6. Maintenance

6.1. General Maintenance Information

6.1.1. General

Cleaning and Maintenance work should only be undertaken by contractors with appropriate experience and should be in accordance with an approved method statement and risk assessment. Facilities team to control areas via a permit to work system.

Prior to carrying out any maintenance and/or cleaning it is essential that reference is made to the relevant section of the O & M Manuals for information / instructions on the elements / fabric to be worked on. All general, regular cleaning and maintenance is to be carried out in accordance with all relevant health and safety legislation and guidance and is to take into account the potential hazards identified in the health and safety file and OEM O&M manuals.

Maintenance procedures are intended to ensure that plant operates safely and efficiently over the longest possible working life. The type of procedures and the frequency with which they are carried out may vary considerably for different items of plant. The schedules provided in Section 6.9 are provided to supplement the Manufacturers Literature which is provided within Book 2 - Manufacturers Info (OEM).

When undertaking any maintenance procedure an attitude of general awareness should be adopted at all times. Consideration should be given to general noise levels, vibration, temperature variations and excessive build up, of dirt, grease etc. Any changes in the state of the plant should logged, monitored and where necessary rectified as soon as possible.

6.1.2. Electrical Supplies

Only suitably qualified and competent personnel with an authorised permit to work should carry out maintenance on the electrical services equipment. Personnel must be familiar with safe systems of work and the appropriate risk assessments and method statements must be in place prior to carrying out any works. Live electrical work should not be carried out.

Isolate the supplies completely e.g. by selecting "OFF" at the isolator and by removing the appropriate fuses BEFORE working on electrical circuits.

Note that the use of insulated tools, rubber mats and rubber gloves does NOT provide complete protection against injury by electric shock.

Where it is necessary for work to be done on LIVE CIRCUITS, it should be done by qualified personnel who are fully aware of the DANGER and fully risk assessed.
Plant under automatic control will start- up or shut-down WITHOUT WARNING. Such plant should be de-energised before work is done on the circuits. Refer to the Building Management System (BMS) operating and maintenance instruction manual for details.

6.1.3. Statutory Regulations & General Requirements

Statutory Regulations

The requirements of the Health and Safety at Work Regulations should be read, understood and adhered to by all maintenance personal.

Mechanical Services General Requirements

All external bib taps which are not used regularly (within 30 days) must be allowed to run for approximately 5 minutes at full bore, this is to flush out the supply pipe feeding the outlet.

Domestic water services are subject to a water hygiene risk assessment in compliance with HSG L8. Maintenance and testing routines will be identified and stipulated within the risk assessment. The water temperature in cold water storage tanks should be below 20°C. If temperature is higher than 20°C ALL taps which are served from the system tank should be run at full bore to replace the water in the tank. The temperature should be taken using a calibrated hand held thermometer.

Pressure vessels are subject to the requirements of the relevant local regulations and Pressure Systems Safety Regulations (PSSR). Generally such vessels shall be inspected at least once in every 6 monthly period by a competent person.

Electrical Services General Requirements

All electrical services must be tested in accordance with the requirements of the current regulations. Fire alarm systems and emergency lighting installations must be tested to current standards and requirements including BS7671, EAW Regulations, HASAW, HSE guidance on PAT.

6.1.4. Plant / Pipework Under Pressure

Pressure build-up may occur in the water systems:

- ASHP
- Boiler Plant
- LTHW Systems
- Boosted Water Services

The end user must be aware of the Pressure Systems Regulations, as under these regulations they have a duty of compliance to establish a written Scheme of Examination, which is to be produced by an appointed competent person.

It is the responsibility of the end user to establish the exact requirements and to comply with the regulations.

6.2. Specialist Service Provider Contact Information

Trade	Sub-Contractor	Address	Contact	Telephone / Email
Mechanical Services Installer				
Gas Services Supply and Installation				
BMS Installation				
Flue Supply and Installation				
Insulation Supply and Installation				
Water Treatment and Commission				

6.3. Post Maintenance Checks

Plant Running Checks	
	The following checks should only be carried out by suitably qualified personnel who are fully conversant with the Health and Safety at Work Act:
1	Ensure that domestic hot water flow temperatures are maintained.
2	Maintain a regular check on the boilers & CHPs and the system flow and return temperatures. Ensure the systems are adequately vented.
3	Maintain a regular check on chemical dosing plants to ensure that the required water conditions prevail.
4	Check all plant indicator lamps daily.
5	Where practicable visibly inspect the motor, drive and fan assemblies.
6	Check for signs of any apparent undue noise, deterioration or vibration to items of plant and/or equipment and investigate immediately.
7	Check motor running currents (where applicable).
8	Check associated LV switchboards and panels. Log readings for power consumption. (where applicable).
9	Observe correct operation of automatic control valves.
10	Maintain fixed operating cycle on all plant provided with stand-by equipment.
11	Inspect specialist systems and carry out checks in accordance with the manufacturer's instructions.

6.4. Equipment Handling any Special Lifting and Handling Requirements

Referance should be made to the Equipment weights set out in Section 6.5 & OEM Manufacturers Literature provided within Book 2 - Manufacturers Info (OEM).

6.5. Equipment Weights (Main Items of Equipment 5kg and over)

Equipment Ref	Description	Location	Weight (kg)
ASHP	Mitsibishi Electric AW-HT /LN-CA-E /0604	Roof	Dimensions 1,878H x 1753W x 810D Weight 350kg / 353kg (Weight shipping/operating)

6.6. Lubrication Schedule

Regular lubrication should be carried out to ensure maximum service from plant. Neglect of lubrication will result in the foreshortening of bearing and plant life and ultimately leads to plant failure. Always ensure that the right lubricants are used for the job they have to do and that they are suitable for the temperature and loads to which they will be subjected.

- Lubricants, must not enter the ground or the sewage system.
- Used lubricants must be disposed of through used oil recycling or as hazardous waste.
- Used filter elements and cartridges must be disposed as hazardous waste.

For further information, see The Hazardous Waste (England and Wales) Regulations

WARNING: Before handling lubricating oil or grease consult the MSDS and/or COSHH assessment and wear the appropriate ppe. As a general guide avoid skin contact and maintain high standards of personal hygiene to prevent skin disorders. Never allow any oil, especially synthetic oil, to remain in contact with skin as it can cause poisoning by skin absorption. Avoid breathing in oil vapours emitted from hot machinery, maintain concentrations of fumes and vapour as low as possible.

Item of Plant	Lubrication Item	Information	6 Monthly	12 Monthly
Gas Booster	Fan Bearing Assembly Bearing			X
Booster-sets	Motor bearings	Motors without lubricating nipples are maintenance-free. Lubricate motors with lubricating nipples with a high-temperature lithium-based grease. See the instructions on the fan cover of Grundfos motors. In the case of seasonal operation where the motor is idle for more than six months of the year, we recommend that you grease the motor when you take the pump out of operation.		X

6.7. Special Tools

Beyond a reasonably competent engineers general tool kit no special tools are considered necessary to carry out maintenance repairs to the services embraced within this manual.

If commissioning checks are carried out on the fans and air distribution performance the following basic instruments will be required:

- Combustion analyzer
- Electric Anemometer
- Rev Counter
- Volt and Ammeter
- Temperature and Humidity Measuring Equipment (Calibrated)

6.8. Maintenance of Common Equipment used in Multiple Locations

6.8.1. Hand Operated Valves (Manual)

Butterfly Valves
Butterfly Valves do not require any routine maintenance. If the valve requires maintenance, it is advised you contact the Albion sales office for advice as not all models are easily dismantled.

Screwed Ball Valve
If any maintenance is to be undertaken on the Screwed Ball Valves it is the responsibility of the installer to ensure the system is adequately drained, depressurized and the valve isolated before any work commences. A full risk assessment should be undertaken prior to any works taking place.

Brass Double Check Valves
Should the brass double check valves become blocked, the valve is fitted with an internal drain port to assist with debris removal. If any maintenance is to be undertaken on the valve it is the responsibility of the installer to ensure the system is adequately drained and depressurized. A full risk assessment should be undertaken prior to any works taking place.

6.8.2. Control Valves

Reference should be made to the BMS Controls O&M Manual provided in Book 2 - Manufacturers Info (OEM).

6.8.3. Flexible Connections

When correctly selected and properly installed flexible connectors will provided many years of trouble free service. It is essential they are used within their temperature, pressure and media limitations. Regular inspection of the rubber is advised to check for deterioration we also advise a thorough internal and external inspection after a maximum of 12 months of service.

Flexible Connectors are an important part of any system and consideration should be given to retaining a replacement connector should any evidence of deterioration or wear be witnessed to prevent a long term shut down of the system.

Flange bolts should be checked for correct tightness at regular intervals.

The rubber should never be painted as this could damage / deteriorate the rubber and lead to reduced performance and premature service life.

6.8.4. Non Return Valves

The non-return valve should be checked on a regular basis to ensure optimum performance. Key checks that should be performed during maintenance include checking that the valve flap opens freely and has not become caught or dislodged. You should also clean out the valve of any debris that could be affecting the sealing or closing.

6.8.5. Pressure Relief Valves

ART 6200 PRV Repair Instruction

Main valve will not close:	
Failure Mode	**Repair Method**
Pilot valve setting too high	Slowly adjust the pilot valve anticlockwise
Sealing position leakage	Tighten the nut or change the sealing parts
Needle valve doesn't work	Open the needle valve(anticlockwise) and flush the valve
Main valve diaphragm broken	Change the diaphragm
Excess debris accumulation	Disassemble, clean the valve. Replace any damaged parts
Seat leakage	Replace the seal
Joint leakage between SS connection components	Tighten the nut or change SS part

Main Valve will not open:	
Failure Mode	**Repair Method**
Oversize valve	Use the bypass valve to achieve pressure reducing control
Needle doesn't work	Slowly adjust the needle valve clockwise till to the setting pressure
Pilot valve damage	Replace the pilot valve

6.8.6. Strainers & Filters

Strainers have to be cleaned at regular intervals. We recommend that cleaning should generally be combined with maintenance activities, e.g. at control valves. The regular servicing and/cleaning of the strainer screen ensures a constant and low pressure drop in the strainer.

6.8.7. Pressure Gauges

Pressure gauges generally require little to no maintenance, other than periodic calibration recommended every 12 months.

6.9. System Scheduled Maintenance

6.9.1. General

The tables below provides a summary of the recommended intervals between maintenance inspections/actions as itemised in further detail within the OEM Literature provided in Book 2 - Manufacturers Info (OEM).

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 later) the manufacturer's information should be followed.

6.9.2. BMS System

Reference Should be made to the BMS Manual for Distech BMS Service Guidelines contained in Book 2 - Manufacturers Info (OEM).

6.9.3. ASHP & Associated Equipment

FREQUENCY	**:**	**TASKS**
Daily	:	None
Weekly	:	None
Monthly	:	None
3-monthly	:	1-10
6-monthly	:	1-11
Annually	:	1-11

Note: Checks to be carried out by approved engineer. In case of necessary maintenance activities involving disambling of Pipes re-assemblying must be free of internal tension.

3 Months

REF	TASK	DONE
1	Tighten the electrical connections and replace any worn ordamaged cables	
2	Check for any leaks on the cooling circuit. Perform this operation at the frequencies indicated in the relative European regulations	
3	Check the unit power supply voltages	
4	Check the compressor power supply voltages	
5	Check the fan power supply voltages	
6	Check the operation of exchanger and/or pipe anti-freeze resistances (where fitted)	
7	Check the operation of solenoid valves	
8	Check the tightness of all sealed connections and test points.	
9	Clean/replace rooftop unit filters	
10	Check in accordance with the manufacturers recommendations.	

6 month

REF	TASK	DONE
1	Check evaporator resistance operation	
2	Measure overheating & Overcooling temperature value	
3	Measure compressor discharge gas temperature value	
4	Measure High & low pressure value.	

5	Measure fan,compressor & Pump absorption, 3 phases (L1, L2, L3) or single phase where single-phase present	
6	Measure outdoor air temperature	
7	Measure evaporator and condenser inlet and outlet water temperature where fitted	
8	Check the filter and clean the oil	
9	Check tightening of shell and tube exchanger heads	
10	Check the functionality of all safety devices.	
11	Check in accordance with the manufacturers recommendations.	

12 month

REF	TASK	DONE
1	Check Safety Valve Operation and Drains	
2	Check and if necessary replace dehydrator filters on the liquid line	
3	Check the wear on the fan contacts	
4	Check the cleanliness of the shell and tube exchangers and clean them if necessary (swabbing can damage the internal scoring of the pipes: use appropriate chemical products)	
5	Check the horizontal positioning of the unit	
6	Check for rust on the cooling circuit, especially the pressure vessels. Apply appropriate surface protection if necessary	
7	General unit cleaning	
8	Check the acidity, humidity, pressure and temperature of the oil sump	
9	Check dielectric rigidity	
10	Check correct operation of oil level sensor (where fitted)	
11	Check in accordance with the manufacturers recommendations.	

6.9.4. Pipework

FREQUENCY	**:**	**TASKS**
Daily	:	None
Weekly	:	None
Monthly	:	None
3-monthly	:	None
6-monthly	:	1-4
Annually	:	1-6

REF	TASK	DONE
1	Inspect externally all valves, cocks, strainers, check valves etc for defects or malfunction. Rectify flange or other leaks if possible or note for early attention.	
2	Inspect pipe work throughout the system, including in concealed positions, for damage or leaks and take the necessary action.	
3	Clean out strainers fitted to the pipe work as necessary.	
4	Valves, unless operated, are likely to become immovable. All valves should, therefore, be operated fairly frequently and not less than twice per year. Count the original 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.	
5	Check visually that all hangers, brackets and supports are secure. Tighten up all nuts on hangers, brackets and supports etc as necessary.	
6	Inspect all parts for external corrosion and take the necessary action. If only superficial, clean and repaint.	

6.9.5. Pump Sets

FREQUENCY	:	TASKS
Daily	:	None
Weekly	:	1-2
Monthly	:	None
3-monthly	:	1-3
6-monthly	:	None
Annually	:	1-5

REF	TASK	DONE
1	If a pump is standing idle for some weeks turn the shaft a few revolutions by hand to break the rust film.	
2	Inspect the mechanical seals for undue leaks or damage. No adjustment is possible. If leaking, carefully renew the seal materials or replace the mechanical seals.	
3	Clean associated strainers. Check condition of AV mountings.	
4	Thoroughly clean, check for wear, fit replacements as necessary. Check all mechanical and electrical connections. Maintain in accordance with the manufacturers recommendations.	
5	Check in accordance with the manufacturers recommendations.	

6.9.6. Pressurisation Unit

FREQUENCY	:	TASKS
Daily	:	None
Weekly	:	None
Monthly	:	1-3
3-monthly	:	None
6-monthly	:	None
Annually	:	1-5

REF	TASK	DONE
1	Inspect the unit externally for signs of water leakage. If leak is found repair as necessary.	
2	Check that the pressure is stable at pre-set level, if not increase pressure to suit. If unit cuts out on low pressure contact manufacturer.	
3	Check all electrical circuits for continuity. Ensure that earth continuity exists (to be undertaken by a qualified electrical engineer).	
4	Re-paint all steel / paint work as necessary.	
5	Check in accordance with the manufacturers recommendations.	