# MAINTENANCE PROCEDURES

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## Introduction

A regular and organised programme of maintenance work, planned to cover all details of the installation within given maintenance periods, will ensure continued satisfactory operation with a minimum liability to interruptions to supply caused by equipment faults.

These maintenance instructions comprise general recommendations relating to the installation carried out under this contract. Reference should also be made to any manufacturers literature provided in Section 9.

Careful attention must always be given to securing the safety of personnel and equipment while maintenance or repair work is in progress and prior to carrying out any maintenance works operatives must be trained and competent, both in the equipment and systems being maintained as well as in the complexity level of work being carried out.

Operatives should also be fully conversant with the relevant Health and Safety Legislation.

Before any work is commenced on any item of electrical equipment, the supply and ancillary circuits must be made "dead" (isolated) and locked off. In general all maintenance staff should remember the following golden rules:

* Identify the source(s) of supply.
* Isolate the source of supply.
* Secure the isolation.
* Test that the equipment/system is DEAD, then begin work.
* Reference should be made to the Health and Safety Executive’s Health and Safety series booklet HS(G) 85 on Electricity at Work available from Government bookshops.
* Reference should be made to Electricity at Work Guide 1989.
* Reference should be made to the appropriate section of the B.S.7671 Regulations for Electrical Installations prepared by the Institution of Electrical Engineers.

Where maintenance work is in progress a DANGER notice must always be attached to any "live" apparatus to call attention to the danger of approach.

A CAUTION notice should also be attached to plant or its associated control equipment warning of possible damage to equipment, which may be caused by interference.

## Routine maintenance operations

The maintenance sheets tabled within this section of the manual outline a routine of brief inspections for the mechanical installation that should ensure correct operation of the various systems.

These procedures should be carried out in conjunction with the relevant manufacturers literature included within this manual and should form the basis of any planned maintenance system that may be incorporated by the client.

In the event of any disparity between these recommendations and those indicated by the manufacturer (now or at a later date), the manufacturers information should be followed. However, actual user experience and knowledge of trained maintenance personnel will develop the long-term maintenance requirements for this particular installation. ­

**WARNING:**

**Before commencing maintenance work on any item of plant, always ensure that it is mechanically isolated from the system and that the electrical supply has been locked off. Ensure also that all control and ancillary electrical units connected to the plant are safely isolated and cannot enable the item of plant during maintenance.**

## Specialist Maintenance

The maintenance of specialist systems and equipment should only be carried out by the Manufacturer/Supplier or Approved Agent because of the requirements for particular knowledge and the use of special equipment and methods.

The following systems are considered to require specialist maintenance due to the nature of the systems and the specialist equipment required to carry out testing and maintenance. It is generally a requirement of building insurance policies, local authority and fire authorities that approved and recognised Contractors provide the required certification.

|  |  |
| --- | --- |
| Gas System & Gas Appliances |  |

## Maintenance Matrix

The table below provides a summary of the recommended intervals between maintenance inspections/actions as itemised in further detail within the actual maintenance sheets included in sub-section Maintenance Sheets.

These routines would form the basis of any planned maintenance system that may be incorporated by the building occupier. In the event of any disparity between the recommendations and those indicated by the manufacture (now or at a later date) the manufacturer's information should be followed.

However actual user experience will develop the long-term maintenance requirements for any particular installation.

The following notation has been used:

D = Daily 3M = Three Monthly

W = Weekly 6M = Six Monthly

M = Monthly Y = Annually

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Description** | **D** | **W** | **M** | **3M** | **6M** | **Y** |
| Heating Plant / System |  |  | **✓** |  |  | **✓** |
| General Pipework |  | **✓** | **✓** |  |  | **✓** |
| Cold Water System |  | **✓** | **✓** |  |  | **✓** |
| Hot Water System |  | **✓** | **✓** |  |  | **✓** |
| Ventilation Equipment |  |  |  | **✓** | **✓** | **✓** |
| Sinks & Basins |  | **✓** |  |  | **✓** |  |
| Water Closets |  | **✓** |  |  | **✓** |  |
| Water Quality |  |  |  | **✓** |  | **✓** |

## Mains Cold Water System

All cold water outlets and appliances within the building are mains water fed from the new supply via new copper pipework that was flushed, cleaned and chlorinated on completion.

General System Pipework Inspection

**Every Week**

* Visually inspect pipework, valves and connections for leaks

**Every Month**

* Visually inspect pipework, valves and connections for leaks
* Check that all pipework hangers, brackets and supports are secure.
* Clean out any filters, strainers or dirt pockets fitted to the pipework

**Every Year**

* Tighten up all nuts on hangers, brackets and supports etc
* Inspect all parts for corrosion and take action if necessary
* Operate all isolation valves (at least yearly) to ensure they do not become immovable. Count the turns to full closure, then to full open and finally close to the original setting.

## Gas Service & Gas Safety

Current electrical and gas regulations must be adhered to at all times and therefore all maintenance work on the Gas Installation or the Gas Safety Circuit MUST only be carried out by a competent and approved person registered with the Gas Safe Scheme.

**Every 3 Months**

* Check gas pipe system for signs of leaks.
* Ensure natural air intake and discharge ducts to gas meter room are free of obstruction.
* Ensure area around gas meter room is kept free of obstructions and clean.

## Heating – Gas Boilers

To comply with the current issue of the Gas Safety (Installation and Use) Regulations the Installation & Servicing Instructions for the boiler are provided in Section 9A.

Servicing and maintenance of the appliances should be carried out at regular intervals (annually) by a competent person approved at the time by the Health & Safety Executive.

## Domestic Hot Water Service

**General System Inspection / Maintenance**

**Every Week**

* Visually inspect pipework, valves and connections for leaks

**Every Month**

* Visually inspect pipework, valves and connections for leaks
* Check that all pipework hangers, brackets and supports are secure.
* Clean out any filters, strainers or dirt pockets fitted to the pipework

**Every Year**

* Tighten up all nuts on hangers, brackets and supports etc
* Inspect all parts for corrosion and take action if necessary
* Operate all isolation valves (at least yearly) to ensure they do not become immovable. Count the turns to full closure, then to full open and finally close to the original setting.

**Thermostatic Mixing Valves**

Maintenance of all thermostatic mixing valves is essential to ensure the product continues to operate to specification after installation and continues to offer scald protection.

The frequency of maintenance intervals depends upon the condition of the water passing through the TMV and will be determined by in-service testing that should be carried out at intervals somewhere between 6 months and 12 months.

In the absence pf practical experience it is recommended that in-service testing is first performed 6-8 weeks after commissioning. If no problems are detected then checking again 12-15 weeks after commissioning will build up a history. Refer to literature provided.

## Ventilation Fans

**Every Month**

* See that the fan blades are clean
* Check and if necessary lubricate fan and/or motor bearings in accordance with manufacturer’s instructions. Avoid over lubrication, remove any surplus lubricant spreading from the bearings. Fans running high temperature applications may need more frequent lubrication

**Every Year**

* Remove all oil or grease from fan and/or motor bearings thoroughly clean, check for wear, fit replacements as necessary, re-lubricate. Refer to Motor Maintenance Instructions for further details
* Dismantle unit as detailed in manufacturers instructions and clean and lubricate

## Above Ground Drainage

With regard to inspection and maintenance of the new soil and waste pipework installation, we expect that the hospital maintenance department will integrate this with the existing regime. Otherwise we advise:

**Every 3 Months**

Make general inspection of system to ensure there are no leaks.

**Every Year**

Dismantle and clean all traps and make detailed inspection of system regarding corrosion and rectify as necessary.

It may be found by experience that traps will require cleaning at 3 monthly intervals this being dependent on usage of the installation.

## Sanitary Ware & Brassware

**Sinks & Basins**

**Every Week**

1. Check both hot and cold taps and replace any worn washers.

2. Check bowls for damage.

3. Check plug and replace with new plug if missing.

4. Operate unit to ensure it is left in working order.

**Every 6 Months**

5. Check waste pipe for leaks and clean out bend.

6. Check both hot and cold water isolating valves for leaking glands etc., and repair as necessary. Operate valve to ensure the basin can be isolated.

**Water Closets**

**Every Week**

1. Check pans for damage and cracks.

2. Repair any seats which have broken hinges or replace broken seats.

3. Operate WC to ensure that it is left in working order.

4. Check the water level in the waste water preventer.

5. Check that the overflows are running free, and note the discharge point.

**Every 6 Months**

1. Check ball valves for operation and replace any floats which are punctured.

2. Replace washers on valves as required.

3. Lightly grease linkages for handle.

4. Check isolating valve for operation and for leaking glands.

## Legionella Control

To enable a preventative maintenance schedule to be prepared to minimise the risk of infection the source of the legionella bacteria must be understood.

The bacterium is a common one that will survive and multiply in water. It can be found in fresh water including rivers, lakes, streams and ponds. It has also been found in wet soil. There is a strong likelihood of very low concentrations of the bacteria being present in all open water systems, including building services.

It has been established in the laboratory that the optimum temperature for multiplication for the bacteria is about 37°C. Traces of iron oxide and a pH of around 6.9 favour growth and multiplication. As the temperature increases, the rate of multiplication decreases and at 46°C it falls to zero.

The bacteria will survive at higher temperatures, but the survival time decreases to practically zero at 70°C. Below 37°C the multiplication rate decreases and can be considered insignificant below 20°C. The organism can, however, remain dormant at lower temperatures and return to activate multiplication when more favourable temperatures occur.

With the accepted design of building services being 60°C for hot water storage, and below 20oC for cold water storage and mains cold water it can be seen that mixed water temperatures found in whirlpools, spas, showers and cooling towers are the area's where the bacteria if present will multiply.

Contaminated water presents a risk only when it is dispersed into the atmosphere as an aerosol. This risk increases with the reducing droplet size for two reasons; one being that as the terminal velocity of the droplet reduces the droplet will remain airborne for longer periods. The second is that only small droplets will pass deeply into the lung and cannot be easily expelled.

Water services are capable of generating aerosols from the impact of the tap water hitting washbasins, sinks and baths and from showers.

**Hot Water System**

In this building, domestic hot water is generated, stored and distributed from the gas fired combination boiler at 60°C and is only blended down to a delivery temperature of 43°C at the point of use. The risk of Legionella growth is therefore insignificant.

**Cold Water System**

The use of Mains Cold Water at all delivery points, the absence of cold water storage and the insulation of all pipework should ensure that cold water within the system pipework remains at a temperature below 20°C, making the risk of Legionella growth insignificant.

## General ‘Plumbing’ Maintenance

This final section provides ‘generalised’ maintenance guidance that may or may not all be applicable to this installation but is generally recognised as good practice.

**Pipework - including fittings & valves etc.**

Regular maintenance must be carried out, and the following programme takes precedence over other instructions unless it conflicts with special instructions stated elsewhere.

Failure to properly maintain pipework and valves etc., may result in leaks (which can cause damage as well as increasing the cost of water treatment); corrosion; and also valves and other components may become inoperable.

***Every Week***

1. Inspect externally all valves, cocks, automatic air vents, traps, strainers, check valves etc., for defects or malfunction. Rectify flange or other leaks if possible, or note for early attention.

2. Note leakage from valve glands and tighten up or re-pack as necessary. Replace "O" rings that are leaking. Before doing so it is usually necessary to isolate the section and drain down. With lubricated plug valves it is important that they are rotated before and after inserting additional lubricant of correct grade to stop leaks and cure stiffness. For diaphragm type valves refer to special instructions.

3. Note for attention at convenient time any valves failing tight shut-off. This includes valves with renewable discs.

***Every Month***

4. Inspect pipework throughout the system, including in concealed positions such as ducts or trenches, for damage or leaks, and take the necessary action.

5. Check visually that all hangers, brackets and supports are secure.

6. Inspect expansion loops and bellows, noting any misalignment. Correct as necessary. Make sure pipes are free in their guides. Check that pipes are securely fixed at anchor points.

7. Clean out any filters, strainers, or dirt pockets fitted to the pipework.

***Every Year***

8. Tighten up all nuts on hangers, brackets and supports etc.

9. Inspect all parts for external corrosion and take the necessary action. If only superficial, clean and repaint.

10. Valves unless operated are likely to become immovable. All valves should therefore be operated fairly frequently, and not less than once per year. Count the turns to full closure, then to full open, and finally close to the original setting. If the valve is fitted with a permanent stop (i.e. a double regulating feature), IT MUST BE CAREFULLY SET TO THE ORIGINAL POSITION after fully closing and opening. If the valve movement causes gland leakage, tighten or repack.

**Insulation**

Any insulation removed from pipes, tanks, cylinders etc., for maintenance or alterations should be replaced immediately. This is particularly important where there is a possibility of freezing or condensation, or where excessive temperature may cause problems and waste of fuel.

***Every Month***

1. Inspect all insulation for external damage, slack or missing clip bands etc., and arrange any remedial work required.

2. Note any staining on insulation, which may be evidence of water leakage within. Repair the leak and make good the lagging.

3. Examine carefully any damage to insulation that is vapour sealed and repair immediately. Make sure that both pipe exterior and insulation are dry before re-sealing.

4. Check that the means provided for pipeline identification have not been removed or obscured.

**Valves**

Valves are tested initially with cold water by the manufacturer and have been subjected to further tests during the installation. Valve gland packings tend to soften when subjected to heat so it is recommended that gland packing nuts should be tightened after a few hours on temperature, as this will ensure a much longer life from the packing and a more effective seal.

Wheel valves are intended to be operated by the wheel with which they are fitted and the use of wheel spanners should always be avoided in case of emergency such as a valve having seized. Excessive force in closing a valve often results in rupture of the seating surfaces, particularly in the case of renewable disk valves.

Valves with gland packings should be periodically inspected to check that the pressure seal is being maintained. At the first sign of leakage the gland should be adjusted to add further compression to the packing. It is always advisable to carry in stock replacement gland packings so that the stuffing box can be either topped up or completely repacked as necessary.

Renewable disk valves, as their name implies, are designed so that the disk can be renewed to restore the valve to first class working conditions. Spare disks of the correct quality should, therefore, be stocked and used when necessary.

All valves must be operated on a regular basis to ensure that they are free to operate and to minimise any tendency towards sticking.

**Discharge system / soil & waste**

Discharge pipe systems should be kept in a clean and sound condition in order to maintain maximum efficiency and the following points should be noted:

Vertical ventilating pipes of cast iron or steel are liable to accumulate rust at bends and offsets.

When access covers, caps and cleaning eyes are removed, damaged packings, ring seals, washers and missing fixings should be renewed before replacement.

Care should be taken in the use of chemical descaling agents, which are often of a corrosive nature and materials employed in the pipe system should be clearly identified before treatment, to ensure that the internal surfaces are not subject to damage by chemical attack.

Caution is necessary when using methods of clearing obstructions, which involve the use of air or water at high pressures. Hand operated rods for remaining blockages in discharge pipes should be capable of passing through the system without damaging the internal surfaces of pipes and fittings.

Mechanised rodding equipment should only be used by properly trained operators and the pipework to be cleaned should be thoroughly examined beforehand to enable selection of the appropriate cleaning attachments.

***Cleaning & Descaling***

The following notes describe the normal types of blockages or deposits found in plumbing and/or drainage systems and the methods used for their removal.

***Deposits Due to Misuse of the Discharge System***

Complete or partial blockages due to large objects or compacted masses, such as toilet paper and sanitary towels, can usually be loosened by rodding. All such material should be removed from the system at the nearest access point.

***Lime Scale***

The worst condition will be found in the stacks and pipes from urinals where precipitation of lime, generated by the reaction of urine in contact with hard water, accelerates the process of scale formation.

In these situations conditions can be further aggravated by the residue from abrasive cleaning powers, used in cleaning of sanitary appliances. This may combine with the line precipitate causing a complete blockage of the pipe. Recurring scale formations of this type are best dealt with by periodic descaling of the system using suitable inhibited acid based cleaners.

The discharge stacks and pipes should be inspected periodically and the rate of scale formation noted. The required frequency of treatment and the strength of acid required to soften the scale can then be established and included on a planned maintenance schedule.

It should not be necessary to repeat the treatment more than 3 to 4 times a year. Where lime scale incrustation in a urinal discharge pipe is very heavy to the point of almost total blockage, the obstruction can sometimes be softened and removed by the application of an acid drip method.

***Accumulation of Grease & Soap Residues***

Obstructions in discharge pipes and traps caused by accumulations of grease and soap residues can often be partially removed by use of a plunger, but a more effective treatment is by flushing the system with a strong solution of soda crystals dissolved in hot water.

The process is easy to carry out and once the required frequency of treatment has been established it can be applied as a routine periodic service. Blockages of this type are mostly found in long discharge pipes from sinks or wash basins, especially in soft water areas and where the rate of flow in the pipe falls below that required to sustain a self cleansing velocity.

Where mirrors are fixed above basins, hair combings washed into the waste pipes will combine with the grease and soap residues and considerably increase the risk of blockage.

***Cleaning & Descaling Techniques***

The following notes describe the principle methods used for cleaning using mechanical means.

***Plunger***

This provides a simple means of clearing a slight blockage in a sink or basin branch pipe and trap or even a WC.

***Rods***

This is the traditional method of clearing blockages. A number of devices are available for the end of the rod, e.g. scrapers, plungers and brushes. These are suitable for cleaning pipes of 75mm size and larger. Where only moderate flexibility is required to introduce the rods into the pipework. Mechanically rotated versions are also available.

***Kinetic Ram***

The kinetic ram gun can be usefully employed for the removal of obstructions in branch pipes provided its function and limitations are properly understood. The function of the gun is based on the principle that the impact of compressed air against a column of water behind a blockage will create a shock wave, which is transmitted to the obstruction to dislodge and remove it. A stubborn blockage can, however, produce a "blow back" of the gun and injure the operator or damage pipework/appliances not designed to withstand the pressure applied.

Where there are open branches on the system, waste matter may be forced out of the openings and damage wall/ceiling decorations. The use of this type of gun in plumbing installations should generally be restricted to the removal of blockages consisting of compacted soft material e.g. grease, soap residue and saturated paper.

***Coring & Scraping***

Coring of the pipe can be considered in pipes of 100mm size and above, when the pipe bore is severely restricted or even completely blocked with hard lime scale or similar material. However, the pipe material should first be ascertained to ensure that damage would not result.

The process involves the use of a purpose made rotating steel cutter on a flexible drive that can be pushed into the pipe to cut through the obstructions. Peripheral accumulations of grease and other gelatinous formations in pipes of these sizes can generally be removed satisfactorily by the periodic use of profile scrapers attached to ropes and pulled through the pipe.

***Chemical Dosing***

Work involved in the removal of scale and grease from sanitary appliances and plumbing drainage installations requires understanding of the problem and skill in the handling and application of chemicals and tools. Extreme care should be taken to ensure that all necessary precautions are taken to minimise the risk of personal injury.

Protective clothing e.g. gloves and eye shields should be provided for the operatives. On completion of the work all exposed surfaces of sanitary appliances should be thoroughly washed, using a detergent cleanser to remove any acid or other chemical which might otherwise come into contact with a person using the appliance.

Adjoining finished and decorations may need protecting while the work is in progress. Attention to safety precautions is vital if injury to the operator or damage to the pipework/appliances is to be avoided.

## Spare Parts & Consumables

Generally there are no crucial spares or consumables that must be kept as most items are readily available from the relevant manufacturer for next day delivery or can be picked up from a local merchant.

In addition, to hold spares properly pre-supposes the availability of a designated stores area and knowledgeable person to maintain the spares in a useable condition.

We suggest that any in-house maintenance team develops a spares policy through experience of running the building and records details of any spare parts deemed necessary in the spares table provided on the following page.

Some plant manufacturers provide comprehensive illustrated spare parts lists, but it is not expected for the building user to order every item listed. A distinction must be made between consumable items and those items that have a nominal service life and other items that may outlast the service life of the plant/equipment.

Recommendations included within this sub-section of the manual are based on the manufacturer's information, where available. The information is intended to provide guidance and not a definite schedule of all spares that will be required.

The stock of spares should be based upon a policy decision. The stock of spares will be dependent upon the degree of "in-house" maintenance that is undertaken, the "sub-letting" of service contracts and the policy of the building owners purchasing department.

The following is offered for assistance in selecting the correct balance:

1. Identify the consumables that will be necessary for day to day and week to week maintenance. These include such items as lubricants, bulbs, fuses, relays, water treatment chemicals etc. All of these are necessary and only time will tell the rate of consumption.
2. Identify the equipment that will give most trouble to most people or cause high running costs "down time". Then obtain from the equipment manufacturers a list of spares, particularly the items that they consider vulnerable and are not "off the shelf" items. Add these to the list(s) within appropriate sub sections of this manual.
3. Check when buying spares of any kind if there is a limited shelf life and/or limiting storage temperature or ventilation requirement. Consider purchases accordingly.
4. Initially purchase direct from the supplier or manufacturer if a proprietary item, but in the long term investigate alternative sources of supply as cost savings can probably be made.
5. Once initial supplies have been selected allocate a suitable storage area. Always ensure that:-
6. A stores procedure is adopted so that usage can be monitored for economic buying and re-stocking.
7. High value and "walkable desirable items" are kept under lock and key.
8. An inventory is taken 3 or 4 times a year and the condition of stock examined on each occasion.

## Spares Table

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| **Spare part** **required for:** | **Description** | **Manufacturer &** **Part Number** | **Sourced From** |
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| **Spare part** **required for:** | **Description** | **Manufacturer &** **Part Number** | **Sourced From** |
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