	Construction Plant-hire Association Tower Crane Interest Group	
	Tower Crane Technical Information Note	
TIN 017	**Radio Communication for Lifting Operations**	

Introduction

Tower cranes often work on congested construction sites where the signaller is out of sight of the tower crane operator and the standard hand signals specified in BS 7121 cannot be used. As an alternative, hand held VHF/UHF radios are often used. This however, can lead to a number of problems which may interfere with the clear communication vital for safe lifting operations:-

- Loss of signal and thus communication, leading to loss of control of the lifting operation;
- Interference from radios on adjacent sites, which can lead to loss of communication or directions being given to the wrong crane operator;
- Misunderstanding between the crane operator and the signaller, leading to problems such as a load being lifted before the slinger has his hands clear, loads colliding with the building structure and the load being lowered before people are clear of the landing area.

Radio Specification

The first two issues should be addressed by specification of the correct radio equipment for the application taking into account:-

- Signal strength – if it is too low there is a risk of signal loss - too high and it will cause interference with adjacent sites. When working blind the structure may well cause signal loss and a booster aerial could be required. Signal strength should be checked at the beginning of each shift before lifting operations are started;
- Frequency – choosing a different frequency from other radios on the site or in the area will avoid interference from or to other radios;
- Durability – radio hand sets should be sufficiently durable to withstand use on site;
- Charging – adequate charging arrangements to ensure that batteries are charged at the end of a shift and that spare charged batteries are available at all times;
- Battery capacity – sufficient capacity to last for a full shift
- Radios in tower cranes cabs should be provided with foot switches to allow the operator to transmit whilst leaving both hands free to operate the controls.

Calls Signs and Standard Commands

The third issue, misunderstandings between the crane operator and signaller, should be addressed as follows:-

- Both parties must have a sufficient command of a common language (normally English) to ensure that clear, unambiguous communication can take place;
- A clear, unique call sign should be allocated to each signaller and crane operator;
- Each message should preceded by the call sign (e.g. TC1….);
- The crane operator should not respond to any command (other than **Stop**) that is not preceded by the call sign;
- Voice commands must only be given by one person, normally the signaller, at any one time;
- Voice commands should be given using the signals in the following table.

Standard Voice Commands For Lifting Operations

	Command	Crane Type
1.	**"Take the Weight"**	All
	"Hoist"	
	"Hoist Slowly" *(See Note 1 below)*	
2.	**"Lower"** *(See Note 1 below)*	All
	"Lower Slowly"	
3.	**"Slew Left"** (*See Note 2 below)*	All
	"Slew Right" *(See Note 2 below)*	
4.	**"Trolley In"**	Saddle jib tower cranes
	"Trolley Out"	
5.	**"Jib Up"**	Luffing jib tower cranes, mobile cranes and crawler cranes
	"Jib Down"	
6.	**"Extend Jib"**	Mobile and some self erecting tower cranes
	"Retract Jib"	
7.	**"Travel Forward"** *(see Note 3 below)*	All travelling cranes
	"Travel Backward" *(see Note 3 below)*	
8.	**"Stop"**	All
	"Stop Now" *(Emergency Stop)*	

NOTE 1: When fine positioning control is required, the person giving the signal should repeat the command continuously for as long as motion is required **"Lower slowly, Lower, Lower, Lower, Lower, Lower, Lower, Stop"**. As long as the crane operator can hear the command he will know that the radio is working. If the commands cease before the final **Stop** he will know that communication has broken down and stop the operation.

NOTE 2: Left and Right are defined from the viewpoint of an operator sitting in a cab looking down at the load. This also applies when a crane is being operated using remote controls.

NOTE 3: In the case of a travelling tower crane **Forwards** and **Backwards** should be clearly designated by signs on the tower crane track that are visible to both the signaller and the operator. If the signaller cannot see the track, he must be provided with a site plan indicating the designated directions.

Radio System Familiarization

It is essential that all radio users are familiar with the controls and operation of the model of radio that they are required to use.

Anti-collision Radio Systems

On sites where multiple tower cranes are installed and there is the possibility of jibs, counter jibs and hoist ropes clashing, an anti-collision radio system should be installed. This comprises of a separate radio in each tower crane cab operating on a unique frequency to allow open, unimpeded communication between all the tower crane operators. In the event of the jib or counter jib of one crane approaching the hoist rope of a higher crane the operator of the higher crane can immediately warn the operator of the lower crane.

Radio Licensing Requirements

Radios used for two way communication on construction sites, and for industrial use, are referred to as Private Mobile Radio (PMR). Some low powered PMR radios use a European system called PMR446 and do not require a licence. This system is however limited to 8 UHF frequencies, each with 38 channels, which may lead to interference from other users. PMR446 radios are also limited to a maximum of 500 mW Effective Radiated Power, which gives a range of 0.5 to 1 mile in built up areas and 2 miles in open country.

More powerful radios work on VHF and UHF radio frequencies which are assigned to a user by OFCOM who also regulate the frequency bands. To obtain a licence on one of these frequencies an application needs to be made to OFCOM. The benefits of a licensed frequency are generally greater range, less interference from other users and more features available on the radio sets.

These frequencies are allocated to businesses only, on a case-by-case basis. Once the licence has been issued, radios can be purchased. The supplier will need to see a copy of the licence to program the radios to the correct frequency before shipping.

Additional guidance is given in:-

- Information Sheet RA 195. *Business radio communications for tower cranes* published by OFCOM at www.ofcom.org.uk/static/archive/ra/publication/ra-info.htm
- BS 7121-5:2006 *Code of Practice for Safe Use of Cranes – Part 5: Tower Cranes*

Responsibility for the Provision of Radios

The provision of a suitable radio system for use during lifting operations is, as with all other aspects of lifting operations, the responsibility of the Hirer, although the system may well be installed by the crane Owner at the Hirer's request.