer (if any) as appropriate
   Ditch Witch: 8” Kodiak Cobble Backreamer or other reamer (if any) as appropriate

Boring Process Items to Consider:

1. **Directional boring machine position:** Position the machine, via digging or blocking, so that the drill pipe enters the soil parallel with the road surface and at 16” (40.6 cm) to 18” (45.7 cm) [bottom of bore at 18” (45.7 cm) to 20” (50.8 cm)] below the road surface. Having the drill pipe enter parallel with the road surface tends to greatly simplify the process of controlling the bore depth and direction.
2. **BORE SLOWLY:** The material being bored through is, as a general rule, already very highly compacted. To prevent raising the pavement surface, particularly asphalt pavement, the material in the bore hole must be flushed out the bore, not compacted into the surrounding roadbed material.
3. **Control water (mud) pressure:** Mud pressure can raise the pavement surface as well as super compacted soil. Exercise control over the mud pressure.
4. **Use viscosifer solution:** This will help remove boring sediment, help stabilize the bore, and help lubricate the bore.
5. **Under difficult boring conditions:** When the pavement has a concrete base, many bores have been successfully done by using a dirt head and “bouncing” the drill head along the bottom of the pavement.
6. **Document the Bore:** Record a bore log that contains at least the following information and provide it to the customer.
   a. Depth of bore at center of each traffic lane
   b. Distance between bores at center of each lane
   c. Width of each lane
   d. GPS (Global Positioning System) coordinates of each sensor insertion access box.

Additional Information Resources:

1. **Directional Boring Contractor Certification Course -** Contact GTT Technical Service at the phone number listed on the last page of this document.
2. **Installation Instructions Canoga™ Vehicle Detection System Model 702 Non-invasive Microloop -** literature number 75-0500-2206-2 (available on-line)
3. **Installation Instructions and Operations Manual Traffic Sensing System II Traffic Monitoring Card Model 942/944/942E/944E** - literature number 75-0301-2817-9 (available on-line)

Technical Support

If you have questions or comments concerning this Technical Bulletin, please call the GTT Technical Service department at: 1-800-258-4610.

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