

SECTION TWO

MAINTENANCE

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GENERAL DEFINITION AND REQUIREMENTS2.1.1 Introduction

This section is intended as a back-up to the schedules provided within each section in Part Two of this manual. It is designed to help the operator in carrying out the scheduled maintenance described therein, and to provide assistance in the setting up and running of a planned maintenance programme.

2.1.2 Maintenance Requirements

The specific maintenance requirements for plant and equipment generally are detailed within the appropriate manufacturers literature contained in Volume Two.

2.1.3 Preventive Maintenance

The primary function of maintenance is to ensure that all systems and the plants within them are always in good repair so that their performance and efficiency is in no way impaired.

In order that this function is achieved, maintenance must be carried out on a preventive rather than curative basis. In other words, the condition of each time prior to a particular maintenance task being carried out should always be found to be well within its normal operating tolerances, the purpose of the maintenance task being therefore to bring that particular aspect up to an "as new" condition.

Preventive maintenance requires that a pre-planned programme of routine work is undertaken. This has the advantage of ensuring control of maintenance work at times, and allows non-programmed emergencies to be handled without any major or lasting disruption to normal maintenance.

2.1.4 Specialist Maintenance

The maintenance of specialised systems and equipment should only be carried out by the manufacturer/supplier or approved agent because of the requirement for particular knowledge and the use of special equipment and methods.

### 2.1.5 Frequencies

It is impossible to be precise when stating the frequencies at which the maintenance of items should be carried out, as they are very much dependant on a great number of variables such as application, situation, usage, age, etc. Therefore, the frequencies given within this manual must be treated as advisory only to be adjusted as necessary in the light of experience gained through running the plant.

With this in mind maintenance frequencies should be constantly reviewed and amended if necessary until the optimum frequency for each item is found. Once this frequency has been established any further change found necessary, particularly towards an increase in frequency, should be treated as a possible early warning signal and its cause should be investigated and established.

### 2.1.6 Tools and Equipment

The majority of maintenance tasks cannot be carried out either correctly or efficiently unless the right tools and equipment are available and used.

The range of tools and equipment necessary will very much depend on the extent to which the maintenance is to be tackled on an "in-house" basis. It must be comprehensive enough to cater for all envisaged work, for an insufficient selection will lead to misuse with the inherent possibility of damage to equipment and personnel.

IMPLEMENTATION2.2.1 Setting-up a Programme

In order to ensure that the correct maintenance is carried out at the right time, a planned programme of maintenance spanning a minimum of one year must be compiled.

The form that the programme will take will depend on the number of staff, demarcation of job functions, number of shifts or hours of work, and many other parameters. Because of these variables no rigid rules can be given for setting up a programme, although the following basic considerations will assist in this task.

Always allow some time in each month for the inevitable emergencies and breakdowns that will occur.

Make sure that daily inspection of all plant areas is included as part of the maintenance routine.

Ensure minimal shutting down of plant by arranging that all maintenance tasks necessitating this area are carried out at the same time. This may well involve other plant.

Remember that a simultaneous plant shutdown might lose an entire service whereas a sequential shutdown will allow partial service to be maintained.

Be aware of the possible consequences of shutting down a plant in relation to dependencies of other plants and systems on it.

Finally, maintenance programmes cannot be prepared in a day. It can take up to a year or more to finalise a practical, viable and effective programme.

2.2.2 Records

It is most important that records are kept of all work carried out, no matter how minor, on maintenance and repair. The record should state what was done, by whom, the time taken, materials used, and any observations noted. This is essential in order to build-up a feed back system to assist in future planning, budgeting and work scheduling.

Records contd..

In hand with this a log should be kept of the operation of the plant in respect to plant selection, performance and hours of operation, including gauge readings.

All gauge readings and other measurements taken should be compared with previous readings to highlight any trends or drops in performance.

2.2.3 Inspection

All plant and service areas and plants within them should be visually checked at least once per day for:-

- Correct functioning
- Noise and/or vibration
- Temperature in excess of normal operating value
- Unusual odours
- Stains and blemishes
- Security

Any abnormalities should be noted and checked out as soon as possible.

3.1 MAINTENANCE NOTES

Introduction

The information provided on the following pages should be used in conjunction with the maintenance schedules provided in the various sections within Part Two of this manual.

## DISTRIBUTION BOARDS

Ensure that all equipment is isolated and made safe before undertaking maintenance work.

Never assume that the neutral that appears to be associated with the circuit in question is associated.

An inspection should always be made as soon as possible after a circuit fault.

Existing adjustments should not be disturbed unless absolutely necessary.

The consequences of causing a short circuit on high capacity 415 volt systems can be very serious, as the current flowing into any arc can release a large amount of energy resulting in flame and damage.

Do not use cotton waste for cleaning purposes. Cloths should be dry, clean and free from loose fibres and metallic threads. Blower nozzles should be of non-metallic construction.

The general inspection should include the checking of the interior for build-up of dust and overheating; the fusebridges and carriers for signs of arcing; the correct grade of fuselink is fitted; barriers and safety covers are correctly fitted and that wiring connections are secure and clean.

After maintenance work has been carried out, a check should always be made to ensure that no tools and materials have been left inside the apparatus.

ELECTRICAL DISTRIBUTION

All circuit tests should be carried out in accordance with the current I.E.E. Regulations.

When checking connections to equipment, particular attention should be given to flexible connections to motive plant.

Plug Tops should be checked to ensure that the fuse rating is correct.



## SWITCHBOARDS AND SWITCHGEAR

### A. GENERAL:-

Maintenance should be carried out in accordance with the recommendations laid out in the following British Standard Code of Practice:-

BS 5405: 1976 - Maintenance of Electrical Switchgear.

Switchgear should not be left in service for more than six months without having its operation checked.

A thorough inspection should always be carried out as soon as possible following a circuit fault.

Observation of equipment operating under live conditions must never be carried out unless two responsible personnel are present.

The consequences of causing a short circuit on high capacity 415 volt systems can be very serious as the current flowing into an arc can release a large amount of energy, resulting in severe flame and damage.

All equipment should be positively isolated and checked to be electrically dead before any work is carried out on it.

Care should be taken to ensure that all remotely served live circuits are positively isolated before any work is carried out. Never assume a circuit is dead without first testing, and never assume the testing equipment is satisfactory. Always test a voltage indicator against a known live source immediately before and after use.

Whenever cables are disconnected in the course of maintenance or replacement, always ensure that the bared cable ends are insulated with tape and marked for identification.

Existing adjustments should not be disturbed unless absolutely necessary.

After maintenance work has been carried out, a check should be made to ensure that no tools and materials have been left inside the apparatus, and that temporary earths used for testing have been removed.

GENERAL Contd..

Do not use cotton waste for cleaning purposes. Cloths should be dry, clean and free from loose fibres and metallic threads. Any blower nozzles should be of non-metallic construction.

Use a fine file or fine glasspaper to clean contacts, not emery cloth or carborundum papers.

Use only proper switchgear oil for lubrication of moving mechanisms, not molybdenum disulphide or graphite bearing oils.

B

SWITCHBOARDS:-

Bus-bars and cables must be dead and earthed before work is carried out on the housing.

A regular check should be carried out for any signs of malfunctioning, indicated by panel hot spots, unusual odours, electrical discharge noise, etc.

A regular log should be kept of all instrument readings, and recalibration carried out as required.

Indication lamps should be replaced as soon as they become defective.

Special tools and isolating equipment should be regularly checked to ensure that they are serviceable and in their proper storage positions.

When cleaning auxiliary contacts and insulation, ensure that the compartment is made safe by locking the safety shutters.

A heavy build-up of dust is dangerous and should be removed with the aid of a vacuum cleaner.

Unless otherwise instructed, the inspection and service should include as applicable, the checking and maintenance of safety shutters, isolating contact orifice bushings and plugs, position selector mechanisms, auxiliary contacts, insulation, fuselink carriers and bridges, carriage slides, and all protective devices and control equipment, together with the "megger-testing" of bus-bars.

When testing protective devices, check that their operation results in correct operation of the equipment they control. Secondary injection testing should be carried out on all protective devices.

Before "megger-testing" bus-bars, isolate all light-current devices by removing fuses and, if necessary, the neutral lead. Remove neutral link from all circuits.

Before returning a switchboard to service, check that all phase barriers and protective covers are correctly fitted.