

This information sheet provides details about Private Business Radio (PBR). A business radio system is used to pass messages between a base station and mobile sets and mobile to mobile as an aid to conducting business. The different Business Radio licences allow the licensee to operate different types of systems in accordance with licence conditions and Wireless Telegraphy legislation.

Business Radio Communication for Tower Cranes

OfW77 (previously Radiocommunications Agency information sheet RA 195)

1. Introduction

Tower cranes often use Private Business Radio (PBR) as a signalling method to ensure safe operation. This leaflet provides advice on the use of PBR in this situation.

To install and operate PBR in this environment, special requirements must be observed. Unless it is carefully engineered, any radio system mounted high on a structure is likely to receive and cause interference over a wide radius. Since only a limited number of PBR channels are available, a crane will probably share a spectrum frequency with other users in the same area, and maybe even on the same construction site. Therefore it is vital to engineer a 'clear' channel.

A number of approved techniques have been developed to provide clear channels. If these techniques are not adopted, safety of life may be put at risk both on the construction site and elsewhere.

2. The problem

When a radio is used at ground level, surrounding buildings and ground clutter soak up some of the signals, reducing the distance over which the signals can be received. A radio located high up on a crane can transmit into free space and will be receivable many miles away.

This may not seem a major problem, since most of the talking is done by the banksman; the crane driver is mainly listening. However, the banksman may not be at ground level either, so may transmit over as large a range as the crane driver.

Communication between the banksman and the controller poses different propagation problems as construction progresses. On the construction site, the building itself may obstruct radio communication, so it may not be possible to reduce the output power. (Besides, reducing output power often does little to contain transmissions into free space, although it does prevent communication into parts of the building such as lift shafts.)

As the building goes up, the banksman is increasingly likely to transmit from a raised position, but the building may still block his transmissions in a particular direction. The crane is likely to be above the construction and able to transmit freely in all directions throughout the work. The area where it will be hardest to penetrate is the opposite side of the building, if operations in that area are necessary.

3. More robust radio techniques

a) Signalling systems

The Continuous Tone Controlled Signalling System (CTCSS) or other forms of signalling can reduce the effects of channel sharing, but will not solve the problem. A crane receives signals from a large catchment area, so the use of signalling will only reduce the number of transmissions that the crane driver has to listen to, but will not reduce the interference caused to other users.

b) Special techniques

Several engineering techniques can alleviate the problem, such as:

- using directional antennas or other methods to restrict the range of transmissions by confining the radiation vertically between operator and banksman; and
- using different types of communication on the up and down paths.

Other techniques include superimposing the radio traffic over the mains voltage, and using a leaky feeder from the rear jib to limit the radiation pattern. These are excellent solutions, but both have been patented.

It is essential to reduce the radius for both transmission and reception as far as possible. You are advised not to use a magnetic mount aerial; because it is omni-directional, it will radiate freely, transmitting and receiving communications over a wide area.

c) Callsigns

One very simple way to improve the safety of radio communication is to use a callsign at the start of each message. If there is a risk that a spectrum frequency will be shared with another crane, and messages will be of a similar nature, a unique callsign can ensure that messages are acted upon only by their intended recipient. Furthermore, if we receive an interference complaint, we can more easily identify the users involved if they use callsigns. The use of callsigns is a licensing requirement, so contractors should explain the benefits to their crane operators and ensure that they use callsigns.

4. Type of frequency

Ofcom (the Office of Communications) can allocate you either a single-frequency or a dual-frequency channel. If a crane will be at a site for a considerable length of time, you will require a licence and we will need to assign a channel. However, if the contract is for less than 12 months, you can hire equipment from a supplier who holds a current PBR Suppliers Licence.

5. Licensing requirements

All PBR use must be licensed, but you are free to choose either a single or a dual frequency and the system you will employ. We do not mind which system is chosen, as long as interference to other users is minimised. Engineering trials have shown that frequencies can be shared much more closely than previously thought possible, if the systems are carefully engineered.

To prevent unacceptable interference, we have defined a maximum signal strength of 48dB/μv per metre, measured 2km from the crane at a height of 3 metres above ground level. No matter which safety techniques are employed, this limit remains constant.

However, not all equipment in cranes needs to abide by this limit – for example, it is unlikely to be necessary in areas of the UK where spectrum use is light. However, if we receive an interference complaint and the offending system does not abide by the limit, it will need to be re-engineered so that it does.

6. Further information

For more information about PBR communication for tower cranes, contact:

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