



# Application Note AN-4

## AURATEK for Surface and Buried Applications

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### Introduction

**ENCLOSURE** is an outdoor intrusion detection sensor which offers tremendous flexibility in its applications. Its flexibility enables it to be utilized for both surface and buried requirements. The environments that surface and buried sensors face can be quite varied, however, they must still operate with a high level of performance.

### Installation for Surface Applications

**Movement** - The sensor cable should be tied down so that there is minimal movement of the cable from the wind. Movement of the cable should be restricted to  $\pm 5$  cm ( $\pm 2$  inches) to minimize the chance of nuisance alarms. The cable can be tied down with plastic tent pegs or weighted down with any non-metallic material (e.g. stones, wood, bricks, sand bags).

**Traffic** - The detection cable should not be placed in high traffic areas for surface applications. Vehicles, driving over the sensor cable can damage it, especially if run over in gravel areas.

**Standing Water** - Like all applications of **ENCLOSURE** standing water is not a problem. If the sensor cable is covered by standing water and there are ripples of 2 cm (1 inch), the ripples can cause a reduction in the probability of detection.

**Running Water** - As described in the rapid deployment Application Note #5, **ENCLOSURE** can cross running water on non-metallic conduit right above the water. For surface running water, the sensor cable should cross the water at a minimum distance of 30 cm (1 foot) above it. This can be accomplished by suspending the cable above the water or by putting it on a log that runs across the running water. The sensor cable should be kept a minimum distance of 1.0 m (3.3 feet) if it runs parallel to the running water.

**Non-moving Metal Objects** - The sensor cable should be installed at a minimum distance from the object equal to one half the height of the object.

**Moving Metal Objects** - The sensor cable should be installed at a minimum distance of four times the height of the moving metal object.

**Metal Fence** - The sensor should be installed at a minimum distance equal to one half the height of the fence.

**Trees** - Individual trees do not present a problem for **ENCLOSURE**. In wooded areas, if the trees are wet from rain and are blowing in the wind, there may be a reduction in the probability of detection.

## Installation for Buried Applications

### a) Buried in Concrete

**Depth** - The burial depth is 2.5 cm (1 inch), just enough to cover the sensor cable.

**Width** - The groove cut in the concrete should be a little wider than the sensor cable. The groove should be approximately 2 cm (3/4") wide.

**Fill** - Any concrete crack filler can be used to cover the cable.

**Rebar** - Having rebar in the concrete does not represent a major problem because the sensor cable receives its signals from the air. However Auratek does recommend the use of fiber reinforcements in concrete that the ENCLOSURE cable will be in to reduce any possible detection problems.

### b) Buried in Asphalt

**Depth** - The burial depth is approximately 2.5 cm (1 inch), just enough to cover the sensor cable.

**Width** - The groove cut in the asphalt should be a little wider than the sensor cable, approximately 2 cm (3/4 inch) wide.

**Fill** - Any asphalt crack filler can be used to fill in the slot and seal it.

### c) Buried in Gravel

When the sensor cable is buried in gravel, the main consideration which dictates how the cable is buried is whether vehicles pass over the cable or not.

### d) Vehicles Passing Over Sensor Cables

**Conduit** - The sensor cable should be buried in any non-metallic conduit to protect it from stone damage.

Also, the conduit should have holes in it to allow drainage.

**Burial Depth** - If light vehicles pass over the sensor cable buried in conduit, the burial depth can be just under the surface approximately 2 cm (3/4 inch). If heavy vehicles pass over the sensor cable buried in conduit, the burial depth should be 10 cm (4 inches). Also, the groove should be back filled with sand before it is covered with gravel. Note that lead-in cable could be run inside metallic conduit.

### e) Buried in Soil

**Depth** - The factor which dictates the burial depth of the cable in soil is the moisture content of the soil. If the sensor cable is buried in soil with large moisture content such as clay, then a shallow burial depth should be used. If on the other hand the soil is dry sand, the burial depth is not important because sand is like air to the sensor cable, hence it has no effect on performance.

**Saline Content** - If the soil has a high saline content such as beach sand by an ocean, no special burial depth is required. The saline content will not affect the detection performance of the ENCLOSURE sensor as it does with other buried active sensors.

**Iron Content** - No special burial depth is required for the sensor cable due to an iron content in the soil. ENCLOSURE receives its signal from the air, therefore, the iron content does not affect the detection capability of the system as it does with other active buried sensors.

**Rodents** - The cables are all commercially available for a wide range of applications and can be supplied with different coatings including some designed to resist rodents. In addition, voltage is applied across the cable which will deter rodents from permanently damaging the cable. However, as a further precaution, the sensor cable can be buried in a non metallic conduit, and the lead-in cable in a metallic or non-metallic conduit.

## Interconnections

### a) Processor Unit

The Processor Unit is supplied in a NEMA-4 weatherproof box.

### b) Lead-in Cables

- **For surface applications**, the lead-in cables can also be run on the surface.
- **For buried applications**, the lead-in cable can be run on the surface initially and then buried. The buried portion should start approximately 3.0 m (10 feet) before the buried sensor cable begins.

### c) Antenna

**Passive mode** - The (reference) antenna should be mounted within the walled perimeter, on the highest point (e.g. on adjacent buildings), and it should be located within the protected perimeter. An existing antenna mast can be shared to host the reference antenna if it already exists.

**Active mode** - The (transmitting/reference) antenna must have line of sight with the sensor cables. If the antenna is transmitting to the sensor cables, it should be located in the middle of the zone. If the sensor cable is transmitting to the antenna, the antenna should be located at  $\frac{3}{4}$  the length of the zone. In either case, a minimum setback distance of 15 m (50 ft) from the sensor cable is required. The minimum height of the antenna should be 5.0 m (17 ft).

### d) Wireless Alarm Annunciator

An optional spread spectrum wireless alarm annunciator can be supplied. With an operating range of 2.0 Km (1.2 miles), it is especially useful in rapid deployment portable applications.

## Conclusion

Unlike many of the other outdoor perimeter detection sensors that must operate on either the surface or buried but cannot operate in both applications, ENCLOSURE operates with a high level of performance in both applications. Its tremendous flexibility makes it an ideal sensor for these applications.

**For Fenced Compound Applications**, please consult Application Note #3.

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