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# POLICE COMMUNICATIONS CONTROL COMPLEX

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## Introduction

The operational function of a force headquarters communications complex is to act as a command and switching centre. Information is transmitted and recorded in speech, data and visual form within the force, and between forces and other terminals, in providing the public with a service including '999' emergency calls.

Whether a force operates centralised mobilising or not, the efficiency of its service and response times largely depend on its communications. It is essential therefore that information is conveyed between terminal points in the quickest and most accurate way possible, and with maximum safeguards against communications failure, for any reason.

It is important that both the public and force officers have complete confidence in the service and use it to its utmost benefit. There must be no weak link in the communications chain from the caller right through control to divisional, sub-divisional offices, and units on the ground.

The importance of police/public relations cannot be over emphasised, this function should be satisfied for the general public, press, national and local broadcasting bodies, without it causing serious embarrassment to the force's normal operation.

Visits to control centres can do much to enhance the police forces' and fire brigades' images as modern and efficient organisations, by demonstrating how emergency calls are received and dealt with. One of the most satisfactory viewing arrangements to meet this need, is a gallery or balcony which, if equipped with operational consoles, provides for the public realistic situations at close quarters. Apart from the public relations function the area can serve the dual role of being a special or major incidents room.

## Location of Force Headquarters and Control

The locations of force headquarters and controls are often dictated by factors other than the needs of communications. Even though it is possible to provide radio and line networks to meet almost any configuration, the opportunity should be taken whenever possible, and consistent with other needs being satisfied, to locate the controls where the following considerations can be met:

a. That the proposed site is near to a centre of line communication and cables can be 'led into it'. A site in the country, although probably attractive in terms of surroundings and cost of land, could well be extremely expensive in the provision of adequate line circuits.

b. In the future there is likely to be a further concentration of emergency call answering points for the '999' service. The choosing of a situation remote from one of these points will entail expensive lines, particularly where these have to be low loss, direct links in order to ensure satisfactory transmission of speech.

c. That the site is centrally situated with regard to the operational area and remote stations. This will minimise the cost of any lines linking the stations to the control.

d. That the site is suitably situated to allow direct radio linking from force control to all, or most, of the hilltop site radio stations —— to reduce the vulnerability of the scheme by eliminating 'Master Stations'.

( A 'Master Station' is one which is controlled from force headquarters and in turn controls all other stations in the scheme.)

Physical considerations of the communications complex buildings, associated rooms and equipment

The main reasons for control complexes becoming both inadequate in size and facilities are:

a. the natural increases of information passing through controls - there has been a growth rate of approximately 10% per year;

b. changes of operational methods brought about by amalgamations of forces;

c. the introduction of new motorways.

The use of central computers and associated terminal equipment in the near future could also further highlight control room inadequacies.

The opportunity of designing a completely new communications complex normally only occurs two or three times in a service life time and is usually the result of a new headquarters being built, or an outdated control being replaced. Because of the constraints that are imposed by using existing buildings, it is desirable to start afresh rather than trying to re-mould old ones. As for any other project of this kind it should become a challenge to plan and provide a complex which will not easily become inadequate and outdated due to the introduction of new communications techniques, aids, and changes in operational methods.

The size of the 'external shell' and internal structure of the building should not inhibit future expansion. Maximum 'flexibility' of layout should be contrived by taking into account the two following important considerations:

a. That central focal points such as mapboards, vehicle availability displays, projector screens or any other permanent or semi-permanent fixtures are notable for causing inflexible layouts, however desirable they are for other reasons.

b. That 'computer' type floors allow maximum flexibility for changes of console layouts and the running of connecting cables to telecommunication and other peripheral equipment.

Some of the first and most important questions to be answered when planning controls are:

a. What kind of functions and activities have to be catered for?

b. What accommodation is required to meet individual functions?

c. What will be the total area, size and shape of the building?

The following information about accommodation is offered as a guide to forces planning either city or county type controls, handling a large number of channels and information.

It is becoming commonplace for police headquarters Controls to have up to twenty channels to control, with between ten and twenty operating positions. The channels would typically consist of

a. Force vhf
b. Inter force vhf
c. Divisional headquarters or uhf.

In the case of fire brigades there is at the present time one brigade vhf channel, but boundary changes and increases in the number of mobile units could bring the need for more channel and operator capacity.

Typical room sizes are as follows

a. Control Room - 1,250 sq ft

The dimensions of the room will largely be dictated by the number and layout of consoles and visual aids. The room height is normally determined by map-boards, but if the room is made twice the normal height it becomes easy to include a viewing gallery or balcony in the arrangement. The room is required to house operators consoles for

i. Radio Operators
ii. Incident Officers
iii. Supervising Officer
iv. Motorway Operator/s
v. Police National Computer Operator
vi. PABX Operator - Optional

and all the usual visual aids.

b. Teleprinter Room - 200/250 sq ft

One teleprinter requires 80 sq ft of space plus 20 sq ft for each extra teleprinter, therefore it would be possible to house up to seven teleprinters in the area stated with space for filing cabinets, broadcast units, tape basket, chairs, writing desk with telephone, and movement.

c. Radio Equipment Room - 400 sq ft

This is required to house

i. Equipment racks
ii. Storage cupboards
iii. Work bench
iv. Fire fighting equipment (if the room is in an isolated part of the building)

d. Telephone Equipment Room for PABX - 72 to 400 sq ft

The size of this room will vary between the stated sizes according to the type of installation required. 400 sq ft would be necessary for an installation for a large police or fire force headquarters.

e. PABX Switchboard Room - 170 sq ft

The switchboard may be sited in the main control, but where a separate room is used up to four operating positions can be contained within 170 sq ft.

f. Motorway Equipment Room - 350 sq ft

This is required to house

i. Motorway telephones equipment
ii. Motorway hazard warning lights equipment

g. In addition to the above areas, space is required for the following

i. Major Incident Room/Viewing Area
ii. Inspectors/Communications Officer office - 120 sq ft
iii. Staff Room;
the size should be based on an area of 15 sq ft/person working in the control room.

iv. Male and Female Toilets
v. Studio for Radio/Television Broadcasting

The total area of the accommodation listed would be in the order of 3,000 sq ft for the whole complex.

Design Requirement

To design a self-contained communications control complex which is secure and free from disturbance by movement of staff from other headquarters departments. The environment should be controlled, comfortable, agreeable with a convenient layout and easily operated equipment. This allows the users - the operators - who are all important in providing the public with an efficient service, to work under the extremes of operational situations ranging from little or no action to major incidents such as motorway, train or plane crashes without being under undue physical and mental strain.

Operational Requirement

It is evident from my contact with forces planning new controls that insufficient consideration is being given to the important subject of 'message flow' within the communication complex. I make no apology therefore for again bringing to your notice the following important information about the operational requirement and environment - from a paper presented by Mr R Stoodley at the Ryton-on-Dunsmore 'Radio Communication' presentation in 1968.

'To define the operational requirement satisfactorily a system design approach is essential and a data model should be constructed showing the information or 'message flow' so that assessment of the overall amount of work that has to be done during the working day and the busy hours can be made. Making use of the Ministry of Public Buildings and Works Activity Data Method, procedure would be as follows:-

Identify: Identify the task and give it a number on the flow chart.

Describe: Describe the task, when it is done, what is done, and why it is done. Furthermore, should it continue to be carried out.

Analyse: Analyse the task and determine who is involved and the number of people concerned from beginning to end. Note any special devices required that may speed up the process, make it more accurate or reduce the number of people needed. On the flow chart show the people and how they communicate with each other via direct speech, intercom, radio, data or visual aids.

a. Determine Space Demands: From the information assembled list the number of people to carry out the work during the busy hours and allow for expansion. An efficient Operations Room appears to attract more work from the public. The furniture, equipment and free access space components are determined and a sketch plan made of each one.

b. Determine Conditions: These conditions can be stated as temperature, humidity, sound, illumination and security and will be discussed later.

c. Determine Direct Service Demands: Cable ducts, pneumatic tubes for message handling are in this category.

d. Determine Equipment Arrangements: Prepare a drawing of the area available and make a scaled cut-out of each component. If it is really necessary to have focal points such as maps, vehicle availability or television monitors equipment, optimum viewing angles have to be decided. These in turn position the console suite. Individual seating positions should be arranged so that each person can see without undue strain, and as a rule no one should have to raise or lower his head more than about 10 degrees from the horizontal line of sight.

It is desirable within the limits of acceptable cost and physical size of the consoles to make each control position self-sufficient. By presenting all radio channels, line circuits, vehicle availability 'read out' and other visual aids at each control position, maximum flexibility of layout is maintained.

To accommodate all the equipment required for each operator it is becoming necessary to have either 'wrap round' or double rise facia consoles with lengths up to 4' 9".'

Environment

Human efficiency is impaired if the environment is not controlled within reasonable limits. The following information is for guidance and has been collected from available data. Codes of practice and appropriate bodies or institutions should be consulted for further advice.

a. Temperature and Ventilation: It is generally accepted that a temperature of 65°F for both summer and winter is the optimum. Relative humidity ought not to be a problem and should be about 50%. A ventilation rate of 2 cubic feet of fresh air per minute per square foot of floor space is advisable. During the summer time Operations Rooms with large picture windows become unbearably hot, and money spent on air conditioning plant may be a better investment than some electronic aid.

b. Lighting: Great care should be taken in planning the lighting, which should be controllable. For best results a mixture of fluorescent tubes and incandescent bulbs should be specified. The generally accepted standard is 30 lumens/sq ft increasing to 45 for maps and fine detailed work. Glare is the most harmful effect of incorrectly placed fittings particularly for people wearing glasses; the light source should be at least 30° above the line of sight. Fluorescent light fittings should not be fitted flush with the ceiling as this method makes the ceiling appear quite dark and will cause eye fatigue.

c. Acoustics: Noise control is achieved by proper planning to segregate sounds. Careful selection of equipment and good design will control noise at the source. Use of sound-absorbing materials and double glazing are methods normally sufficient for most areas. The noise rating for a typical room would be about 35db with reverberation times for maximum intelligibility between a half and one second.

d. Security: Although normally considered to be physical security against attack there are other events which come into the same category, particularly flooding, the loss of electrical power and fire risk. Common equipment racks are usually positioned in basement rooms which may be flooded due to a water pipe fracture, not unknown during cold weather; fractures have happened in a hot water system. This results in radio equipment being enveloped in water vapour. With electrical apparatus there is always a fire risk and in some of the older police and fire headquarters, where timbers are thoroughly dried out by central heating, appropriate extinguishers should be catered for in the layout plan.

Also coming under the heading of security is the safeguarding of line links. The following information about the subject has been taken from a paper entitled 'The Communications Implications of Centralised Mobilising' by Mr S W Calkin.

"Safeguarding Line Links: The importance of ensuring that the lines feeding into a central control are secure cannot be too strongly emphasised. The aim should be to achieve as great a diversity as possible in cable routings - separate cables in separate duct ways - alternative circuits routed via separate exchanges. There should be always at least two well-separated outlet cables at a central control, containing a sufficient number of circuits to provide alternative links both for incoming and outgoing service. It would hardly be practicable to obtain a complete line network with alternative routes throughout and would certainly be costly; but the two cable entries at the control are vital. The vulnerability of a single entry cable is so great that my advice to any force that proposed to accept this would be simply "Don't Centralise". It is sometimes found that the local Post Office engineers do not, even now, fully understand the need for alternative cable entries to force controls and are inclined to raise difficulties; but you need to stand very firm on this and insist on true alternative routing. Where a control is to be built in a newly developing area, there should be early discussions with the Post Office so that the necessary ductways can be contructed before roads and pavements are laid."

## Control Systems

As yet very little has been said about control systems, but the Directorate, in conjunction with industry, has been responsible for the design of new systems during the last two years. The new modular, solid state, control systems are

capable of providing the greater flexibility and adaptability essential for effective integrated control of remote fixed stations over radio and landline circuits.

The design concept makes possible vast reductions in space requirement compared with conventional systems. The system is simple to install and due to the special design features lends itself to very easy expansion with the absolute minimum of disruption to existing services.

The equipment offers all the normal control facilities with push-button control and in addition allows units operating on different channels to communicate with each other by the use of a 'connect' facility under the control of the headquarters operator.

These systems are becoming available and will be introduced into service at force and divisional headquarters in early 1972. In the latter case they will serve the 'In-Force' Communications requirement in connection with the Police National Computer Network.

By the use of these controls and private wire circuits from force to divisional headquarters the situation will have been achieved whereby both mobile and foot patrols using either vhf or uhf channels have access to both force and divisional headquarters.

Peripheral Equipment

Technology is also bringing its benefits to peripheral equipment such as vehicle availability systems, random slide projectors and illuminated map boards.

In the case of vehicle availability systems, two police forces have now embarked on experimental schemes using 'semi-automatic up-dating' techniques. Information about state and position of men and vehicles is fed into a central store directly from the mobile unit — the updating being initiated by the mobile operator.

Projectors are now in use, with large area map presentations being displayed from magnified micro-film.

Conclusion

The information and guidance given in this paper can be further supplemented by forces taking advantage of the findings of a Working Party under the chairmanship of Chief Superintendent Anderson which is at present studying in depth the requirements of a communications control complex.

Mr Woodmansey joined the Home Office in 1943 and, except for a period of service with Royal Signals as an instructor in the Army Wireless chain, has been with the Directorate ever since. He has served at a number of depots and at the Central Communications Establishment, Harrow, where he was the Engineer in charge of installation. He is now a Senior Wireless Engineer at Headquarters engaged in planning Police communications.