# 9. LIFTS

## Introduction

9.1.00 Lifts in New South Wales are required to be designed and installed to AS 1735 – Lift Code Series and the BCA (Building Code of Australia).

Lift installation and inspection under the Act and Regulation are the responsibility of the building owner, and the lift design and installation the responsibility of the contractor. WorkCover have the power to enter any building at any time.

## General

9.2.00 NEEDS ASSESSMENT

The need for lift (vertical transportation) services is determined by a number of factors which include the following:

- The number of floors in the building
- Types of departments (hospital planning units) proposed to be accommodated within the building, and
- Type of inter-departmental traffic within the building likely to be generated for movement of people and goods e.g.
  - the number of staff and shift patterns, visitors and visiting hours
  - the location of theatres and x-ray facilities
  - the distribution of food, beverages, supplies, and waste disposal
  - emergency evacuation of patients, staff and visitors.

The type and extent of lift services to be provided is determined by the type and volume of traffic likely to be generated within the building and the service performance level that is considered acceptable for the level of medical service being provided by the hospital.

9.2.05 CAPITAL COST

The capital cost of lift installations is determined by a number of factors. The key factors include the following:

- The number and type of lifts (i.e. bed/passenger, goods or service)
- The type of lift drives (i.e. electro-hydraulic, geared electric, gearless electrical)
- Lift car interior finishes and lift control system.

Design economy is achieved by careful selection of the suitable type and size and appropriate number of lifts for the building. coupled with the need to limit cross infection by separating patients from visitors and staff.

This document deals with the key elements which influence the lift selection.

## Glossary of Technical Terms

9.3.00 A Glossary of Technical Terms is provided in Section 10, Appendix 1.

## Objectives

9.4.00 The aim of this document is to provide a consistent basis for the assessment of vertical transport provisions in hospital projects.

## Application

9.5.00 This document will apply to all new lift installations and, where possible, to refurbishment, etc. of existing installations.

## Services

9.6.00 GENERAL

The types of lifts to be selected are determined by the traffic requirements which can be broadly divided into three groups:

- Passengers; used for staff, ambulant patients, visitors.
- Goods; use for food trolleys, medical supply trolleys, linen trolleys, garbage and waste.
- Patients in beds and empty beds, furniture and equipment.

For a multi-lift installation (particularly for a high rise building), it will be cost efficient to assign different lift type and car size to suit a particular type of traffic grouping.

For a medium to low rise building, multi-purpose lifts would be selected to minimise initial capital and recurrent costs.

This document covers some of the key selection criteria when lift services are considered to be required for the proposed building development.

## Factors Determining the Need for Lift Services

9.7.00 To minimise recurrent costs, new hospital buildings should be planned without the need of lift services.

Notwithstanding, lift services are generally considered to be necessary under the circumstances listed below.

1. Where patient care areas are located above a level with direct egress to a road or open space (BCA requirement)

2. Where interdependent HPUs are not on the same level.

| | | |
|---|---|---|
| Operating Suite | <----------> | Emergency |
| Operating Suite | <----------> | ICU/CCU |
| Operating Suite | <----------> | Inpatient Units |
| Inpatient Units | <----------> | Kitchen |
| Inpatient Units | <----------> | Supplies |
| Imaging | <----------> | Emergency (Note) |
| Imaging | <----------> | Operating Suite (Note) |
| Imaging | <----------> | Inpatient Units (Note) |

3. When the building has three or more levels for reasons of work efficiency

Note: When the Imaging Department is not on the same level as Emergency, Operating Suite and Inpatient Units, satellite facilities will be required if lift services are not provided.

## Lift Positions

9.8.00 When lift services are found to be necessary for a hospital building, the planning and schematic design for the lift installation shall be carried out at the very early stage of the project. This is due to the long delivery and installation times of lift systems, and the preferred need to be able to incorporate actual contract liftwell dimensions in the structural design to minimise space loss.

The proposed lifts should be centrally located and should be easily accessible. The required number of lifts as determined by detailed traffic analysis will be grouped in one or more nodes.

Greater flexibility and performance efficiency may be gained with a smaller number of nodes (groups) depending upon the building arrangement.

The number of lift nodes required for the building or abutting buildings is determined by the horizontal distance that building occupants would have to travel from anywhere on the floor to the lifts. The lift nodes shall be positioned such that the maximum travel does not exceed 50m.

Stairwells should be planned and positioned immediately adjacent to a group of lifts to encourage pedestrian traffic.

## Number of Lifts

9.9.00 The number of lifts required for a hospital building is determined by the peak traffic requirements in terms of the following:

- Number of people and vehicles (trolleys) requiring the lift service during the peak period, peak traffic or peak period is not defined in the guideline. Examples potentially giving rise to peak traffic periods would be staff shift changeovers, visiting times, meal times, casualty or outpatient overloads.
- Handling capacity of the proposed lifts (i.e. the car size and drive performance),
- The extent of downward traffic during the period of up-peak.
- Whether it is desirable to group all lifts together. Consideration should be given to the separation of general public and specialised patient lifts in larger hospital situations and the effect this has on the budget.

Detailed traffic analysis and performance calculations shall be carried out during the early planning stage of the project to determine the number of lifts required and their optimum grouping and location.

Should the results of the traffic study indicate that only one lift is required for both ambulant and non-ambulant patients, one additional lift of the same type shall be provided in the case of one lift being put out of service for routine maintenance or due to equipment faults. Both lifts shall be grouped together but in separate fire rated shafts for compliance with B.C.A. requirements.

## Type and Mix of Lifts

9.10.00 The types and mix of lifts shall be assessed based on the following criteria:

1. Bed/passenger lifts are to be used for both people and vehicular traffic for moving goods and patients on trolleys.
2. Orthopaedic bed/passenger lifts may be used in place of bed/passenger lifts provided that the need for a larger lift car can be justified on the basis of clinical need.
3. Consideration may be given to a separate Food Services Lift for meal delivery if the kitchen is at one end of the building. However, justification for the provision is required.
4. For lift installations with four or more cars, the lift car entrance at the main landing for loading of food trolleys and other supplies trolleys should be separated from the normal lift lobby. Where functionally allowable patient and public lifts should be separated.
5. Dedicated Food Services Lift(s) is/are not required. Express services can be provided by the provision of Special Key Control in the lift control system.

6. Dedicated 'dirty' goods lift(s) is/are not required.

## Drive Systems

9.11.00 There are two main drive systems for lifts: electro hydraulic drive and electric drive. The traffic study analysis together with the decision on type and mix of lifts shall determine the lift drive systems.

An electro hydraulic lift is driven by a pump which raises or lowers the lift car by varying the oil pressure in a ram. The pump is driven by an electric motor.

An electric lift is powered by an electric motor (AC or DC) which is coupled to the hoisting mechanism through a reduction (worm) gear. The motion of the car is obtained through traction between suspension ropes and driving sheaves. There are varying types of electric lifts and selection should be based on life cycle cost analysis and fitness for purposes.

Basic options available in the drive selection are:

- Traction with overhead machine room.
- Traction with underslug machine room.
- Hydraulic with machine room adjacent to lift well.

A new type of traction lifts without machine room are not suitable at present (May 2005) because the standard car sizes available are too small for hospital beds.

A hydraulic lift has a lower initial cost and maintenance cost, when compared with a similar duty electric traction lift. The area required for lift well and machine room is smaller (about 12 % smaller), resulting in more efficient use of building space.

Extensive usage of a hydraulic lift raises the oil temperature and lowers its viscosity. Erratic performance of the lifts affects the floor leaving accuracy.

In summary, hydraulic lifts are suitable for the following applications:
- Low rise hospital of up to 3 or 4 landings and not more than 10 metre travel.
- Primarily used by disabled persons.
- Where an overhead machine room is not practical due to aesthetic or other considerations.

## Lift Controls

9.12.00 The number of lifts shall be determined by the building characteristics and usage. No more than four lifts should ever be located in line, and where additional lifts are required to serve the same levels, a second facing bank shall be employed in a common zone.

Each lift zone shall be controlled by the associated control system, facing banks being considered as a single control zone.

The control systems shall be microprocessor based.

A special service control facility shall also be provided to permit authorised staff to secure exclusive service of the designated lift(s) for medical emergencies or routine meal delivery.

9.12.05 OPERATION ON EMERGENCY CONTROL

The lift control system shall be capable of operating the lifts on emergency power in the following manner:

- Immobilise lifts at the main landing,
- Bring remaining lifts to the main landing in sequence, and
- Permit one or more designated lift(s) to remain in service as determined by the available capacity of the emergency power supply.

## Earthquake Protection

9.13.00 The lift design and installation shall incorporate earthquake provisions in accordance with the Australian Standard AS 1170.4 (with Supplement 1) Earthquake Loads.

## Traffic Analysis and Lift Performance

9.14.00 GENERAL

The lift requirement in a hospital shall be determined at an early stage of design development.

A lift consultant shall be engaged to carry out a traffic study to determine the lift requirements.

The following basic information is required for traffic analysis and shall be provided to a lift engineer:

- Number of floors and the intended usage.
- Floor to floor height.
- Building population or floor areas.
- Number of beds for health care building.
- Number of medical and other staff.

In hospitals the activity sequences include professional and non-professional staff involvement with patients, administration and other back-up activities. The back-up activities are: cleaning (sterilisation, laundry), catering, records and goods handling.

9.14.01 PERFORMANCE CRITERIA

The criteria used for lift design are Average Waiting Time (AWT) and 5-minute Capacity (PC5) and Maximum Transit Time (TP). PC5 us defined as percentage of the building population carried in 5 minutes by the lift system.

The accepted design standards for hospitals are:

- Averaging Waiting Time: 30 to 50 sec
- 5-min capacity: 10 to 15 % of population
- Maximum Transit Time: 120 to 150 minutes

Major teaching hospitals require the highest standard of services and this shall be provided.

If the hospital population is not available, use 3 to 5 persons per bed to estimate.

9.14.05 TROLLEY TRAFFIC AND OTHER SERVICES

In hospitals, trolley traffic is estimated to be four up and four down trips for every 100 beds.

Document conveyor can be used for handling of medical and x-ray records.
Service lifts can be used for movement of dirty and clean laundry to and from laundry store.

Pneumatic tube system can be used for movement of blood samples, pathology specimens and pharmaceutical products to and from laboratories.

## Lift Car Sizes and Finishes

9.15.00 LIFT CAR SIZES

A bed/passenger lift shall have a minimum clear size of 1600mm wide x 2300mm deep x 2400mm high and be provided with handrail all round and a shirting as specified in Section 22 of the Lift Code AS1735 Part 2.

A bigger car size, 1800mm wide x 2600mm deep x 2400mm high is required to accommodate orthopaedic and intensive care beds.

The smaller (and less costly) car should be selected where orthopaedic procedures are not expected to be used.

Some saving can be achieved with less elaborate lift car finishes as special wall finishes can add considerably to the cost of a lift car. The car interior finishes should always be designed for serviceability and ease of cleaning

9.15.05 GENERAL

NSW Health have determined hospital type car sizes for two types of use: a larger capacity for orthopaedic patients and a smaller for other hospital use. The smaller (and less costly) car should be selected where orthopaedic procedures are not expected to be used.

Some saving can be achieved with less elaborate lift car finishes as special wall finishes can add considerably to the cost of a lift car. The car interior finishes should always be designed for serviceability and ease of cleaning.

It would appear more relevant for the two types of use to be extended to include for bed patients, as defined in Clause 6.1.2, non-bed orthopaedic patients, and other hospital use.

The car size for non-bed orthopaedic patients, and other hospital use could be similar, although the lift for patients in wheelchairs should be sized to allow easy turning of the wheelchairs in the lift. NSW TAFE have standardised on a 1600 wide by 1650 deep car to allow this, and this could be a reasonable standard size, pending further information on the smaller 'Hosplan' lift size.

## Goods and Services Lifts

9.16.00 FOOD SERVICE GOODS LIFT

Provide enough lifts to allow the exclusive use of at least one lift for food services. In off peak times these lifts can be used for other domestic type duties.

In any hospital requiring vertical transportation, the food service requires exclusive use of at least one lift at meal times. Planning should provide free access to this lift in a manner that the delivery of raw material, meals and collection of dirty dishes etc. does not interfere with and/or hinder other traffic. The same lift can be used at off peak times for linen delivery and dirty linen collection and other domestic-type duties. This lift should be served by a lobby separate from those provided for normal passenger use.

9.17.10 SERVICE LIFTS / DUMB WAITERS

Consider relative position of sterile areas and pharmaceutical distribution systems.

Service lifts (or dumb waiters) with automated loading and unloading ability may be considered between the Sterile Supply Unit and the Operating Suite. With judicious planning, requirement for vertical transportation may be removed.

9.17.05 LOAD AND COST REDUCTION

If vertical goods transportation is required, service lifts/dumb waiters are cheaper than passenger lifts.

Both the goods lifts and the service lifts mentioned above can relieve traffic loading from the main costly hospital bed/passenger lifts and can reduce main lift requirement and consequent cost.

## Transport of Small Items

9.18.00 TELELIFT, DOCUMENT HOIST, PNEUMATIC TUBE SYSTEM

Consider other type of materials transport systems in larger hospitals only if this will reduce lift traffic load (Refer to - Lifts-Trolley Traffic and Other Services).

Various document and materials transport systems are available on the market, the installation of which could assist in demand reduction on the lifts and should be considered. Consideration should include the use of electronic transmission systems for information between diagnostic services, treatment areas and wards.

9.18.05 PNEUMATIC TRANSPORT SYSTEMS

Pneumatic tube transport systems with leak-proof carriers that have a clear see- through section to enable visual inspection of content prior to opening are highly recommended.

Use of a clear, leak-proof inner bag system is highly recommended.

The pneumatic piping system is to be designed and suitable to permit clean out of piping and disinfection via use of a special dispensing tube or other strategy.

Transport tube system carriers shall be capable of being sterilised or disinfected.

If pneumatic transport systems are installed, the number and location of pneumatic transport stations must be assessed.