

HWM Applications Note – GSM Antenna Selection and Installation

Introduction

Signal strength within the cellular network can vary dramatically even within the same cell; proximity to the transceiver, type of antenna, position and angular orientation of the antenna, all have a significant effect on the ability of a device to reliably communicate with the cellular network. To ensure reliable GSM/GPRS data communications it is essential that the most suitable antenna is selected and it is mounted in the most appropriate location.

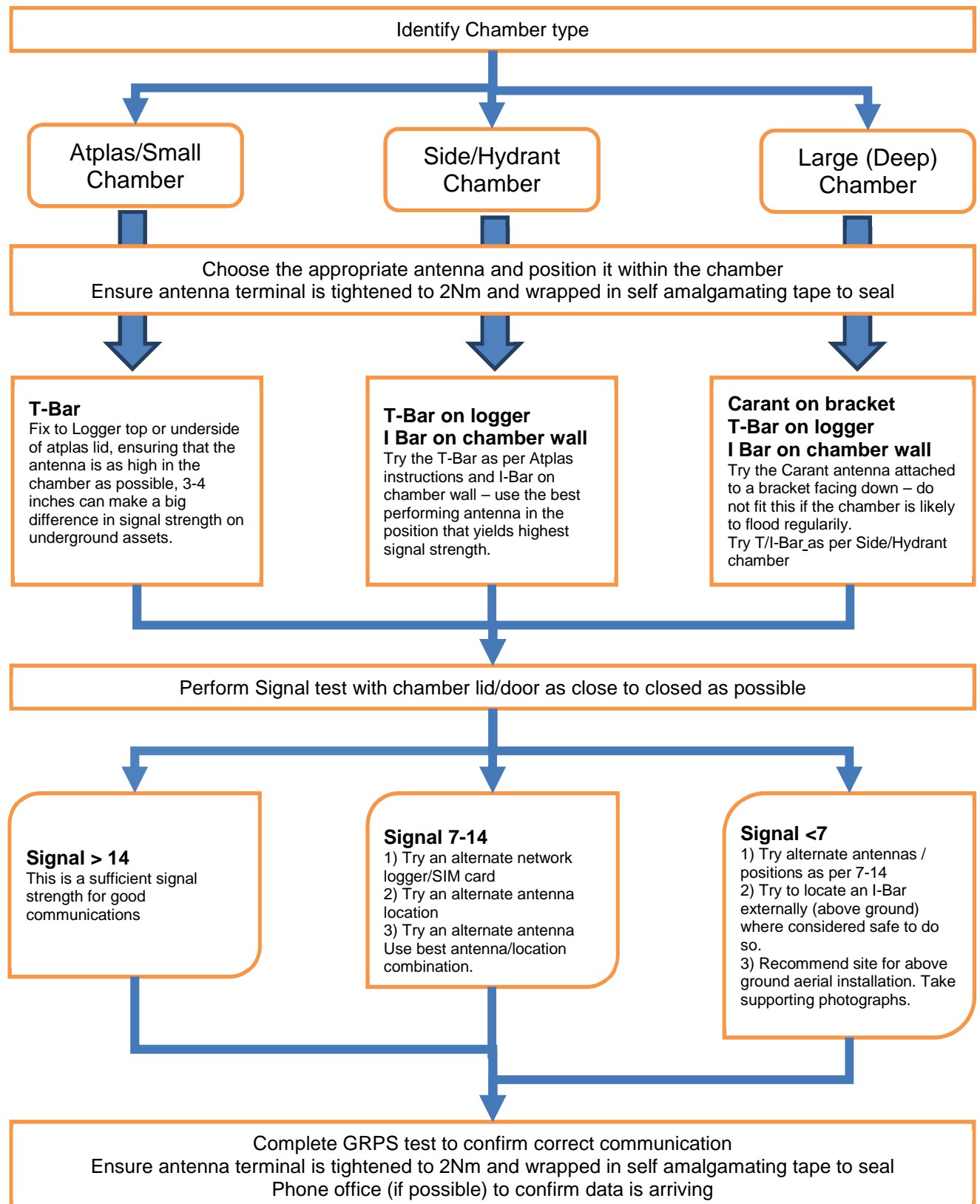
Installing a device without considering the type of antenna and its installation constraints can lead to disrupted and unreliable data communications and accelerated battery consumption. The following gives practical advice on how to minimise potential problems.

General Considerations

- Always perform multiple signal strength tests moving the antenna to different positions (please see below for description of signal strength test results).
- When performing Signal Strength Tests ensure that the chamber lid/cabinet door is in as close to normally closed position as possible to ensure an accurate result.
- Use the Radwin Network Test function to establish the service provider with the strongest signal at the particular location.
- Consider changing service providers when reviewing the results from the Network Test.
- Deploy the antenna as close to the surface as practically possible, especially when installing in a large chamber.
- If the device is installed in an underground chamber consider, where possible, locating the antenna in a secure position outside the chamber.
- Ensure that the antenna connector is in good condition and correctly tightened (finger-tight is not sufficient for the type of connectors used). Adequate tightening of the connector (2Nm) reduces the risk of water ingress and thereby signal attenuation as a result of changes in impedance.
- Never attempt to modify the dielectric seal of the antenna connector, it is designed to keep moisture away from conducting parts which lead to corrosion and attenuation.
- Consider using secondary environmental protection for the antenna connector such as self-amalgamating tape.
- If a logger is installed in a chamber that is likely to flood (e.g. an Atlantic Plastics chamber), position the logger upside-down in the chamber to avoid unnecessarily submerging the antenna connector.
- Use the shortest possible antenna lead.
- Where long transmission leads are required, consider using a low-loss alternative to corrugated copper cables, e.g. Times Microwave white braided coaxial cable.
- The signal emitted from any antenna submerged under water will be significantly attenuated; place the antenna in a location where it will not become submerged.
- Always ensure that the latest firmware is installed in the device.

HWM Applications Note – GSM Antenna Selection and Installation

Installation Process Decision Tree



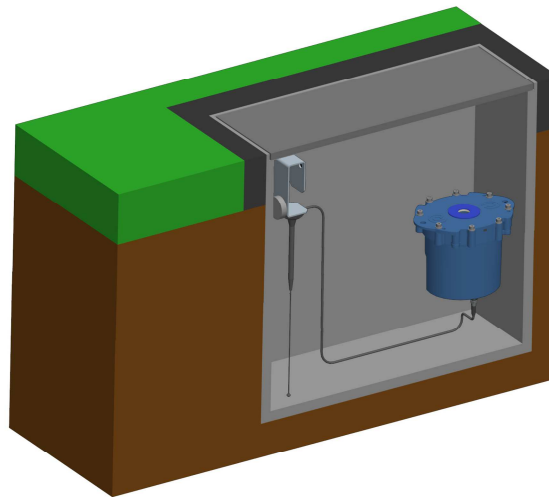
HWM Applications Note – GSM Antenna Selection and Installation

Cellular Network Signal Strength (measured by Radwin)

- 0-7 Insufficient, the device may be able to register with network but will not be able to send or receive data.
- 7-14 Marginal, depending upon the ambient conditions data transmission may be possible, important to select the correct antenna and install it in the most suitable location.
- 14-21 Adequate, Data transmission should be reliable.
- 21+ Ideal, Strong signal strength data transmission will be reliable.

Antenna Options

Carant – For most installations the Carant antenna will give the best performance.



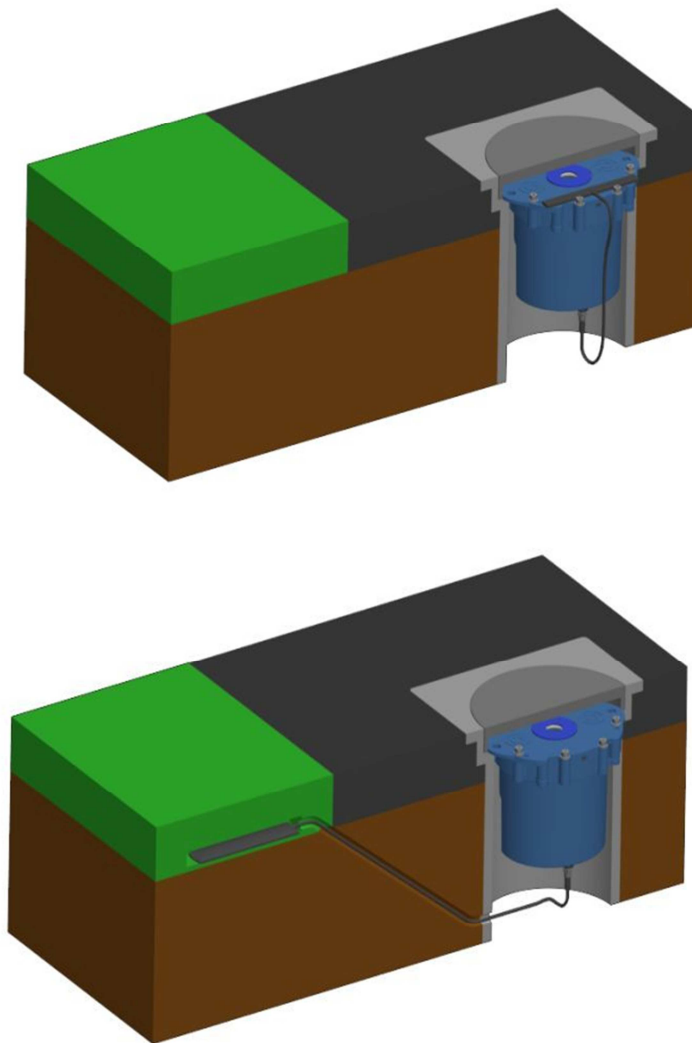
Carant Installations Considerations

For optimum performance the antenna requires a metal grounding plane, consider installing a metal bracket made of a ferrous material to attach the magnetic base of the antenna.

- Install the antenna near to as close to the surface in large underground chambers, ensuring that the lid will not interfere with the antenna when being opened/closed.
- This antenna is vertically polarised, it should always be installed in the vertical orientation.
- Never bend the radiating element of the antenna
- The Carant can also be attached to an installation bracket mounted to an existing marker post

HWM Applications Note – GSM Antenna Selection and Installation

T-Bar – This antenna is ideal for installing on top of the device especially in locations with restricted space.

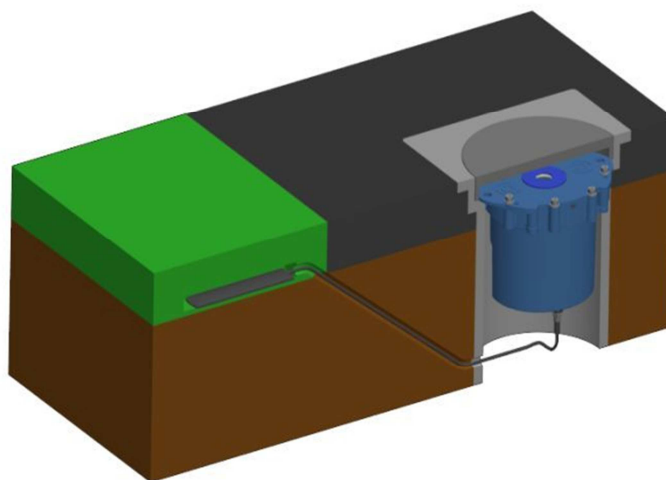
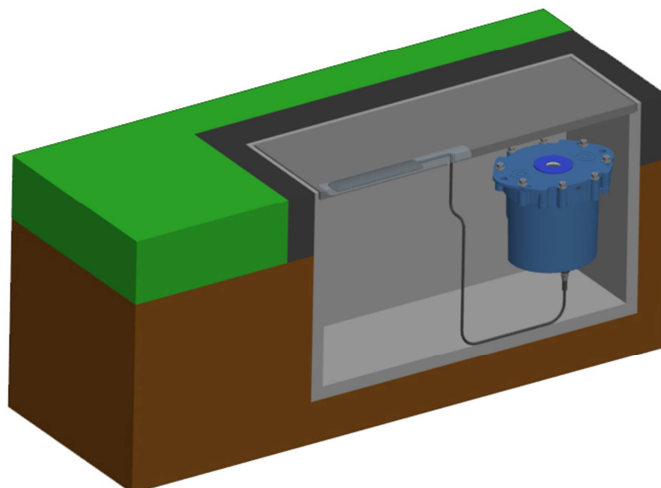
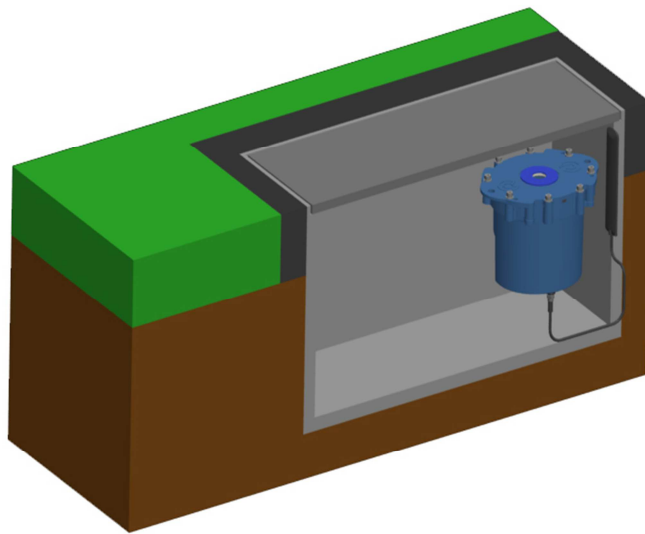


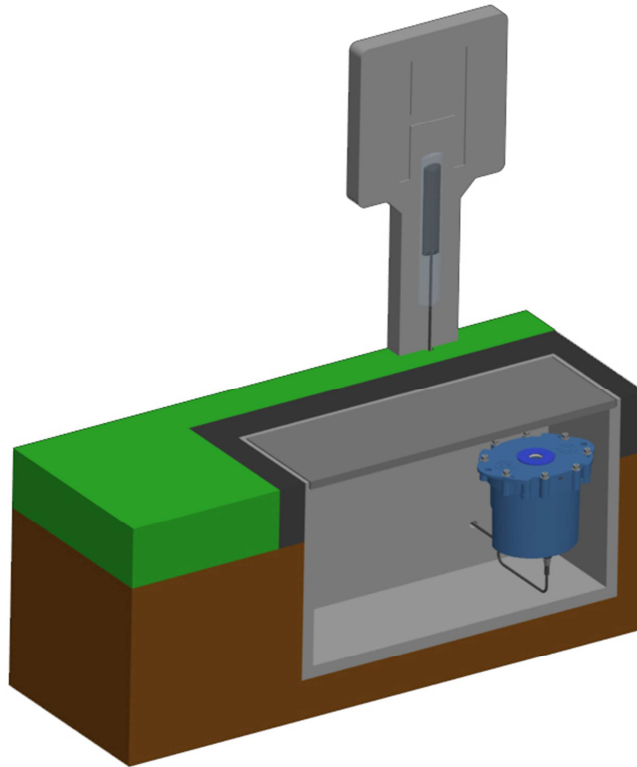
T-Bar Installations Considerations

- If burying the antenna, ensure it is not deep
- Adhere the antenna to external structures using marine quality adhesive (such as the brand 'Goop').
- Keep the antenna cable as short as possible, 0.5m.
- Avoid attaching the T-Bar to a metallic surface as this can adversely affect signal strength and performance, however it may be better than underground

HWM Applications Note – GSM Antenna Selection and Installation

I-Bar – The physical construction of this antenna makes it ideal for attaching to structures external to subsurface chambers.





I-Bar Installations Considerations

- Antenna can be attached to the side wall of a small chamber or to the top side of the chamber lid.
- With the use of a longer cable version (or an extension cable where absolutely necessary) and a sealing compound, this antenna can also be fitted in the ground, on marker posts, in cracks or brickwork near by to the chamber.
- If the antenna is to be placed outside the chamber care must be taken to physically protect both the antenna and cable from damage. This can be done by burying the cable or installing a suitable conduit.
- Avoid attaching the T-Bar to a metallic surface as this adversely affects signal performance

Conclusion

Selecting the most appropriate antenna, installing it correctly and finding the best location possible for it will provide reliable communications.

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Additional Information

HWM Parts list:-

AER8015	T-Bar 0.5m
AER8020	I-Bar 1.0m
AER8025	I-Bar 3.0m
AER6000	Carant High Gain Antenna 2.5m
AER6001	Carant High Gain Antenna 5.0m
AER6003	Carant High Gain Antenna 8.0m
AER6002	Carant High Gain Antenna 10.0m
CABA8510	FME Aerial Extension 10.0m
CABA8510-1	FME Aerial Extension 8.0m
CABA8510-2	FME Aerial Extension 5.0m
CABA8510-3	FME Aerial Extension 2.0m