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## Chapter 6 – Environmental Conditions

### 6.1 Recommended Site Environment Specifications

Each system module comprises numerous electronic and mechanical components, which are sensitive to extreme temperatures, humidity, dirt and air pollution. The operational environment of any Nuclear Medicine system inevitably has a noticeable effect on its reliability. High temperatures increase the failure rate of almost any electronic component. Temperature cycling may induce temporary or permanent changes in electronic equipment and/or mechanical components and can influence the performance of the system. Fast temperature changes can cause physical damage to the Detector's crystal. Unfiltered air in the room can cause damage to the hard disk, floppy disk drive, optical disk, etc.

Therefore, the units of the Imaging System should be installed only in a clean, dust-free, temperature-controlled environment, as specified in [Table 6–1](#).

**Table 6–1:** Environment Specifications

PARAMETER	REQUIRED ENVIRONMENT SPECIFICATIONS
Temperature	20 - 25 °C (68 - 77 °F)
Maximum Gradient	3 °C / hour (5.4 °F / hour)
Humidity	40 - 70% RH non-condensing
Magnetic Field in Camera Room	Less than 1 Gauss

In addition to the specifications listed in [Table 6–1](#), free flow of air is required around the Computer. The Scan Room temperature and humidity are influenced by such factors as volume, temperature, humidity and flow pattern of incoming room air.

Operation is guaranteed up to 27 °C (81 °F). When designing the equipment control system, it should be noted that system cooling is required even in winter months.

Many sites have shut down their cooling facilities in the past and have used external atmospheric air to cool the system. The use of external cold air must be carefully controlled, to correct the temperature, humidity and air cleanliness levels, and ensure proper operation of scanner system.

## 6.2 EMC Compliance

This system complies with IEC60601-1-2 (2nd Edition - 2001) EMC standard for medical electrical equipment. For additional information see [Appendix D – EMC Compliance](#).

### 6.2.1 Ventilation (gas) Studies

If the Infinia system is going to be used for ventilation (gas) studies, provision must be made for air extraction, as contaminated air near the detectors may affect image quality

## 6.3 Thermal Loads

The following thermal loads are relevant to the site environment:

- Equipment heat dissipation
- Room heaters and lights
- Number of persons in the scan room
- Dissipation through walls, ceilings, floors, doors, windows
- The thermal loads of the camera main units are listed in [Table 6–2](#).

**Table 6–2:** Equipment Thermal Loads

Equipment	Watts	BTU/Hour
Gantry	2,100	7,200
Patient Table	100	342
Hawkeye Option	420	1438
Computer	350	1,200
Monitor	120	411
UPS (where applicable)	According to manufacturer's specifications	According to manufacturer's specifications
Total (without Hawkeye Option)	2,570	8,811
Total (including Hawkeye Option)	2,770	10,591

**Note**

Any additional equipment such as processing station or multi imager should be considered while calculating the total thermal load.

In addition to the heat generation specifications listed in Table 6-2, the amount of heat dissipated through walls, ceilings, and floors due to lighting, air ducting, heating, air conditioning, etc., should also be considered. The number of persons in the Scanning Site any given moment, will also have an effect on heat buildup.

As environmental factors change, varying levels of heat and humidity will be introduced or dissipate. Heating, cooling and humidity control equipment should therefore be used to maintain the required environmental conditions.

In order to maintain a proper air flow, the air conditioning duct arrangement should be planned so that cool air is not directed to the computer and the Gantry. Exhaust or return air vents should be located in the ceiling above the computer system. Air should be supplied by an overhead duct and diffuser or through a low wall system.

In planning the air conditioning installation, space must be provided for camera maintenance and environmental control system. Environmental control system installation plans must be submitted to the Vendor's Installation Department, in order to facilitate complete site planning.

## 6.4 Environmental Tests

### 6.4.1 Power Source Test

Tests must be performed on site main supplies, prior to the camera installation. The mains tests can be done with a unit Power-line Disturbance analyzer such as “DRANETZ - series 606”. Surveillance requires seven working days on site, on all three phases. Voltage measurements are as follows:

1. Slow average of mains voltage beyond  $\pm 10\%$ .
2. Surge or sag of RMS voltage beyond  $\pm 10\%$ .
3. Frequency variations beyond  $\pm 1\%$ .
4. Spikes higher than 400 V (230 V line), 200 V (120 V line), their amplitude and time duration.
5. Line regulation tests - should be performed after loading each phase (at the point where the camera switchboard will be connected).
6. Ground Conductivity - the resistance between True Ground point and the Electrical connection to the equipment must be less than 1.2 Ohm.

### 6.4.2 Temperature Tests

Prior to installing the Imaging System, humidity and temperature tests must be performed at the site area. Surveillance requires seven working days on site.

CAMERA WARRANTY AND SERVICE AGREEMENTS ARE  
CONTINGENT UPON MAINTAINING THE SITE ENVIRONMENT  
ACCORDING TO THE ABOVE SPECIFICATIONS.