

CATHETER LABORATORIES

DESIGN NOTES TO HBN 00-03

OVERVIEW

Catheter labs are used for a wide range of invasive cardiac investigations and treatments and should be situated as close to a day case admissions and recovery area

It is essential to provide adequate radiation shielding within the LAB to comply with all relevant regulations notable the Ionising Radiations Regulations 1999

Listed below are just some of the treatments that can take place within a catheter suite:

- Coronary angiography
- Percutaneous coronary intervention (PCIs)
- Electrophysiology studies
- Radiofrequency ablations
- Transcatheter aortic valve implantation
- Implantable cardioverter defibrillators
- Neurovascular angiography
- Insertion of implantable devices

As some of these are delicate procedures the siting of the unit must be such to give easy access to Cardiac operating theatres'

Procedures like PCIs should also be sited with emergency access from the emergency department or from ambulance bays.

Equipment that should be sited within the Catheter Laboratory:

- A multi-angular digital angiographic X-ray system (single or biplane) comprising a C-arm (X-ray source and image intensifier, also known simply as the Image intensifier), a fully adjustable patient table and ceiling mounted flat panel monitors for angiographic work.
- Trolley for power injection facilities for contrast media.
- Stimulators, ablaters and mapping systems mounted on a trolley.
- Heated Lotion cabinet for preparation of contrast media.
- Computer workstation for the cardiac nurse
- **Equipment room** to house cupboards for storage of consumables and racks for catheters
- Wall mounted drug cupboards
- A scrub area with scrub trough and associated facilities for scrubbing and gowning
- **A control room** to house computer for cardiac physiologist, one computer for viewing, capturing and annotating pressure and ECG data, one computer for entering data about the procedure with a replay facility for acquired images. (this should be linked to the display in the lab opposite the operator)
- The number of monitors depends on the range of procedures taken Typically this will be
 - o 2 Haemodynamic screens
 - o 2 Radiography screens
 - o 1 Intravascular ultrasound screen
 - o 2 electrophysiology screens
 - o 1 mapping workstation
 - o NOTE- One of the patient monitors must be powered independently of the X-ray equipment to allow for continuous monitoring of the patient should a malfunction occur.

Additional Catheter Laboratory Notes

A minimum size of 50m² is recommended for the equipment and staff. Most equipment is floor mounted and any floor mounted C arms will need to be secured by heavy duty fixing devices capable of retaining a moving mass weighing up to 3 metric tons with high residual torque.

Any ceiling mounted systems may have to have additional structural supports. BI plane systems such as this one will need more lateral width than mono plane to avoid collision between equipment.

The patient table should be capable of multi directional movement and operating in conjunction with an isocentre positioned at or near the patient's heart. There should be sufficient room at both sides of the patients table to provide the operator space to work at either side. Consideration should be given to the size and weight of patients as tables may cause additional strain on the floor structure.

The monitors give real time images and must be positioned so that they can be comfortably viewed by the operator. The physiologist must have easy access to the fluoroscopy reference monitor.

Additional Control Room Notes:

The machine should be positioned so that the view from the control room window is of the patient from the foot end of the table.

Control room must have adequate radiation protection (to be checked by hospital RPA) and intercom between rooms.

The control room should be accessible from the lab and direct to the circulation areas.

Engineering Considerations:

- Each Lab should be equipped with a ceiling mounted minor operating light selected to meet the clinical function of that particular laboratory. This is normally situated to illuminate the shoulder end of the patient.
- The general lighting should be coordinated with the patient table and tube stand to ensure that fluoroscopic imaging perception is not adversely affected. Locally controlled variable lighting levels should be provided to avoid reflection on monitoring screens.
- Medical oxygen, medical compressed air and medical vacuum, together with nitrous oxide and active anaesthetic gas scavenging, should be provided by ceiling mounted pendants.
- "X-ray on" signs (illuminated safety sign and warning lamp) are required outside the main doors to each laboratory and another to the control room. The sign should also include the lettering "do not enter" visible only when illuminated. These signs should have incandescent filaments energized from a suitable power source within the room and switched via appropriate devices interlocked with equipment. All signs to be fed from essential supply.
- All alarms must be visual as well as audible as lead lining will make it difficult to hear them
- To determine ventilation requirements, it is necessary to establish the range of procedures to be undertaken. Many of the procedures of short duration such as insertion of pacemakers require ventilation only to treatment room standards; lengthy procedures will require air conditioning to operating theatre standards.

All sanitary fittings comply with HBN 00-10: Part C – sanitary assemblies. It is recommended that ceramic wall tiles are avoided due to the risk of infection if the grout becomes contaminated. A seamless plastic splash back is preferred.

Flooring finish should be of a homogeneous vinyl or rubber type with welded joints to avoid any infection risk. Coved or set in skirtings are preferable to help when mopping the floors.

Lighting within the room should be sufficient for general use. Guidance to lighting design can be found in the CIBSE Lighting guide 2: Hospital and Healthcare.

Generally the lighting should be designed to EN12464-1 as follows

Task/Activity	Em	UGRL	Uo	Ra
General Lighting - Prep	300	19	0.6	80
Control Room	300	19	0.6	90
Cath Lab	1000	19	0.7	90

Where Em = Illuminance should not fall below E_m Maintenance values in the visual task area

UGRL = Upper limit for direct glare.

Uo = Uniformity (ratio between lowest (E_{min}) and Mean illuminance level (E) in the area evaluated

Ra = Lower limit for colour rendering index.

The room will have to have sufficient air supply/extract designed to the CIBSE ventilation guide. Recommended to achieve 15 AC/hr with positive pressure. Internal temperature between 18 - 28°C. Pressure regulating flaps may be required to balance pressure regime

All sockets to be Essential supply with UPS

References-

Health Technical Memorandum 03-01: Specialised ventilation for healthcare premises.

Health Building Note 01-01: Cardiac Facilities

Health Building Note 00-03: Clinical and Clinical Support Spaces.

EN12464-1:2011 European standard for Lighting of indoor work places.