



Document No.	GP 59-72
Applicability	Group
Date	27 December 2005

Guidance on Practice for UHF 2-way Radio Design

GP 59-72

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) GP 59-72. This Guidance on Practice (GP) is ordered to indicate the criteria that shall be involved when designing a facility UHF 2-way radio system.

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1. Scope

This GP document provides guidance for the design of facility UHF radio systems. Manufacturers and system types may vary by region based on the governing requirements of local or regional authorities.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

BP

GP 12-25	Guidance on Practice for Earthing/Grounding.
GP 12-60	Guidance on Practice for Hazardous Area Electrical Installations.
GP 59-82	Guidance on Practice for Public Address General Alarm Systems.

British Standards

BS 6656	Guide to Prevention of Inadvertent Ignition of Flammable Atmospheres by Frequency Radiation (2002).
BS 6657	Assessment of inadvertent initiation of bridge wire electro-explosive devices by radio frequency radiation (2002).

International Consortium on Non-Ionizing Radiation Protection

Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz).

3. Definitions / Abbreviations

Base Station

Desktop radio system sometimes integrated with the repeater whereby communication with and monitoring of portables and mobiles can be performed (dispatch area).

Channel

Frequency used for communication that can support one simultaneous voice conversation usually utilizing 2 frequencies (one for transmit and the other for receive).

IP System Rating

Ingress Protection System – a rating system that has two numbered components which rate equipment for protection against solid particles and water penetration.

Logical Trunked Radio (LTR)

System design primarily in North America whereby the control channel is not dedicated to prevent wasting bandwidth with a dedicated control channel (normally operating in the 800-900 MHz range).

Mobile Radio

Fixed mounted two-way radio generally used in vehicles, being powered from the vehicle power and generally having more power and a better range than a portable (see Figure 1).



Portable Radio

Handheld two-way radio device usually carried on the person of a worker during a shift, equipped with a rechargeable battery and generally having less range than a mobile radio (see Figure 1).

Public Address / General Alarm system (PAGA)**Push To Talk (PTT)**

a button used to initiate a voice transmission. Transmission only occurs while the button is depressed

Radio Frequency (RF)**Repeater**

Transmission device that “repeats” the radio signal to extend coverage of a two-way radio system and generally required per frequency channel (see Figure 1).

Remote Control Unit

Remote units wired to a repeater that allow monitoring and control of the repeater usually over a 2 or 4-wire connection.

Safety Integrity Level (SIL)

an indication of the protection and resilience a system needs based on the potential damage if it failed.

Sound Pressure Level (SPL)

a way of measuring the volume of an audio signal.

Squelch

A circuit function that acts to suppress the audio output of a receiver intended to reduce the background static or interference that may be received on a radio.

Talk-back

Usually defined as a range whereby a portable or mobile radio can transmit back to the repeater.

Talk-out

Usually defined as a range whereby a base station or repeater can transmit to a portable or mobile radio.

Trunked System

A computer controlled radio system where radios are assigned to talk groups and are only assigned a channel when the PTT button is pressed.

Ultra High Frequency (UHF)

radio frequency band between 300-3000 MHz with most private frequencies being allocated in the 450-470 and 900MHz ranges.

Uninterruptible Power Supply (UPS)

a battery backup for maintaining power if utility power fails.





Figure 1 - Two-Way Radio Device Examples

4. Safety

4.1. Interference

All radio equipment radiates electromagnetic energy that can cause interference with other electronic equipment and harm to personnel. The following additional safety considerations should be followed when designing a UHF radio system.

- a. Even though all radio equipment in the EU is tested to be compliant with EMC regulations regarding generating and accepting interference, this does not preclude the need to ensure that the radio system does not cause interference with other electronic components.
- b. Examples follow of where potential problems may exist when using radio equipment near systems.
 1. Fire & Gas systems
 2. Telemetry
 3. SCADA
 4. Metering Systems
 5. UPS
- c. Tests should be carried out prior to the facility becoming operational to ensure that no interference problems exist or that if they do, adequate procedure are written in the Operational Handbook on proper procedures for mitigation.
- d. Suitable signs should be posted where radio use is prohibited.

4.2. Personnel safety

- a. All manufacturer's safety documentation shall be followed to minimize the potential hazard of non-ionising radiation caused by UHF radio systems.
- b. Examples of considerations when operating UHF radios are:
 1. Maintain a distance of 2.5 to 5 cm (1 to 2 in) between the antenna and the operator when transmitting.
 2. Only use a manufacturer's approved belt or holster when wearing a portable radio.
 3. Do not exceed the manufacturer's approved transmit time. Radios are tested to meet ICNIRP exposure recommendations and guidelines of operation are based on this.

This list is purely for informative purposes and may differ for different radio systems and manufacturers. The manufacturer's operational safety handbook will outline the specifics for each radio system.

