GOVERNMENT OF SAMOA

HEALTH FACILITIES PLUMBING SYSTEM PREVENTATIVE MAINTENANCE POLICY 2020-2025

MINISTRY OF HEALTH

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INTRODUCTION

Typical plumbing concerns for all health facilities include repairing toilets, sinks and showers; maintaining piping systems through the facilities for air, water and gas; keeping drain systems and waste-water lines open and operating properly; and maintaining sprinkler systems, heads, valves and other fire-safety equipment; and most importantly, keep up with regulatory requirements under the National Building Code of Samoa 2017[1].

Health facilities must address measures to conserve water. From both environmental and economic perspectives, it makes good sense to keep an eye on water consumption. Hence, an up-to—date and efficient plumbing system can help make water conservation in health facilities a reality.

On the other hand, it is well known that the sanitary requirements for hospital environments are much more demanding than other non-health facilities environments. What is not as well known is that some health facilities bacteria strains tend to be more resistant in both level and spectra to antibiotics and bacteriostatic and bactericidal concentrations of antiseptics and disinfectants. Therefore, it is very important for the Ministry of Health to work together with a certified and qualified plumbing company to reduce hazards for all public health facilities' plumbing systems. Poorly maintained healthcare plumbing, can hold dangerous bacteria which can harm patients and healthcare workers.

Purpose:

This policy document is formulated as a guiding tool for the Ministry of Health for the planning, designing and renovating of the drainage, waste, vent, water distribution, storm drainage, natural gas, medical gas, medical vacuum and speciality systems in all public health facilities under the supervision of the Ministry of Health including the two main hospitals (TTM Hospital in Upolu & MTII Hospital in Savaii), district hospitals and health centres. Public health facilities across the country have a wide range of occupants including patients, their family representatives or relatives and healthcare workers.

In addition, this policy highlights the provision that may be encountered by the plumbing professional in the design of any health facility including the following:

- ✓ Plumbing fixtures and related equipment
- ✓ Boiler System
- ✓ Sanitary drainage system
- ✓ Water supply system
- ✓ Laboratory waste and vent systems and
- ✓ Pure water systems and medical gas systems.

Rationale:

The vision of the Ministry of Health as articulated in its Corporate Plan (FY2020/21 – FY2022/33) is ***"accelerating health services for the health and wellbeing of Samoan people"***[2]. Hence the Ministry must always keep the interest of the patients in mind when making decisions in locations where plumbing system design choices for health facilities affect the patients.

[1] MWTI. 2017. *National Building Code of Samoa.* Apia
[2] MOH. *Ministry of Health Corporate Plan FY2020/21 – FY2022/23 – Final Draft.* Apia

Plumbing system in health facilities require heavy use to help treat sick patients. However, they can also contain significant dangers. Pathogens can hide in healthcare plumbing pipes[3]. Therefore, patients and health workers can get infections from water that splashes back from plumbing system.

Multi-drug resistant organisms can stick to healthcare pipes and form biofilms. These biofilms can be difficult or nearly impossible to remove completely but the organisms in biofilms can cause serious, hard-to-treat infections for patients and healthcare workers[4].

In addition to these frightening risks, unmaintained plumbing can result in the interruption of health services in health facilities[5]. We are fully aware that water is vital for treating sick patients and preventing the spread of disease. Even a short disruption in water flow, can significantly impact the provision of effective, safe and quality health services.

Plumbing issues in health facilities can prevent health workers from helping patients. Additionally, they can increase the risk of infections as cited above, and diseases spreading to patients, their relatives and visitors and health staff as well.

For these reasons, the Ministry of Health as the major healthcare provider in Samoa places notable emphasis on the development of the **"Samoa Health Facilities Plumbing Preventative Maintenance Policy"** to facilitate the regular predictive and preventative plumbing maintenance services for all health facilities in Samoa. The provision of these services should be done by a competent, certified and qualified plumbing company.

Scope:

The plumbing preventative maintenance policy applies to all plumbing services in all health facilities both in Upolu and Savaii; and shall be utilized during the implementation of all health projects including minor and major health infrastructural developments. It is expected that health facilities plumbing systems design shall meet their primary intent of providing sanitary, safe, reliable and sustainable health facilities. In order to provide the latitude needed to accommodate new technologies, methods and materials in health facilities, technical deviations from the stipulations of this policy document may be made only if a safe, reliable and sustainable plumbing design shall results. Such deviations must be approved by the Ministry of Health in collaboration with the Ministry of Works, Transport and Infrastructure.

In addition, this policy is intended for use by the Ministry of Health and others like Ministry of Works, Transport and Infrastructure and plumbing companies that are engaged in the design and/or renovation of health facilities. These facilities include but are not limited to:

(i) Tupua Tamasese Meaole Hospital in Upolu
(ii) Malietoa Tanumafili II Hospital in Savaii
(iii) District hospitals
(iv) Rural health facilities/centres both in Upolu and Savaii
(v) Pharmaceutical Warehouse
(vi) Public Health Building and
(vii) MOH headquarters

[3] Potera, C. 2015. *Plumbing Pathogens: A Fixture in Hospitals and Homes.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4528999/ . Accessed on 1st November 2020
[4] Rogers, I. 1994. *Influence of Plumbing Materials on Biofilm Formation and Growth of Legionella pneumophila in Potable Water Systems.* American Society for Microbiology. USA
[5] WHO. 2006. *Health Aspects of Plumbing.* WHO Headquarters. Switzerland

POLICY ISSUE

The new Tupua Tamasese Meaoles Hospital in Upolu, Ministry of Health Headquarters and Public Health Building and other refurbished district hospitals in both Upolu and Savaii were all built under the Samoa Wide Approach Program (SWAp) for Health in 2010 with the financial support from the Government of Samoa in collaboration with its health development partners (World Bank, New Zealand MFAT and Australian DFAT). These health infrastructural developments were built with the aim that all systems installed including plumbing system will be in operation for the maximum of 10 years.

However, when the Ministry of Health conducted its Health Facilities Assessment in 2018, it appeared that there is a need to update some systems such as plumbing system[6].

The overall condition of plumbing system at the main hospitals both in Upolu and Savaii (TTM Hospital and MTII hospital) as well as district hospitals and health centres, is in poor condition. Hence, it requires the either renovation of building new plumbing systems.

Some of the challenges identified include:

(i) Water and Drainage Systems

It was notable during the Komiti Faufautua o le Soifua Maloloina of Upolu health facilities site visits in the last financial year (FY2019/20) that the most common plumbing problems in the TTM Hospital in Upolu & MTII Hospital in Savaii and few district hospitals we had visited include leaks, lack of ultra-purified water and clogging due to chemicals or other debris[7].

Hospitals or health facilities must have ultra-high purity piping to ensure that their patients are not infected during surgery or other clinical procedures. These special pipes must also be designed to withstand corrosion from chemicals that may be dumped over the course of the day.

Contaminate steam and sewage leaking into fresh water are also common problems observed in visited health facilities.

(ii) Irregular prevention inspection

This issue was identified from the assessment conducted specifically to assess the boiler and steam supply system of the Tupua Tamasese Meaole Hospital[8]. The outcomes of this assessment revealed that there was no regular prevention maintenance inspection conducted for the two boilers operated at the TTM Hospital.

Regular preventive inspection is a necessary part of the plumbing system maintenance services. Predictive maintenance techniques, such as pump vibration analysis, can detect impending breakdowns and allow time for scheduled repair to avoid service interruptions. Particularly in high-use areas such as TTM and MTII hospitals, this step will ensure that all systems operate properly with minimum downtime for repair.

[6] MOH. 2018. *Health Facilities Utilization Assessment Report.* Apia
[7] Komiti Faufautua Soifua Maloloina-Upolu. 2019. *Health Facilities Site Visit Report.* MOH. Apia
[8] Tusi's Service Provider. 2020. *Inspection Assessment Report: Tupua Tamasese Meaole Hospital Eurooboiler Garioni Naval Steam Boilers and Steam Supply System.* Apia

(iii) Lack of predictive and preventative maintenance services provide

The boilers had not been services for quite a while. This indicates that the responsible staff did not perform their maintenance services as expected.

In addition, there was not any evidence available indicating that there was regular maintenance conducted for plumbing systems in all health facilities both in Upolu and Savaii.

With the huge number and type of equipment items in health facilities plumbing system, it is a challenge to ensure that everything is covered frequently enough and no surprises occur. This is where the maintenance history records are invaluable.

(iv) Poor documentation of plumbing system maintenance services implemented

A look at type, age, design and condition, as well as maintenance history, can reveal hidden opportunities for improvement. These opportunities don't necessarily mean huge capital outlays.

First, responsible ACEO might consider improving cleaning, adjusting, lubricating, and preventive plumbing maintenance work content or frequency, or scheduling minor upgrades of existing components. Over the longer range, s/he can consider major capital expenditures, using the plumbing equipment history to evaluate return on the investment.

If each work order accurately and completely documents the work done and time spent, these records will show the executive management of the Ministry of Health exactly where the best opportunities for improvement lie. The responsible Assistant Chief Executive Officer (ACEO) in collaboration with the health facilities plumbing personnel also can run an analysis of plumbing system maintenance history to show, in descending order, which equipment items have required the most maintenance actions.

(v) Limited Knowledge and Expertise of MOH Plumbing Staff on Hospital Plumbing System

There are only two plumbers employed under the Ministry of Health to provide maintenance and repair services for all health facilities that are under the Ministry's supervision. Moreover, the MOH maintenance staff limited plumbing skills; hence, they cannot solve all issues pertaining health facilities plumbing system[9]. For the best outcome, it is very critical to work with a qualified and certified commercial plumbing company with experience in healthcare plumbing systems

[9] MOH. 2020. *Draft Samoa Health Workforce Development Plan*. Apia

KEY STRATEGIC AREAS (KSA)

The following Key Strategic Areas are developed to overcome the aforementioned challenges faced by the Ministry of Health.

1. Plumbing System Risk Assessment

Having undertaken a plumbing system risk assessment to better understand how the plumbing system in the facility is configured, the risk management team will be in a position to identify possible hazard sources and hazardous events, and the risk to which vulnerable people will be exposed. The following section describes hazards and hazardous events related to the plumbing system that should be considered as part of the risk assessment.

Complex plumbing systems, as are often found in health facilities like Tupua Tamasese Meaole Hospital in Upolu and Malietoa Tanumafili II Hospital in Savaii, may create optimal conditions for Legionella proliferation. Common hazard sources include the following:

(i) Pipework that allows heat transfer:

Poorly designed or improperly installed water systems may allow transfer of heat to cold water piping from heated water systems, other equipment or the environment, when the piping is within roof spaces, poorly insulated or subject to direct sunlight or other forms of external heating. Any of these situations can result in cold water temperatures greater than 20 °C, increasing the risk of bacteria growth.

(ii) Pipework that allows water stagnation:

Pipework can allow water to stagnate if it has been improperly installed or has been modified over time in a way that allows water to remain in it for extended periods (e.g. lengths of pipes cut off and capped during the transformation of a ward to offices). Some common practices, such as installing capped pipes to allow for future facility expansion, and bypass valves on filters and ultraviolet (UV) systems, can also result in stagnation.

Sections of a water distribution system that do not allow the flow of water are known as dead legs. Another stagnation concern is idle legs, which are pipe lengths that are not regularly flushed (eg when a patient bathroom is unused for 7 days.

(iii) Age or condition of pipes:

The presence of biofilms, scale, sediment, sludge, corrosion products or organic matter in pipes can provide environments for bacteria such as legionella to grow. Certain plumbing materials (e.g. fittings made of rubber or some plastics) can provide attachment surfaces for biofilms and nutrients to support proliferation of bacteria. They can also affect the flow of water, again producing conditions that may contribute to bacteria growth.

(iv) Cold water storages:

Some health facilities such as district hospitals and health centres store water in tanks to ensure consistency of supply. Storage tanks may provide environments where residual disinfectant diminishes over time, or sludge or biofilm builds up, creating an environment conducive to bacteria growth. Storages located in or on roofs can also be subject to increased temperatures. Tanks should be monitored and cleaned periodically.

Health Facilities Plumbing system assessment is very important to be implemented to assess the critical areas of the plumbing system in all health facilities both in Upolu and Savaii. This should be performed by certified plumbers to avoid the risk of pipe corrosion, clogs, leaks and burst tubes that can cause flooding and health facilities damage.

It recommended for all health facilities plumbing system to be regularly assessed to ensure that the systems run smoothly which helps the Ministry of Health prevent costly and unexpected repairs. However, pluming assessment should be properly executed to be able to achieve the following objectives:

a) Detect early problems to mitigate the risk of damaged pipelines and plumbing systems;
b) Eliminate the hassle of delayed work due to clogs and water leaks;
c) Avoid bigger water and boiler systems damages; and
d) Prevent a drastic increase in water consumption bill.

2. Plumbing System Design

The design of a health facility plumbing system includes the following:

(i) Plumbing Fixtures and Related Equipment

It is very important for health facilities plumbing system to consider the procurement of appropriate plumbing fittings and related equipment required. This is the responsibility of the Ministry of Health in collaboration with the selected professional plumbing engineer to work alongside with the architect and responsible MOH staff to discuss the general and specific requirements regarding the plumbing fixtures and related equipment.

The plumbing designer is responsible to prepare preliminary drawings and coordinate with the architect and the responsible MOH staff with procurement of supplies needed for the required piping systems and the plumbing fixture spaces. These should be planned to be in line with the National Building Code of Samoa 2017.

(ii) Domestic Water System

This section addresses the design requirements for domestic cold, hot and hot water return distribution systems within and to give feet beyond the health facilities or hospital buildings perimeter.

Domestic water shall be provided for all plumbing fixtures, food service fixtures in hospitals and equipment, and all other systems, equipment and devices that require domestic water supply.

Building domestic water systems shall be metered and isolated from the public water supply in accordance with the national requirements.

The design of health facilities supply and distribution systems shall provide a volume of water at the required flows, pressures and temperatures to ensure safe, efficient and code compliant operation during periods of peak demand. Piping shall be sized at a velocity not exceeding six feet per second (fbs) for cold and hot water and four fbs for hot water return.

Main distribution piping risers shall utilize chases within the building footprint for vertical routing to multiple floor levels where possible. Accessible shut-off valves shall be provided at the base of each riser and at each branch connection to risers. Shut-off valves shall be ball valves 1 – ½ and below and double lug butterfly valves for 2” and above.

Do not locate water piping within stairways, electrical or telecommunications rooms.

All interior domestic water supply and recirculation piping shall be insulated to prevent condensation.

Provide water softener systems to reduce hardness as required to supply food service equipment in hospitals kitchens, water heating equipment, pure water production equipment, and other systems, fixtures and equipment which hard water may adversely affect operation or longevity.

Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.

Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the domestic water distribution system and connected components. Locations shall include but not be limited to the following:

- at each fixture and piece of equipment
- at each branch take-off from mains
- at the base of each riser
- at each battery of fixtures
- where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

Accessible full size capped valves shall be provided where require for future connections.

All valves shall be accessible for operation and servicing. Provide access panels for all concealed valves, coordinate the location of access panels with the architectural features of the building and obtain approval of locations from the Ministry of Health.

Static pressure at plumbing fixtures shall be limited to 55psig (preferred), 80 psig (maximum), on each floor level by accessible redundant pressure regulating valves. Provide additional pressure regulating valves as required for proper operation of individual equipment.

Pressure reducing valves shall be duplex parallel, one on one off. Engineer to evaluate size for design fixture load, where located within domestic water lines serving in-patient areas, critical area, and or any area or equipment where un-interruptible (24 hour) water services is required.

Design of pressure regulating assemblies shall incorporate prevention of over pressurization of downstream piping in the event of valve malfunction.

A packaged domestic water booster pump system shall elevate the incoming water pressure as required to serve fixtures and equipment. Selection of pumping system type shall be based upon flow and pressure demand, efficiency of operation, life expectancy and maintenance requirements of the equipment. Pumps shall be end suction or centrifugal double. Stack pumps are not acceptable. Domestic water for all health facilities shall be provided using at a minimum a duplex pump.

Design of domestic water systems shall avoid all cross connections and eliminate the possibility of water contamination. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide an approved vacuum breaker or testable backflow preventer. Location of vacuum breakers shall prevent any possible backflow through them.

(iii) Sanitary and Drainage System

This section addresses the design requirements of Sanitary and Drainage System.

Drainage system design requires safe, clean and hygienic treatment areas that regularly maintained and needs to deal with amount of effluent delivered in the system. The drainage standards in the National Building Code of Samoa 2017 shall apply as per requirements.

In health facilities, there are several different types of drainage systems. It is imperative that these systems are kept separate in health facilities, so that the infection control strategy is not jeopardized, and the system maintenance is easier to maintain.

The drainage systems are the following:

(i) Waste Water Drainage – Generally drainage from Wash Hand Basins, Showers, Baths, Sinks, Scrub Sinks and Floor Drains. Drainage that does not contain human waste or contaminated water discharge.

(ii) Soil Water Drainage – Drainage from systems that contain human waste. Such as WC's, Urinals, Dirty Utility Flushing Rims (Slope Hopper) and Baby Washing Rooms.

(iii) Storm Water Drainage – This is drainage from water precipitation from external conditions such as rain, sprinkler water discharge or bib tap discharge.

(iv) Chemical Drainage – Drainage from dedicated laboratory areas where systems will need to be neutralized before connecting to the main system; and

(v) Radiation Drainage – This is drainage from the healthcare facility oncology areas and hot labs and toilet areas. This only applies to low level of radiation and not industrial radiation uses. Some of the above systems maybe combined with other systems to ensure the system operation and function, such as including designing for grease / oil interceptors.

All the above systems will be required to be vented to atmosphere via a vent pipe connection to the drainage runs. The vent pipe can be provided at high level or just above the point of discharge of the sanitary fixture units. For very small health facilities like health centres, where there are local toilet facilities made up or a water closet (WC) and Wash Hand Basin (WHB), then the system is not required to be vented at high level via vent pipes, but a stub stack shall sufficient for a system to be vented via the drainage system connection. For small rise and small floor area healthcare facilities, an automatic air vent or air admittance valve can be provided at the top of a sanitary drainage system.

For the drainage system design of health facilities, the following elements are important to consider:

(i) Appropriate and good durable piping materials

(ii) Appropriate access to and into the piping, this is absolutely critical and the responsibility of the architect in conjunction with the engineer,

(iii) Access by means of manholes and inspection chambers is preferred as it allows downstream and upstream cleaning with high pressure water systems.

(iv) High pressure cleaning (rodding) is highly preferred as it is more effective and it does not damage the piping.

(v) Minimum external drainage piping diameter preferred to be 150 mm ID to prevent blockages.

(vi) Access to be situated where drains enter/exit from buildings in order to be able to rod into the building. This access should preferably be a manhole or inspection chamber.

(vii) All bends under floors in ground and above to be long radius consisting of two 45 bends with a meter of piping in between.

(viii) Junctions have a 45 bend with a meter of piping in between the junction and the bend.

(ix) Internal building discharge pipes to be separate pipes for soil and separate for waste water to prevent overflow of soil water into the shower or bath or floor drains.

(x) Provide backflow prevention with overflow outside the building where the soil waste water exits or enters the building (this is all on ground level only).

(xi) Internal soil and waste water discharge pipes to be 100 mm diam (ID) and minimum gradient 1:60. Please not the ID is essential.

(xii) Where waste (50) pipes drop into the floor, it must be connected with a 100 mm diam. "floor-stub-stack) to the under-floor 100 mm diam. discharge water piping. these floor-stub-stacks can be used as access to the under-floor discharge piping system.

(xiii) All under-floor pipings, bends, junctions, change of directions, change of gradient must all be "long-radius" and have appropriate access from above where possible and in service ducts where possible to allow easy access which is critical for maintenance.

(xiv) Ventilation must be provided on all branches longer than 6m and at least one 100mm diam. open vent pipe at the highest furthest point of the drainage system and ventilation also where necessary elsewhere.

(xv) Pumping systems must be provided where really necessary and only if it cannot be avoided and then it must be only a very high quality and very reliable robust pump system with separate maceration system and with appropriate overflow storage capacity.

(xvi) The pumping main must be high quality, durable piping material such as "mineflow" or similar type of robust piping.

(xvii) The pumping system must have full redundancy and have back up power.

(xviii) No buried waste line shall be smaller than 3 inches. No buried vent line shall be smaller than the full size of the sanitary pipe that it is serving. No above ground vent line shall be smaller than 1 – ½". No roof vent terminal shall be smaller than 3 inches. Waste piping serving water closets shall not be smaller than 4 inches.

(xix) Locate all sanitary vent terminals a minimum of 30 feet horizontally from, or 3 feet vertically above all air intakes, operable windows, doors and any other building openings, unless a written variance is accepted where 25 feet horizontally would be the minimum.

(xx) Avoid locating drains above sensitive equipment or areas where water leakage would cause majority property loss or contamination. Where this is unavoidable, provide a stainless drain pan with drain and leak detection alarms tied into health facilities management system and seal floor above with 20 year floor seal.

(xxi) Do not locate drainage or vent piping within stairways, electrical, telecommunications rooms or to be leased spaces. Where this is unavoidable, provide a stainless drain pan with drain and leak detection alarms tied into health facilities management system and seal floor above with 20 year floor seal.

(xxii) Do not locate floor drains within pharmacy drug preparation areas, operating rooms or areas where hazardous materials are handled or stored.

(xxiii) Health facilities have equipment that discharge effluent of high temperatures and which require piping that can handle such hot effluent. For this cast, iron piping is the best. In some cases, a "cooling box" is also required.

(xxiv) Long horizontal pipes in ceilings shall not be allowed and only if it is a branch pipe no longer than 6m or 10 m if it has ventilation.

(xxv) Floor drains without water discharging into it must be avoided. Where no water can discharge into the drain, a small water supply pipe must be provided with a valve to flush the system daily.

(xxvi) Grease tapping must be provided where necessary and as close as possible from the source of where it is generated. Arrangements must be made for the removal from the site of the grease and fat.

(xxvii) The quality assurance (QA) is the responsibility of the contractor and not of the engineer. However, the engineer must see that the contract applies the QA and the engineer must approve the system of the contractor when the contract begins.

(xxviii) The contractor to study and apply the works information document.

(xxix) The "works information document" is a document that contains all the design assumptions, the design decisions, the relevant specifications and relevant information for the contractor and the design and construct elements such as the pumping systems.

(xxx) Appropriate maintenance by competent persons is, as is training of operational staff to prevent discharging of material other than normal soil and waste.

(xxxi) Inspection, testing, camera inspections, smoke testing are all critically important.

(xxxii) An intelligent Building Management System is essential for any health facility and the pumping systems and other important signals must be monitored.

(xxxiii) The plumber shall be a certified, qualified and registered under the Professional Plumbers Association.

(xxxiv) The plumber shall maintain the systems for a period of 12 months after completion for a fixed cost. He shall keep record of all incidents such as drainage blockages and indicate on a drawing where blockages occurred and reasons why.

(xxxv) All drains shall be vented according to the latest version of the International Plumbing Code and the National Building Code for Samoa 2017.

(iv) Storm Drainage System

This section addresses requirements for storm drainage system for health facilities. The requirements include:

- ✓ Pipe, tube and fittings
- ✓ Specialty pipe fittings
- ✓ Roof drains and
- ✓ Cleanouts.

Primary and secondary roof drain systems shall be designed using the applicable rainfall rate in conjunction with code established areas-to-pipe sizes allowed.

Avoid locating sumps or piping above sensitive equipment such as CT Scan, radiology imaging equipment or areas where water leakage would cause major property loss or contamination. Where this is unavoidable, provide a stainless drain pan with drain, leak detection and seal floor above with 20 year floor seal.

No roof drains shall have an outlet connection smaller than 3 inches.

Storm drains that cannot be discharged by gravity shall be routed to a sump and be pumped out to a point in the storm system that is capable of flowing by gravity.

Provide cleanouts at the base of each vertical downspout and at intervals not exceeding 75 feet in horizontal building drain. All interior cleanouts shall be accessible from walls or floors. For horizontal cleanouts, provide an access door and blind plug. For vertical cleanouts, provide an access door, wye, and blind plug. Plumbing engineer is responsible for coordinating access door locations for incorporations on the health facilities architectural plans.

(v) Boiler System

Boilers have long been the workhorses for health facilities Heating, Ventilation and Air Conditioning (HVAC) systems, and operating them safely, efficient and sustainably are a continual challenge.

For hot water boilers, the heating system shall be designed, installed and operated in a way that does not put personnel at risk, or damage the health facilities or other installations, and with due consideration to minimize energy use.

The heating system shall be designed with due consideration to installation, commissioning, operation, maintenance and repair of components, appliances and the system.

At the planning stage or during the progress of design work, the following items shall be agreed upon and decisions documented:

(i) clarification of the responsibilities of the designer and the installer and whether or not a qualified operator is required;
(ii) compliance with relevant national and statutory regulations, and whether PSSR or MCPD will apply, for example;
(iii) thermal characteristics of the health facilities for calculation of heat requirements and possible improvements of energy conservation;
(iv) external design temperature and internal design temperature;
(v) method of heat load calculation;
(vi) energy source, primary fuel type and emissions to air;
(vii) whether a permit is required for the combustion plant;
(viii) consideration of solid fuel supply, ash removal and disposal, if required;
(ix) location and size of fuel storage and access thereto, if required;
(x) position of the heat generator, bearing in mind access for maintenance, means of fueling and provision of combustion air;
(xi) type, location, dimensions, construction and suitability of chimney and flue terminal, if required;
(xii) choice of suitable pressurization;
(xiii) position of feed and expansion cistern for open vented systems or expansion vessel, filling point and pressure gauge for sealed systems;
(xiv) facilities for filling and draining the system, and for testing the water condition;
(xv) electrical power requirements;
(xvi) type and position of heat emitters;
(xvii) control of heating and attached system, including frost protection;
(xviii) route and method of installing piping and insulation;
(xix) provisions and specification for balancing the system;
(xx) provision for measurement of energy consumption;
(xxi) surface temperatures of exposed heating system surfaces

The importance of adequate maintenance on boiler control and alarm systems cannot be over-emphasized. Hence, it is important that the following points are noted:

- ✓ The Ministry of Health is responsible for ensuring that all MOH maintenance staff working on or with a boiler must possess sufficient training to be able to carry out their expected duties. Maintenance staff must only carry out the work for which they have been trained and are deemed competent. Suitable training courses and maintenances services for maintenance personnel can usually be provided or recommended by manufactures of the boiler/s, burners, fittings or control equipment.

- ✓ The operators of the boiler must ensure that they hand over the boiler to MOH maintenance staff in a safe condition with a manual.

- ✓ On completion of maintenance, the checking of all controls, limiters and alarms shall be verified by the boiler operator in the presence of the MOH maintenance staff before the boiler is placed online.

(vi) Medical Gas and Vacuum Systems

This section addresses the requirements for medical vacuum, waste anaesthetic gas disposal, compressed air, oxygen, nitrous oxide, nitrogen, carbon dioxide, laboratory vacuum and gaseous nitrogen systems within and to give feet beyond the health facilities perimeter.

These requirements include:

(i) Medical vacuum and gas systems shall be designed in accordance with the National Building Code of Samoa 2017, and any Guidelines available for Design and Construction of Hospitals and Health Facilities.

(ii) Medical vacuum and gas systems serving patients shall be independent of all other vacuum and gas systems serving laboratory, or other critical areas.

(iii) Medical and laboratory compressed air systems serving patients or labs shall not be used to serve non-respiratory equipment such as sterilizers, pneumatic doors, operating theatres etc.

(iv) Design medical gas and vacuum systems to deliver the following nominal pressures at the points of use:
   a. All pressure systems shall be 45 to 50 psig at maximum flow
   b. Nitrogen shall be 160 to 185 psig at maximum flow
   c. Nitrous oxide shall be 46 to 48 psig at maximum flow
   d. Vacuum shall be 15 to 19 inches Hg at most distant inlets.

(v) Design lab gas and vacuum systems to deliver the following nominal pressures at the points of use:
   a. All pressure systems shall be 45 to 50 psig at maximum flow
   b. Vacuum shall be 19 inches Hg at most distant inlets

(vi) Coordinate the requirement for the use of ventilators with Biomedical Team. Design the oxygen and medical air systems to accommodate required flow demands.

(vii) Include waste anaesthetic gas disposal terminal inlets and piping in appropriate projects. The source this disposal terminal inlets shall be an independent system from the medical vacuum system.

(viii) Provide at least one instrument air control panel within rooms containing instrument air outlets used for equipment. Verify need for instrument air use or electric for surgical tools with the Ministry of Health Hospital and Clinical Services Department.

(ix) Locate station inlets and outlets at an appropriate height to prevent physical damage to attached equipment and accessories. Station inlets and outlets located above countertops shall be provided with sufficient space to allow usage and attachment of equipment without interferences by countertop, backsplash or overhead cabinets.

(x) Provide sufficient spacing between station inlets and outlets to allow simultaneous use with vacuum collection bottles, regulators, adaptors or any other equipment attached. Provide slide retainer bracket for collection bottle attachment adjacent to each vacuum station inlet. Renovations shall be updated so that they are installed the same as installing new.

(xi) Ensure that all vacuum and gas source equipment and alarm systems are provided with both normal and emergency electrical power supply.

(xii) Drawings shall show all valves and pressure sensor locations.

3. Plumbing System Installation

The provision of quality and safe healthcare services to our patients depend on our health facilities plumbing system. When problems arise, they can easily affect the health and safety of our patients. Hence, it is very crucial to ensure the installation and repair of plumbing systems in all health facilities across Samoa are well implemented.

IMPLEMENTATION PLAN

KEY STRATEGIC AREAS	ACTIONS	IMPLEMENTERS	TIMEFRAME	COST
1. Plumbing System Assessment	Hire a qualified plumbing engineer or professional plumber to effectively conduct plumbing systems risk assessments for all health facilities both in Upolu and Savaii including the Nurses Hostel and Pharmaceutical Warehouse	• MOH Divisions: o A&M o F&P o HSCRM	FY2020/21	**SAT200,000.00**
	Ensure these elements are considered in plumbing systems risk assessment reports: ✓ Plumbing Systems Designs and installations ✓ Hospital Associated Infections ✓ Fixtures and Fittings ✓ Domestic hot and cold water systems ✓ Drainage, sanitary waste and vent system ✓ Drainage storm water systems ✓ Natural gas systems ✓ Medical gas and vacuum systems	• MOH Divisions: o F&P o A&M o QA&IPC o HPED • MWTI	FY2020/21	
	Compile and submit plumbing systems risk assessment reports for technical advice/s and decision making.	• MOH Divisions: o A&M o F&P o HSCRM	FY2020/21	

KEY STRATEGIC AREAS	ACTIONS	IMPLEMENTERS	TIMEFRAME	COST

2. Plumbing System Design	Hire a qualified registered plumbing engineer/architecture or plumber to design plumbing systems for new health facilities (Saanapu and Falelatai Health Centres) in accordance with plumbing requirements under the National Building Code of Samoa 2017.	• Ministry of Health Divisions:
		  ○ F&P
		  ○ A&M
		• MWTI
			FY2021/22	**SAT100,000.00**

	Ensure the effective implementation of Health Impact Assessment on designs of all health facilities plumbing systems both in Upolu and Savaii.	• MOH Divisions:
		  ○ HPED
		  ○ A&M
		•
			Six monthly	**SAT50,000.00**

3. Plumbing System Installation	Hire a certified, qualified plumber or plumbing company with experience in healthcare plumbing systems to install plumbing systems for health facilities	• MOH Divisions:
		  ○ F&P
		  ○ A&M
			When required	**SAT100,000.00**

	Procure equipment, machines and supplies necessary for a complete functioning of health facilities plumbing systems	• MOH Divisions:
		  ○ F&P
		  ○ A&M
			When required	**SAT500,000.00**

	Ensure the Health Impact Assessment is conducted before, during and after the installation of health facilities plumbing systems	• MOH Divisions:
		  ○ F&P
		  ○ HPE
		  ○ A&M
			Six monthly basis	**SAT50,000.00**

	Effectively monitor the installation of all health facilities plumbing systems to ensure the compliance with the National Building Code of Samoa requirements for plumbing services	• MOH Divisions:
		  ○ F&P
		  ○ HPE
		  ○ A&M
		• MWTI
			On-going	**SAT50,000.00**

KEY STRATEGIC AREAS	ACTIONS	IMPLEMENTERS	TIMEFRAME	COST
4. Plumbing System Maintenance **and Repair**	Develop the Plumbing Maintenance Plan or Guideline and update according to: a. routine, general and detailed inspections b. the inspection and maintenance of each plumbing works and items of special equipment c. the maintenance of items that require regular attention to preserve good performance	• MOH Divisions: o F&P o HPE o A&M	FY2020/21	**SAT85,000.00**
	Effectively implement general maintenance and repair services for all health facilities (2 main hospitals, district hospitals and health centres) both in Upolu and Savaii are effectively	• MOH Divisions: o F&P o A&M	Quarterly	**TTM Hospital: SAT800,000.00** **MTII Hospital: SAT250,000.00** **District Hospitals: SAT155,000.00** **Health Centres: SAT190,000.00**
	Hire a certified, qualified plumbers or plumbing companies with experience in healthcare plumbing systems to assess and repair lavatories systems in all health facilities	• MOH Divisions: o F&P o A&M	FY2020/21	**SAT500,000.00**
	Develop and strengthen the implementation of plumbing systems maintenance history records.	• MOH Divisions: o F&P o A&M	Ongoing	**SAT25,000.00**
5. Capacity building of	MOH staff who are responsible staff must be well-equipped with skills and capacity	MOH, WHO, relevant development partners	Ongoing	**SAT100,000.00**

KEY STRATEGIC AREAS	ACTIONS	IMPLEMENTERS	TIMEFRAME	COST
MOH Plumbing System Maintenance Staff	required for health facilities pluming system installation and maintenance.			
	Ensure each health facility should have a qualified, certified and registered plumber to implement plumbing maintenance and repair services to save costs	MOH, PSC	FY2021/22	**SAT500,000.00**

MONITORING AND EVALUATION

Plumbing System Design and Installation:

The Health Sector Resourcing and Monitoring Division will be responsible to facilitate the tendering process for plumbing system design and installation since these tasks will be outsourced to professional plumbing contractors due to the lack of required plumbing technical skills and expertise in the Ministry's workforce.

Plumbing System Maintenance and Repair:

The following divisions and sections of the Ministry of Health will be responsible for monitoring and evaluation general maintenance services provided for effective, safe and healthy plumbing systems for all health facilities under the Ministry's supervision:

(i) Assets and Maintenance Division;
(ii) Finance and Procurement Division;
(iii) Internal Audit
(iv) Healthcare Waste Management and Occupational Health and Safety Section under Health Protection and Enforcement Division; and
(v) Water Quality and Sanitation Sections under National Health Surveillance and IHR Division

Their M&E works will be implemented through conducting regular/routine monitoring visits and compliance checks.

The Professional Plumbing Contractors will be sought to conduct an overall preventative maintenance and repairs for all health facilities, the MOH Headquarters, Pharmaceutical Warehouse and the Nurses Hostel on annual basis. Hence, the Health Sector Resourcing and Monitoring Division will monitor the performance of these contractors.

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ANNEX 1: SAMOA HEALTH FACILITIES PLUMBING MAINTENANCE SYSTEM PROCEDURES

Scope of Plumbing Services in Health Facilities:

The scope of work includes the provision of Plumbing Maintenance and Repair Services on an "as needed and when requested" basis including emergency response at the various District Hospitals facilities and health centres, the main hospital buildings, MoH Headquarters, the Warehouse and the Nurses Hostel.

Ministry of Health

The MoH will be responsible for daily maintenance and inspections, and minor plumbing repair works. Major plumbing works will need to be outsourced to a professional contractor. MoH will need to conduct a proactive regular plumbing preventive maintenance of the critical components of the plumbing system, including pipes, valves, water and drains. These will have to cover the following:

- ✓ Check for active plumbing leaks
- ✓ Check for signs of damage or corrosion
- ✓ Water Pressure
- ✓ Checking Valves for Correct Operation
- ✓ Check Drains
- ✓ Backflow Testing
- ✓ Check waste water management
- ✓ Check broken materials and equipment

Professional Plumbing Contractor

Maintenance requirements outside of the expected level of MoH maintenance activities will be outsourced to qualified contractors, with preference to local firms. Their work will be supervised by the Head of the MoH Assets and Maintenance division. A work plan / programme of outsourced maintenance will be developed for planning and budgeting purposes. Contracts for outsourced maintenance will be tendered or based on competitive bidding quotations in accordance with the Government of Samoa procurement guidelines.

The type of work the Contractor(s) will respond to will include, but is not limited to:

- ✓ Cistern does not flush when handle / chain is operated
- ✓ Cistern fills very slowly
- ✓ Water comes out of the cistern overflow outlet
- ✓ Condensation on the outside of the cistern
- ✓ Broken soap and tissue dispensers
- ✓ Broken cubical locks
- ✓ Broken toilet tiles/walls
- ✓ Poor waste water management system
- ✓ Broken urinals taps
- ✓ Blocked urinals
- ✓ Ceiling leakages and other piping leakages

Plumbing Systems Maintenance Procedures:

These procedures for maintaining plumbing systems in health facilities should be followed:

1. A system of planned preventative maintenance will be used, involving the inspection and assessment of plumbing works on a quarterly basis.
2. A fault-reporting and tracking system will be operated, whereby staff will be encouraged to report faults or potential plumbing problem areas, such as leakages, damaged cisterns, broken locks, taps, urinals, blockages, damaged walls and broken tiles.
3. Faults or repairs will be logged by the ACEO and related personnel, who will conduct a risk assessment on each one to determine whether or not the repair is urgent.
4. Repairs will be allocated to, or commissioned from, appropriate staff or contractors and followed up to check that any necessary work has been completed satisfactorily.
5. All maintenance work, including minor tasks, will be subject to a prior risk assessment, and adequate risk management and safety arrangements will be put in place before the work is carried out.
6. All maintenance contractors will be expected to comply with MoH health and safety policies and safety measures.
7. Urgent repairs will be prioritised and completed as soon as is practicable. Where there is a delay in any essential maintenance work, the manager will take whatever action is necessary to ensure safety and control any risk in the meantime.
8. Access to any relevant risk assessments, drawings, instructions, handbooks and records will be provided to maintenance staff or contractors.

The maintenance system will cover all areas of the premises as specified:

a. all buildings — indoor and outdoor water systems
b. equipment and devices
c. water sewage/waste management system

All material parts of the premises, including fixtures and fittings, will be well maintained in accordance with the maintenance schedule.