NHS National Services Scotland

Scottish Health Technical Memorandum 08-04:

Specialist services
Pneumatic tube transport systems
Part A: Overview and management responsibilities

Health Facilities Scotland
Engineering and Environment

November 2011

Contents

Acknowledgements

This SHTM has been updated and expanded from SHTM 2009: Pneumatic tube transport systems, Part 1: Overview and management responsibilities, published by NHSScotland Property & Environment Form Executive (PEFEx) in June 2001, and now superseded.

Health Facilities Scotland are grateful for assistance in the preparation of this document provided by NHS Forth Valley and Quirepace Limited.

Preface

About Scottish Health Technical Memoranda

Engineering Scottish Health Technical Memoranda (SHTMs) give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of healthcare.

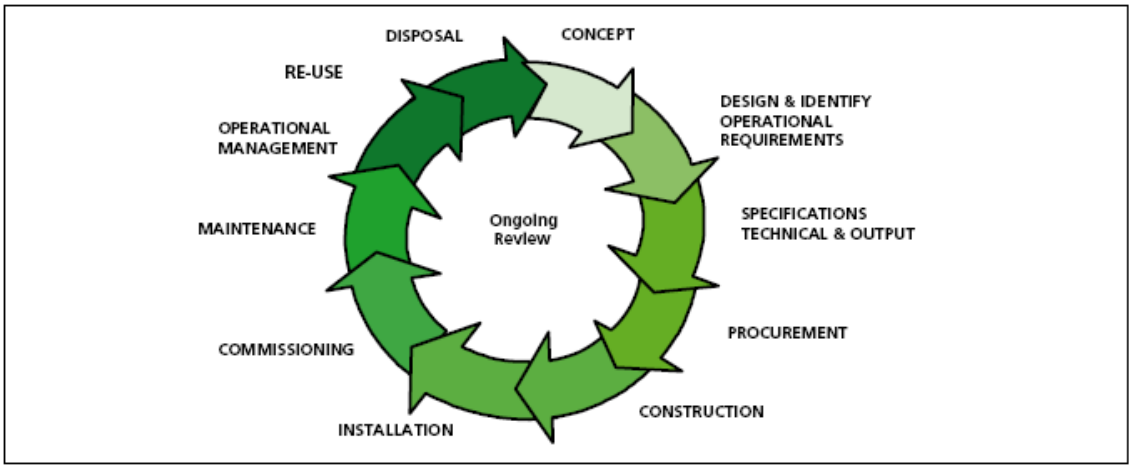
The focus of SHTM guidance remains on healthcare-specific elements of standards, policies and up-to-date established best practice. They are applicable to new and existing sites, and are for use at various stages during the whole building lifecycle: Healthcare providers have a duty of care to ensure that appropriate engineering governance arrangements are in place and are managed effectively. The Engineering Scottish Health Technical Memorandum series provides best practice engineering standards and policy to enable management of this duty of care.

It is not the intention within this suite of documents to repeat unnecessarily international or European standards, industry standards or UK Government legislation. Where appropriate, these will be referenced.

Healthcare-specific technical engineering guidance is a vital tool in the safe and efficient operation of healthcare facilities. Scottish Health Technical Memorandum guidance is the main source of specific healthcare-related guidance for estates and facilities professionals.

The core suite of eight subject areas provides access to guidance which:

- is more streamlined and accessible;
- encapsulates the latest standards and best practice in healthcare engineering;
- provides a structured reference for healthcare engineering.



Healthcare building life-cycle

Structure of the Scottish Health Technical Memorandum suite

The series of engineering-specific guidance contains a suite of eight core subjects:

Scottish Health Technical Memorandum 00: Policies and principles (applicable to all Scottish Health Technical Memoranda in this series)

Scottish Health Technical Memorandum 01: Decontamination

Scottish Health Technical Memorandum 02: Medical gases

Scottish Health Technical Memorandum 03: Heating and ventilation systems

Scottish Health Technical Memorandum 04: Water systems

Scottish Health Technical Memorandum 05: Reserved for future use

Scottish Health Technical Memorandum 06 Electrical services

Scottish Health Technical Memorandum 07: Environment and sustainability

Scottish Health Technical Memorandum 08: Specialist services

Some subject areas may be further developed into topics shown as -01, -02 etc and further referenced into Parts A, B etc.

Example: Scottish Health Technical Memorandum 06-02 Part A will represent: Electrical safety guidance for low voltage systems

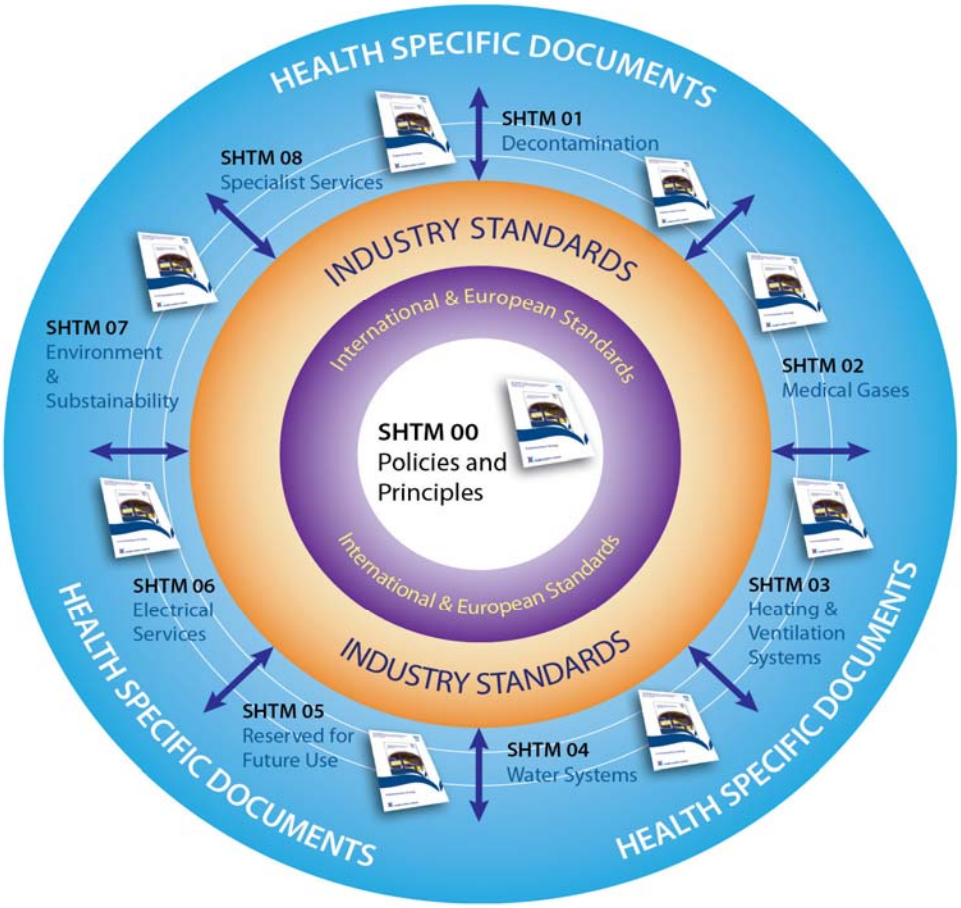
In a similar way Scottish Health Technical Memorandum 07-02 will simply represent: Environment and Sustainability – EnCO_2de.

All Scottish Health Technical Memoranda are supported by the initial document Scottish Health Technical Memorandum 00 which embraces the management

and operational policies from previous documents and explores risk management issues.

Some variation in style and structure is reflected by the topic and approach of the different review working groups.

Health Facilities Scotland wishes to acknowledge the contribution made by professional bodies, engineering consultants, healthcare specialists and NHS staff who have contributed to the review.



Engineering guidance structure

1. Introduction

Preamble

1.1 Hospital departments are coming under increasing pressure to examine how capital investment projects can be used to improve efficiency in both the provision of services and the use of manpower. Automated transport systems such as pneumatic tube transport systems now feature prominently in the capital plans of hospitals, and in particular pathology departments, throughout the United Kingdom and abroad as a cost-effective method of improving the quality of service to their customers.

1.2 Pneumatic tube transport systems provide an efficient, rapid and secure means of transporting various items such as blood and tissue samples, drugs, X-ray films (where still in use) and documents from one department to another. The speed of the system (up to 5 metres per second would be regarded as an effective speed) considerably reduces the length of time patients and staff have to wait for results. This can be a major factor in the decision to install a pneumatic tube transport system, together with the facility to handle spontaneous and demand items.

1.3 In addition to improving turnaround times, pneumatic tube transport systems also promote a more effective use of ward-based and messenger staff by reducing the amount of time they spend physically transporting items from one location to another. Nursing staff are therefore able to spend more time with their patients.

1.4 The installation of a pneumatic tube transport system must be consistent with the overall communications policy of the hospital since it will form an integral part of the information technology network. The physical movement of items through the pneumatic transport system will be recorded electronically via computerised requesting stations located in wards and departments.

1.5 The sophistication and flexibility of pneumatic tube transport systems mean that each individual installation can be tailored to meet the specific requirements of the customer.

1.6 This Scottish Health Technical Memorandum (SHTM) is equally applicable to both new and existing sites. It gives advice and guidance to healthcare management, design engineers, estates management and operations managers on the legal requirements, design implications, maintenance and operation of pneumatic tube transport systems in healthcare premises.

1.7 Current statutory legislation requires both management and staff to be aware of their collective responsibility.

2. Management responsibilities

Statutory requirements

Introduction

2.1 So far as pneumatic tube transport systems are concerned, the chief areas of legislation with which managers should be familiar are health and safety and operator protection.

Health and Safety at Work etc Act 1974

2.2 The largest and most important body of law to be considered by management teams is the Health and Safety at Work etc Act 1974 (the HSW Act) and its various Regulations.

2.3 The HSW Act and its Regulations require employers to assess the risks to their employees. Attention is drawn to the following with respect to pneumatic tube transport systems:

- the stored energy hazards associated with transport systems;
- the infection hazard associated with the microbial pathogens that may be handled by personnel;
- the hazard of infection to patients and staff by the inadvertent release of a load;
- the hazards associated with the handling of medical samples while loading and unloading;
- the hazards associated with radioactivity.

2.4 The guidance given throughout this SHTM is designed to ensure that these hazards are minimised and that all procedures comply with the relevant legislation and established good practice.

Management of Health and Safety at Work Regulations 1999

2.5 The Management of Health and Safety at Work Regulations 1999 expand upon the principles of the HSW Act.

2.6 The core of the Regulations is a requirement for employers to make a systematic assessment of the risks to health and safety to their employees and others arising from work activities.

Workplace (Health and Safety and Welfare) Regulations 1992

2.7 Most of the Regulations deal with the physical requirements of the workplace. Managers concerned with the operation of pneumatic tube transport systems

should pay particular attention to the Regulations on maintenance, temperature, cleanliness, room dimensions and space, and traffic routes.

Provision and Use of Work Equipment Regulations 1998

2.8 The Provision and Use of Work Equipment Regulations 1998 (SI 1998/2306) aim to ensure the provision of safe work equipment and its safe use.

Pressure Systems Safety Regulations 2000

2.9 Systems in hospitals do not exceed 250mb even when the system is stalled shut.

2.10 The Regulations define the competent person: 'a competent individual person (other than an employee) or a competent body of persons corporate or unincorporate'.

Control of Substances Hazardous to Health Regulations 1999

2.11 The Control of Substances Hazardous to Health (COSHH) (Amendment) Regulations 2004 impose duties on employers to protect employees and other persons who may be exposed to substances hazardous to health and also impose certain duties on employees.

2.12 Users of pneumatic tube transport systems should note that a 'substance hazardous to health' may include a micro-organism which creates a hazard to the health of any person. Guidance on the precautions to be taken when handling micro-organisms may be found in the HSC documents, *Categorisation of pathogens according to hazard and categories of containment*, (second edition 1990), compiled by the Advisory Committee on Dangerous Pathogens, and *Safe working and the prevention of infection in clinical laboratories*, compiled by the Health Services Advisory Committee. Reference should also be made to the Scottish Government Health Department, Advisory Group on Infection, Scottish Infection Manual, Guidance on core standards for the control of infection, in hospitals, healthcare premises and at the community interface. A full risk assessment should be undertaken taking into account infectious, chemical or radiation hazards which may be present in pathology specimens within carriers. These will include blood, sputum and biopsies containing formalin with potential exposure to harmful vapours. These issues will influence the design of carriers and their securing devices. Sealed containers within carriers still appear to provide the optimum method of dealing with containment.

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995

2.13 Commonly known as RIDDOR, these Regulations impose duties on persons responsible for the activities of persons at work and on self-employed persons to report accidents resulting in death or major injury arising out of, or in connection with, work and to report specified dangerous occurrences. They also require certain particulars of accidents at work to be reported both to the Department of Health and also to the Health and Safety Executive, and require records to be kept.

Manual Handling Operations Regulations 2002

2.14 The Regulations require employers to make an ergonomic assessment of all manual handling operations which involve a risk of injury, and to reduce the risk as far as reasonably practical. Factors to be assessed include the nature of the task, the load, the working environment and individual capability.

2.15 Managers should assess the risks associated with loading and unloading samples transported in the system.

Personal Protective Equipment at Work Regulations 1992

2.16 Managers should assess whether the risks associated with pneumatic tube transport systems require the use of personal protective equipment.

Electromagnetic Compatibility Regulations 2006

2.17 The Electromagnetic Compatibility Regulations 2006 impose requirements concerning the electromagnetic compatibility of most types of electrical and electronic apparatus which must be complied with when such apparatus is to be supplied or taken into service.

2.18 A pneumatic tube transport system (and any ancillary equipment) is a 'relevant apparatus' within the terms of the Regulations, and will have to meet standards for emission of and immunity to electromagnetic disturbance.

2.19 The Regulations do not apply to any pneumatic tube transport system supplied or taken into service in the EC before 28 October 1992. A pneumatic tube transport system supplied or taken into service in the UK on or before 31 December 1995 is not required to comply with the Regulations provided it complies with the requirements of the Wireless Telegraphy Acts listed in Schedule 1 of the Regulations.

Note: Detailed guidance on the application of the EMC Regulations in healthcare premises may be found in SHTM 06-01 Parts A & B.

2.20 Electrical supply and distribution services, including all manufactured equipment, must comply with the following legislation in all or in part as applicable:

- the Electricity Act 1989;
- the Electricity Supply Regulation 1988 (as amended 1994). These impose requirements regarding the installation and use of electric lines and apparatus of suppliers of electricity, including provisions for connections with earth. These regulations are administered by the Engineering Inspectorate of the Electrical Division of the Department of Energy and may impose requirements which are additional to those of the Electricity at Work Regulations;
- the Electricity at Work Regulations 1989. The principal statutory requirements for electrical safety in the workplace are the Electricity at Work Regulations 1989. The Regulations came into force on 1 April 1990. The purpose of the

Regulations is to require precautions to be taken against the risk of death or personal injury from electricity in work activities.

Other responsibilities

2.21 Management has a general responsibility to ensure that the pneumatic tube transport system is operated at a standard suitable for the purpose for which it was installed.

2.22 The transportation of drugs within the system should be controlled by a procedure which provides secure means of transfer of the drugs between the pharmacy and hospital stations.

2.23 The transportation of samples within the system should be governed by a management quality procedure covering the precautions and handling procedures to be undertaken by staff using the system. A list of items *not* to be transported in the system should be displayed at all workstations.

2.24 The Construction (Design and Management) Regulations 2007 place duties upon clients, designers and contractors to rethink their approach to Health and Safety so that it is taken into account and then co-ordinated and managed effectively throughout all stages of a construction project from conception, design and planning through to execution of works on site and subsequent maintenance and repair.

3. Functional review

General

3.1 A pneumatic tube transport system, which may be either a 'point-to-point' or a multi-point system, is a distribution network of tubes through which carriers of various sizes containing small items are driven by air flow. The prime mover is an exhauster or blower with a change-over valve which can alter the direction of the air flow in the tube as required to move the carrier through the system. The destination of the carrier may be controlled by diverters which switch the carrier from one branch to another. A central controller ensures that carriers are routed through the network.

Types of system

Point-to-point

3.2 Point-to-point pneumatic tube transport systems (see Figure 1) provide two-way transfer between points via a single continuous tube linking two points. These would be as much as 1,000 metres, or more, apart. The systems may be suitable for use in an application which requires simple operation and a dedicated link between departments, for example between an accident & emergency unit and the pathology department.

Multi-point

3.3 Multi-point tube transport system networks can consist of a number of systems covering various zones or areas (see Figure 2) provide full intercommunication between all stations in the network or zone. Where systems are large and traffic is heavy, the network may be split into zones. This allows local transport of carriers in each zone, as well as transfer to another zone, when required. This type of system is used in a large hospital, with, for example, the pathology and the pharmacy departments being in separate zones. Consideration may be given to the colour coding of carriers that would confirm the zones to which they belong provided this does not impede flexibility or incur unacceptable additional costs arising from the need for additional carriers. The convention is to colour code the carriers by their use, such as:-

Carrier colour	Use
yellow	Pathology
green	Pharmacy
red	Blood products
blue	Documents

3.4 Colour coding of systems or zones indicated on schematics would provide ease of recognition and each system given an individual identifying number. Those stations on individual zones could also be addressed using the system.

Tubing

3.5 The most widely used tubes for hospital systems comprise PVC-U of sizes 160mm and 110mm diameter with a trend towards the larger diameter being specified. However, other sizes are available. It should be appreciated, however, that carriers are fitted with spacers to ensure good seals. The result is that a carrier operating within a system comprising tubes of 110mm diameter will have an outside diameter of 70mm. It is therefore questionable if tubes of less than 110mm diameter would be useful.

3.6 The tubing must have a large bending centreline radius (650mm to 1,200mm) to allow the carriers to negotiate the bends and care is required in routeing the tubing through the hospital. Many systems are being fitted into existing hospitals where routes which can accommodate suitable tubing and the maximum bending radius are fairly limited. New build hospitals may take into account the space requirements for the tube systems during the design process, and allow greater flexibility in choosing a tube bending radius.

Blower

3.7 The blower size will be determined by the maximum carrier weight, tube diameter, length of tube and system operating velocity. In complex sites multi-zone systems are generally more practical.

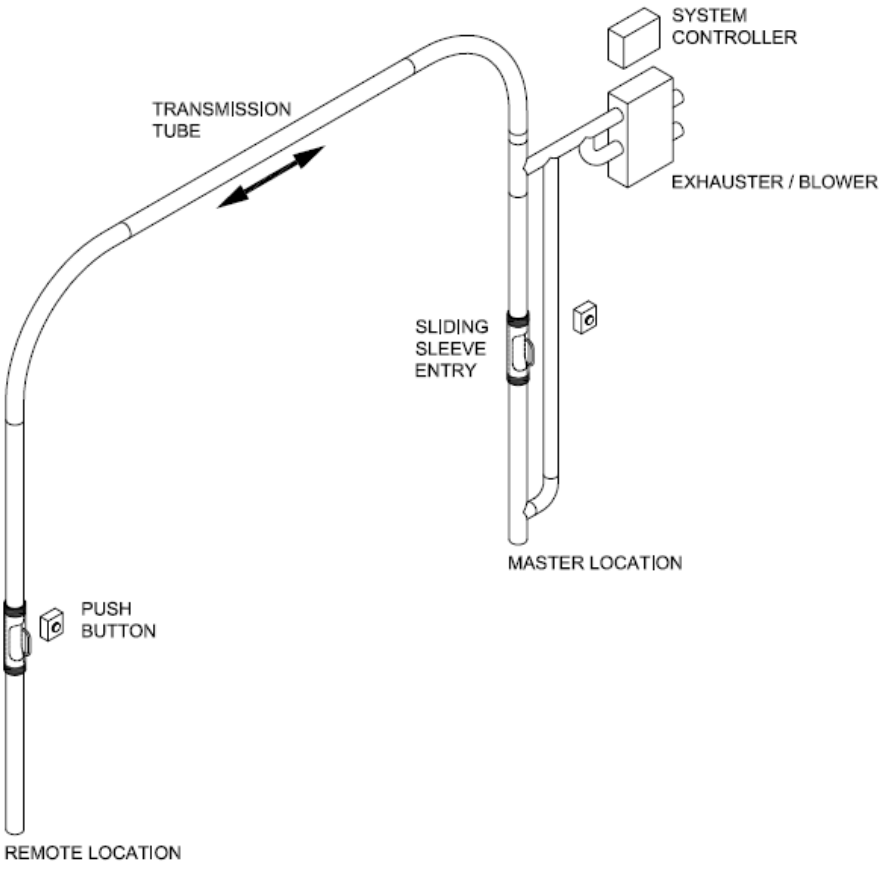


Figure 1: Typical point-to-point system

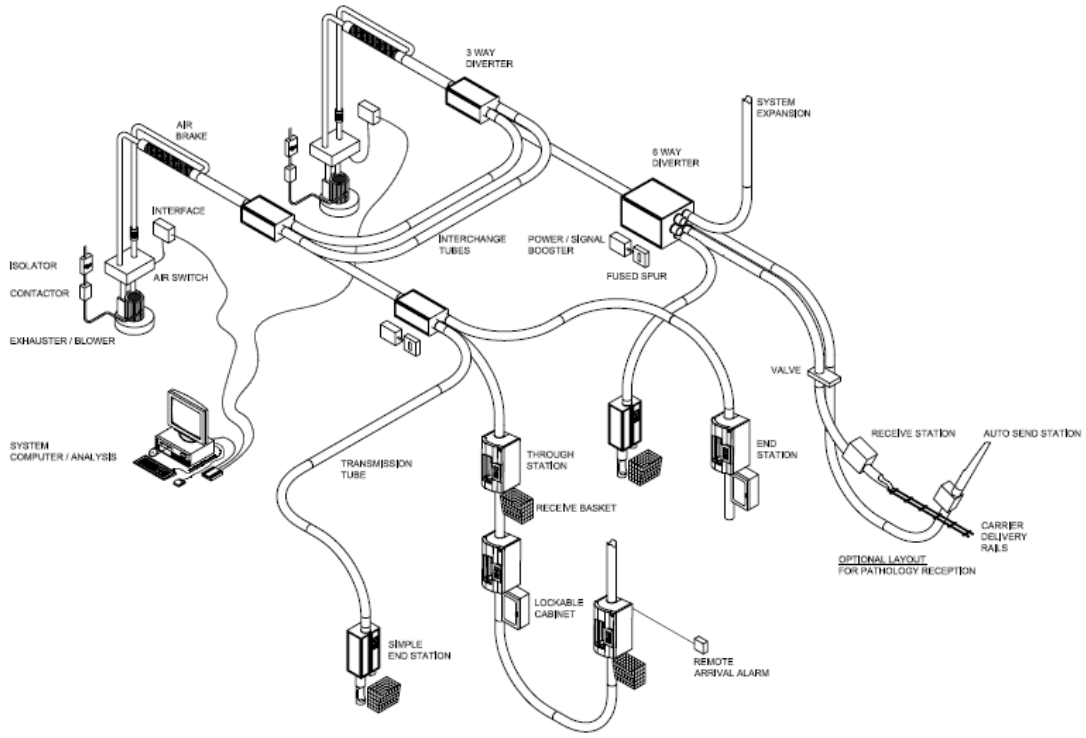


Figure 2: Typical layout of Pneumatic tube system incorporating interchange tubes

Weight limits

3.8 Carriers can transport packages up to 2.0 kg (on a 160mm diameter system) although heavier packages may be conveyed if required subject to the manufacturer's recommendation.

System operation

3.9 The material to be transported is loaded into a carrier which is then placed in the tube at the send station. A destination station address, usually a three-digit numerical code is entered via a keypad and the carrier is then sent automatically through the network of transmission tubing to the destination. Although travelling at a speed of 4-6 metres per second, fragile items may be transported safely whereby carriers are accelerated gradually, and arrival at the destination is cushioned by a gentle braking system. Empty return carriers would be uniquely addressed to their 'home station' so that they do not activate the arrival alarm.

Travel times

3.10 The time taken from keying in the destination station to reception depends on the distance between the stations but will normally be one to three minutes, with a maximum of 15 minutes between stations in large systems.

3.11 The control transfer system determines the best possible route for carriers and automatically queues them for transmission at the earliest opportunity. The carrier journey time is normally much quicker than manual transfer, and the pneumatic

tube transport system provides an efficient means of transferring materials, without the need to use trained medical staff or porters.

3.12 Each receiving station may have a locked cabinet into which the carrier is deposited, a feature that is recommended when the system is used to transport prescription drugs.

3.13 If considered necessary, carriers may be specially labelled for use for specific items, such as drugs or pathology samples, or for a particular department to ensure that they are returned to the appropriate terminal as soon as possible. This may also serve to prevent any possibility of cross contamination from pathology samples being transported in the same carriers as pharmacy items. The use of sealed containers, however, may be considered adequate protection for the purpose and would offer complete flexibility that colour coding of containers might inhibit. A suggested colour coding regime is set out in paragraph 3.3.

Advantages and disadvantages

3.14 The advantages and disadvantages of pneumatic tube transport systems may be summarised as follows:

Advantages

- faster turnaround time for transported items;
- service available 24 hours a day;
- productivity savings allow more time to provide direct patient care;
- reduction in inter-departmental movements of staff; increased productivity and efficiency.

Disadvantages

- limited capacity (although majority of samples will be capable of transport in system);
- manual backup option required in event of system failure (although pneumatic systems have proved reliable);
- risk of infection and cross-contamination (use of sealed container will minimise this risk);
- reduced security in transfer of drugs (controlled despatch of drugs with regard to release carrier).

The disadvantages may not be significant, as briefly outlined in brackets after each item.

Control system

3.15 The system should be controlled by a computer or microprocessor and should include the following functions:

- send/receive transaction between stations;
- system self-test;
- system status information;
- automatic purging cycle;
- system software re-configuration;
- continuous polling of all stations;
- system send/receive priorities (urgent items);
- forward address list (maintenance of stations);
- manual control (receiving of carriers etc.);
- system purge (push/pull facility);
- PIN or touch key security system;
- monitor carrier movement.

Optional features

3.16 The system may also incorporate some or all of the following features:

- carrier storage: redistribution of carrier to other stations;
- redistribution of carrier to point of maximum deficit;
- management status/traffic/alarm reports: print-out;
- zoned network system: large installations;
- visual/audible indication: to nominated/specific staff members;
- pharmacy security drug transfer system: secure station to station transfer;
- electronic tagging of carriers (Radio carrier identification (RCI));
- high / low-order destination; (high = secure transaction; low = non-secure transaction) provided prioritising does not inhibit the efficient running of the system;
- fire alarm interface;
- carrier track and trace.

General installation considerations

3.17 The following points should be considered before installing a pneumatic tube transport system:

- current volume of traffic between departments, including return carriers;
- type of samples to be transported; lockable carriers would be required for the transport of Patient Records between Medical Records and Wards, Theatres, etc., assuming that they could be accommodated within carriers;

- size of samples to establish carrier size most suitable. The carrier size will govern the radius of bends used in the installation. A list of carrier sizes is given in Part B 'Design considerations and good practice guide' of this SHTM;
- number of stations, their location and links. This will determine the system required, that is, point-to-point or multi-point network;
- plant room location(s) for blower(s) with 3-phase electrical supply;
- operational policy on security for drug transfer;
- items that should not be transported in system; this will vary from installation to installation;
- system expandability;
- need for installation of dedicated systems such as A&E to and from Pathology in support of larger networks.

The following brief notes illustrate how pneumatic tube transport types of systems are being used in various hospitals:

- **The Ayr Hospital** operates a 160mm diameter pneumatic tube system with two zones and 26 stations covering laboratory pharmacy, medical records and all wards in the hospital;
- **Bristol:** a four station system provides a link for transferring drugs, blood and pathology samples between the maternity hospital and the Bristol Royal Infirmary, which are approximately 500 metres apart. The system is capable of transferring actual blood bags;
- **Royal Marsden Hospital,** London: the system is used to transfer tissue samples direct from the operating theatre to the pathology laboratory for immediate analysis. The system has a High Efficiency Particulate Absolute (HEPA) filter through which all incoming air is drawn;
- **Forth Valley Royal Hospital:** the hospital is served by a 110mm diameter five-zone multi-station system with 56 stations located to serve the majority of departments including wards, ITU, theatres, day surgery, endoscopy, accident & emergency, rehabilitation, psychiatry, oncology, renal, pharmacy and pathology;
- **UCLH:** The Hospital is served by a 160mm diameter pneumatic tube system incorporating more than 100 stations on 15 zones serving the majority of wards and departments. The systems are linked by a network of central and remote interchanges for the efficient exchange of carriers. The system has dedicated high speed multi-carrier lines to serve the pathology department some 750m distant running under the roads of central London.

4. The suitability of products to be transported

4.1 A survey carried out in 1987 indicated that there was no deterioration in the samples travelling at speeds of up to 15 metres per second. Other reports indicate that with samples travelling at speeds of 6 metres per second, no deterioration in sample quality can be detected. This is of particular importance when test analysis can be altered by haemolysis. In this context, however, it should be noted that sample deterioration is generally caused by rapid acceleration and deceleration, not the speed with which the sample travels within the system. This is recognised by most manufacturers of pneumatic tube transport systems, who ensure gradual acceleration and deceleration with an air cushioned soft carrier arrival station. The benefits of high-speed transportation should be weighed up against the impact on system pressure and energy use. To assist the designer, an analysis of transport times between critical departments would be beneficial prior to taking any decision on the optimum velocity.

4.2 The modern pneumatic tube transport systems operate at 5 metres per second as the nominal speed that is able to handle fragile samples. Controlled deceleration has eliminated sample problems identified with some early systems.

4.3 Consideration should be given to all carriers used in healthcare applications and should be specified as being of the leak proof type assessing the benefit against the additional costs and the experience and frequency of spillages. The use of the pneumatic tube transport system for the delivery of microbiology samples including blood culture bottles, presents no problem in sample quality and improves the timeliness of specimen arrival; thus ensuring better cultural relativity between organism types. It is essential at least that 'leakable' samples are first placed within a sealable bag or inner container before being introduced into the carrier. Then, users have to ensure that the leak proof lid is properly secured prior to despatch. Experience has confirmed that most interruptions to service have been due to spillage related to operator error in despatching carriers with lids not properly secured.

4.4 It is also possible to send small histopathology samples providing care is taken to ensure containers for samples are leak-proof. It is essential when transporting samples for analysis in laboratories that these are accompanied by the relevant paperwork that is separately wrapped to prevent contamination from accidental spillage.

4.5 Reports from the United States indicate that it is safe to transport blood products from the blood transfusion laboratory to the theatre using modern pneumatic tube transport systems.

The items carried in a hospital system vary but generally include:

Pathology:

- blood samples;

- urine samples;
- culture swabs;
- stools;
- blood cultures;
- spinal fluids;
- frozen section;
- radioactive blood samples;
- laboratory test results (may also be sent via computer network).

Pharmacy:

- intravenous 500ml to
- 1,000ml with admixtures;
- protein based drugs;
- general pharmaceutical;
- patient TTD drugs;
- controlled drugs;
- aerosol medications;
- cytotoxic drugs (in prepared syringes).

General:

- samples;
- surgical instruments;
- X-ray films;
- medical records;
- menu cards.

5. Security

5.1 The need for security must be carefully weighed against the need for rapid access to the system, especially in an emergency situation when time delays can play a crucial part in patient outcome. As a general rule the send/receive stations should be located in an area away from the public, but in a convenient location for staff use. This could be, for example, inside a ward or theatre cluster where access can be restricted. The baskets may be lockable with the key under the control of the nursing staff.

5.2 The system can also provide varying degrees of security from a simple lockable send/receive station to security coded access.

5.3 The facility to isolate stations from the system is available on most systems. This has advantages if areas are to be left unattended for predefined periods, or for system maintenance.

5.4 It is generally more secure for samples to be delivered directly from point to point using pneumatic tube transport systems, rather than by a messenger service. The number of lost and mislaid samples is reduced under the pneumatic tube transport system.

5.5 If a decision has been taken to utilise lockable carriers, every carrier - irrespective of source, destination and content, should be lockable.

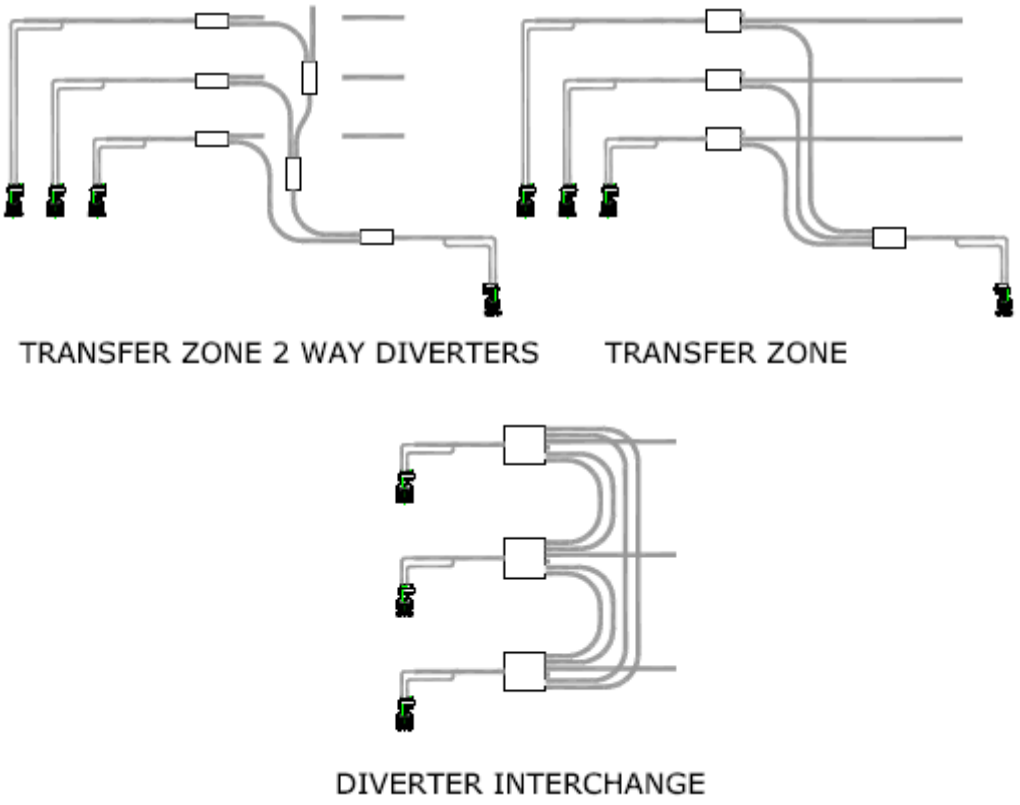
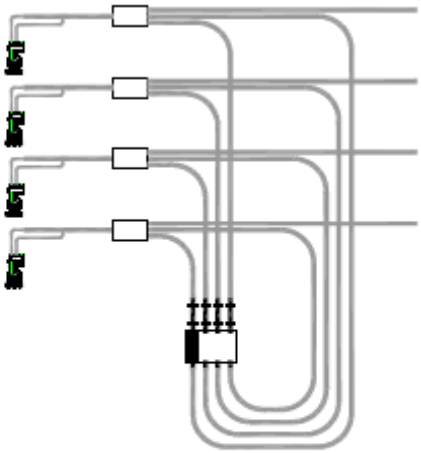


Figure 3: Typical Transfer, Diverter and Coupler arrangements.



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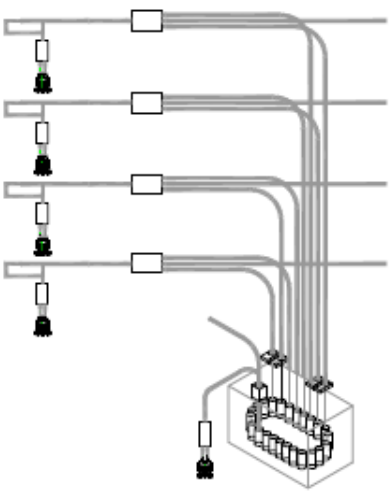
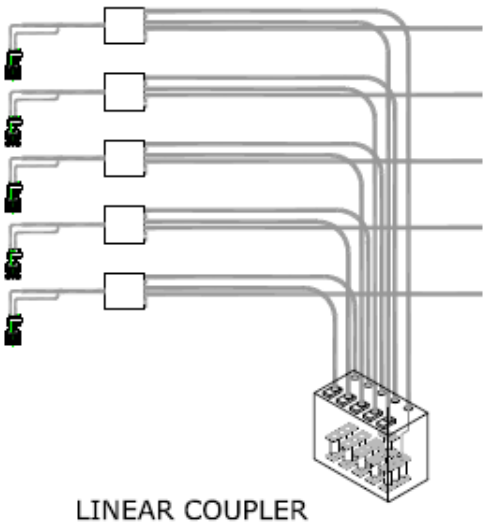


ROTARY COUPLER



LINEAR COUPLER

Figure 3 continued: Typical Transfer, Diverter and Coupler arrangements.

Figure 4: Lockable carrier

Figure 5: Carriers with swivel-lids

6. Use of pneumatic tubes by pathology

General

6.1 Pathology laboratories have been under pressure to review the delivery of their services to customers. This is as a result of increased financial pressure from within their own organisations and commercial competition from external organisations. There is debate centred on the need for patient-focused care and whether or not there is still a requirement for a central hospital laboratory on site or whether sample testing can be devolved to clinical areas. The key factor in this discussion is the turnaround time for results, which requires the strategic management of the test process. The test process comprises three elements:

Pre-analytical phase:

- test ordering;*****
- venepuncture;
- specimen identification;
- specimen transportation;*****
- laboratory reception.*****

Analytical phase:

- sample preparation and analysis.

Post-analytical phase:

- result interpretation;
- transfer of result to clinician/requester.*****

Note: The areas where pneumatic tube communications can improve efficiency and thus competitive advantage are marked above with an asterisk *****

Reasons for improved efficiency

Test ordering

6.2 The effectiveness of the venesection service can be greatly improved if the laboratory manager knows, prior to deploying venesection staff, what demands any individual customer is likely to make that day. This can be achieved by wards and departments sending their requests for venesection early in the morning via the pneumatic tube transport system to a central point, thus enabling the laboratory to send the correct number of venesectors to any area and thus maximising the use of its resources.

Specimen transportation

6.3 The timeliness of specimen delivery to the laboratory is greatly improved as samples can be despatched to the laboratory immediately after being taken, or in batches as each individual area is completed. This enables venesectors to continue taking samples on the ward, whilst enabling the laboratory to spread its workload, as it has a constant supply of samples. It also dispenses with the large batch of samples that puts unnecessary pressure on the analytical system for short periods of time, whilst leaving expensive capital equipment under utilised for long periods. Considerable time delays can also occur when medical and nursing staff take samples outside the normal venesection service times unless there is an effective way of getting samples to the laboratory. This often involves urgent specimens in an 'out of hours' situation when staffing numbers are at a minimum and work pressures are at their highest. A recent survey at one hospital indicated that up to 64% of staff delivering samples to the laboratory were ward based and that 52% of samples took between one and two hours to arrive at the laboratory. The subsequent installation of a pneumatic tube transport system at strategic points throughout the hospital virtually eliminated sample delivery by ward staff and significantly reduced the time delay in samples reaching the laboratory. The consequences were greatly reduced result turnaround time, better patient care on the wards and a general improvement in the use of valuable resources.

Laboratory reception

6.4 Once a sample has arrived in the laboratory main reception, there is often a delay in the sample being forwarded to the appropriate department for analysis. The installation of a dedicated pneumatic tube transport system between the main laboratory reception and individual departments can radically reduce this bottle neck. A dedicated system could still remain an integral part of an entire network with its own interchange arranged to achieve direct transfer of carriers from any station on the network. This would avoid double handling at the reception point.

Transfer of results to clinician/requester

6.5 Once samples have been analysed, and the results authorised and printed, delays can often occur in the despatch of results to the clinician/requester via the traditional hospital messenger service. The use of a pneumatic tube transport system can greatly reduce transfer times.

References

Acts and Regulations

NB: Access to information related to the following Acts and Regulations can be gained via www.legislation.gov.uk

The Building (Scotland) Act 2003, HMSO, 2003

Clean Air Act 1993, HMSO, 1993

Electricity Act 1989, HMSO, 1989

Health and Safety at Work etc Act 1974, HMSO, 1974

Registered Establishments (Scotland) Act 1998, HMSO, 1998

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