7. HYDRAULIC SERVICES

Introduction

7.1.00 This document outlines the place of Hydraulic Services within hospital design and the philosophy behind the development of the document.

Standards, Codes, Regulations and NSW Health Policy Directives & Circulars

7.2.00 The following documents are applicable to the design and installation of hydraulic services in hospitals:

- AS/NZS 3666 Air Handling and Water Systems of Buildings Microbial Control.

  AS/NZ 3500 series - Plumbing and Drainage.

- New South Wales Government Gazette No. 126 dated July 1999 of New South Wales Code of Practice Plumbing and Drainage. The introduction of requirements where water temperatures exceed 50 deg C at taps, backflow prevention, storage water tanks and expanded range of approved non metallic water pipes for use in potable water supply systems.

- WorkCover Authority of NSW Safety Guide No. 4517 in regard to Thermostatic Mixing Valves installed in Healthcare and Accommodation Industries.

- NSW Health Department Circulars outlining requirements for the provision of cold and heated water. The circulars have both management and operational implications which must be addressed before decisions on the type of hot water generation and system can be decided. Additionally, the circulars describe the type and style of taps to be provided.

- NSW Health Department Policy Directive PD2005 /344 – Requirements for the Provision of Cold and Heated Water

- AS 4032 series - Water supply – Valves for the control of hot water supply temperatures

- Standards Australia of the Standard MP52 requiring all components, plant and equipment installed within cold and hot water piping systems to which potable water supply pipelines connect to be certified.

- Requirements of the Building Code of Australia.

- PCA204 Plumbing Code of Australia 2004.

Glossary of Technical Terms

7.3.00 A Glossary of Technical Terms is in Section 10, Appendix 1 of this document.

Objectives

7.4.00 The objective of this document is to present a common set of criteria for hydraulic services in a format which is accessible both to designers and those who brief designers. In general specific planning procedures and known design criteria have not been addressed.

This document does not cover general subjects which are normally dealt with under ‘good engineering practice’. Designers are to refer to Australian Standards for good practice and statutory regulations for minimum standards. Similarly calculation methods which are available in AS/NZS 3500 and similar codes have not been repeated.

The change in philosophy from minimum standards to recommended standards embodied in

AS/NZS 3500 is now adopted in regulations. Although this document does not alter this approach, it is recommended that future studies be carried out as part of the development of other guidelines with the objective of modifying AS/NZS 3500 to be more relevant to the Health Building environment.

Application

7.5.00 Hydraulic services comprise that work installed by a licensed person in accordance with Statutory Regulations generally known as plumbing and drainage code. Hydraulics services comprise the following:

- Sanitary Drainage
- Sanitary Plumbing
- Trade Waste Plumbing and Drainage
- Trade Waste Pre Treatment
- Grey Water Systems
- Stormwater Systems
- Rising Mains and Pumps
- Fixtures and Fittings
- Water Services (Hot and Cold)
- Gas Services
- Fire Hydrant Systems and Fire Hose Reel System
- Hydrotherapy Pools

Gas services within the scope of hydraulics are limited to reticulated gas such as natural gas or on site liquid petroleum gas storage cylinder with local reticulation.

The requirements of statutory regulations complicate the nature of the water services by requiring further sub groups:

- Domestic cold water
- Domestic hot water
- Domestic warm water (38ºC – 43ºC)
- Flush services
- Non potable cold water
- Non potable hot water
- Ultra pure water
- De-mineralised water
- Legionella free water
- Irrigation system water

General Installation Requirements

7.6.00 Materials shall be selected that are suitable for the specific characteristics of the service being installed. This shall include consideration of parameters such as temperature and concentration of wastes, corrosion, leaching and chemical attack.

Fixed services and maintenance points shall be located in a manner that does not create unacceptable risk or disturbance to patients or staff – including maintenance personnel – and health care procedures.

Service elements such as pipes, isolating valves operating switches and alarms shall be clearly identified.

Location and operation of fixtures shall suit the application and shall not cause a health risk.

Fixtures shall be easily cleaned. Water discharge devices such as flushing tanks and shower roses, shall be selected to enhance water conservation.

Water Supply

7.7.00 SITE WATER SUPPLY

If practicable, it is highly recommended that the water service is supplied from an external ring main and connected at two locations with a valve midway to maintain a continuity of supply in each section of the building should maintenance be required.

Where water quality does not comply with Health – Quality of Drinking Water – Regulations, National Health and Medical Research Council /Australian Water Resources Council 1987 Guidelines or local guidelines, consideration shall be given to providing a water treatment / filtration plant to maintain the integrity of hot water equipment, tapware, specialist health equipment and air-conditioning plant pipework.

Water quality shall not cause risk to patients and shall be suitable for intended medical procedures.

Where water supply is critical, it shall be available at all times.

Where the water supply is reliable, local critical demand shall be satisfied with individual local back-up. Duty and standby pumps shall be designed and installed if the supply system includes pumping.

7.7.05 BACKFLOW PREVENTION AND FILTERS

Backflow prevention devices shall be providing in accordance with AS/NZS 3500 requirements and the Local Authority. They should be located at the meter for site protection and at sources that require zone and individual protection.

Water filters should be installed on the potable water supply to protect sensitive components used in TMVs and sensor-operated tapware.

7.7.10 METERING

Water meters shall be provided for each site connection. Meters will be read by the water authority to charge the site. In addition to this authority's meter, a number of sub meters to monitor water consumption shall be installed. These meters shall be installed at cooling towers, kitchens, separated buildings, external irrigation systems, laboratories, hot water systems, tank outlets and any other areas where water consumption greater than 20KL per day will occur. All meters shall be capable of providing a pulse outlet. Backflow protection shall be installed as required by relevant codes such as AS/NZS 3500 as a minimum.

7.7.15 SITE RETICULATION

Where possible, locate reticulation pipes in below-floor voids at ground floor level and in ceiling or roof spaces, clear of mechanical equipment with droppers connected to the sanitary fixtures and equipment. Where slab on ground construction is utilized, install pipework in spaces at upper floor levels and ceiling spaces.

Avoid locating pipework over inpatient areas and other areas that could be adversely affected by noise generated in water pipes. Hot and cold water pipes shall be separated by enough distance to avoid heat transfer. Hydraulic services shall not be located above electrical services and Operating Theatres.

Avoid copper pipes in or below ground concrete slabs.

Avoid flusherette services and in-wall cisterns.

Do not design for 10mm diameter copper tube to single fixtures.

Water velocities up to 1.5 metres per second are acceptable at maximum peak demand.

Consideration of probable demand shall be exercised where two fixtures in the same room

space will be used by one person only; such flow rates shall be taken as a single fixture only.

Where water quality is known to be corrosive to copper tube, plastic pipe materials such as cross linked polyethylene or polypropylene random could be provided.

Water supply systems shall be adequately zoned and isolated to provide local safety shut downs whilst maintaining maximum availability. Isolation valves are highly recommended to be located on the service lines to individual fixtures or group of fixtures.

Single fixture or zone backflow prevention devices shall be designed to comply with AS/NZS 3500.1 – Water supply. Vacuum breakers shall be installed in hose bibs and supply nozzles used for connection of hoses or tubing in laboratories, cleaner's sinks, bedpan-flushing attachments and autopsy tables.

To prevent condensation, closed cell foam insulation shall be installed on pipework where dew point can be reached. Insulation shall have a continuous vapour barrier.

All isolation valves for hydraulic services shall have permanently fixed brass identification discs. Discs shall be clearly permanently engraved to identify the item.

When the service plan includes haemo-dialysis, continuously circulated filtered cold water shall be provided.

7.7.20 WATER STORAGE

Cold water storage shall be provided only in those instances where the public utility main is inadequate to supply the hospital complex.

Where main supplies are doubtful, storage shall be based on 3 hour supply based on a consumption of 1000 litres per bed per day.

Where practicable, administration buildings and non-essential facilities shall be excluded from storage facilities.

Where storage tanks are required, they shall be separated into two 50% sections each capable of separate drain down and cleaning without system shut down.

Precast round storage tanks shall be considered for external or roof mounted use.

All tanks shall be fitted with close fitting lids. Overflow shall be provided with flap valves. Ball float valves shall be of a non hydraulic shock type.

Attention is drawn to solar gain on exposed tanks.

Where hot water is stored in commercially produced mains or reduced pressure vessels, preference shall be given to stainless steel as an alternative to enamelled mild steel.

Domestic Hot and Warm Water Systems

7.8.00 DOMESTIC HOT WATER

System design generally shall comply with AS 3500.4 - Hot water supply systems.

A minimum of two hot water units is required to be installed in each main system. Remote point of use type systems may utilise a single unit.

Care is required in assessing domestic hot water requirement. This particularly applies to storage capacity and regeneration of hot water for outlets supplied in a Health Care Building.

Hot water piping is highly recommended to be arranged in a ring main or a number of ring mains and incorporate a hot water return pipe.

Branch pipework to individual outlets or groups of outlets shall not exceed three metres for 15 mm diameter pipe in order to minimise deadlegs. Each branch shall be equipped with an

isolation valve for maintenance purposes located adjacent to the cold water supply branch isolation valve serving the same outlets.

Hot water supply to areas such as Dirty Utilities is required to be separated from the remainder of the hot water system using approved back-flow preventers.

Central hot-water distribution systems serving patient care areas shall have a flow and return to provide continuous hot water at each hot water outlet.

Circulation pumping shall be designed and installed with both a duty and stand-by pump. Calorifiers shall be of a failsafe design.

7.8.05 WARM WATER SYSTEMS

Warm water systems shall either be centralised circulating systems or thermostatic mixing valve systems connected to the domestic hot water system and cold water supply.

Generally branch services to sanitary fixtures to which patients have access shall be provided with warm water in accordance with the current NSW Health Circular. (2002/10)

7.8.10 THERMOSTATIC MIXING VALVE (TMV)

Thermostatic mixing valve (TMV) designs shall comply to AS 4032 series - Water supply – Valves for the control of hot water supply temperatures, and installation shall comply to AS 3500.4 - Hot water supply systems.

The inlet hot water temperature to TMVs shall not exceed the recommendation of TMV manufacturers.

Where concealed, TMVs shall be identified with clear signage in a visible location to ensure servicing is carried out.

TMVs shall be mounted at a maximum height of 1.6 metres from the floor slab for maintenance purposes.

Tempering valves shall not be used.

7.8.15 CENTRALISED WARM WATER SYSTEMS

Centralised plant warm water systems which are approved for use in the Health Care Facilities may be considered as an alternative to thermostatic mixing valves where a cost advantage can be demonstrated after consideration of both capital cost and maintenance routines required by NSW Health Circulars.

Circulation-type warm water systems are approved by NSW Health.

A decision to design piped warm water rather than TMVs should only be taken after consultation with management of the Health Care Building.

Factors which should be considered in the decision would be:

- Capital costs of each system to create warm water;
- Proposed method of disinfection and associated costs;
- Maintenance costs of the systems for plant, valves and disinfection;
- System monitoring, testing and data recording costs.

Heat Recovery

7.9.00 A number of mechanical systems provide large quantities of ‘waste heat’ - that is - heat which would normally be rejected to atmosphere. This heat can potentially be used for heating domestic hot water or warm water with resulting energy savings.

Principal among these is the central chilled water plant in which waste heat at certain times of the year far exceeds the potential for its use in domestic and space heating. Depending on the

type of chiller used, heat may be available at up to 55ºC. As such it is suitable for preheating of water for domestic use.
Refrigeration plant, principally kitchen cool rooms, may also be adapted to provide waste heat for domestic hot water pre-heat. As with chilled water plant temperature limits apply.

General Reticulation Requirements

7.10.00 DESIGN PRESSURE

The design of water piping systems shall achieve 50kPa minimum water pressure when taps are fully open and a maximum water pressure of 500kPa when taps are fully open.

7.10.05 PIPING RETICULATION

Pipe sizing shall be calculated allowing for domestic hot water or warm water draw off loads to all sanitary fixtures utilising an accepted diversity factor based on recommended probability of simultaneous use.

Thermal insulation shall be provided to all circulating water pipe work.

Sanitary Plumbing and Drainage

7.11.00 GENERAL

Drain pipes shall be designed and installed to comply with AS 3500.2 - Sanitary plumbing and sanitary drainage

Gravity drain systems shall be installed wherever possible. If pumping systems for the disposal of sewerage or effluent are installed they shall be installed in duplicate and shall be connected to the hospital standby generator power supply. Alternatively, the systems shall incorporate a minimum of four (4) hour storage in the event of disruption in normal power supply.

Drain pipes shall be designed and installed to suit the waste carried and the temperature of waste. Where possible, it is highly recommended that ipipework is concealed and vents are interconnected in roof or ceiling spaces to reduce the number of roof penetrations.

It is highly recommended that drainage piping is not installed within the ceiling or exposed in operating and delivery rooms, nurseries, food preparation areas, food serving facilities, food storage areas, computer centres and other sensitive areas. Where exposed overhead drainage piping in these areas is unavoidable, special provisions shall be made to protect the space below from leakage, condensation or dust particles.

Inspection and cleaning openings shall be positioned external to the building fabric. Where this is not possible, inspection and cleaning openings shall be positioned in ducts or within the wet areas it serves. Inspection and cleaning openings shall not be positioned in ceiling spaces.

Access pits suitable for cleaning and pumping out are recommended in service areas rather than cleanout openings within pipes and junctions. Access pits are highly recommended to be located adjacent to vehicular access.

Waste water systems access covers, inspection openings and inspection chamber covers shall not be located within high risk areas, within functional areas.nor pass through walls and ceiling spaces of patient rooms and treatment rooms.

Floor drainage grates shall not be installed in the clean area of a Sterile Supply Unit or treatment area. It is highly recommended that floor drains are rationalised to an absolute minimum due to their ability to harbour bacteria.

Mixing of chemicals wastes that result in fume emissions shall take place within a vented drainage system and not at a common tundish.

Drain liners serving automatic blood-cell counters shall be carefully selected to eliminate the potential for undesirable chemical reactions (and/or explosions) between sodium azide wastes and copper, lead, brass, and solder.

Connect mechanical plant equipment drains to the sewage system, in particular, plant which discharges water containing chemicals. Drains from fan coil and air handling units may discharge to sewer.

Sanitary Fixtures

7.12.00 INTRODUCTION

Sanitary fixtures constitute a major cost component of hydraulic services and should be selected to achieve the following criteria:

- Function
- Aesthetics
- Durability
- Vandal and Breakage Resistance (to the degree possible)
- Clean lines
- Sealed to wall and floor surfaces
- Ongoing availability of parts and services

Selection of sanitary fixtures is usually made by the architect in consultation with the Client and Hydraulics Consultant for special hospital-type fixtures. Poor choice of fixtures can add significantly to the total cost of hydraulic services without enhancing their function. This particularly applies to selections made on appearance criteria rather than function. For example choosing a non-white fixture can double its price compared with standard white.

7.12.05 SELECTION CRITERIA

Sanitary fixtures shall be selected on the following criteria:

Hygiene:
That is ease of cleaning and potential for holding infectious material. Cleaning costs are a major component of hospital operating costs and fixtures which are time consuming to clean add significantly to this.

Durability:
In general, most domestic standard fixtures are of adequate durability for hospital applications. Exceptions to this are non-ceramic materials (e.g. plastic and fibreglass) where the potential for damage by cleaning with abrasives may require additional management control.

Suitability for Function:
Quite clearly the fixture must be suitable for its function. Beyond meeting their basic function, additional enhancements must be demonstrated to be necessary on a clinical need basis.

Colour:
Only white fixtures (not coloured) shall be selected.

Cost:
Where the above criteria are met, selection between alternatives shall be on the basis of lowest capital cost.

7.12.10 WC PANS

WC pans shall be pedestal type with a flush-to-floor concealed trap connection and shall be suitable for disabled persons use in compliance with Australian Standards.

Only when justified by cost analyses are wall hung WC pans or wall flush back pans acceptable.

WC pans shall be provided with white open front seats (mixed sex use) where appropriate, constructed of solid section, high quality, scratch resistant thermosetting plastic with soft close hinges. Seat covers shall only be provided to W.C. pans located in shower rooms or bathrooms.

WC pans shall be provided with cisterns and dual flushing buttons, pads or levers. Concealed in-wall cisterns shall only be provided where architectural constraints demand Flushing valves (either tank or mains-fed) shall be subject to cost justification.

7.12.15 PATIENT & PUBLIC USE BASINS

Basins for use by patients and the public shall be selected on the basis of the total cost to install including the cost of any associated supports, vanity etc; In general on stud walls.

Patient-use basins shall be simple support vanity type with wall-mounted cocks with self-draining spout. On masonry walls, wall-hung basins may be cost effective.

Basin shall be provided with 40mm chrome plate 'P' trap with in-wall waste pipe. Integral trap basins shall be not be used except in disabled persons toilets.

Subject to economic justification, single lever pillar taps may be used.

Supplies to taps shall be colour coded.

-	Yellow:	Warm Water	38ºC – 43.5ºC
-	Blue:	Cold	15ºC
-	Red:	Hot Water	50ºC and above (Not for use in patient care areas)

7.12.20 SCRUB (SURGEONS) BASINS

Scrub basins are expensive and shall only be installed where a demonstrated clinical need for scrub facilities exists. Scrub basins shall be supported from masonry or suitably reinforced stud wall construction. Scrub taps shall be elbow action or knee action with wall mounted self draining spout. Temperature controlled water shall be provided in accordance with warm water practice.

7.12.25 SCRUB TROUGHS

Scrub troughs (refer AS 1756 – Household sinks) shall be fabricated from stainless steel Grade 302 1.2mm thick to Dept of Commerce, New South Wales standard design.

Scrub troughs shall be provided with single lever down cast spray elbow action taps, knee operated or sensor taps. Client request for knee- operated or sensor taps may be approved if justified. These shall be supplied from a temperature adjustable thermostatic mixer valve.

Only where clinical justification can be established shall hands free proximity switch or similarly activated sprays be provided. Where provided, such taps shall incorporate a timer and TMV temperature control and be of modular electronic design suitable for easy component replacement.

7.12.30 SHOWERS

Showers shall be provided with slide rail telephone-type handsets and flexible hose. Slide rails shall be 32 mm stainless steel securely fixed as a grab rail. Hoses shall extend 1800 from wall mounting and terminate not less than 150mm above the flood level of the shower floor. Telephone handsets should be impact resistant. White plastic hoses shall be minimum 15mm. reinforced plastic material.

Particular attention is directed to sealing shower outlets effectively to a continuous water proof membrane which shall prevent the transmission of water via the interface between floor waste risers passing through floors.

The floor of en suite rooms shall be graded from door of room to floor waste outlet. At an early stage of planning, incorporate a set down into concrete floor so that provision is made for graded floor.

7.12.35 SINKS

Sinks shall be constructed of stainless steel with wall-mounted taps and local isolation taps.

Sinks for domestic applications of a non-medical nature shall be standard commercial products.

Non standard fabricated stainless steel sinks may be provided only in kitchens or where a clinical need can be demonstrated.

Sinks shall be complete with stainless steel on plastic 50 mm waste outlets. Provide loose fitting plastic plug.

Where appropriate, provide lever action single mixer tap rather than hot and cold sink set taps.

7.12.40 URINALS

Wall hung ceramic urinals with manual cisterns shall be used in preference to stainless steel urinals or electronic flushing devices. Stand on grate stainless steel urinals shall not be used. Automatic urinal flush cisterns shall not be used.

7.12.45 BATHS

Baths shall be constructed of thermoplastic and shall have wall mounted cocks.

Flow rates to baths shall allow a quick fill time (20mm inlet outlet cocks and services shall be provided).

Cleaning regimes shall utilise non abrasive cleaning materials.

7.12.50 FLOW CONTROL

Water conservation by terminal fitting flow control is considered highly important to water quantities used by Health Facility Buildings at fixtures which provide a continuous flow such as showers and basins. Where a filled fixture (eg bath or pot sink) is provided, it is important that the fill time is not increased by flow control.

Shower Flow Rates
Water flow to showers shall be determined by flow required from selected shower outlet for 10 minute duration.

Diversity of flow shall be applied to the number of showers in the Building.

7.12.55 ISOLATION

Provide individual isolation where the architectural layout is such that group isolation to basins is not economical. Individual mini taps shall be used for hot and cold service flow control where required.

Trade Waste

7.13.00 INTRODUCTION

Trade waste (liquid) is usually that waste (waste water) which is discharged to public sewers from industrial or commercial processes. It is liquid containing substances used in the manufacture or processing of food preparation or industrial process but does not include domestic waste water from showers, water closets, basins and sinks.

The type of liquid waste should be identified and reference made to the Water Authority Standards. Wastes which are not acceptable for direct discharge to sewer mains should be identified and a method incorporated in the design that will treat or break down the strength or temperature of the liquid waste so that compliance with the Water Authority Standards is achieved.

The authority which controls the treatment and disposal of liquid waste products will impose maximum standards of contamination or standards of acceptance. These standards apply to all waste products discharged to the disposal system, usually the sewer. In addition the authorities may charge the user for the quantity and quality of trade waste discharged in order to recover the cost of treatment.
In each case of anticipated trade waste discharge, the regulatory authority (Water Board or Shire Council) must be approached with the anticipated discharge.

The information on discharges is provided by the users and it is essential that they establish as accurately as possible the quantities and concentration of anticipated pollutants. It is important to note that investigation into the work practices and methods used by the hospital must be undertaken to accurately estimate the type, volume and nature of waste products intended to be disposed of by means of the sewer.

7.13.05 WASTE CATEGORISATION

One way of reducing the level of pollutant discharge to sewer is by on site pre treatment plant. The types of pollutant that 'on site' pre treatment plants will remove, dilute, neutralise or arrest are:

Type of Pollutant	Example	Department Producing Pollutant
Floatable	Grease	Kitchen
Suspended	Solids	Plaster Room, Mortuary
Chemical	By-Products	Laboratory, Hydrotherapy Pool
Thermal	Heat	Sterilisers
Biological	Dangerous Pathogens	Laboratories, Mortuary
Toxic Products	Cyanide, Metal Trace Elements	Laboratories, Medical Imaging, Oncology, Endoscopy
Active Products	Radioactive Waste	Nuclear Medicine
Biochemical Oxygen Demand (BOD)	Degradation	Laundry, Animal House, Kitchen

7.13.10 ALTERNATIVE APPROACHES TO PRE-TREATMENT

Assumptions should not be made regarding the type and strength of liquid waste that may be generated from areas of health facilities. At scheme design stage of planning, it is advisable to obtain written statements from users regarding the frequency, quantity and strength of liquid tradewaste which may be generated and ask the Water Authority for an opinion regarding appropriate method of treatment. Liquid tradewaste treatment may be assumed and it may not be necessary.

Hospitals and other users have a number of options for meeting the standards for trade waste discharges set by the regulatory authorities. These are:

1. Eliminate or minimise the waste
2. Pre-treat the waste before discharge to sewer.
3. Reduce the concentration of contaminants to acceptable levels.
4. Separate the waste and have it removed from the site by other means (usually contractor)

Of these, 1 and 4 are management issues and must be considered at planning stage before the alternatives are incorporated in the design. As with many other issues these are amenable to objective analysis using techniques such as life cycle costing. An example of this approach would be to compare the costs and merits of on-site silver recovery from medical imaging processes with collection and removal by a contractor for off site recovery and treatment.

Consideration should be given under item 3 above to the minimisation of processes and the use of products which are trade waste generators. For example cooking arrangements should minimise the use of oil and fats. Where possible recovery of such cooking by-products should be at the point of origin rather than by removal from waste water.

As part of the scheme design phase of the project a 'Waste Audit' should be undertaken for all types of waste (solid or liquid). The audit can then be used to assist in deciding the most appropriate ways of dealing with the waste**.**

7.13.15 REGULATORY STANDARDS

Each water authority may establish its own standards. It is the responsibility of designers to obtain the current standards from the authority having jurisdiction over the site.
The following may not be disposed of to the sewerage system:

- Hypodermic needles
- Syringes
- Instruments
- Utensils Swabs
- Dressings
- Bandages paper or plastic items
- Any portions of human or animal anatomy
- Infectious and solid waste subject to agreement of the regulation authority.

7.13.20 ORGANIC POLLUTANTS

SUBSTANCE	1991 STANDARDS	1994 STANDARDS
BOD	Acceptance standards to be determined by the treatment capacity of the receiving sewer system.	Acceptance standards to be determined by the treatment capacity of the receiving sewer system.
Grease	As above	50 mg/l
Beach Grease	100 mg/l	5 mg/l
Sulphate	Acceptance standards to be determined by the treatment capacity of the receiving sewer system.	200 mg/l
Suspended Solids	Acceptance standards to be determined by the treatment capacity of the receiving sewer system.	1500 mg/l

7.13.25 INORGANIC POLLUTANTS

POLLUTANT	PRIMARY TREATMENT SEWAGE PLANT	SECONDARY / TERTIARY SEWAGE TREATMENT PLANT	1994 STANDARD PROPOSED
Barium	20 mg/l	20 mg/l	2 mg/l
Mercury	0.05 mg/l	0.05 mg/l	0.03 mg/l
Copper	10 mg/l	5 mg/l	5 mg/l
Lead	10 mg/l	10 mg/l	2 mg/l
Iron	100 mg/l	100 mg/l	50 mg/l
Silver	2 mg/l	2 mg/l	2 mg/l
Selenium	5 mg/l	5 mg/l	5 mg/l
Cadmium	5 mg/l	5 mg/l	1 mg/l
Ammonia	200 mg/l	100 mg/l	50 mg/l
Phosphorus	N/A	50 mg/l	50 mg/l
Formaldehyde	50 mg/l	50 mg/l	5 mg/l
Nitrogen	N/A	200 mg/l	50 mg/l

7.13.30 GREASE AND PLASTER TRAPS

Grease will remain in suspension in water at temperatures in the order of 38ºC and above.

The purpose of the grease trap is to cool the kitchen waste to a point where the grease separates from the main body of waste water and remains as a removable floating substance on the water surface.

Where pre-cooked meals are produced off site and re-constituted on site the provision for grease treatment shall be adjusted in accordance with the on site load. Should washing up be undertaken on site and cooking off site, grease trap provisions related to 50% of full load

calculations shall be offered to authorities for negotiation and approval.

Grease traps may be constructed of pre-cast or cast in situ concrete, galvanised mild steel plate, fibreglass or stainless steel. Grease traps generate corrosive fumes which attack copper and must be ventilated.
Grease traps shall be located on site in a position accessible from outside of the building without need to interrupt any services and which is easily accessible for tanker vehicle access.

It is preferable to avoid pumps, but a permanent pump-out pipe link to a disposal point may be provided if no alternative exists. Pumps should be a positive displacement helical screw type. Mobile pump arrangements provided by the cleaning service are preferred to in-house pump systems. Where practicable above ground galvanised mild steel grease traps should be considered because of their superior thermal performance.

Plaster traps shall have easy access for emptying and cleaning. They should be located outside the treatment room or should be accessible from outside the room. Servicing should be able to be carried out with minimum disruption.

Trade waste substances intended to be disposed via sewer systems should be reviewed to determine if there are alternative ways of removal from buildings.

Selection of pipe materials, jointing type and processes should be carefully selected so that material will not deteriorate by conveying the proposed waste. Recommendations of Australian Standards, NSW Code of Practice, Plumbing and Drainage and Manufacturers should be followed to ensure long life of the selected pipe material.

All pre-treatment waste systems such as dilution pits, arresters and strainer baskets shall be located in the service / dirty zones of the department if the system cannot be installed externally.

Photographic Waste

7.14.00 GENERAL

Photographic processing including x-ray processing is a significant source of trade waste.

This waste may include a large quantity of metals including iron and silver. A range of chemicals is used in the processing of film and paper. The chemicals contribute to two types of liquid wastes - spent photographic chemicals and contaminated rinse waters. The following are found in photographic waste:

Silver:
Treatment of photographic waste should be aimed at collecting the easily recoverable silver by collection service or by on-site processing. Silver is found in film and photographic paper; also in ‘spent’ fixer and bleach fix.

Sulphate:
Corrodes concrete sewer pipes and can produce hydrogen sulphide, a dangerous gas.

Sulphite:
Consumes dissolved oxygen in sewage leading to anaerobic conditions and odours.

Ammonia:
High concentration of ammonia may pose an occupational health risk to sewer workers. Ammonia may also corrode copper pipes.

7.14.05 PIPE SYSTEM

Photographic wastes corrode copper pipes which must not be used to convey trade waste products. UPVC is the preferred material.

Fixer and developer shall not be discharged directly to the sewer. They shall be collected and treated by on-site processor or taken off site to be treated by an authorised waste disposal agent.

7.14.10 HOUSE KEEPING

'House keeping' refers to activities and practices which minimise the amount of waste generated. There are a number of housekeeping practices which are applicable to photo processing.

Reducing the amount of water used has a number of benefits. It will save on water as well as reducing the pollutants in waste. Equipment used in the industry is becoming more sophisticated. Some processing machines do not use water at all, whilst older ones use too much water. Machines that use water should be checked to determine if they are using too much.

Limit the amount of chemicals used. Chemicals are relatively inexpensive to buy, but their disposal is expensive.

Look for alternative products which do not include ammonia. There are a number of chemicals available which are made with alternative substances. Consider regeneration of spent chemicals on site instead of disposal. Consider the use of non-bromide-based materials.

X-ray processing plant should include a wash-water limiter or control system on any water wash processor. This will ensure that water is used only when film is being processed, and that only the minimum amount required is used.

7.14.15 SILVER RECOVERY

Install a suitable silver recovery system or make appropriate collection arrangements.

Where a collection system is employed, fixer and developer shall be collected and stored for off-site treatment and disposal.

Where a silver recovery system is employed, in shall be in accordance with the trade waste agreement and all spent solution that contains silver (such as bleach fix) must pass through this system and into a dilution tank.

7.14.20 BALANCING TANK/PIT

After the waste water has passed through the silver recovery unit, it must go into a balancing tank/pit. All other photographic waste must also go into this tank, including all water from washing baths and tanks. The nature of photographic waste allows a cancelling out or neutralisation of wastes to occur in the tank. This makes sure that a concentrated waste does not enter the sewer in one peak load.

The balancing tank should meet the following volume criteria for x-ray developing with a minimum of 1 hour retention:

Hospitals & Specialist X-Ray - Minimum Size	200 litres
Medical Centres with X-Ray Service - Minimum Size	100 litres
Dentists and other small practices - Minimum Size	50 litres

Stormwater Drainage

7.15.00 AUSTRALIAN STANDARD

Storm water system design generally shall comply with AS/NZS 3500.3 – Stormwater Drainage as referred to in the BCA and Local Authority by-laws.

7.15.05 STORMWATER DETENTION

Where required by the Local Authority, a stormwater drainage system that will collect roof water and surface water runoff in accordance with Local Council requirements shall be installed. Stormwater is to flow through a series of pipelines and pits, then treated for impurities before being processed through an on-site stormwater detention basin. The stormwater then discharges into Council's system for the area.

7.15.10 STORMWATER RETENTION

Where required by the Local Authority, a stormwater drainage system that will collect roof water and surface water runoff in accordance with Local Council requirements shall be installed. The stormwater is to flow through a series of pipelines and pits, and then treated for impurities, before infiltration into a number of in-ground absorption pits.

7.15.15 ROOF DRAINAGE

Roof rainwater collection systems shall be designed to handle a 20 year cycle, 6 minute storm duration as available from Bureau of Meteorology statistics. Surface water collection shall be based on a once in 5 year cycle storm of 6 minutes duration where a fail safe flood path exists. Where a fail safe flood path does not exist, a once in 100 year storm of 6 minutes duration shall be used as a calculation basis as available from Bureau of Meteorology statistics.

Roof drainage systems shall be designed to incorporate separate overflow relief discharge to minimise roof gutter overflow and consequent building damage and service interruptions.

Consideration shall also be given to ways of preventing leaf build up in gutters to prevent building damage and service interruption due to gutter overflow.

Surface water drainage lacking a fail safe flood path is to be avoided.

Box gutters are not acceptable. Eaves gutters or fail safe design are preferred.

Storm water drainage grates shall be cross-webbed in car parks and paths and not be located in wheel chair access areas or trolley areas.

Water Storage for Reuse

7.16.00 ROOF WATER

A life cycle costing is to be completed and if required by the Local Authority, a roof water run-off system shall be provided that collects, treats and distributes as potable water for human consumption or for irrigation and toilet flushing.

Roof water is to be collected and discharged into an on-site storage tank where the water is treated and distributed as potable water.

The tank is to be sized to include any future buildings shown on the drawings. A water balance study must be undertaken to ensure the storage tank has water available at all times.

The storage tank is to be constructed from reinforced concrete or other impervious material. A partition within the tank structure shall be provided that allows half the tank to remain in service while the other half is being cleaned out in accordance with AS/NZS 3500.

The water is to be treated with measured doses of chemicals in accordance with the requirements for potable water consumption. A detention period of 30 minutes is necessary before the water is discharges at the fixtures.

In-line pumping equipment is to be provided capable of delivering potable water to the fixtures at the required pressure and on demand.

Overflow from the storage tank is to discharge into Council's stormwater system.

At the completion of the works, the tank should be filled with potable water, tested, commissioned and fully operational.

7.16.05 GREY WATER

Collection of shower, bath and basin waste should be assessed with a life cycle costing analysis to determine if the collection of grey water is acceptable and if the Local Authority will allow it.

7.16.10 HYDROTHERAPY POOLS

Hydrotherapy pools require large amounts of heat both to maintain the temperature of the pool water and to offset evaporation from the water. The moisture evaporated from the water must be removed from the space, usually by ventilation. Potential exists to transfer this waste heat back to the pool water and space heating using commercially available heat pump systems. While requiring higher capital costs than conventional heating, these systems offer very large energy cost savings and should be considered for all proposed hydrotherapy pools. Life cycle cost analysis should be applied.

On Site Cogeneration (Heat Recovery Systems)

7.17.00 INTRODUCTION

Hospitals have the potential to utilise plant and systems that provide a primary function and in so doing reject heat that potentially can be used for a secondary function. Such systems are often referred to as cogeneration systems.

Examples of cogeneration systems are:

- Natural gas engine driven plant to drive large chillers to produce the cooling energy for air conditioning systems
- Natural gas engines to drive electrical generators for the production of electricity for site use and resale to the distribution authority.

In running the natural gas engines, very large amounts of high grade waste heat from engine exhaust gases and engine cooling (radiators) are generated at temperatures up to - and in some cases exceeding 100ºC; heat that is normally wasted to the environment. This heat can be recovered and used for heating water for domestic hot water use, thereby offsetting the cost of natural gas to directly heat the water.

There are other forms of low grade heat that can be recovered for preheating water such as heat rejected in the refrigerant gas cycle in the chiller plant used in the air conditioning system.

Additionally, use of solar energy as a heat source for water heating should be evaluated.

In such cases waste heat should be recovered as a matter of course or solar heating utilized. These systems may also be subject to green house or energy credits that will impact on the savings in adapting these systems. The viability of these systems should be subject to a life cycle costing evaluation and incorporated into the hospital design where the evaluation is favourable.

Such systems can compromise the integrity of water purity and care in design in regard to cross contamination is an important issue.

Pumping Systems and Deep Excavation

7.18.00 Pumping systems may be required for sewer, stormwater and water supply.

Pumping is to be avoided if other means are available. This includes extreme low grades of drainage (say 1%). Consider relocation of fixtures by negotiation with the architect.

Life cycle costing may be applied to situations where a choice between expensive rock excavation and pumping is involved. Non-essential fixtures in such conditions should be evaluated.

Deep Excavations: Prudent design should be exercised to avoid excessively deep drainage.

UPVC Plumbing

7.19.00 UPVC pipes represent an economic alternative to metal pipe (cast iron and copper) for

sanitary plumbing. Some restrictions apply in relation to its temperature properties and metal pipe will still be required for some applications.

Sanitary plumbing above ground shall utilise UPVC pipes and fittings for all waste discharges other than continuous hot waste flows from sanitisers and sterilisers.

Life cycle cost comparison recommended to evaluate UPVC with fire stop collars compared with cast iron pipe stacks.

Landscape Irrigation

7.20.00 Landscape irrigation systems are to be discouraged. Instead planting should comprise native plants suitable for the geographical location.

Landscape contracts should include a significant plant stabilisation period to establish self-sustaining growth.

Landscape watering, where provided, shall comprise local hose cocks with manual local controlled satellite systems.

Consideration shall be given to self-activated tractor sprinklers for large grassed areas. Where automatic irrigation systems are unavoidable, dripper systems are preferred to spray systems.

Gas Service Installations

7.21.00 The gas service installation is to be designed and installed in accordance with AS 5601, AG601 Gas Installations and AS/NZS 1596 the storage and handling of LP Gas.

NATURAL GAS: Where natural gas is available, provide natural gas from the local authority's infrastructure. The pipeline to be a metered service with a regulator and located in an appropriate position on the property.

LP GAS: Where natural gas is not available and liquefied petroleum gas (LPG) is economically viable to other forms of energy, provide for the on-site facilities. Ensure the LPG service is sized for natural gas to enable easy conversion should natural gas become available to the site in the future.

Provide a LPG storage tank and locate the tank in a safe and secure area where it is accessible to service vehicles. The LPG tank to have with lockable hinged steel dome cover to valve and regulator complete with hinge pins, padlock and keys.

Design the size of the tank to ensure that the time between refilling is not less than three weeks at maximum daily load.

Install the LPG tank on a 100mm thick reinforced concrete slab. Extend the slab size beyond the plan view of the tank by 1500mm in all directions.

Provide an 1800mm high chain wire fence security with galvanised steel posts and galvanised steel top and bottom rails. Install the fence around the perimeter of the concrete slab enclosing the LPG tank with lockable gates at diagonally opposite corners.

Appropriate fire protection facilities are to be installed.

Kitchens shall be provided with appropriately labelled gas isolation valve/s at the main entry point for isolation in event of fire.