

CONTROL LIFE SUPPORT SYSTEMSDescription

1. The life support systems on Controls are:

a. Mains and Standby Power.

b. Air conditioning system which operates in four modes:

(1) Normal

Fresh air is taken in through the Fresh Air Intake, through a Dust filter in the Mixing Chamber to Circulation Fan, with circulation to each room and return via vents in the doors to the main corridor and so back to the Mixing Chamber. The system is designed to operate with all doors closed. Foul air is extracted from toilets and kitchen and vented into generator room. A percentage of previously circulated air is also extracted and passed to atmosphere via the generator room. The remainder is mixed with fresh air in the Mixing Chamber for further circulation. The circulated air may be cooled or heated according to preset requirements. The whole system is automatic but may be manually controlled if required. The balance of air intake over extraction keeps the building at a slight over pressure.

(2) Modified Normal

The Modified Normal mode is similar to the Normal Mode except that the Air Cooling System is shut down at the penalty of discomfort, as this uses an appreciable quantity of water. This is a significant factor when operating on stored water.

(3) Recirculation

Recirculating air with Fresh Air Intake and Stale Air Extraction closed down. In this mode there is no over pressure to the building.

(4) Filtration

Air is taken in via the Filtered Air Intake allowing fresh air to be drawn into the building through a filter bank to remove particles of dust.

c. Water storage tanks through which all mains water is drawn until the rising main is turned off. At this point the full tank is the total water available for operations. This may be augmented by Jerrycans if they are available.

2. Standby Generator. This may be operated by manual or automatic control. On automatic control the generator will start when mains power is lost. When this happens lighting is restored in about 10 seconds but several minutes must elapse before full power is restored to all services in use through the load shedding equipment. On restoration of mains power the Standby Generator closes down and all services have full power at once. Standby Power is insufficient to operate all the services in the building hence the load shedding device to allow a choice to suit the current requirement. The MSX has devices to deal with fluctuations in the power supply, both mains and standby. The induction for the generator takes air from within the building, ie the generator room.

3. The Life Support Systems have several characteristics to note:
 - a. When the standby generator is operating during recirculation it is necessary, at present, to prop open the damper in the external air vent in the generator room which normally closes against external pressure and to close the damper between the extract fan and the generator room. This allows the generator to "breathe" fresh air but has the disadvantage of drawing possibly contaminated air into the generator room.
 - b. Recirculation, with no intake of air, progressively degrades conditions within the building. With full manning, operators performance will deteriorate as the concentration of carbon dioxide in the building increases. Whilst there are no devices to measure this concentration, calculations based on formulae provided by the Institute of Naval Medicine show that the concentration will increase to significant levels as follows:
 - (1) CO₂ concentration will reach 0.5% (maximum level allowed under HASW regulations) in 3.7 hrs.
 - (2) A concentration of 1.0%, at which level it is safe to operate for a period of up to 3 days, will be reached in 6.9 hrs.
 - (3) A level of 1.5%, at which level it is safe to operate for only a short period, will be reached in 11.5 hrs.
 - c. Filtration has a limited duration because the filter banks will become congested at a rate depending on the amount and particle size of radioactive material being deposited. When the filters are saturated they cannot be cleaned or replaced.
4. The Life Support Systems are to be used as follows:
 - a. Up to RED Warning the Control is to be operated on Mains Power, Mains Water and with full Fresh Air Intake. This is the Normal Mode.
 - b. At RED Warning:
 - (1) The Standby Generator is switched on manually and Mains Power is turned off. Oil consumption is approximately 5 gallons per hour and a full storage tank will provide power for 40 days. When the Mains/Standby power change is involuntary there is some disruption to services which, though probably not serious when the MSX is protected, is best done under control. Where the MSX is unprotected, the power supply to it can be turned off in the Comms Room before the Standby is started and turned on again after the change to Standby Power. On restoration of power voluntarily, the same procedure of switching off the power supply to the MSX until mains services are restored will prevent MSX failures.
 - (2) Mains Water is shut down and the stored supply used because close or even distant attack may fracture or damage the supply and so contaminate the water. Water is of such importance to survival that it is better to ration it before any possible damage than to risk contamination of the stored supply.

- (3) The air supply remains as Fresh Air.
- c. At the approach of Fallout and not less than 30 minutes before its predicted arrival, the building is put under Recirculation.

(1) This mode can be operated for only a limited period. The management team must watch for periods of no deposition and where such periods can be predicted accurately the Fresh Air Mode is restored for as long as it is safe to do so. By this process the Control can be operated on a mixture of Recirculation/Fresh Air Modes maintaining the efficiency of personnel, a low concentration of CO₂ and conserving the Air Filters at maximum efficiency.

(2) Should a period of deposition continue for more than 6 hours, the Filtration Mode is used. This Mode reduces the limited and unknown life of the filters and is only used when absolutely necessary and for as short a time as it takes to restore conditions in the Control to an acceptable level.

- d. When deposition is complete, either during Recirculation or Filtration, and there is a predicted period of no deposition the Fresh Air Mode is restored.

NOTE: During peacetime exercises the Recirculation Mode is not to be operated for more than 3 hours, after which period Fresh Air Mode is to be operated for 1 hour before a further period of recirculation. This will ensure that the Health & Safety at Work Act Threshold Level Value of 0.5% concentration of CO₂ will not be exceeded.

5. The Life Support Systems are used so that the personnel in the Control can operate safely and efficiently and at the same time preserving the consumable assets of the building such as Air and Water for as long as possible against unknown requirements.

6. It should be noted, however, that where intelligence revealed that any period of conventional hostilities was likely to escalate to chemical attacks which could affect Controls, it is at present mandatory that the building is to be put under Recirculation Mode immediately.

Actions required to change the modes of Operation

A. MODIFIED NORMAL MODE AT 'RED' WARNING

7. At RED Warning the mains water supply is turned off and standby power set in operation. It is also possible that in order to conserve water the cooling system will be switched off. This Modified Normal Mode is achieved as follows:

- a. Notify Senior Duty Officer of time Standby Power will be taken into use.
- b. Operate Controls to achieve Standby Power.
- c. Switch off Compressors.
- d. Switch off Cooling Tower Fan and Condensor Water Pump.

- e. Turn off Main Water Supply.
- f. Turn off Water Supply to all taps.
- g. Turn off Water Heaters in:
 - (1) Decontamination Room.
 - (2) Ladies Toilet.
 - (3) Kitchen Washing Water Heater.
- h. Switch off Nos 1 and 2 Water Transfer Pumps.

B. RECIRCULATION

8. When operating in the Recirculation Mode, no external air is drawn into the building and no foul air is drawn from the rooms indicated in para 1 (b) and no refrigeration is used.

9. To change from Normal Mode to Recirculation Mode the following sequence is to be followed:

- a. Switch OFF the Exhaust Fan.
- b. CLOSE (tightly) the Fresh Air Intake Gas Damper.
- c. CLOSE the Exhaust Damper.
- d. Ensure that all Air Lock doors are CLOSED.
- e. Ensure that all personnel use all internal doors correctly, ie they are only opened to allow entry or exit from any rooms.
- f. Check that all Air Evacuation Valves are fully closed and that none are struck in a partially open position.

C. REVERSION TO NORMAL MODE

10. To revert to Normal Mode from Recirculation Mode it is necessary to:

- a. Open the Fresh Air Intake Gas Damper.
- b. Open the Exhaust Damper.
- c. Switch on Exhaust Fan.

D. FILTRATION

11. When operating in the Filtration Mode external air is drawn in through the Filters, circulated and exhausted to atmosphere much as in Normal Mode. To change from Recirculation Mode to Filtration Mode the following sequence is to be as follows:

- a. Open sliding ISOLATING DAMPERS on the GAS FILTER BANKS (1 on each Bank).
- b. Check Air Flow Control Dampers are open (1 on each Bank). These are lever valves on the external side of the filters.
- c. Open GAS DAMPERS (1 on each Bank).
- d. Open Sliding Damper above GAS FAN.
- e. Check Air Flow Control Damper is CLOSED.
- f. Switch on Gas Fan.
- g. Open gradually the Air Flow Control Damper at the same time observing the air flow meter indicator. When the needle on the indicator reaches 1600 cu ft/min, LOCK the Air Flow Control Damper in position.

12. During this initial stage the Air Pressure Alarm will activate until the air pressure in the building has stabilised at point 5 w.g. The bell on the Alarm Unit can be cancelled but you must monitor that the Red Lamp which extinguishes when the building is pressurised. Should the lamp fail to extinguish then a check must be carried out to find out where air is leaking from the building.

13. The building now remains in Filtration Mode for approximately 25 minutes to effect a complete change of air then return to Recirculation Mode as follows:

- a. Switch off GAS FAN.
- b. When Fan has stopped rotating, CLOSE the Sliding Damper above the FAN.
- c. CLOSE the Air Control Damper.
- d. CLOSE (tightly) the two THERMO-TANK GAS DAMPERS on the Filter Banks.