



GOVERNMENT OF THE PEOPLE'S REPUBLIC OF
BANGLADESH

NATIONAL WASH STANDARDS AND IMPLEMENTATION GUIDELINES

FOR HEALTHCARE FACILITIES IN BANGLADESH

A large, stylized graphic of a water splash, rendered in shades of teal and blue, occupies the lower half of the cover. The splash is dynamic, with water droplets and ripples visible, symbolizing cleanliness and hygiene.

DIRECTORATE GENERAL OF HEALTH SERVICES
MINISTRY OF HEALTH AND FAMILY WELFARE



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National WASH Standards and Implementation Guidelines for Healthcare Facilities in Bangladesh

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ACRONYMS

AMR	Anti-Microbial Resistance
BSTI	Bangladesh Standard Testing Institute
BNBC	Bangladesh National Building Code
CBHC	Community Based Health Care
CC	Community Clinic
CCU	Coronary Care Unit
COVID 19	Coronavirus Disease 2019
CPVC	Chlorinated Polyvinyl Chloride
DGHS	Directorate General of Health Services
DGFP	Directorate General of Family Planning
DG Nursing	Directorate General of Nursing
DHIS2	District Health Information Software 2
DP	Development Partner
DoA	Department of Architecture
DoE	Department of Environment
DPHE	Department of Public Health Engineering
FP	Focal Person
FSM	Fecal Sludge Management
FYP	Five Year Plan
GoB	Government of Bangladesh
HCFs	Health Care Facilities
HCAI	Health Care Associated Infection
HCSs	Health Care Settings
HCWs	Health Care Workers
HED	Health Engineering Department
HEPA	High Efficiency Particulate Arrestance
HPNSDP	Health, Population and Nutrition Sector Development Programme
HPNSP	Health, Population and Nutrition Sector Programme
HSD	Health Services Division
HWB	Hand Wash basin
ICU	Intensive Care Unit
INGO	International Non-Government Organization
IPC	Infection Prevention and Control
IT	Information Technology
JMP	Joint Monitoring Program
LGIs	Local Government Institutions
LNGOs	Local Non-Government Organization
MEFW	Medical Education and Family Welfare
MHM	Menstrual Hygiene Management
MNH	Maternal, Newborn Health
MoFDM	Ministry of Food and Disaster Management
MoH & FW	Ministry of Health & Family Welfare
MoLGRD & Co	Ministry of Local Government, Rural Development & Cooperatives
NTC	National Technical Committee

NTU	Nephelometric Turbidity Unit
OD	Open Defecation
O & M	Operation & Maintenance
OPs	Operational Plans
OPD	Outpatient Department
OSS	On-Site Sanitation
OT	Operation Theater
PPE	Personal Protective Equipment
PPR	Polypropylene Random
PVC	Polyvinyl Chloride
PWD	Public Works Department
QoC	Quality of Care
RCH	Reproductive and Child Health
RWH	Rain Water Harvesting
SDG	Sustainable Development Goal
SDP	Sector Development Plan
SARS	Severe Acute Respiratory Syndrom
TTC	Thermotolerant Coliform
UHFPO	Upazila Health and Family Planning Officer
UN	United Nations
UNICEF	United Nations Children Funds
WASA	Water Supply and Sewerage Authority
WASH	Water, Sanitation and Hygiene
WASH FIT	WASH Facility Improvement Tool
WHO	World Health Organization
WSP	Water Safety Plan



Message

The Government under the leadership of the Honorable Prime Minister Sheikh Hasina, is committed to attain Universal health coverage (UHC) and improvement of quality of life. Quality healthcare is critical to UHC which encompasses safe water supply, improved sanitation and hygiene (WASH) facilities in Healthcare Facilities. Adequate WASH in health care facilities help ensuring quality and safe care and minimize risk of infection for patients, caregivers, health care workers and surrounding communities.

I am happy to team that a National WASH Standard and Implementation Guideline has been developed in order to facilitate improvement of Water, Sanitation and Hygiene facilities in healthcare centers. WASH standards are the minimum requirement of services to provide adequate and safe level of healthcare in addition to minimizing the risk of health-care facility related infection for patients, staff and caregivers. I do believe that if all the health care centers start implementing the WASH standards, it will definitely help them towards delivering quality care, achieving infection prevention and control services and thus reducing morbidity and mortality, especially maternal and child mortality. This will also help to accelerate the pace of our progress towards SDG targets and bring about a new era of quality healthcare for the people of Bangladesh and moving towards universal health and WASH coverage.

The Ministry of Health and Family Welfare will extend its support to implement the WASH Standards and Implementation Guidelines. I would like to urge relevant government agencies especially those are responsible for hospital construction and maintenance and management like HED, PDF and hospital authorities to ensure that standards for water, sanitation and hygiene facilities are built and maintained in all new hospitals as well as in the upgraded hospitals. Our ministry will provide necessary budget allocation through Operational Plans to facilitate implementation of the WASH standards.

Finally, I would like to express my sincere thanks to all relevant government agencies, NGOs and development partners specially WHO-Bangladesh for their technical and financial support in developing the “National WASH Standards and Implementation Guidelines for HCFs”.

Joy Bangla, Joy Bangabandhu
Long live Bangladesh.

Zahid Maleque, MP

Minister

Ministry of Health & Family Welfare Govt. of the People's
Republic of Bangladesh



Message

Water, Sanitation, hygiene and environmental conditions in healthcare facilities (HCFs) have been the areas of concern despite their associated risks with infection, antimicrobial resistance (AMR), morbidity and mortality. Adequate WASH facilities are essential components of providing quality health services and it serves to prevent infections and spread of diseases, protects staff and patients, and upholds the dignity of vulnerable populations. A review of the few published studies revealed that inadequate sanitation in HCFs is a major cause of dissatisfaction among patients and a deterrent to women seeking institutional delivery and care. They also pointed towards the need for enabling policy environment, nationally-mandated indicators, and independent quality control for WASH in HCFs. Unfortunately, many of our HCFs lack adequate WASH services, compromising the ability of health care professionals to provide safe care and presenting serious health risks to those seeking treatment.

I am pleased to learn that the “National WASH Standards and Implementation Guidelines for HCFs” has been developed through series of workshops with stewardship of the National Technical Committee for WASH in HCF. The development of this document marks the achievement of an important milestone: it sets out our vision for change on WASH in HCFs to deliver quality of care service delivery, prevent hospital acquired infection. It represents an ambitious agenda to transform the WASH situation in HCFs and is intended to support effective, quality and sustainable implementation of improved WASH interventions in HFS. I am hopeful that the concerned programs of the Ministry of Health and Family Welfare along with other relevant ministries, development partners and organizations will coordinate and collaborate to implement the planned actions based on the Implementation Guidelines.

The “Standards and Implementation Guidelines” should be used as a reference for policy-makers, planners and relevant agencies like HED and the PWD during planning, designing and implementation of a health care facility. This will contribute to increased access to WASH in HCFs and support our efforts towards the achievement of the related SDGs.

I express my sincere thanks to all contributing agencies and development partners, in particular WHO, Bangladesh for their contribution and technical support in the development of the document.

Mr. Md. Anwar Hossain Hawlader
Secretary
Health Services Division
Ministry of Health & Family Welfare Govt.
of the People's Republic of Bangladesh



Message

The best environmental management practice for the health-care sector includes efficient infection prevention and control (IPC) measures, adequate water supply, sanitation, Hygiene and safe disposal of medical waste management. Without WASH services, the ability of health care workers to carry out the proper infection prevention and control measures becomes limited, with implications for the quality of care of neonates, under-fives and their mothers. This 'National Standards and Guidelines' for WASH in HCFs will support health professionals, practitioners, service providers and NGOs to provide quality of care through safely managed WASH, IPC and medical waste management and thus improving the health status of the health care staff, patients, caregivers and through them to the local communities.

This WASH Standards and Implementation Guidelines has been developed through a consultative process with technical experts from government and NGOs and development partners. My sincere appreciation to Prof. Dr. Nasima Sultana, former Additional Director General (Admin) DGHS for her leadership in developing this document. I acknowledge the unwavering contribution of Dr. Yunus Ali, Deputy Director (Hospital-2), DGHS, the Convener of the Technical Sub-committee and the subcommittee members throughout the development process of the Standards and Implementation Guidelines. Apart from DGHS, I would like to extend my thanks to the various experts from MoLGRD&Co, DPHE, WHO, Unicef and WaterAid and the various NGOs/INGOs who have provided inputs to enrich this National Standards and Implementation Guidelines. Their feedback and suggestions greatly enriched the document.

Finally, I greatly appreciate and acknowledge the contribution and the leadership of DGHS in developing a "National WASH Standards and Implementation Guidelines for HCFs" that will direct our efforts towards the achievement of SDGs 3 and 6.

Prof. Dr. Abul Bashar Mohammad Khurshid Alam

Director General

Directorate General of Health Services



Message

Adequate water sanitation and hygiene are essential components of providing basic health services. The provision of WASH in health care facilities serves to prevent infection and spread of diseases, protect staff and patients and uphold the dignity of vulnerable populations, including pregnant women and the disabled.

Unfortunately, many HCFs in the world lack basic wash services. In 2020 WHO and UNICEF assessed the status of WASH in health care facilities. Nearly 40% of facilities lack improved water, 20% without sanitation, and 35% without hand hygiene. In Bangladesh, 21% HCFs lack basic water supply services, and 19% lack improved sanitation facilities. Only 34% of facilities have basic hygiene services.

Drinking unsafe water impairs health through illnesses such as diarrhea. Poor sanitation and hygiene also contribute to the health burden through the spread of diseases. Poor WASH provisions in HCF exacerbate the problem as a patient have a weakened immune response and are particularly susceptible to disease and infection while in the HCF. It causes up to 56% of all neonatal deaths among hospital-borne babies in developing countries. Estimates show that of every hundred hospitalized patients, ten in developing countries will acquire health care-associated infections. Conversely, evidence suggests that improving services through safely managed water and sanitation can dramatically improve health by reducing diarrheal deaths.

In 2018, the Secretary-General of the United Nations (UN) announced a Global Call to Action to elevate the importance of and prioritize action on WASH in all health care facilities, including primary, secondary, and tertiary facilities in both the public and private sectors. WHO and UNICEF are also co- leading the implementation of a global roadmap built from country-led initiatives. To improve WASH services in health care facilities, eight practical steps have been identified and are described and illustrated through case studies. These steps include developing national roadmaps and standard-setting targets, improving infrastructure, and engaging communities.

WHO, since its inception, has been playing a significant role in promoting WASH and building the capacity of the countries. It has developed several international guidelines, standards and strategies on Water, Water Quality Management and Sanitation. Further, WHO is monitoring the global WASH progress, including WASH in HCFs and Schools. In response to a request from DGHS, WHO has provided technical support and guidance to develop this document on WASH standards.

I look forward to seeing the standards being followed, implemented, and funded on the ground. I reassure my commitment to supporting any endeavor from the government and its partners towards improving WASH services in HCF.

Dr Bardan Jung Rana

WHO Representative World Health Organization
Country Office for Bangladesh

ACKNOWLEDGEMENT

The process of developing the National Standards for WASH in Health Care Facilities (HCFs) and these guidelines has been very evolving and therefore needed people with an esteemed knowledge base and experience on WASH. The National Technical Committee (NTC) for WASH in HCFs in the Directorate General of Health Services (DGHS) of the Ministry of Health and Family Welfare (MoH&FW) requested World Health Organization (WHO) to provide technical support and guidance to DGHS for the development of National Standards for WASH in HCFs and Guidelines to implement the standards in Bangladesh. For this, the Chairman of the National Technical Committee (NTC) constituted a Technical Sub-committee to facilitate, support and cooperate with WHO in the development process of National Standards for WASH in HCFs and the guidelines to implement the standards. WHO appreciated the DGHS's initiative and engaged a WASH Consultant to work with the Technical Sub-committee. The efforts of the sub-committee in developing the national WASH standards and its guidelines has been commendable and a big step towards improving quality of health care services through making the environment conducive for service providers, patients and Caregiver.

Distinctively, I wish to acknowledge Prof. Dr. Nasima Sultana, Former Additional Director General (Admin) DGHS & Chairman, NTC and Dr. Yunus Ali, Deputy Director (Hospital 2), DGHS, the Convener of the Technical Sub-committee to take the leadership for providing moral support in ensuring the National Standards for WASH in HCFs and the Guidelines to implement the standards are developed and disseminated to the stakeholders for use. While it would be difficult to mention the contributions of all by name, it would be generous to recognize a few who lent critical support to the standards and guidelines preparation. National Standards and Guidelines are born out of the tireless efforts made by a team of members Dr. Md. Yunus, Director, CSC, DGHS, Engr. S.G. Mahmud, WHO Bangladesh, Ms. Mahajabeen Ahmed, UNICEF Bangladesh, Engr. Alauddin Ahmad, ITN-BUET, Dr. Farzana Taher Munmun, CBHC, DGHS, Architect AKM Masud Parvez, Department of Architecture, Engr. AHM, Khalequr Rahman, DPHE, Engr. SM Sadequl Islam, PWD, Dr. Nurullah Awal, Water Aid, Dr. Nuzhat Naurin Amin, WASH Cell, DGHS and Dr. Md Shamim Hussain Chowdhury, WASH Cell, DGHS. While preparing the Standards and Guidelines, they have always been very accommodative of changes, flexible to incorporation of suggestions and innovations, and committed to maintaining the quality of the output.

A special word of thanks goes to of my colleague, Director, Hospitals and Clinics, for his commitment and technical advice. I also sincerely express thanks and gratitude to Engr. Md. Wali Ullah, WHO consultant who facilitated the strategic development process and used his expertise and insights in preparation of the standards and guidelines document for health care facilities in the country.

The National Standards for WASH in HCFs and Guidelines has been reviewed by the experts and professionals at home and abroad as well as the members of NTC from the different stakeholders. I am expressing my gratitude to all of them that they have made it convenient to ensure and enrich the quality of the product.

Furthermore, I wish to extend my sincere gratitude to WHO Bangladesh for its support in the preparation of the national standards and guidelines document. We hope that, WHO, UNICEF and other stakeholders will continue working with the government to accelerate the implementation of WASH activities in the HCFs in the country. Finally, a special word of thanks goes to those who contributed to a successful preparation of this document.

Finally, I sincerely hope that the team effort would continue during the National Standards for WASH in HCFs implementation phases.



Prof. Dr. Ahmedul Kabir

Additional Director General (Admin) DGHS,
MoH&FW and
Chairman, NTC

GLOSSARY

Adequate water supply	Sufficient quantity of suitable quality water, following Bangladesh standard and continuously available to satisfy the water demands of health care facilities (HCFs).
Alcohol-based hand rub	An alcohol-based preparation (liquid, gel or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth.
Antiseptic hand rubbing	Applying an antiseptic hand rub to reduce or inhibit the growth of microorganisms without the need for an exogenous source of water and requiring no rinsing or drying with towels or other devices.
Antiseptic hand washing	Remove or destroy transient microorganisms and reduce resident flora using water and antimicrobial soap.
Aquifer	A body of permeable rock able to hold or transmit water
Black water	Wastewater containing fecal matter and urine.
Care giver(s)	Refer to family, friends, or voluntary workers who accompany patients to a HCF and provide basic, non-professional care. Care giver (s) may be occasional visitors, or they may stay to prepare food, clean and care for patients in a HCF
Changing room	A room within HCFs where health care workers dress in protective clothing and dispose of soiled and contaminated protective clothing.
COVID 19	Coronavirus Disease-2019 (COVID-19) outbreak, which started in Wuhan, China, in December 2019, have turned into a pandemic. Bangladesh have started the preparation to control and contain the pandemic in the country since January 2020 based on National Preparation and Response Plan.
Detergent (surfactant)	Compounds that possess a cleaning action.
Disinfection	A process of removing or inactivating microorganisms
Drinking water	Water with acceptable quality complying with national standards used specifically for drinking.
Emergency	Sudden, unexpected, or impending situation that may cause injury, loss of life, or damage which therefore requires immediate assistance or relief.
Emerging diseases	Are the one that have appeared in a population for the first time, or that may have existed previously but are rapidly increasing in incidence or geographic range.
Environmental surface	Floors, walls, ceiling, table tops, doors, handles etc.
Environmental Hygiene	Is that branch of public health that is concerned with the control of all those factors in man's surroundings or physical environment which may have deleterious effect on human health and well-being. Alternatively, it could be defined as all those aspects of public health that are determined by physical, chemical, biological, social and psychological factors in the environment.
Flush toilet	Also known as a lavatory or water closet (W.C.) is the toilet that disposes human excreta (feces and urine) by using water to flush it through a drainpipe to another location for disposal.
Grey water	All wastewater generated in households or office buildings mainly from cleaning activities such as laundry, showers, dishwashing, floor cleaning and bathing.
Hand washing facility	A facility characterized with running water and soap and mainly used for hand washing (Basin).
Hand washing	Washing hands through proper rubbing for 20 secs with plain soap and water.
Hazard	Any source of potential damage or harm or adverse health effect on something or someone.
Health Standards	Clear and verifiable requirements that must be met to achieve minimum essential environmental health conditions in health care facilities.
Health care associated infections (HAIs)	An infection occurring in a patient during the process of care in a health care facility, which was not present or incubating at the time of admission. Health care-associated infections can also appear after discharge
Health Care Waste	A by-product of health care services that include all waste, hazardous or not, generated in the process of performing medical activities.
Hygiene	Conditions and practices that help to maintain health and prevent the spread of diseases
Improved latrine	A sanitation facility, which ensures hygienic separation of human excreta from human contact.

Improved water source	A water source that by its nature of construction adequately protects the source from outside contamination, particularly fecal matter.
Operation and Maintenance	Refers to all post-construction activities needed to operate and maintain and manage a water supply and sanitation system, which goes beyond the technical definition but includes also managerial aspects to run Water, Sanitation and Hygiene (WASH) infrastructures on a sustainable basis.
Privacy	Ability of the sanitation facility to provide: protection from disturbance and being observed; shelter against the rain and sunrays; and security to the user.
Rehabilitation	Entails the correction of major defects and the replacement of equipment to enable the WASH facilities to function as originally intended.
Resident time	Refers to average time water is supposed to stay within the tank to avoid deterioration
Residual chlorine	Amount of chlorine that remains in the water after a certain period or contact time.
Sanitation	Refers to the provision of facilities and services for the safe management of human excreta (urine and feces).
Tube well	A well consisting of a pipe with a solid point and lateral perforations near the end, which is driven into the earth until a water-bearing stratum is reached, when a suction pump is applied to the upper end.
Soak pit	A simple excavation in the ground either lined or filled with stones, which allow water to percolate into the surrounding soil.
Sterilization	The use of physical or chemical procedure to destroy all microbial life. The most practical method in health-care settings is saturated steam sterilization.
Surgical hand antisepsis	Antiseptic hand wash performed preoperatively by surgical personnel to eliminate transient and reduce resident hand flora.
Turbidity	Cloudiness in water caused by particles in suspension, which makes chemical disinfection of the water less effective. Turbidity is common measure in nephelometric turbidity units (NTU) and can be determined visually using simple equipment.
Visibly soiled hands	Hands showing visible dirt or visibly contaminated with proteinaceous material, blood, or other body fluids (e.g. fecal material or urine).
Water availability	Sufficient and reliable quantities of quality water supplied throughout to meet all uses in HCFs.
Water storage tank	A container with specifications for storage of water for use.
Water supply	Refers to the provision of water by urban or rural utilities usually via a system of pumps and pipes.
Water treatment	Any process that makes water more acceptable for a specific end use. The end uses are both to meet demand for medical and non-medical use in HCFs.

CHAPTER 1

1.0 INTRODUCTION

The term “WASH in health care facilities” refers to the provision of water, sanitation, health care waste management, hygiene and environmental cleaning, infrastructures and services across all parts of a facility. “Health care facilities (HCFs)” encompass all formally recognized facilities that provide health care, including primary (health complex and clinics), secondary, and tertiary (district or national hospitals), public and private (including faith-run), and temporary structures designed for emergency contexts (e.g. cholera treatment centers). They may be located in urban or rural areas.³⁶

Across the country, WASH services in health care facilities fall short of WHO and national standards. The availability of WASH services, especially in maternity and primary-care settings where they are often absent, supports core universal health care aspects of quality, equity, and dignity for all people. Basic WASH services in health care facilities are fundamental to providing quality care and for ensuring that primary health commitments, as detailed in the Astana Declaration, Kazakhstan 2018 are achieved³⁰.

In 2018, the Secretary-General of the United Nations (UN) issued a Global Call to Action³² to elevate the importance of and prioritize action on WASH in all health care facilities, including primary, secondary and tertiary facilities in both the public and private sectors. The call recognizes the important role WASH plays in preventing infections, saving lives, and improving quality of care. As such, all UN agencies, Member States, and Partners are now being asked to invest more in this critical component for health and wellbeing.

1.1 BACKGROUND

Water, sanitation, hygiene (WASH) and environmental conditions in health care facilities (HCFs) have been neglected areas of concern in the health sector of the country despite their potential for reducing the risk of infection, and anti-microbial resistance (AMR), morbidity and mortality. Limited access to improved WASH in HCFs has a direct impact on quality of care (QoC) and maternal, newborn and child survival¹. A review of the few published studies showing the effects of WASH on maternal and child health emphasized that inadequate sanitation in HCFs was a major cause of dissatisfaction among patients, and a deterrent to women seeking institutional delivery and care¹⁸. This condition further aggravates during the extreme weather/climate events. The growing body of evidence on WASH³⁷ in HCFs and maternal and newborn health underpins the need for an enabling policy environment, nationally-mandated standards and indicators, internal regulation and guidance, and independent quality control for WASH in HCFs as essential steps in improving health care delivery services.

While the achievement of the SDG 6.1 (By 2030, achieve universal and equitable access to safe and affordable drinking water for all - including in health care facilities) and 6.2 (By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and ending open defecation, paying special attention to the needs of women and girls, and those in vulnerable situations- including in health care facilities) for safe drinking water and equitable sanitation is the realization of the human right, it also contributes significantly to the achievement of the health related SDG 3.8 (Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all).

In this context, the Government of Bangladesh with technical assistance of UN agencies and other partners has developed “National Strategy for WASH in Health care Facilities and Framework of Action for 2019-2023”¹⁷. The development process of this strategy has gone through various critical steps and the development national WASH standards and the implementation guidelines was one of the major actions of the framework 2019-2023 of the national strategy. The implementation guidelines will guide the implementation authorities towards establishing WASH standards in all health care facilities for ensuring that all health care facilities have adequate water, sanitation and hygiene services as a contribution towards building a resilient health care system, quality of maternal, new born and child care services, infection prevention and control, and reduction of anti-microbial resistance and safe health care practices. At the same time, WASH standards for HCFs and their consistent application are also critical for achieving the 2030 WASH targets.

The National Technical Committee (NTC), established to oversee the implementation of the “National Strategy for WASH in Health care Facilities and Framework of Action for 2019-2023”, has formed a technical sub-committee to develop national standards and guidelines for WASH in HCFs and the chairman requested the World Health Organization (WHO) to provide technical support for their development.

1.2 SCOPE OF STANDARDS AND IMPLEMENTATION GUIDELINES

Standards are the requirements that must be met to achieve minimum essential environmental health conditions in health-care settings. They must be clear, essential and verifiable statements. Standards of WASH services are set at the national level and are to be used by the wards (urban), union, upazila, district and national level HCFs to achieve the envisaged health benefits.

The Implementation Guidelines, presented in this document, will provide a thorough understanding and rationale of the standards and ways to implement them in an incremental manner. The hospital authority, staff, patients and the visitors at all levels are expected to use the implementation guidelines in order to follow

the WASH standards. This Guideline covers components such water supply, sanitation, hygiene, drainage, health-care waste management, environmental cleaning, laundry and control of vectors with regards to their quantity, quality and access. They are designed for use in health-care settings in both normal and incident situation, and in situations where simple and affordable measures can improve public health significantly.

1.3 USERS OF THE GUIDELINES

The main audience of the implementation guidelines are national and local HCF authorities, government, private and NGO owned HCFs and those responsible for the development, implementation and monitoring of standards and regulations. The audience may also include Public Works Department (PWD), Department of Architecture (DoA), Health Engineering Department (HED), Department of Public Health Engineering (DPHE) and Department of Environment (DoE) since water supply, sanitation hygiene infrastructure are, in some cases, managed outside the health sector.

This document is relevant for staff from directorates/departments of health services, family planning, medical education, diseases and control, public health, primary health care and other health programmes and private health entrepreneurs seeking guidance on water supply and sanitation interventions in the context of disease prevention and control strategies. International organizations, various funding agencies, non- governmental organizations (NGOs), civil society, academia and private sectors working on water supply and sanitation across multiple sectors will also have an interest in these guidelines when developing and contextualizing strategies, programmes and tools for water supply and sanitation measures to ensure they protect public health. At their broadest application, the guidelines are a general reference on water and sanitation and health.

1.4 POLICY SUPPORT

Bangladesh has made significant progress in the development of its health care system. The Government of Bangladesh's agenda for improving maternal, newborn, child, girls, adolescents and population health has been supported through decades of multi-sectoral strategies and collaborations. The key current plans for improving health care, achieving universal health care coverage, and achieving the SDGs include:

- 2017-2022: 4th Health, Population and Nutrition Sector Plan (HPNSP)¹⁶.
- 2017-2022: 7th Bangladesh Five Year Plan (FYP)⁷.
- 2012-2032: Bangladesh Health Financing Strategy Toward Universal Health Coverage¹⁴.

The 4th HPNSP describes the importance of improving the Quality of Care (QoC) through the provision of WASH services at all levels of HCFs. The Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&Co) approved the National Sector Development Plan (SDP) for Water Supply and Sanitation Sector in Bangladesh 2011-2025¹⁹ that emphasizes the need to provide adequate access to safe water and sanitation in communities and institutions (although not specifically in HCFs). The National Strategy for Infant & Young Child Feeding in Bangladesh, 2007¹² and the National Neonatal Health Strategy and Guidelines for Bangladesh, 2009¹³ mentioned the need for safe drinking water for pregnant and lactating women, and for both soap and water for hand washing. Further, the 3rd Health Population and Nutrition Sector Development Programme 2011–2016 did call for HCFs that are user and women friendly, with adequate arrangements for female toilets, hand washing, water and sanitation. The recently developed 'National Strategy for WASH in HCFs and Framework of Actions 2019-2023 in Bangladesh'¹⁷ and the 'Detailed Implementation Plan of the national strategy' also urge to improve the situation of WASH in HCFs.

Effective functioning of health-care settings depends on a number of different requirements, including safe and sufficient water, basic sanitation, adequate management of health-care waste, appropriate knowledge

and application of hygiene, and adequate ventilation. However, many of these requirements are not available in many health-care settings across the world (WHO, 2004a). Health-care associated infections affect between 5% and 30% of patients, although the figures could be significantly higher in some contexts (WHO, 2005a). The associated burden of disease is extremely high, is a significant drain on health-sector and household resources, and disproportionately affects vulnerable members of society. Environmental health in health-care settings (Health-care settings include hospitals, health centres, clinics, health posts, dental surgeries, general practitioner settings and home-based care) can significantly decrease the transmission of such infections. Health-care settings are environments with a high prevalence of infectious disease agents. Patients, staff, Care giver and neighbours of the health-care setting face unacceptable risks of infection if environmental health is inadequate. The health-care setting might even become the epicentre of outbreaks of certain diseases, such as typhus or diarrhoea.

There are many ongoing countrywide initiatives by various stakeholders to support the improvement of WASH services in HCFs. However, there are no national standards and well organized guidelines to guide the provision of such services thus, making it difficult for the MoH&FW to develop a detail costed implementation plan of the national strategy for WASH in HCFs and to monitor and ensure quality control. The absence of WASH standards leads to uneven WASH intervention with respect to planning, budgeting, designing and construction, and quality control. Experience has shown that, in the absence of nationally acceptable standards and guidelines, WASH interventions in HCFs are implemented in a substandard manner that makes monitoring of the relevant SDG goals using JMP monitoring tools. Therefore, development of WASH standards and guidelines for its implementation in HCFs is imperative to improve the quality of health care services to the people involved in line of the health care services in the country as well as to facilitate the monitoring the national progress towards the achievement of SDGs' targets for SDG 3 and SDG 6.

1.5 OBJECTIVES OF WASH STANDARDS AND GUIDELINES

Overall, the WASH Standards and implementation guidelines are intended to put in place a uniform and harmonized conditions in the provision of WASH services in public and private HCFs across the country. The implementation guidelines, on the other hand offer practical guidance for effective implementation of national standards towards provision of WASH services in HCFs for improvement of quality of health care services in Bangladesh. The specific objectives are to:

1. Provide technical guidance on planning, budgeting, implementation of national and sub national level WASH interventions in HCFs;
2. Provide relevant information on technical issues to guide implementation and O&M of WASH services for sustainable WASH delivery; and

Ensure achieving environment friendly and clean HCFs and protect service providers, patients, caregivers from the transmission of infections and encourage care-seeking behavior.

1.6 STRUCTURE OF THE DOCUMENT

The WASH in HCFs guidelines consist of eight chapters.

Chapter 1 provide background information, scope of the guidelines, users of the guidelines, policy rationale, objectives and structure of the document.

Chapter 2 describes the overview of the global WASH scenario in HCFs and WASH scenario in HCFs in Bangladesh.

Chapter 3 of the document describes the recommended national standards for WASH in HCFs (water supply, sanitation, hygiene facilities, environmental cleaning and medical waste management).

Chapter 4 describes the WASH services in HCFs during emergency.

Chapter 5 elaborates the implementation process of the national standards for WASH in health care facilities. The chapter describes the enabling policy environment, roles and responsibilities, coordination, using the guidelines to gradual improvement, technology choice, human resources and training.

Chapter 6 describe the guidelines and guiding notes for implementation of the national standards.

The chapter 7 provides the assessment checklist and the final chapter (chapter 8) provides the monitoring framework that will be used to assess and report on WASH conditions in HCFs over time.

Specific terms are explained in the glossary. References and further reading are provided in the reference list.

CHAPTER 2

2.0 OVERVIEW OF WASH IN HEALTH CARE FACILITIES

This chapter provides an overview of the current situation of WASH services in HCFs both at global and country levels and its comparison.

2.1 GLOBAL PERSPECTIVE

From the global perspective, the provision of WASH services in HCFs is very low. Many HCFs in low-resource settings lack basic WASH services*, compromising the ability to provide safe care and presenting serious health risks to staff, patients and Care giver. Furthermore, compliance with hand hygiene guidelines among health care workers (HCWs) globally is still low**. Findings from the global assessment in 2016, indicate that 74% of health care facilities globally had basic water services, 21% of health care facilities globally had no sanitation service, 57% of health care facilities globally had hand hygiene facilities at points of care and 60% of health care facilities globally had systems for segregating waste (JMP Report 2019³⁴). This is mainly because globally, provision of improved WASH services in HCFs has for decades not been given deserving attention in relation to the role it plays on socio-economic development and community well-being at large particularly in developing countries.

Due to such a grave situation, access to improved WASH services within the HCFs has become an issue of global major concern, drawing significant attention from different stakeholders including governments,

Development Partners (DPs), and the international public health community²⁸. The devastating Ebola outbreak in parts of Western Africa in 2015 and recently Pandemic Corona Virus Disease (COVID 19) outbreak have underpinned the need for improved access to WASH services in HCFs.

**(source: JMP Report on WASH in HCF, 2019)*

A BASIC WATER SERVICE	A BASIC SANITATION SERVICE	A BASIC HYGIENE SERVICE	A BASIC WASTE MANAGEMENT SERVICE	A BASIC ENVIRONMENTAL CLEANING SERVICE
Water is available from an improved source on the premises.	Improved sanitation facilities are usable, with at least one toilet dedicated for staff, at least one sex-separated toilet with menstrual hygiene facilities, and at least one toilet accessible for people with limited mobility.	Functional hand hygiene facilities (with water and soap and/or alcohol-based hand rub) are available at points of care, and within five metres of toilets.	Waste is safely segregated into at least three bins, and sharps and infectious waste are treated and disposed of safely.	Basic protocols for cleaning are available, and staff with cleaning responsibilities have all received training.

***In 2014 only 17% of health care workers washed their hands with soap after touching patients or wounds, and only 2% washed their hands with soap before patient contact or aseptic tasks in Bangladesh. Similarly, while half the healthcare facilities in Cambodia in 2010 had handwashing facilities inside, health care workers washed their hands with soap during less than one in 30 consultations (Source: JMP report on WASH in HCF, 2019)*

2.2 BANGLADESH PERSPECTIVE

There is currently no countrywide programme to ensure that WASH infrastructure and services are adequate and functional at various levels of HCFs throughout Bangladesh. In addition, there is currently no complete national WASH data in HCFs. However, various regular or irregular survey like BDHS, MICS, Health facility survey, Hygiene survey cover data on WASH situation in health care facilities in Bangladesh which do not fulfil the requirement for Joint Monitoring Program (JMP). Findings from the global assessment of JMP report 2019³⁴ on WASH in HCFs in Bangladesh indicate that 70% basic water coverage, 93% improved sanitation, 28% hospitals are connected with sewer system, 54% hand hygiene facilities available at point of care and 11% basic health care wastes management service available in HCFs and 25% HCFs had systems of segregating wastes.

A comparison on WASH situation in HCFs can be drawn between the Global and the Bangladesh from the above statements mentioned in articles 2.1 and 2.2 to understand the country's situation are shown in Table 2.1 below:

Table 2.1: Comparison between Global and Bangladesh WASH situation in HCFs

Topic	Global	Bangladesh
Basic water services	74%	70%
Improved sanitation facilities	79%	93%
Hand hygiene facilities available at point of care	57%	54%
Health care facilities had systems for segregating wastes	60%	25%

From the above comparison it is clearly understood that Bangladesh need to do more as Bangladesh is committed to achieve SDG targets by 2030.

CHAPTER 3

3.0 STANDARD VALUES FOR WASH IN HEALTH CARE FACILITIES

The establishment of national WASH standards is a key stepping stone towards improved access to WASH services in health care facilities. There are two sets of such standards available, one is at global level which WHO has developed in 2008 to guide the member countries to adopt WASH standards according to their need and context (for details see Annexure-1). The other one is the National Building Code (BNBC). The BNBC has been approved by the government in 2015 which sets water supply, Sanitation and Hygiene requirements for health care facilities (for details see Annexure 2 and 3). For setting the WASH standards in HCFs in Bangladesh these two sources have served a basis for consideration in addition to local context, resource limitation, community culture and practices and health requirement in HCFs have also been considered in setting the standards. In the following sections describes the rationale of identifying the standards values for each of the sub components of water sanitation and hygiene taking into account of local context and cultural considerations.

3.1 Water

The basis of setting standards for WASH parameters are the BNBC-15, WHO and the current facilities being provided by PWD to HCFs. In BNBC the minimum water quantity requirement is set at 225 liter/patient/day which is much higher than that in WHO standards i.e. 5 liter/patient/day. On the other hand, municipal water supply is designed taking the total demand of 120 liters per day per person. PWD is also using the same value while designing water system in an HCF. Therefore, we have considered water demand 120 litre as sufficient and practical.

As the water quality, BNBC, 2015 also recommends water quality in line with WHO guidelines, 2004 for drinking water quality. Bangladesh drinking water quality standards 1997 set the higher values than WHO guideline values, 2004 in some parameters (e.g arsenic allowable limit in WHO is 10 ppb whereas Bangladesh standards for arsenic is 50 ppb). The values in Bangladesh standards are very old and it is under the process of updating. Considering the health risks associated with biological, chemical and physical characteristics of water, HCFs need to be of higher quality water and for some special treatment and analysis need high grade water quality. Therefore, this document has adopted WHO recommendations for water quality for health reasons. Table 3.1 below shows the minimum water requirement for HCFs in Bangladesh.

Table 3.1: Minimum water requirement in HCFs

Water	Minimum water quantities required in the health care setting including toilet flushing in Bangladesh	
	Outpatients	10 lits per consultation
	Inpatients	120 lits per patient/day
	Operating theatre or maternity unit	150 lits/intervention
	Dry or supplementary feeding centre	10 lits/consultation (depending on waiting time)
	Wet supplementary feeding centre	15 lits per consultation
	Inpatient therapeutic feeding centre	100 lits/patient/day
	Cholera treatment centre	100 lits/patient/day
	Severe acute respiratory diseases isolation centre	150 lits/patient/day
	Specialized Medical Unit: Viral hemorrhagic fever isolation centre	400–450 litres/patient/day (available with hot water)
	Water in HCF should satisfy the following quality:	
Quantity²⁶	Physical: No color, No odour and No taste; Turbidity=< 2NTU	
	Microbial: Fecal coliform/TTC=0 cfu/100ml,	
Quality	Chemical:	
	Arsenic=<=10 ppb, Iron=<0.3 ppm	
Access	Chloride=<500 ppm	
	Water shall be piped supply (running) and available all times at entry point of all facilities, clinical care units including waiting areas within all treatment wards and outdoor waiting areas. A safe and reliable drinking-water point shall be accessible for staff, patients and caregivers at all times.	
Access	Specialized hospitals shall be equipped to supply hot water as required by different health care units.	
	Hospitals should be equipped to apply chlorine at the central location of supply system within HCF at a dose that results in a residual chlorine of 0.2 ppm.	

3.2 Improved Sanitation Facilities

“Bangladesh National Building Code 2015 recommends 1 (one) toilet for 8 (eight) male patients and 1 (one) toilet for 8 (eight) female patients for inpatient ward in health care facilities. However, the PWD and the DOA are currently practicing 1 (one) toilet for each 6 (six) beds or patients in inpatient service during construction of new hospital building in Bangladesh. Whereas, WHO recommends 1 (one) toilet for 20 beds or patients in inpatient service of HCFs and separate toilets for staff. It means that practically, more opportunities are being provided for the inpatient’s services in HCFs. So, the practices of PWD and the DoA are recommended for inpatient service in HCFs.

For outdoor patients WHO recommended 4 (four) toilets i.e. 1 (one) toilet for staff, one toilet for male patients, one toilet for female patients, and one child’s toilet. Whereas, BNBC, 2015 recommends 1 (one) toilet for 100 male patients and 2 (two) toilets for 100 female patients. Both the recommendations are close to each other. But WHO recommendation provides more opportunities to the patients and staff in HCFs. So, the WHO guidelines are considered for outdoor patients’ service in HCFs in Bangladesh.

The other sanitation requirements are more or less the same both in WHO and BNBC 2015 recommendations.

Table 3.2: Sanitation requirements

Toilet	Improved Sanitation Facilities	
Quantity	Inpatients	Patient ward: 1 (one) toilet for every 6 beds of which at least one toilet should be reserved for female attendants (specially in male ward). 1 (one) additional toilet for every extra 6 beds or fraction of it.
		One (1) toilet accessible for people with limited mobility with basic requirements in each ward
		Doctors/Staff: 1 (one) toilet should be dedicated for doctors and staff in a small health care setting**. At least 1 (one) toilet for doctors and 1 (one) toilet for staff per ward in a medium to large health care setting.
	Outpatients	At least 2 (two) toilets (sex separated) for small health care setting.
		4 (Four) toilets (sex separated) for **medium health care facility. For large health care settings** 4 toilets (sex separated) + additional toilets at the rate of one (1) toilet for every additional 100 visitors or its fraction.
		An unisex and appropriate toilet should be provided for people with limited mobility
Quality	Toilets should have running water with flushing facility and should be cleaned and usable at all times. Female toilets should have menstrual hygiene management (MHM) with disposal facilities.	
Access	Toilet facilities should be within the hospital compound. Toilets should be separated for each sex and accessible to and usable by physically handicapped persons. The travel distance to toilet facilities shall not exceed 30 m. For inpatient, the travel distance to toilet shall not exceed 10m.	
	Signposting All toilets shall be signposted to help users to find them easily and to avoid inconvenience among users.	

3.3 Hygiene Facilities

In this case WHO recommendations have been adopted for HCFs in Bangladesh. The Table 3.3 below shows the minimum requirement for hygiene facilities in HCFs.

Table 3.3: Hygiene facility requirement

Hygiene Facilities		
Quantity (Hand Wash Basin)	Inpatient	Patient ward: 2 (two) Handwashing basin for each 20 beds. For additional 20 (or fraction) beds, extra 1 (one) basin will be given. 1 (one) wall mounted fixed type hand sanitizer shall be placed in each ward in locations suitable for use Doctor/staff: 1 (one) handwashing basin with running water and soap and a fixed type wall mounted sanitizer will be given in each staff/doctors toilet.
	Outpatient	For Patients Two (2) Hand wash basins for small health care facilities, Three (3) for medium health care facilities and Four (4) or as necessary for large health care facilities (no gender segregation) ***
		For Staff and Doctors 1 (one) Hand wash basin in each consultation room/at point of care. Each consultation point shall also have one hand sanitizer bottle mounted on wall.
Quantity (Shower/ Wash room)	Inpatient	2 (two) shower rooms for every 20 beds in a ward. 1 (one) additional shower for next 30 beds (or fraction).

Hygiene Facilities	
Quality	All handwashing facilities and shower shall always be functional with running water and soap or alcohol-based hand rub and useable condition.
Access	Facilities shall be accessible to and usable by physically handicapped persons Water points shall be sufficiently close to laundry facilities. Laundry facilities, with soap or detergent, hot water (specialized hospital) and disinfectant (such as chlorine solution), are available for inpatient setting.
Drainage	Wastewater is produced from washbasins, showers, sinks, etc. (grey water) and from flushing toilets (black water) should be removed in City/ Municipality drainage system or on-site disposal systems. For on-site disposal grey water should be treated in separate treatment tank (e.g. Horizontal roughing filter). Grey water cannot be disposed of in an open environment.
Environmental Cleaning	Frequency of wet mopping should not be less than once in every three hours. Air purifier with HEPA filter in OT, ICU or CCU. The filter shall be cleaned at least once in every three months or as per the O & M manual of the filter.
Medical Wastes	Medical waste is safely segregated into at least three bins, and sharps and infectious are treated and disposed of safely (In this case DGHS medical wastes management guidelines should be followed) ²

*These guideline volumes include water used for all purposes: toilet, hand hygiene, cleaning, laundry, drinking and cooking. The actual quantities of water required will depend on a number of factors, such as climate, availability and type of water use facilities (including type of toilets), level of care and local water use practices.

** Small Health care facilities less than 100 beds, Medium health care facilities 100 to 250 beds and large health care facilities more than 250 beds.

***Common scenario in indoor facility is that wards are separated by gender i.e. male ward or female ward. So, when toilets, H/W basin and showers are installed in wards then, all those facilities are usually gender segregated.

CHAPTER 4

4.0 STANDARD VALUES FOR WASH IN HCFs DURING EMERGENCIES

Emergency situations arise due to climate hazards (e.g. earthquakes, cyclones, floods, landslides, wildfires and droughts), technological hazards (e.g. chemical spills, disruption to infrastructure), war, conflict and outbreaks (e.g. Cholera or COVID-19). All this emergency need preparedness to face the impacts of the events in order to protect the public health of the population in affected areas. Depending upon the nature of the event, often results in a steep increase in WASH-related health outcomes of the affected population. The Ministry of Health & Family Welfare (MoH&FW) and the Ministry of Food and Disaster Management (MoFDM) are entrusted to ensure a minimum WASH services in health care facilities to reduce health outcomes in general and to reduce water-related health risks in particular. WHO in 2012³⁵, globally recommended minimal WASH requirements for health care facilities in emergencies which has also been adopted for Bangladesh including the areas of water requirements.

4.1 MINIMAL WASH REQUIREMENTS FOR HCFS IN EMERGENCIES

4.1.1 Water Supply

The Table below shows the minimum water requirement in HCFs during emergency.

Table 4.1: Water Supply requirements in Health Care Facilities during Emergency

Users/ Area	Quantity of Water Required
Staff	5 litres/consultation
Outpatients	5 litres/consultation
Inpatient	40-60 litres/patient /day 15 litres/Care giver /day
Operating Theatre or Maternity Unit	100litres /intervention
Dry / Supplementary Feeding Centre	0.5–5 litres/consultation (depend on waiting time)
Wet Supplementary Feeding Centre	15 litres/consultation
Inpatient Therapeutic Feeding Centre	30 litres/patient/day 15 litres/Care giver/day
Cholera Treatment Centre	60 litres/patient/day 15 litres/Care giver/day
Acute Respiratory or Isolation Ward	100 litres/patient/day 15 litres/Care giver/day
Viral Hemorrhagic Fever Isolation Ward	300–400 litres/patient/day 15 litres/Care giver/day

4.1.2 Water Quality

Infection control and prevention is of paramount importance in HCFs during emergencies. Except for water specifically prepared for specific medical purposes such as dialysis, all water supplies in the HCFs regardless of their use should therefore be treated with chlorine to drinking water standards. The purpose is to provide microbial safety in emergencies. Chlorination should be done in such a way that the free chlorine residual after each contact time remain between 0.5 and 1.0mg/l in all points of system including the end points of supply system.

In general, effective disinfection with chlorine requires that water has low turbidity and it should not exceed 5-NTU otherwise water should be treated (filtration) to remove suspended matter before disinfection.

4.2 Sanitation Facilities

The Table below shows the sanitation requirements in HCF or in a temporary emergency health centers during emergency.

Table 4.2: Sanitation facilities in Health Care Facilities in Emergency

	1 (one) toilet for 20 users.
Inpatient settings	<p>If the HCF experiences a rapid increase in the number of patients or other temporary emergency health centers are being installed as a response to the emergency then, it is possible to start with one toilet for every 40 users lowering the ratio to one per 20 users as soon as possible.</p> <p>It is recommended that the number of female to male toilets should be 2:1. Female toilet should be fitted with MHM facilities.</p>

Outpatient settings	<p>At least 4 (four) toilets for outpatient settings.</p> <p>The number of toilets should vary from one HCF to another. The minimum recommended number of toilets for small to medium HCFs should be :</p> <ul style="list-style-type: none"> • 1 (one) toilet for staff (two if separate toilets are required for male and female staff) • 2 (two) separate toilets for patients (one for female patients, one for male patients), and • 1 (one) toilet for children <p>Larger outpatient settings should have more toilets than smaller ones. The number depends on local factors.</p>
Toilets for people with special needs	<p>HCFs or temporary emergency health centers should reserve at least one emergency toilet for those people who are very sick, under five children, pregnant women, elderly, or people with disability.</p>
Hand hygiene facilities	<p>At least 2 (two) handwashing basins should be provided in wards with more than 20 beds. Hand wash facilities should be available with running water (if possible) and soap or alcohol based hand rub at the points of care.</p> <p>Handwashing basins should be provided close to toilets (5m) at all settings with running (if possible) water and soap. In absence of water alcohol hand rub should be present.</p> <p>Hand sanitizer shall be posted at walls of inpatient settings located at suitable locations for easy access to staff, patients and Care giver.</p>
Showering facilities	<p>In in-patient settings the recommended ratio of 1 (one) shower per 40 users (patients, staff and carers). However, if there is a rapid increase in the number of inpatients, or new health-care facilities are being constructed in response to the emergency, then this target may be relaxed in the short term with the aim of reaching it as soon as possible. Separate showers should be planned for staff and patients, and for both sexes,</p> <p>In outpatient settings, at least 4 (four) showers per outpatient setting. 1 (one) shower for male staff, 1 (one) shower for female staff, 1 (one) shower for male patients, and 1 (one) shower for female patients.</p>
Signposting	<p>All toilets should be signposted to help users to find them easily and to avoid inconvenience among users.</p>

CHAPTER 5

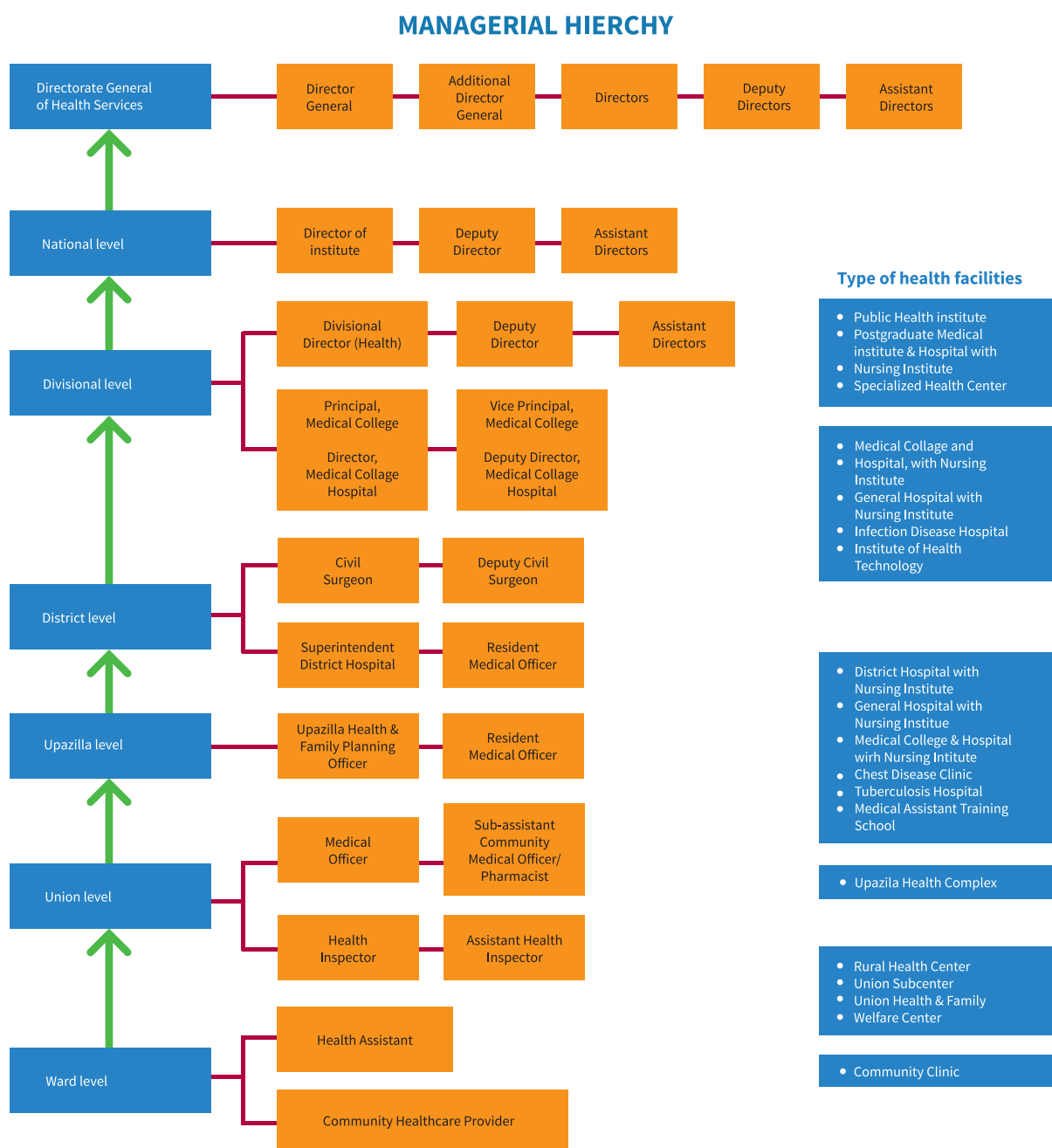
5.0 IMPLEMENTATION OF THE NATIONAL WASH STANDARDS IN HCFs

This chapter highlights the institutional arrangements of the two divisions (Health Services Division and Medical Education and Family Welfare Division) of the Ministry of Health and Family Welfare (MoH&FW) for health service delivery from the national to the community level. It also highlights the enabling environment supported by the various government policy documents for implementation of WASH standards in HCFs at all levels. In addition, it describes the roles and responsibilities of different stakeholders in the implementation of the WASH standards in all HCFs at all levels (national, district, upazila, union and wards). It also describes various elements of implementation e.g. needs assessment, technology choice, gradual improvement, resource allocation, human resource and training and monitoring and reporting.

5.1 INSTITUTIONAL ARRANGEMENT

The Ministry of Health & Family Welfare (MoH&FW) has two divisions: (1) Health Services Division (HSD), and (2) Medical Education and Family Welfare (MEFW). The HSD is responsible for activities like policy, management and development of health care facilities, matters related to the construction and maintenance. The MEFW is responsible for policy regarding medical education, medical training, and activities related to maternal and child health and family planning centers.

There are six tiers of health care infrastructure under the Directorate General of Health Services: national and divisional (Tertiary health care settings), District (Secondary health care settings), upazila (sub-district), union, ward and community (Primary health care settings). Division-level hospitals (with 500 or more beds) are governed by a Director, while Superintendents oversee district hospitals (with 100-250 beds). At the upazila level, Health and Family Planning Officer (UHFO) oversees the Upazila Health Complex (UHC). Ward Boys/Ayas are in charge of cleaning activities. The management hierarchy of DGHS is given below.



Source: Health Bulletin 2017, MOH&FW)

5.2 ENABLING ENVIRONMENT

National Strategy for WASH in HCFs and its implementation plan are already in place. Moreover, health related various policy & strategy documents and programs, National Sector Development Plan for Water Supply and Sanitation Sector in Bangladesh 2011-2025¹⁹, National Hygiene Promotion Strategy for water supply and sanitation sector in Bangladesh 201220 have already laid the foundation of the importance and necessity of WASH in HCFs. In addition, Directorate General of Health Services, MoH&FW has issued several policy guidelines and procedures to tackle Pandemic COVID 19 in Bangladesh^{3, 4, 5, 6} (e.g. National Preparedness and Response Plan for COVID-19, Bangladesh Version 5, 2020, National Guideline for Health Care Provider on Infection Prevention and Control of COVID-19 pandemic in Health care Setting, 2020 etc).

Maternal and Neonatal Health (MNH) related documents e.g. the National Strategy for Infant & Young Child Feeding in Bangladesh, 2007¹² and the National Neonatal Health Strategy and Guidelines for Bangladesh, 2009¹³ mentioned the need for safe drinking water for pregnant and lactating women, and for both soap and water for hand washing. The 3rd Health Population and Nutrition Sector Development Programme 2011–2016 did call for HCFs that are user and women friendly, with adequate arrangements for female toilets, hand washing, water and sanitation. These supportive policy documents, strategies and guidelines created enabling environment that will allow health authorities and other stakeholders at national, district, upazila and local (union and wards) levels to establish effective governance and managerial arrangements to plan, provision of funds, implement and coordinate improvements and maintain standards based on these guidelines.

5.3 ROLES AND RESPONSIBILITIES FOR IMPLEMENTATION GUIDELINES

Table 5.1 presents the role and responsibilities of stakeholders at national, district and local levels. It also outlines some of the things they can do to help achieve and maintain adequate environmental health conditions in health-care settings. The list is not exhaustive and can be added to in any local context.

Table 5.1: Roles and Responsibilities of Stakeholders

Stakeholder group	Contribution to improved environmental health in HCFs or home care
Patients	Comply with procedures for use and care of water and sanitation facilities and observe appropriate hygiene measures.
Patients' families and Care giver	Comply with procedures for use and care of water and sanitation facilities and observe hygiene measures. Encourage patients to do the same.
Stakeholder group (Private organizations, Pharmaceuticals company, NGOs, etc.)	.Contribution to improved environmental health in HCSs or home care
Health-care workers (doctors, nurses, non-professional staff members etc.)	Carry out disease prevention duties (such as cleaning, health-care waste management, hand hygiene and asepsis in health care) consistently and well. Care for and maintain water and sanitation facilities. Encourage patients and Care giver to adopt appropriate behaviors. Participate actively in achieving and maintaining targets. Receive and impart training on O & M of WASH facilities, waste management and environmental cleaning.
HCF managers (Director, superintendent, RMO etc.)	Plan and implement programme to set, achieve, monitor and maintain targets. Create conditions in which staff are motivated to meet and maintain targets. Allocate necessary funds for improvements and capacity building.
Health authorities at different levels of DGHS, DGFP	Provide resources and direction for setting, achieving and maintaining targets.

Stakeholder group	Contribution to improved environmental health in HCFs or home care
Environmental health services	Should collect and dispose of health-care waste in a centralized facility. Provide specialist advice for identifying problems and recommending solutions for water supply, sanitation and hygiene.
Medical Education sector	Raise awareness in medical schools and other sectors. Provide training for the health sector.
PWD, HED, Department of Architecture, DPHE and other related Agencies	PWD, HED, DoA and other related agencies: Carry out, design and construction of buildings and infrastructures to ensure WASH standard services in HCFs. Provide skilled services that comply with national standards and guidelines for construction, maintenance and repair of buildings and sanitary infrastructure. DPHE: Carryout water quality testing of HCFs
Construction and maintenance departments/ firms, including local contractors	Provide skilled services that comply with national standards and guidelines for construction, maintenance and repair of buildings and sanitary infrastructure.
National/international Funding bodies and Private organizations	Provide funding for new HCSs, upgrading or renovation of existing ones and ongoing operations and maintenance (O & M) of targets.
Other communities (WASA/ City Corporation/ Municipalities/LGIs, Community organizations, LNGOs etc.)	Participate in disease control sessions through community health organizations that might exist. Report on health-care waste found outside HCSs. WASA/City Corporation/Municipality: Provide water supply to HCFs and ensure necessary actions in safely disposal of medical wastes.

The level of participation described above is achievable through the allocation of resources and commitment at all levels. Effective linkages between different government sectors, and between the public sector, the private sector and local communities are essential.

5.4 COORDINATION AT HEALTH CARE FACILITIES

Managing the various and interdependent aspects of environmental health at the level of the health-care facilities requires involvement of all staff, as well as patients and Care giver. There should be a committee/unit with adequate resources to carry out the implementation of this guideline. In medium and large facilities, the committees will do planning, coordination, monitoring and implementation of targets. National Strategy for WASH in HCFs outlined the committees for district and upazila levels which are shown in Annexure -5. Members of the committee are managers, clinicians, technical and ancillary staff, LGIs and community representatives. The Quality Improvement Committee (QIC) may also be assigned to carryout the tasks of these committees at different levels.

In smaller settings, such as health centers, posts and dispensaries (at union and ward), this role may be taken up by one staff member (Focal Person), who should receive support from Medical Education Officers or other environmental health staff based at the district or upazila level. The Focal Person may be responsible for all aspects of infection control, or may focus more specifically on water supply, sanitation, hygiene, ventilation and health-care waste management.

5.5 CONDUCT NEEDS ASSESSMENT FOR WASH SERVICES IN HEALTH CARE FACILITIES

The assessment using WASH FIT* will help in establishing the WASH needs and feasibility of the health care facilities. The first task in the WASH FIT³⁸ process requires assembling a committed team with leadership skills that can drive the process. It is important that all team members engage in the process in joint decision-making. An assessment team under the leadership of the health care facility at district or upazila (nominated

by the Civil Surgeon/UHFPO) consist of members from the technical departments (PWD, HED & DPHE), Health Department, LGIs and other related agencies or NGOs. Structure of the team is shown in Table-5.2. The Line Directors (LDs), hospitals & clinics and CBHC will ensure the required needs assessment for WASH services in all HCFs under their jurisdictions. Each HCF should ensure the inclusion of WASH activities in plans and budgets of HCFs within its area of authority. Within the health facility improvement plans, WASH activities for each level of facility should be captured and allocated funds. The funds so allocated by the LDs should facilitate the operation and maintenance of WASH services and for construction of new facilities when need arises.

**Water and Sanitation for Health Facility Improvement Tool (WASH FIT) is a risk-based approach for improving and sustaining water, sanitation, hygiene, and health care waste management services in health care facilities. WASH FIT guides multisectoral teams through a continuous cycle of assessing and prioritizing risks, defining and implementing improvements, and continually monitoring progress. The four broad areas covered by WASH FIT include: water, sanitation (including health care waste), hygiene (hand hygiene and cleaning and environmental disinfection), and general management.*

Table-5.2 : Structure of Assessment Team

S/N	District	Upazila
1	Team Leader- Nominated by CS	Team Leader- Nominated by UHFPO
2	Member – Representative of PWD	Member – Representative of HED
3	Member – Representative of DPHE	Member - Representative of DPHE
4	Member - Representative of HCF (male)	Member - Representative from Concerned HCF/clinic/health post (preferably female)
5	Member - Representative from Concerned HCF (Female)	Member - Representative from Concerned LGI.
6	Member - Representative from Concerned NGO (if applicable)	Member – Representative from Concerned NGO (if applicable)
7	Member – Representative of HED	

Major activities of the assessment team will be as follows:

- I. Assessment of construction, renovation, replacements and repairs need of the WASH facilities in health care setting (HCS);
- II. Prioritize the Needs;
- III. Prepare the plan of actions with budget allocation and submit to the head of the HCF;
- IV. Any other activities, the team feels necessary to be done.

Prioritizing of WASH activities in the respective health facility improvement plan shall be guided by the following considerations:

- Activities must be categorized as either minor or major works. Minor works refer to things like fixing and installation of new water pipes, doors or water trap, while major works include building a new structure, changing the entire roofs and ceiling etc. Categorization is important in determining the level of engagement of technical people and in the process of contracting;
- Activities should be prioritized with the support from technical and health staff in order to review the planned technical options in order to determine if it they socially acceptable, financially feasible and environmentally suitable; and
- The plan should include initial investment costs, maintenance, replacement and extension of services.

5.6 PRIOTIZING OF RESOURCE ALLOCATION

Resources may be either from the health budget of the MoH&FW (specially revenue funds), Health Sector Development Funds (various OPs), funds from DPs in the form of grants and or loans, Private Sector, NGOs, locally generated funds or from community. It is important to indicate the sources of fund in the budget. Given the fact that resources are limited compared to the needs of HCFs for both recurrent and development expenditures. Allocation of resources to different WASH activities should be based on the following:

- The list of priority WASH needs as per results of the needs assessment or situational analysis;
- HCFs with highest demand for WASH activities such as those with relatively poor WASH services should be given priority in the allocation of the available funds;
- For immediate impact of the investment, priority should be given to upgrading activities, repair, operation and maintenance (O & M);
- Priority should be given to HCFs, which have high demands and have committed own resources, which require matching fund; and
- WASH activities that are of great demand to vulnerable groups such as pregnant women, children under-five years of age, people with special needs and immune-compromised individuals.

5.7 GRADUAL IMPROVEMENTS

Many health-care facilities are currently far from achieving acceptable levels of WASH and environmental cleaning standards. Some HCFs may not have suitable facilities at all for lack of resources, skills or adequate institutional support. Achieving appropriate standards should follow a gradual improvement approach. Therefore, steps should be taken to prioritize the activities into immediate, medium and long priority so that the most urgent problems can be identified and addressed immediately, the remaining activities are implemented according to planned time lines and resources.

5.8 TECHNOLOGY CHOICE, OPERATION AND MAINTENANCE (O&M)

While designing WASH facilities or choosing a technology the issues of operation and maintenance should be kept in mind. Examples are there where a good system disfunctions due to lack of proper operation and maintenance. The technology should be durable, suitable for local context and easy to maintain without inputs of specialist skills or expensive equipment. Therefore, operation and maintenance of WASH system should be planned, budgeted and manned from the beginning of a programme to improve resilience and sustainability of health-care settings.

5.9 HUMAN RESOURCES AND TRAINING

Many HCFs are running shortage of human resources including O&M staff and cleaners. Due to this, some health-care workers are required to perform both medical and non-medical tasks, including O&M of WASH and environmental cleaning in the HCFs. In many instances especially in IPC, they seem not to be properly trained on the job they are doing. Training programme for health care staff should focus broadly on the following topic:

Hygiene education should be a common topic of discussion in all training programme. Practicing hygiene is everybody's job and therefore and should be complied and overseen by all staff. Hygiene promotion may be limited to providing basic information about such things as the location and correct use of toilets and handwashing points. Health-care workers or the health promoter have a primary role in this.

Where the building design and mechanical services form part of the IPC strategy (e.g. isolation rooms, change room for doffing, ventilation), staff training should include the importance of the correct operational procedures to ensure that protection is maintained. Even the cleaners or the security staff may be engaged after giving proper training to them. Infection prevention and control and hygiene should be given a central place in the training and supervision of health-care workers and ancillary staff on WASH FIT, WASH-IPC behaviors, Monitoring Tools and Reporting. Many activities that are important for infection control are performed routinely by health-care workers as part of their health-care tasks.

Patients and care givers should be adequately preached on how, why, where and when to carry out personal infection control practices including handwashing with soap. This briefing should take place repeatedly, starting as soon as possible on arrival, preferably within 30 minutes. Information about behaviours for limiting disease transmission should be provided verbally by staff, who should have the time to explain clearly to patients and care givers. All patients and carers should be encouraged to wash their hands: appropriate Posters and other visual information can be used by the HCFs to promote given messages. Visual information should be relevant to risk practices, practical and be understood by the target audience. During normal periods and epidemics, health-care facilities should be actively involved in preventive health-care through hygiene promotion.

5.10 MONITORING, REVIEW AND CORRECTION

Maintaining acceptable conditions requires ongoing efforts at all levels. The role of the committees at different levels in ensuring regular monitoring of environmental health conditions is critical. The local health care settings and IT section of the HCFs should be a major partner, providing expert monitoring and advice. For example, health-care settings should be included in regular water quality surveillance and control programmes.

The ongoing monitoring system using DHIS2 platform in DGHS should use a limited set of indicators (recommended in chapter seven) to identify problems and to correct them in a timely manner. A periodic review of environmental health in facilities should also be carried out in a way that illustrates the links between the various activities. As in assessments using WASH FIT, reviews should seek to identify causes for problems and then propose realistic solutions. Recording forms should be developed at the upazila/local level of the health-care setting (HCS), or at the district or national level for standardized monitoring reports. This will allow data from all health-care facilities to be collected (see chapter Seven).

CHAPTER 6

6.0 GUIDELINES AND GUIDANCE NOTES

This section contains 16 (sixteen) guidelines for understanding and practicing WASH and few essential environmental health standards for health-care settings. These guidelines are applicable for national, district and local level (upa zila, union and wards) health care facilities.

These guidelines and guidance notes facilitate the implementation of WASH national standards at different levels of HCFs to improve health services delivery capacity and system and increase care-seeking behavior at the time of needs. The information in this section is intended to be used, together with existing procedures, standards and guidelines, for providing health services in each health-care setting.

6.1 GUIDELINE - 1: WATER SOURCES

Generally, health Care facilities get drinking water from the following three main sources: 1) HCF's own production tubewell 2) City water main and 3) Rain water harvesting

6.1.1 HCFs' own Production Well (Ground Water Source):

Many HCFs have their own water supply sources from production well(s) installed inside their compound which are independent of municipal water supply. Production wells tap water from underground aquifers. Some upazila health complex have hand tube wells for providing water to the outdoor patients. The advantages of having own water source are:

- i. As it is ground water, the water is generally microbially safe, does not need much treatment and available throughout the seasons;
- ii. HCFs can make interventions to adjust the quantity and quality of water supply and
- iii. Water quality is relatively constant. However, additional treatment is required to treat chemical contamination like As, Mn and salinity.

6.1.2 WASA/Municipality Water Supply System (Ground or Surface Water Source): Some primary and most of the secondary and tertiary HCFs are located near the water supply network of WASA/Municipality. It is recommended to take water connection from the networks for HCFs as only simple and easy water disinfection process will be needed to ensure drinking water safety from HCFs end.

6.1.3 Rainwater Harvesting (RWH): This is an alternative source (not very common) that can ensure availability of water in HCFs, especially in areas with severe water scarcity especially in some coastal areas. The capacity of RWH depends on the collecting surface area, storage capacity and the rainfall amount. The main advantage of rainwater is, it is normally clean and free from chemicals.

6.1.4 Guidelines for selection of water sources: HCFs should consider the available quantity, quality and feasibility of water sources. In this regard, the most feasible option is to get a connection of proper size from nearby WASA/Municipal water supply networks. In case WASA or municipal lines are not available HCF can construct its own water source like production tubewell or RWH (if ground water source is not available). In case HCF needs to construct its own source, it should look into the following factors:

- Favorable hydro-geological conditions within the HCFs premises or nearby;
- Low borehole drilling cost;
- Availability of sufficient funding; and
- Ensure suitability of water quality before use of a new source of water.

6.1.5 Operation and Maintenance (O&M) of Water Sources

Production Tube Well

O&M of water sources include routine operation of the system, routine maintenance, minor repairs and corrective maintenance. While the expected service life of a well largely depends on its design, construction and development, the proper operation and maintenance helps improving its performance and eventually increase its life span. HCF (or the responsible authority) should undertake the following actions:

- i. Keep proper records of current, voltage, well discharge, drawdown and operating hours in standard log book;
- ii. Carry out periodic chemical and bacteriological analysis of water and treating it when necessary;
- iii. Check well cap and the area if they are secured annually to avoid source contamination;
- iv. Make site free from hazardous waste, health care waste and other waste that can alter water quality;
- v. Undertake periodic cleaning of screens by adding hydrochloric, polyphosphates, specific proprietary chemicals or chlorine followed by agitation of the water in the well.

For hand tube well (for emergency supply option or for outdoor patients), O&M involves preventive maintenance such as:

- i. Cleaning of the surroundings and
- ii. Check the hand pump/well for fully worn out parts, at fixed time intervals
- iii. Replace fast-wearing parts such as bucket, washer, Nut-Bolts etc.

Rainwater Harvesting (RWH)

Rainwater harvesting system requires minimal attention with respect to their operation (Fig. 6.1). The major concern is to prevent the entry of contaminants into the tank while it is being replenished during a rainstorm. The main sources of bacterial pollution are debris, bird and animal droppings, and insects. The following guidelines should be followed in O&M of a rainwater harvesting system:

- i. Collect rainwater 5 to 10 minutes after rain starts to avoid the entry of pollutants from the catchment area into the tank.
- ii. Check and clean the storage tank periodically (half yearly).
- iii. Cover and ventilate the tank to avoid mosquito breeding, prevent insects and rodents from entering the tank, and minimize the growth of algae.
- iv. Chlorinate water in storage tanks.
- v. Clean gutters and down pipes. Inspect gutters and down pipes while it is raining, as leaks can easily be detected.
- vi. If filter is provided, it should be cleaned every month.
- vii. Leaks have to be repaired whenever detected, especially leaking tank sand traps, as they present health risks.
- viii. Check pumps for its performance, where the pump is used for water lifting.

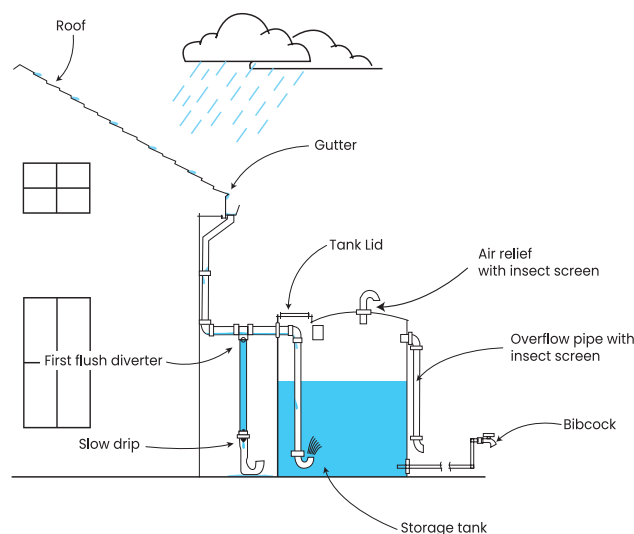


Photo courtesy: Research gate

Figure-6.1: Typical rainwater harvesting

6.2 GUIDELINE-2: WATER STORAGE

6.2.1 Water Tank

The amount of water storage requirement for HCFs is determined by water demand of each facility's level of service and time required to carry out its activities during non-supply of water from the source. Water should be stored in HCFs for the following reasons: a) to address the supply vs demand gap and to guarantee a consistent water supply during intermittent situations and b) to meet demand during non-supply period, emergency or incident situation (e.g. fire incident). Please ensure while construction of a water tank that:

- the top of the water tank is above the ground in order to prevent surface water to ingress into the tank.
- the water tank has two covers for easy inspection and cleaning.;

The water tanks (underground and roof top) should be:

- cleaned and disinfected once every three months.
- provided with washing and flushing outlet.

Follow the steps below during cleaning and disinfecting water storage tanks (Fig-6.2):

- Empty the tank. Open the tank manhole covers and wait for 15 minutes to allow the gas to come out of the tank;
- Scrub or pressure wash the interior walls to remove dirt and filth with detergents;
- Rinse out the tank;
- Scrub or pressure wash the interior walls of the tank with 0.2% chlorine solution, and leave for 2 hours; and

After 2 hours, thoroughly rinse the tank with clean water and refill tank with water.

6.2.2 Estimation of Size of Storage Tank

Every HCF should have a storage tank. The size of the tank should be enough to store 2-3 days demand of water. As per the BNBC, 2015, the capacity of the roof tank and ground water tank shall be calculated in the following way:

Capacity of Roof Tank = $1/2 \times$ Total daily demand of water (m³) + 1 hr. reserve (m³) for fire-fighting requirement (for tall building). Therefore, two times filling of roof tank will meet the daily requirement.

Capacity of Under Ground Reservoir = $1 \times$ Total daily demand of water (m³) + 1 hr. reserve (m³) for firefighting (for tall building). In case of disruption of water supply from the source of supply, the ground water reservoir should meet 2-3 days emergency requirement of water supply of the hospital.

The capacity of under-ground water storage tank requirements for different levels of HCFs are given in Table 6.1 (detailed calculations in Annexure-22).

Table 6.1: Minimum capacity of the Underground water storage tank

Health Care Facility	Total m ³ /day/HCF (GWT)
Upazila - 50 bWeds	130.0
- 100 beds	159.0
District - 100 beds	192.0
- 250 beds	300.0
National / Referral hospital - 500 beds	569.0



Figure-6.2 : Cleaning of water storage tank

6.3 GUIDELINE -3: WATER QUANTITY

6.3.1 Minimum Water Requirement for Health Care Facilities

Regardless of the level of the facility, water in HCFs must be available at all times with adequate quantity and quality for different uses as per facility needs to maintain effective functioning of the facility. Sufficient water is available for drinking, food preparation, personal hygiene, medical activities, cleaning and laundry. Table 3.1 in chapter-3 and Table 4.1 in chapter-4 provide the national standards of minimum water requirements for different levels of HCFs in both urban and rural areas as well as for emergency and these should as much as possible be maintained.

6.3.2 Guidance Notes:

- These guideline values for water requirements include water required for all purposes: Bathing, toilet flushing, hand hygiene, cleaning, laundry, drinking and cooking. The figures should be used for planning and designing of the water supply systems by the competent agency like, PWD, HED etc.
- The actual quantities of water required vary with different units of HCF depending on a number of factors, such as climate, availability and type of water use facilities (including type of toilets), level of care and local water use practices.
- The standard values also include the water requirements for isolation and treatment of patients with cholera, severe acute respiratory syndrome, viral hemorrhagic fever and short period emergency.

6.4 GUIDELINE -4: WATER QUALITY

6.4.1 Minimum Water Quality Requirement

The intended water quality should meet the proposed 'WASH standards' as described in Chapter-3 and be suitable for drinking, cooking, personal hygiene, cleaning and laundry purposes.

However, medical activities that require special quality should undergo additional treatment such as membrane filtration.

Some of the important water quality parameters are mentioned below:

Turbidity \leq 2NTU,

Fecal coliform/TTC = 0 cfu/100ml,

Arsenic \leq 10ppb, Iron \leq 0.3 ppm and

Chloride \leq 500ppm.

All drinking-water is treated with a residual disinfectant to ensure microbial safety up to the point of consumption or use.

Water that is below drinking-water quality is used only for cleaning, laundry and sanitation and is labelled as such at every outlet.

Ensure that water of appropriate quality is supplied for medical activities as well as for vulnerable patients.

6.4.2 Guidance Notes 4:

- If deterioration of water quality is observed, inform local DPHE and DoE to get water samples from HCFs tested for microbiological and chemical quality if the laboratory for water testing is absent in DGHS or DGFP.
- Adopt Water Safety Planning (WSP)* - a risk management approach to ensure drinking- water is safe. The WASH FIT tool (<https://washfit.org/>) should be used for further strengthening the assessment and monitoring WASH in HCFs.

1. * The WHO Guidelines for drinking-water quality recommend water safety plans (WSPs) as the most effective means of consistently ensuring the safety and acceptability of a drinking-water supply. WSPs require a risk assessment including all steps in water supply from catchment to consumer, followed by implementation and monitoring of risk management control measures, with a focus on high priority risks. Where risks cannot be immediately addressed, the WSP approach allows for incremental improvements to be implemented systematically over time.
2. The WASH FIT guide contains practical step-by-step directions and tools for assessing and improving services. It is adapted from the water safety plan (WSP) approach recommended in the WHO Guidelines for drinking-water quality (WHO, 2011) and goes beyond water safety to include sanitation and hygiene, health care waste, management and staff empowerment.

Disinfection of water supply systems

- Disinfect all new and repaired units of drinking water supply system (including storage tank) before their use (reuse).
- Clean and disinfect the existing water supply system half yearly depending upon the quality of water.
- Exceptions may include water specifically prepared for specific medical purposes (for example dialysis), which should be specially prepared.
- Disinfect drinking water with High-Test-Hypochlorite (HTH), bleaching powder, liquid bleach, chlorine tablets etc. considering cost and availability in markets. To ensure adequate disinfection, a contact time of at least 30 minutes should be allowed between the moment the chlorine is added to the water and the moment the water is available for consumption. The free chlorine residual (the free form of chlorine remaining in the water) after the contact time should be between 0.5 and 1.0 mg/l (WHO, 2011) in all points of the system, including end-points. If the health-care facility is responding to diarrhoeal epidemics, the level of residual chlorine should be increased to above 1mg/l at end points (SPHERE, 2011).
- Effective disinfection requires water to be at low turbidity. If turbidity exceeds 5 NTU then treat the water to remove suspended matter before disinfection.

Water for Medical Purposes ⁹:

Water used for some medical activities may need higher quality of water. For example, water used for hemodialysis (Kidney dialysis) should meet strict criteria concerning microbial contamination and chemical contaminants, including chlorine and aluminum, which are commonly used in drinking-water treatment. Applications that Require High Purity Water include:

- Automated Endoscope Reprocessor (AER): Potable water is usually used for the initial flushing and cleaning cycles. The high-level disinfectant cycle and final rinse will work more effectively and not leave scaling and staining on the endoscope if high purity water that meets the AAMI (Association for Advancement of Medical Instrument) water quality for medical device reprocessing is used.
- Clinical Laboratory: This area is more complicated today because of the proliferation of new test methods and equipment. There are a number of purified water standards used in clinical laboratory testing procedures specified:
 - Clinical Laboratory Reagent Water (CLRW)
 - Special Reagent Water (SRW)
 - Water supplied by a method manufacturer
 - Autoclave and wash water
 - Commercially bottled, purified water

The only types that have specifications are the CLRW or CAP/ CLSI** Type-I Water. The industry consensus today is that the type of water for a particular application needs to be validated for that application.

*CLSI (Clinical and Laboratory Standards Institute) Guidelines (4th Edition)

- **Still and Steam Disinfection Boilers:** Feed water that is high purity ASTM (American Society for Testing Materials) Type-II will improve the product and prevent scale and maintenance problems.
- **Medical Washers – Disinfectors:** For both semi-critical and critical devices, the post-flush rinse should be performed with high purity water that meets AAMI water quality standards for medical device reprocessing.
- **Glassware Washers:** To prevent residue that could interfere with the use of glassware, high purity water that meets ASTM Type IV or CLSI Type III should be used.
- **Hemodialysis (Kidney dialysis):** FDA 510K process released water treatment equipment for use in hemodialysis.

ANSI/AAMI/ISO 23500:2011 and ANSI/AAMI/ISO 11663:2009 replace AAMI RD52:2004.

ANSI/AAMI/ISO 13959:2009 and ANSI/AAMI/ISO 26722:2009 replace AAMI RD62:2006.

Some of the water quality specifications or standards have been developed by standards bodies such as ASTM and AAMI are given in Annexures 16-20

6.5 GUIDELINE -5: WATER ACCESS

Water access refers to the availability of water within a reasonable distance to allow convenience of access and use. Access is determined by distribution of water taps or water points within the HCF. The purpose is to ensure that sufficient water-collection points and water-use facilities are available in the HCF to allow convenient access to, and use of, water for medical purposes, drinking, personal hygiene, food preparation, laundry and cleaning. As a guiding principle, water should be available within all wards and in waiting areas.

6.5.1 Guidance Notes for Water Access

- Hospitals may have at least two service connections e.g. one from the own water supply source (as reserve) and the other from the WASA/City Corporation/Municipality water main for continuous supplying water without any interruption in case of mechanical or other failure.
- In sloping ground, the pipe laying shall proceed in upward direction. The pipe shall be provided with anchor blocks to withstand hydraulic pressure. All piping and fittings shall be installed to remain completely air-tight and thereby avoiding waste of water, damage to property and the risk of contamination.
- Precaution should be taken during installation of special equipment or fixtures like check valve, non-return valve, air gap or back flow preventer, thrust block, ventilation pipe, inspection pit etc. against backflow, flooding, fouling and contamination of water supply system.
- Water should be piped supply (running) and available all times within all treatment wards and in waiting areas. A safe and reliable drinking-water point is accessible for staff, patients and caregivers at all times;
- A reliable water point, with soap or a suitable antiseptic or sanitizers, should be available at all critical points within the HCF including operating theatres, delivery room, pathological laboratory, wards, consulting rooms, dressing rooms, etc. and in service areas such as sterilization, laboratory, kitchen, laundry, showers, toilets, waste zone and mortuary;
- Specialized hospitals shall be equipped to supply hot water as required by different health care units;
- Hospitals should be equipped to apply chlorine at the central location of supply system within HCF at a dose that results in a residual chlorine of 0.2 ppm.
- Drinking-water should be provided separately from water provided for handwashing and other purposes, even if it is from the same supply. Drinking-water may be provided from a piped water system or via a covered container with a tap where there is no piped supply. Drinking-water points should be clearly marked.

- Drinking water dispensing unit should not be installed inside or close to any toilet; and
- Laundry facilities, with soap or detergent, hot water and a disinfectant (such as chlorine solution) should be available for inpatient settings.

6.5.2 Materials, Fittings and Appliances for Water Supply

- The materials and fittings for water supply and distribution pipe and for storage tanks shall comply with the standards listed in Part 5 of the Bangladesh National Building Code (BNBC), 2015 and those specified in the Water Supply Section of the code (Annexures 6-9)
- The materials chosen shall be resistant to corrosion, both inside and outside or shall be suitably protected against corrosion and free from all toxic and harmful substances. Polyethylene and unplasticized PVC pipes shall not be installed near hot water pipes or near any other heat source.

Water Supply Service and Distribution Pipes

Water supply service and distribution pipes shall conform to the standards listed in Annexure-6 & 7. The water supply pipes and tubing used outside the building or underground shall have a minimum working pressure of 1.1 MPa at 23°C. In case of water supply exceeding 1.1 MPa pressure, the piping material shall have at least a rated working pressure equal to the highest available pressure. The hot water distribution piping shall have a minimum pressure of 550 kPa at 80°C. Different types/classes of uPVC (Un-plasticized PVC pipes) are used both for service and internal distribution pipes as described in Annexure-8 of the code. However, Polyvinyl chloride (PVC) plastic pipes shall not be used exposed and unprotected as riser or water distribution pipe. Polypropylene Random (PPR) or Chlorinated Polyvinyl Chloride (CPVC) pipes shall be used for cold and hot water distribution piping. Lead pipes may be used only for flushing and overflow purposes in a water supply system. [MPa = Mega Pascal, KPa = Kilo Pascal].

Pipe Fittings

The pipe fittings shall be in accordance with the standards listed in Annexure-9.

Concrete, Pre-stressed or Plastic Water tank

The properties of the materials used for storage tank shall conform to the following:

The roof storage tank shall be constructed with pre-stressed or reinforced concrete or plastic that will resist any action by the plain or chlorinated water. The tank shall be made of water tight without the use of putty. The outlet of storage tank to the distribution system shall be at least 50 mm above the tank bottom. To provide sufficient pressure, the bottom of the tank must be elevated sufficiently above the highest floor. Vent pipe should be provided to avoid any air lock and should be placed where the horizontal branch pipes connect the vertical down feed pipes.

The ground or underground storage tank shall be constructed of either pre-stressed or reinforced concrete. The tank shall be absolutely waterproof and have a water tight cast iron manhole cover suitable for inspection. The inside and outside of the tank may be coated with nontoxic and waterproof materials. The ground tank shall be placed at a location so as to avoid contamination by flood water or any other sources.

6.5.3 Operation and Maintenance (O&M) of Water Supply System

- The HCF or PWD/HED shall inspect and maintain the water supply system in a safe operating condition. HCF should ask a yearly O&M schedule from PWD to ensure smooth conduction of planned O&M work.
- Care should be taken during replacement of any fixtures without interference to the services of patient and staff.
- The non-working pipes or fittings, taps, showers and other fittings shall be replaced by the authority immediately without affecting normal distribution system.
- The storage tank shall be inspected regularly and shall be cleaned and disinfected periodically as mentioned earlier (article 6.2.3).
- The overflow pipes of storage tank shall be inspected regularly to keep the flow free from obstruction. A periodical (4 (four) times in a year)* examination of water quality shall be made.

**(https://www.researchgate.net/post/Is_there_any_guidelines_by_CDC_for_frequency_of_water_testing_in_a_Hospital)*

6.6 GUIDELINE-6: SANITATION FACILITIES

General

Table 3.2 in chapter-3 and Table 4.2 in chapter-4 provide the national standards of sanitation facilities for different levels of HCFs including emergency. Toilets should be maintained thorough cleaning (which removes any fecal material and pathogens), so that the risk for users is minimized and are encouraged to use at the time of needs. The HCF cleaners should do so using methods and equipment (e.g. gloves) that protect themselves.

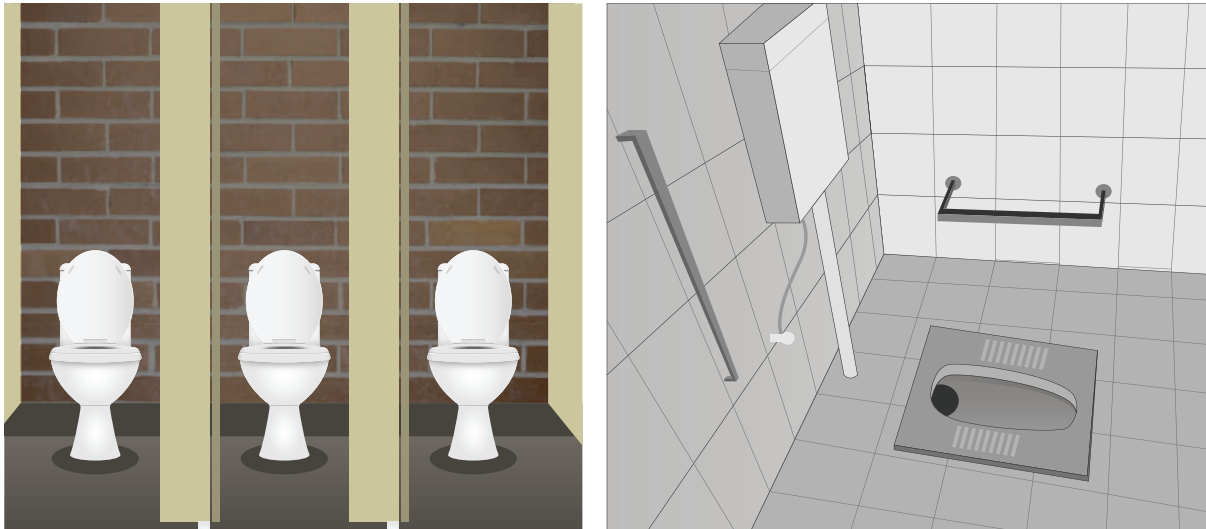


Figure-6.3: Typical types of toilet



Figure-6.4: Toilets for people with limited mobility

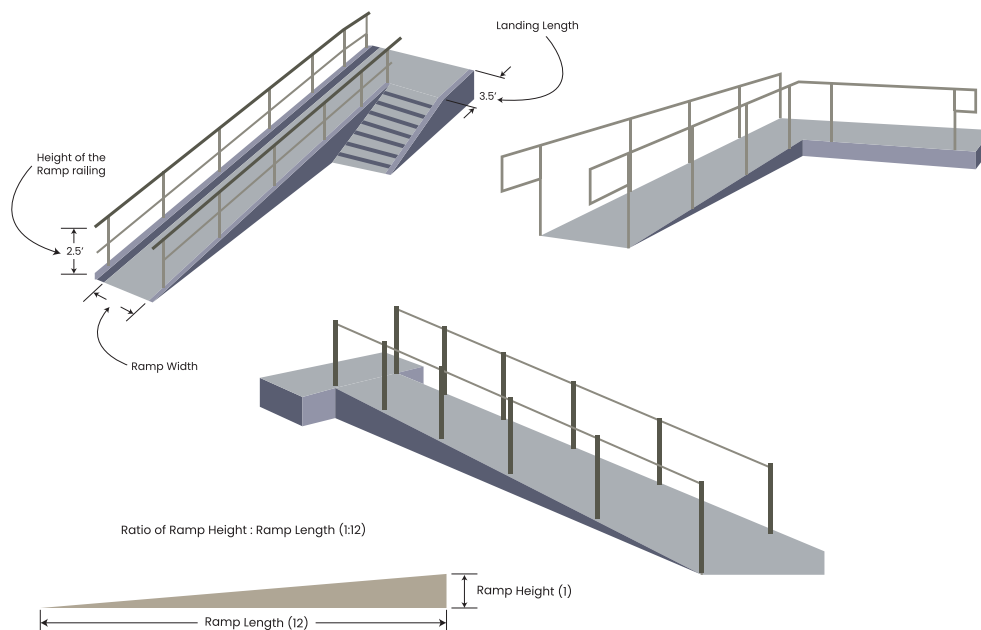


Figure -6.5 : Typical ramp design

6.6.1 Guidance Notes for Sanitation

Social and Cultural Considerations

- Separate toilets are provided for men and women. Signposted clearly to help users finding them;
- Equip the Patient toilets with basic requirement (e.g. hand rail, hand shower, MHM etc.) to make easy to use by people with limited mobility, pregnant women, elderly people;
- Special children's toilets should be provided where many children use the health-care setting. Children's toilets are particularly useful where latrines are used and where the size of the drop hole and the conditions inside a normal latrine are off-putting for children or inconvenient for Care giver;
- Toilets should be designed and equipped in line with community culture and practice (e.g. hand shower water pot and running water); and

Hygiene and safety

- Toilets should be designed, built and maintained so that they are hygienic and acceptable to use and do not become centers for disease transmission.
- Develop periodic cleaning schedule. Assign staff for cleaning and supervision work.
- Ensure running water with functional flushing facility in all toilets, pedal bins in female toilets for menstrual hygiene management (MHM) facilities.
- There should be disposal option for used menstrual materials both inside (pedal bin) and outside for end disposal (closed pit with lid or incinerator).
- Distance between the incinerator and the toilet should be as short as possible
- Ensure toilets should be carefully located and lockable by the user in order to minimize the risk of sexual violence and
- Ensure access routes of toilets are luminated at night.

Handwashing points

- Provide hand washing points with running water, soap and adequate drainage close to the exit of all toilets,
- Encourage their use with signs of steps of handwashing.

Accessibility

- Toilet facilities should be within the hospital compound.
- Toilets should be usable by physically handicapped persons and children for outpatients' toilets.
- For outpatient the distance to toilet facilities should not exceed 30 m.
- For inpatients, the distance to the toilet should not exceed 10 meters. In multi-storied buildings, floors should have toilets. The routes to toilets should be smooth and flat and luminated for easy access for people in wheelchairs.

Cleaning and Maintenance

- Toilets should be cleaned and remain clean at any point of time. However, as a minimum it should be cleaned in every 3 hours with a disinfectant used on all exposed surfaces and a brush to remove visible soiling.
- Avoid using strong disinfectants in large quantities, as this is unnecessary, expensive, potentially harmful for the environment. If no disinfectant is available use plain cold water.
- Ensure periodic checks on effective functioning of the flush toilets in the HCF to identify any mechanical faults especially the blockage of wastewater flow due to a faulty cistern mechanism.
- Ensure repairs of such faults in short possible time to prevent flies and bad smell from blocked toilets.
- Bed pans should be immediately cleaned and disinfected after being used by the patients.
- In specific contexts (e.g. isolation for cholera patients), use a 2% active chlorine solution to disinfect feces or vomit. Usually the chlorine solution is already contained in the container that will receive the feces or vomit from the patients in bed.

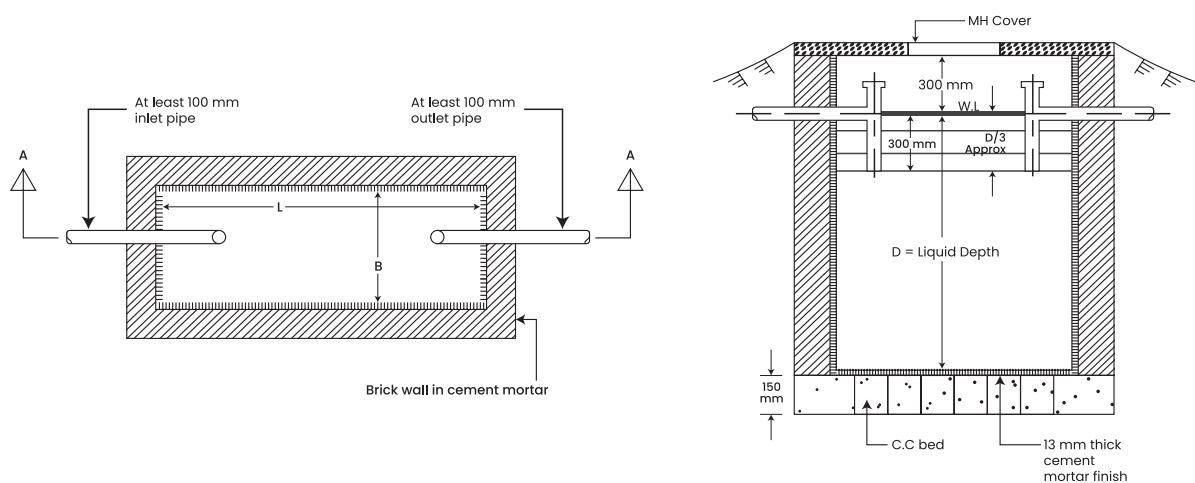


Figure-6.6: Typical design of single pit septic tank

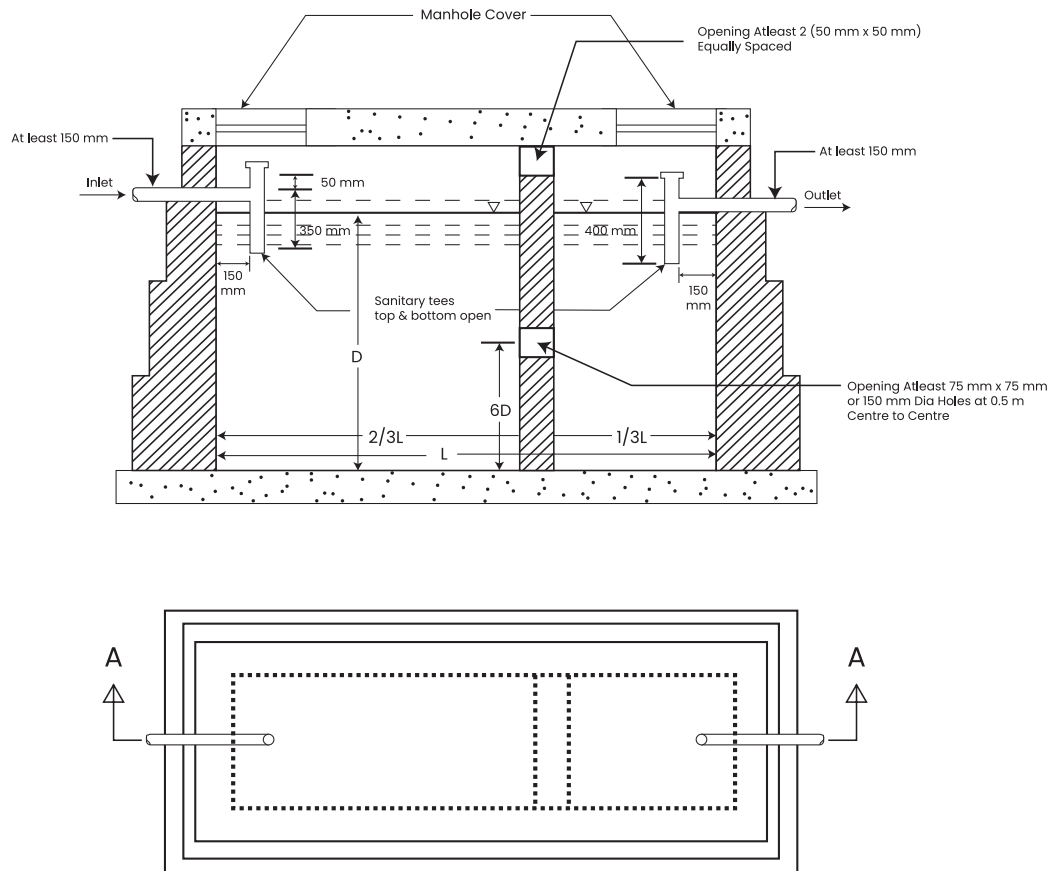


Figure-6.7 : Typical design of twin pit septic tank

6.6.2 Operations and Management of Sanitation Facilities

Sanitation infrastructure and facilities requires careful organization and actions to ensure smooth operations and provision of maintenance services in case of structural or functional changes. Routine and periodic maintenance services are prerequisite for sustaining sanitation facilities in health care facilities.

1. There should be a clear description of staff roles on management of sanitation infrastructure and services. Depending on the facility level there should be a member from existing Quality Improvement Committee (QIC) or WASH Focal person with assigned responsibilities in relation to maintaining WASH infrastructures.
2. There should be weekly and daily cleaning schedule that specify when sanitation facilities should be cleaned and supplied with cleaning and hygiene agents. Cleaning schedule should identify persons or groups responsible for undertaking the cleaning tasks and their supervisors. The schedules should be displayed for easy access and be shared among responsible managers.
3. Orientation, training, and education of users is an important aspect of operations that must be implemented. Orientation materials, personnel and time should be dedicated to help new personnel, visitors, and staff members.
4. Operation and maintenance plan must be put in place to cover for the running and repairs of sanitation infrastructure and services. This should include regular or incidental repairs and scheduled maintenance activities.

5. Monitoring tools for sanitation in Health Care facilities will be developed centrally. It will be the responsibility of each individual facility to obtain tools for monitoring and evaluation exercise, and to make sure that they are being implemented on time.
6. Fecal sludge should be emptied when the septic tank is 3/4 full.
7. Cleaning and maintenance inspection activities should be documented and reported in weekly meetings.

6.7 GUIDELINE-7: HYGIENE FACILITIES

Good hygiene practices such as hand hygiene, bathing and use of personal protective equipment are very important in preventing the acquisition and spread of infectious microorganisms among health care staff, patients and Care giver. If done properly, such practices are simple and inexpensive methods of preventing the spread of HCAs and infectious microorganisms. Furthermore, studies²⁵ have shown that defective or inadequate hand cleaning offers the ability of microorganisms to survive on hands for differing times especially in HCFs whereby the hands of the health care workers (HCWs) become progressively colonized with pathogenic and non-pathogenic during patient care (e.g. hand wash with soap or alcohol based hand rub for at least 20-60 secs to avoid transmission of COVID-19)³. Thus, it has been indicated that, the longer the duration of care, the higher the degree of hand contamination.

The guidelines for maintaining effective hygiene practices within the health care environment which should be adhered by HCFs at all levels in order to minimize risks of contamination and transmission of COVID-19. Other related hygiene issues addressed in the article include bathrooms/shower facility, proper laundry and environmental cleaning as well as environmental management in relation to vector and vermin control. Hygiene practice will work effectively if there are adequate hygiene facilities in HCFs which are easily accessible.

6.7.1 Minimum Number of Hand Hygiene Facilities Requirement

In order to practice effective hand washing, each HCF has to ensure that it provides adequate numbers of functioning hand washing facilities. It has also to ensure the availability of functional hand hygiene facilities for all health care workers at all points of care and in areas where PPE is put on or taken off. In addition, functional hand hygiene facilities should be available for all patients, Care giver and visitors, and should be available within 5 m of toilets, as well as in waiting area, in front of SCANU and other public areas. Table-3.3 of chapter-3 provides a list of recommended minimum numbers of hygiene facilities in different levels of HCF.

The number of hand washing facilities and its' materials are important for promotion of hand hygiene practices. Each HCF should have access of the hand washing facilities and materials with acceptable specifications as presented in Annexures- 10-12 (BNBC, 2015 specification).



Figure-6.8: Typical Hand wash basin

6.7.2 Surgical Scrub - Sinks

These are plumbing fixtures well equipped to enable medical personnel to scrub their hands prior to a surgical procedure. Surgical scrub sinks are essentially used in an operating theater and are designed in a way that promote proper hand washing practices and reduce any possible contamination since all operating tools are sterilized. The sinks are provided with hot and cold water supply which is activated by a knee- action mixing valve or by wrist or foot control as shown in Figure-6.9.

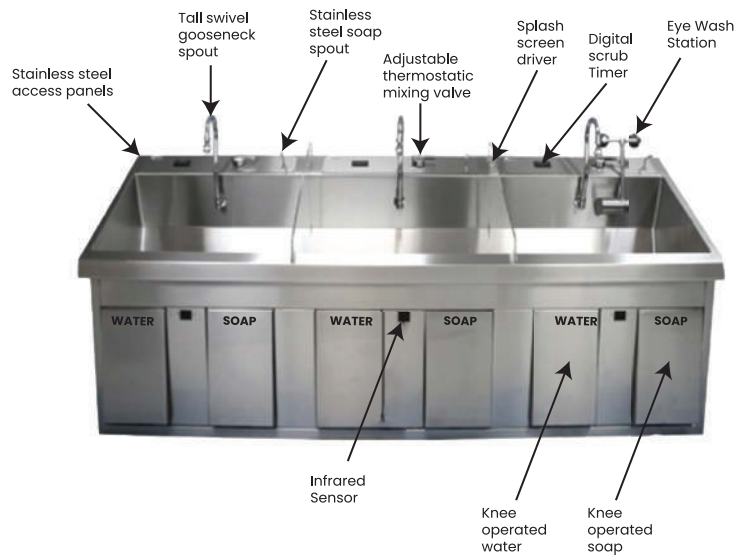


Figure-6.9: Types of surgical scrub sinks

For maintaining the required hygiene practices the surgeon scrub sink should have the following characteristics:

1. Made of vitreous china, stainless steel, or a material whose durability and imperviousness are equivalent to vitreous china;
2. Adequate size and designed to permit the scrubbing of both hands and arms without having to come in contact with any surface;
3. Shaped and sized to prevent splashing of the user;
4. A non - swivel faucet that provides adequate flow for quick rinsing;
5. Hands - free operation (electric eye or knee/foot operation) to prevent contamination of the hands when water is activated;
6. Provide manual means for adjusting water temperature;
7. Equipped with a seam - free backsplash integral with the sink that extends at least 60 cm above sink level;
8. Provide backsplashes covering the areas under the paper towel dispenser and soap dispenser.

6.7.3 Special Fixtures and Equipment

The hospital shall be provided with clinical sink, bedpan washer and such other fixtures and equipment (PPE) for disposal of bedpan contents, cleansing and disinfection of such fixtures and HCWs personal protection. A clinical sink shall not be considered as a substitute for service sink.

6.7.3.1 Bedpan Washer and Clinical Sink

Bedpan washer and clinical sink shall be connected to soil branches and soil stacks through a water seal trap. The bedpan washer with vapor vent connection shall be provided with additional local vent stack. The bottom of the bedpan local vent stack (except for one bedpan washer) shall be drained indirectly into sanitary drainage system through traps. The size of the trap and connecting pipe shall be at least the size of the vent stack.



Figure-6.10: Clinical sink

6.7.3.2 Personal Protective Equipment (PPE)

Personal protective equipment (PPE) refers to wearable equipment that is designed to protect health care personnel from exposure to or contact with infectious agents.

Types of PPE used in health care settings are (Figure 6.11 and 6.12):

- Gloves-protect hands
- Gowns/aprons-protect skin and/or clothing
- Masks-protect mouth/nose
- Respirators-protect respiratory tract
- Goggles-protect eyes
- Face shield- protect face, mouth, nose and eyes (rarely used in our country)
- Shoe cover



Figure-6.11 : Personal Protective Equipment (PPE-medical)

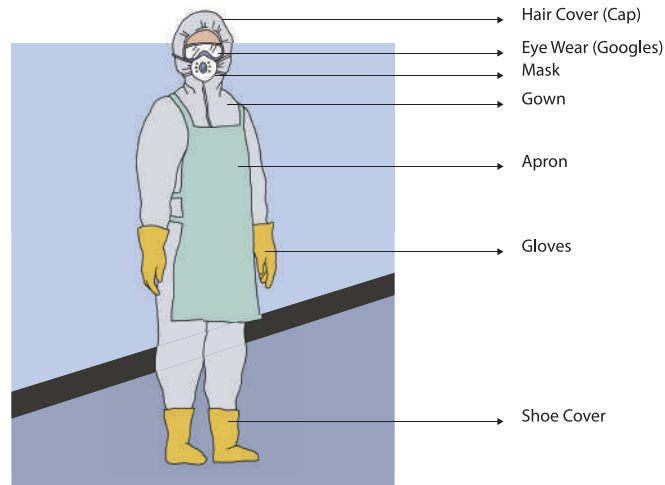


Figure-6.12 : Use of full PPE(PPE-medical)

6.7.4 Hygiene Facilities Usage and Maintenance

The following precautions should be taken in order to ensure proper use of hand hygiene facilities and maintenance:

- Hand hygiene facilities should not be dedicated to any other purpose;
- Hand washing facilities should be regularly inspected and cleaned to ensure they remain in good working condition;
- Paper towels and liquid soap should be provided at each hand washing sink; and
- A current hand washing guide should be posted at each hand washing sink in order promote proper hand washing
- 6.7.4.2 Donning and Doffing of PPE
- PPE should be put on and removed in an order that minimizes the potential for self-contamination (Figure 6.13 and 14).

BOX-1 : Pre-donning instructions of PPE

- Perform hand hygiene before putting on PPE
- Ensure health care worker hydrated
- Tie hair back and remove jewellery
- Check PPE in the correct size is available
- Ensure Proper Fit while wearing Respirator – making sure nose and mouth properly covered, mould the metal part over the bridge of the nose and press all around the face seal to be sure it is tightly in place no air leaks around the edges .
- Avoid touching the mask while wearing it. Do not leave the mask hanging from one ear or hanging around neck, after each use, please take highest care and properly dispose the masks after use

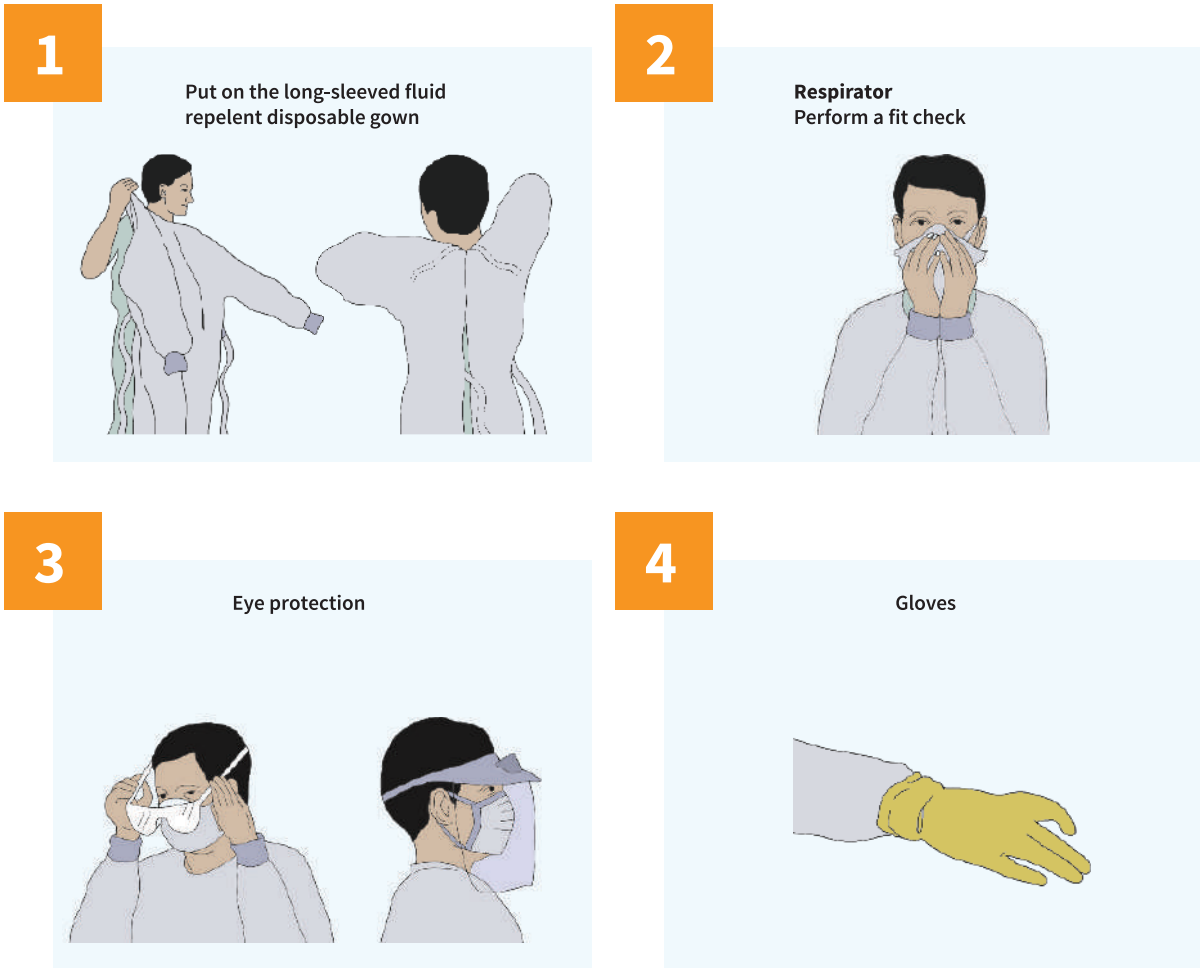


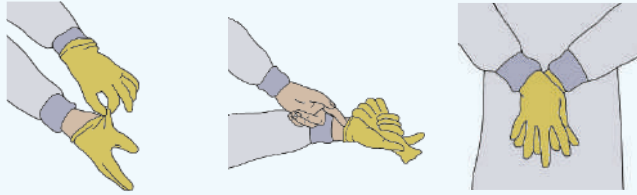
Figure 6.13: Donning of PPE

BOX-2: Doffing instructions

- Remove the mask using the appropriate technique: After putting on, never touch the front of the mask, untie it from behind. Do not touch the front of the gown or gloves as they are contaminated with viruses. If by any chance, after removal or whenever inadvertently touched, clean hands using an alcohol-based hand rub or soap and water if hands are visibly dirty – please wash hands properly with soap. Do not touch face, mouth, nose or eyes.
- Replace masks as soon as they become damp with a new clean, dry mask.
- Do not re-use single-use masks.

1

Gloves-
the outsides of
the gloves are
contaminated



2

Gown-
the front of the
gown and
sleeves will be
contaminated



3

Eye protection
the outside will be
contaminated



4

Respirator
Clean hands with alcohol
hand rub. Do not touch the
front of the respirator as it
will be contaminated



5

Wash
hands with
soap and
water



Figure 6.14 : Doffing of PPE

A Video clip on donning and doffing of PPE can be watch on:

[https://www.youtube.com/watch?v=Xkix8uweNsc \(1m51s\)](https://www.youtube.com/watch?v=Xkix8uweNsc (1m51s))

6.8 GUIDELINE -8: SHOWER

6.8.1 Minimum Number of Bath/Shower Requirement

Bathrooms are important infrastructures for both patients and HCWs for preventing and controlling transmission of diseases. To improve hygiene practices within HCFs it is necessary to have adequate numbers of bathrooms which correspond to the level of bed capacities and staffing levels. The ratio of patient per bathroom in HCFs is mentioned in Table 3.3 of Chapter-3. A proper bathroom within the HCF may have the basic qualities as outlined below:

- A minimum surface area of 3.25m²
- Well drained non slippery floor
- Impervious walls
- Mixture taps for both cold and hot water
- Adequate lighting and ventilation for use safety
- Furnished with wall mounted seats with functional emergency alarm call system with free room for wheelchair maneuvering

6.8.2 Guidance Notes for Guidelines-8

- Bathrooms should be separated for HCWs and patients and clearly labeled to identify the type of users and sex;
- Bathing or showering facility should be connected with running water to encourage them to use as often as required.
- Sometimes water that is not safe to drink can be used for bathing, but be careful not to swallow any water or get it in your eyes. Do not bath in water that may be contaminated with sewage or toxic chemicals.
- During flooding water well may be contaminated. In that case from local authority (PWD/HED/DPHE/Municipality or from the local medical authority may seek specific advice on using well water for showering and bathing and water testing and well disinfection.

6.9 GUIDELINE 9 : PROMOTION OF HYGIENE PRACTICES IN HEALTH CARE FACILITIES

Good hygiene practices are closely linked to hygiene behavior change as an essential part of achieving infection prevention and control in health care facilities. There are many approaches for promoting proper hygiene practices in health care facilities among HCWs, patients and Care giver. However, the degree of adaptability depends on a number of factors including level of education of the patients or Care giver, customs, traditions and the level of commitment on the part of respective HCF management and staff. The following approaches shall be applied by HCFs so as to ensure that all HCWs, patients and Care giver progressively adapt proper hygiene practices in order to minimize the risks of transmission of diseases:

1. Make WASH a permanent agenda in HFCs Quality Improvement Team,
2. Increase funding allocation for hygiene activities,
3. Orientation to the HCF management on hygiene practices, Quantity (Shower/ Wash room)
4. Conduct continuing hygiene education to all departments for example, inpatient wards, Reproductive and Child Health Clinics (RCH), SCANU and at Outpatient Departments (OPD),
5. Provide information, education and communication, self-explanatory posters/ informative pictorial wall paint including SOPs on hygiene behaviors in ward walls, notice board and offices,

6. Provide adequate WASH facilities with O&M component to ensure functionality. Ensure that proper hygiene practices are components of emergency response programmes,
7. Developing strategies and tools to encourage hand-washing promotion by community health and outreach workers.

6.9.1 Guidance Notes for Guideline-9

It is important that all HCWs should have adequate knowledge on how HCAs and COVID 19 are transmitted. This knowledge will help them to take precautions and remedial measures in handling patients and any other contaminated materials or objects within the health care facility (Table-6.2). Directorate General of Health Services of MoH&FW has developed and posted some important guidelines and procedures in the Dashboard of DGHS website to tackle CORONA Virus (www.dghs.gov.bd).

Table-6.2: Precautions and critical remedial measures in handling patients and contaminated materials.

Critical time of hand washing	<ul style="list-style-type: none"> • When hands are visibly dirty or soiled with blood or other body fluids. • Before, during, and after preparing food. • Before eating. • After using the toilet. • Before entering and leaving inpatient wards or any working area of the health facility setting. • After contact with inanimate surfaces and objects (including medical equipment) in the immediate vicinity of the patient. • Before and after feeding a patient. • Before putting on gloves and immediately after removing gloves. • Before and after caring any patient. • Before and after treating a cut or wound. • After changing diapers or cleaning up a child bottom. • After blowing your nose, coughing, or sneezing. • After touching an animal, animal feed, or animal waste • After touching garbage.
How should wash hands	<ul style="list-style-type: none"> • Wet your hands with clean, running water (warm or cold), turn off the tap, and apply soap. • Lather your hands by rubbing them together with the soap. Be sure to lather the backs of your hands, between your fingers, and under your nail • Scrub your hands for at least 20 seconds. Need a timer? Hum the “Happy Birthday” song from beginning to end twice. • Rinse your hands well under clean, running water. • Dry your hands using a clean towel or air dry them.
Awareness on transmission of pathogens by hands (HCAs)	Ensure all health care workers are provided with adequate knowledge and training on transmission of HCAs. These knowledge and training will help them to take precautions and remedial measures in handling patients and any other contaminated objects within the HCF.
Proper drying of hands	Transmission of bacteria is more likely to occur from wet skin than from dry skin. Therefore, proper drying of hands after washing is important in provision of health care. Drying up of hands after washing can be done by using automated dryers, paper towels and sterile towels. It is strongly recommended that paper towels should be used once and discarded into hands-free non-risk waste bin. Clean cloth towels should not be used as they are likely to be susceptible to contamination due to multiple uses by different people.
Use of hand gloves	<p>Use of gloves does not replace the need for hand cleansing by either hand rubbing or handwashing; Wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, or non-intact skin will occur;</p> <p>When wearing gloves, change or remove gloves during patient care if moving from a contaminated body site to a clean body site within the same patient Change or remove gloves after touching a contaminated site and before touching a clean site or the environment;</p>

Paper towels	<p>Paper towels are used for drying hands after washing. They are effective, safe and fast, in hand drying than other methods since they dry hands more quickly, remove bacteria and are less likely to lead to cross contamination. Paper towels also offer the advantages of not requiring electrical power. In order to make effective use of paper towels HCFs will have to do the following:</p> <ol style="list-style-type: none"> Provide paper towel dispensers in all areas where hand washing facilities are installed. Towel dispensers should be mounted such that access to them is free and splashing or dripping onto adjacent wall and floor surfaces is minimized. Provide single - use paper to turn off faucets so as to avoid hand recontamination. Air dryers are discouraged in HCFs as warm air currents dry hands slowly and can be used by only one individual at a time which may result into unnecessary queues and the temptation to dry hands on personal clothing. Provide lidded, lined, foot pedal - operated waste bins, with waste bags, in close proximity to each hand washing sink.
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6.9.2 Hand Hygiene

Hand hygiene means cleaning your hands by using either soap-water or antiseptic hand rub (i.e. alcohol-based hand sanitizer including foam or gel) that has been discussed in Table 6.2 above and in article 6.9.2.2 and 6.9.2.3 below. Perform hand hygiene at hospitals is explained in the following Table 6.3.

Table 6.3: When to perform hand hygiene at hospitals

Immediately	Before	Between	After
Upon arriving at work	Direct contact with patient	Procedures on the same patient where soiling of hands is likely	Contact with patient
	Putting on gloves for clinical and invasive procedures (e.g. administering IV injections)		Removing gloves
	Medicine preparation		Removing other PPE
	Preparing, handling, serving or eating food		Contact with blood, body fluids, secretions, excretions and wounds
	Feeding patient		Contact with items or surfaces known or likely to be contaminated

6.9.2.1 Patient Handling:

Care has to be taken before, during and after handling or touching a patient. Critical moments of hand hygiene are illustrated in Fig.-6.15. Hence HCWs should ensure that their hands are properly washed with soap and water at these critical moments as they can easily contaminate their hands at different occasions such as lifting a patient, wound dressing, taking a patient's pulse, blood pressure, or oral temperature, touching a patient's hand, shoulder or groin.

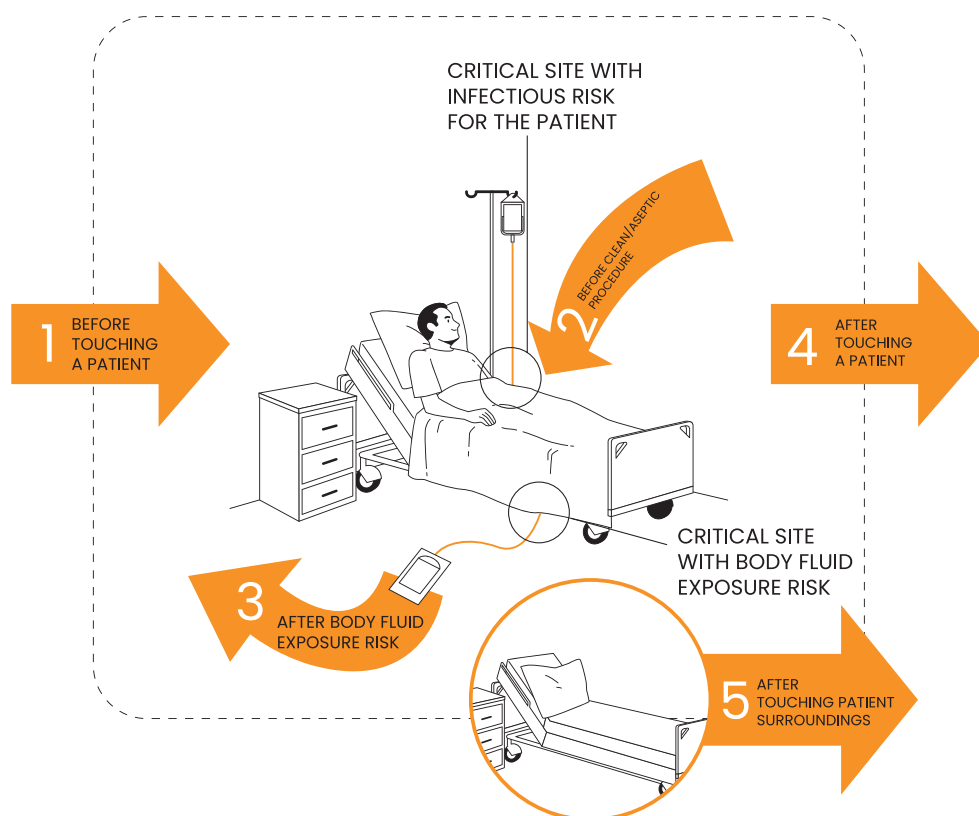


Figure-6.15 : Critical moments of hand hygiene in health care facilities
(Source: Guidelines on Hand Hygiene in Health Care (WHO, 2009))

6.9.2.2 Antiseptic Hand Rubbing

All HCFs should make available alcohol rub (e.g. Alcohols: Isopropyl 60–70% Ethanol 70–90% includes methylated spirit 70%) at the point of care and should conform to the national specifications for alcohol-based hand hygiene products. The alcohol rub should be kept in secure place in order to avoid risk of accidental or intentional ingestion at the point of care by individual patient. It should be applied when hands are not visibly soiled in order to decontaminate hands and should follow the steps illustrated below.

Hand rubbing needs **20-30secs**. The steps of hand rubbing are given below---

- **Step 1:** Apply the alcohol-based hand sanitizer in a cupped hand (2 ml), covering all surfaces
- **Step 2:** Rub hand palm to palm
- **Step 3:** Right palm over left dorsum with interlaced fingers and vice versa
- **Step 4:** Palm to palm with fingers interlaces
- **Step 5:** Backs of fingers to opposing palms with Fingers Interlocked

- **Step 8:** Dry your hand in air
- **Step 6:** Rotational rubbing of left thumb clasped in right palm and vice versa
- **Step 7:** Rotational rubbing, backward and forward with clasped fingers of right hand in left palm and vice versa



Figure 6.16 : Alcohol based hand rub

Hand rub shall also be applied when hands are visibly soiled in order to decontaminate hands and the steps illustrated below.

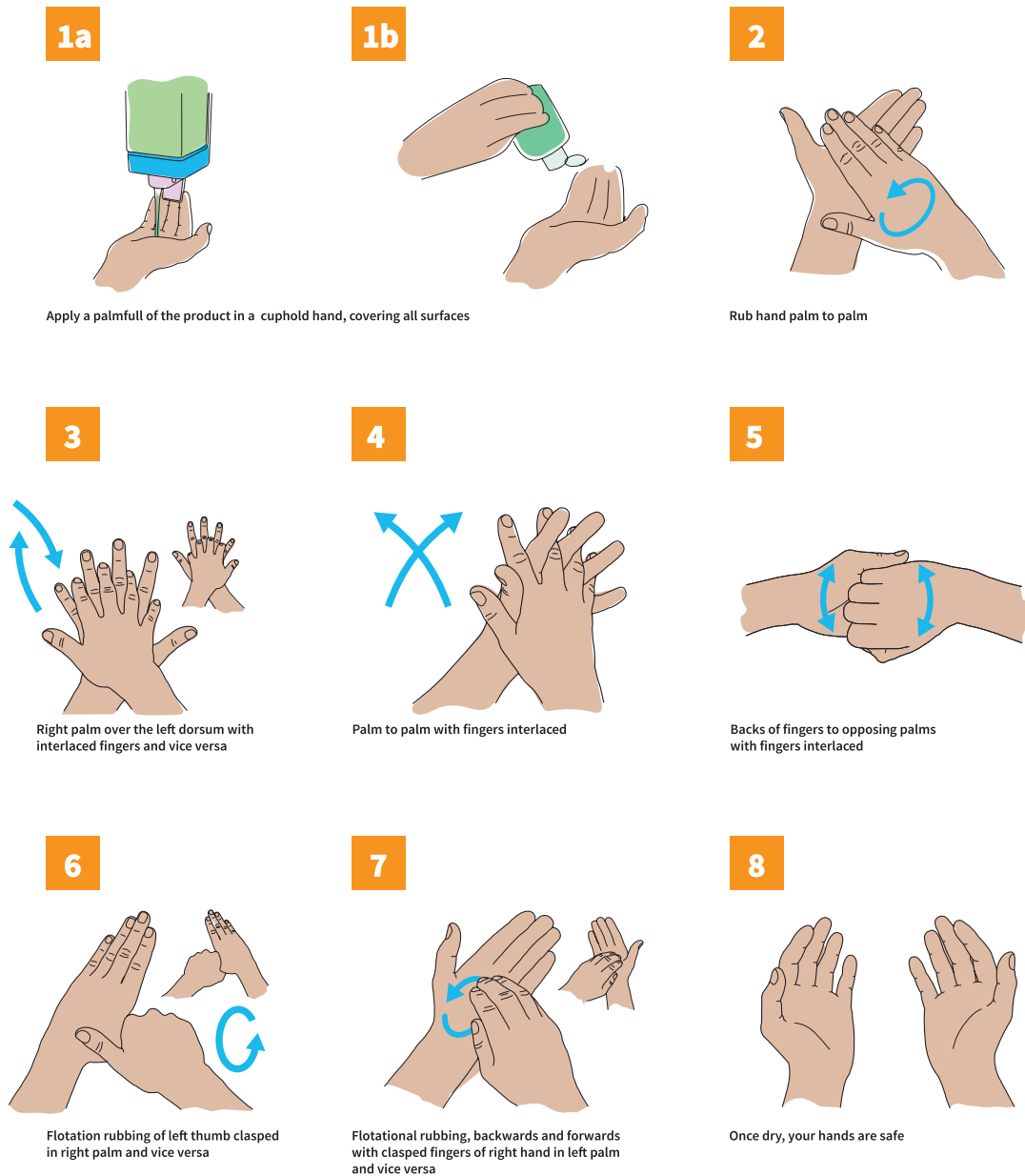


Figure-6.17: Hand hygiene technique with alcohol based formulation

6.9.2.3 Handwashing with Soap and Water

Perform handwash with soap when hands are visibly dirty or soiled or contaminated with body fluids. Wet hands with water and apply the amount of soap necessary to cover all surfaces. Vigorously perform rotational hand rubbing on both hand palms and backs, interlace and interlock fingers to cover all surfaces. Rinse hands with water and dry thoroughly with a single-use towel. Use running and clean water whenever possible. The technique for handwashing is illustrated below in Figure-6.18.



Figure-6.18 : Hand hygiene technique with soap and water

6.9.2.4 Surgical Hand Preparation

The objective of maintaining proper surgical hand hygiene is to reduce the skin bacteria from the hands of the team performing surgery during the process especially in case of unnoticed puncture of the surgical gloves which can release bacteria to the open wound. Unlike hand washing with soap or hand rub, surgical hand preparation should aim at eliminating the transient and reducing the resident flora. Also, it is intended to inhibit the growth of bacteria under the gloved hands. In performing surgical hand preparation, the surgical team should use either an antimicrobial soap or an- alcohol-based hand rub with persistent antimicrobial activity or surgical hand rub before to put on sterile gloves when performing surgical procedures. For safety purposes the steps indicated in Figure-6.19 (WHO Guideline on Hand Hygiene Practices in HCFs, 2007)²⁵ should be strictly followed when performing surgical hand rub.

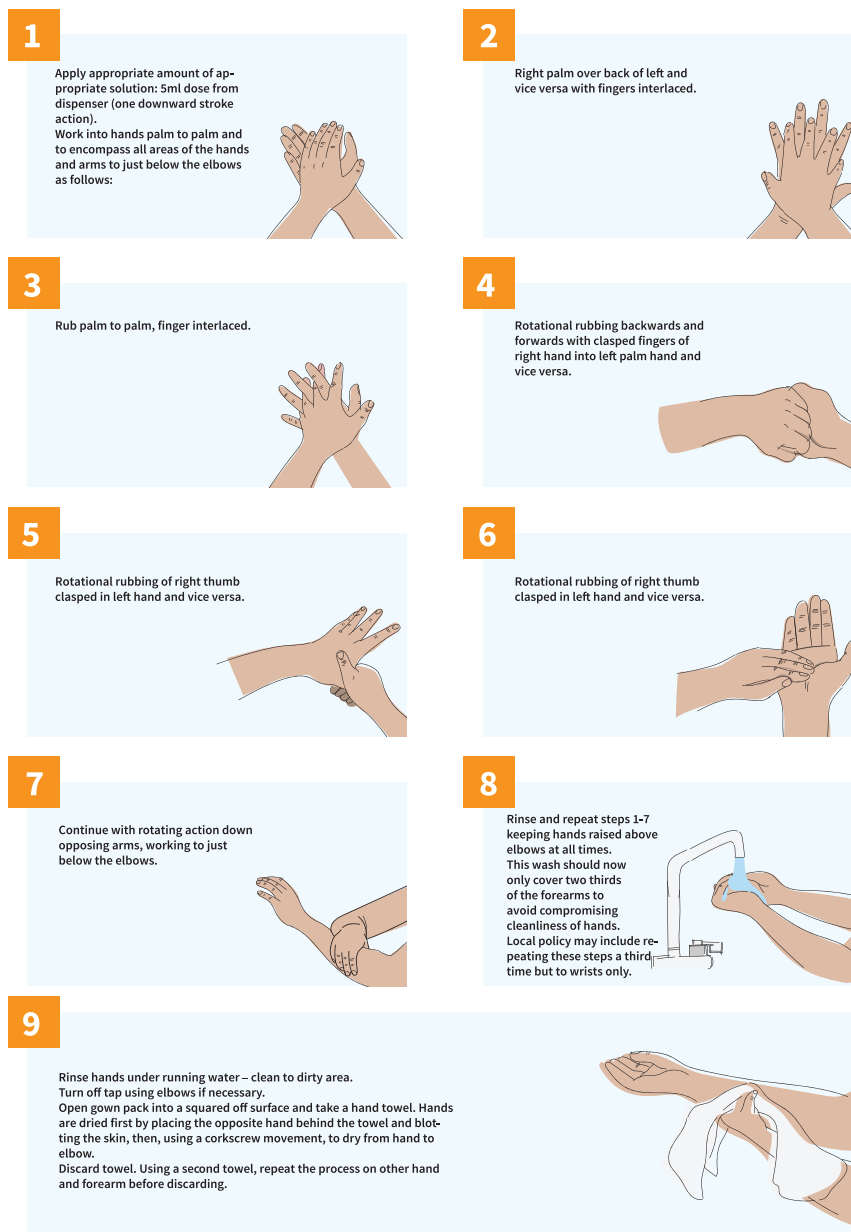


Figure-6.19 : Steps for surgical hand rub

6.9.3 Sustaining Hygiene Practices in HCF

Each HCF should have behavior change strategy so that proper hygiene practices are maintained by staff, Care giver and patients and regularly monitored. The O&M strategy of WASH facilities should also be present in the HCFs in encouraging to use the WASH facilities and in promoting the hygiene practices are carried out by all staff, patients and care givers in HCFs. The following hints will help HCFs to ensure good hygiene practices are maintained:

- Conduct regular supportive supervision on matters related to hygiene.
- Prepare a checklist of issues which require regular monitoring.
- Prepare a working schedule which will show who is responsible for cleanliness, when and how it will be conducted.
- Each HCF should, according to its working environment adopt a behaviour change and communication model which will be used by HCWs to educate client on behaviour change to improve people's behaviours on personal hygiene.

6.10 GUIDELINE -10: ENVIRONMENTAL CLEANING²⁷

Laundry and surfaces in the health-care environment are kept clean. Cleaning of different areas such as preparation tables, chairs, doors, floors, washing sinks, washrooms, kitchen and windows. In HCFs soiled linen harbors pathogenic microorganisms, and hence the risk of disease transmission from soiled linen is inevitable. Proper handling of linen will help to reduce possible risks of transmitting diseases causing microorganisms from contaminated patient linens to HCWs and also reduce HCAs from linens to patients. Environmental cleaning or decontamination is to reduce the number of infectious agents that may be present on (frequently touched) surfaces and minimize the risk of transfer of micro- organisms from one person/object to another, thereby reducing the risk of cross-infection.

- Step 1 – Cleaning
- Step 2 – Disinfection

Infectious agents can survive in the environment and on surfaces for many hours or even days. Decontamination removes pathogens from contaminated surfaces and items. Two key principles of environmental hygiene are-

- Clean BEFORE disinfection
- Clean with mopping /washing with water-detergent

6.10.1 Disinfectants/Decontaminants

Appropriate disinfectants / decontaminants are as follows:

- Soap, detergent,
- Sodium hypochlorite solution, (Chlotech, chlorox)
- Bleaching powder (35% Cl)
- High Test hypochlorite (HTH) 70% Cl)
- 70% ethanol
- Lyzol
- Phenolic compound (e.g. Finis)
- 2% Gluteraldehyde (Cidex),
- Formaldehyde fumigation etc

BOX-4: Note for using 1% hypochlorite solution

1% sodium hypochlorite solution should be applied to surfaces using a dampcloth. They should not be applied to surfaces using a spray pack, as coverage is uncertain and spraying may promote the production of aerosols

If pre-prepared sodium hypochlorite solution is not available, then 0.5%-1% Sodium hypochlorite Solution can be prepared as follows:

1. From concentrated solution
For 1% chlorine solution: Add 200 ml liquid chlorine (5%) to 1-liter water
For 0.5% chlorine solution: Add 100 ml liquid chlorine (5%) to 1-liter water
2. From powder form
For 1% solution: Add 300gm (35% Cl) or 20 tablespoon bleaching powder to 10 L water
For 0.5% solution: Add 150gm (35% Cl) or 10 tablespoon bleaching powder to 10 L water

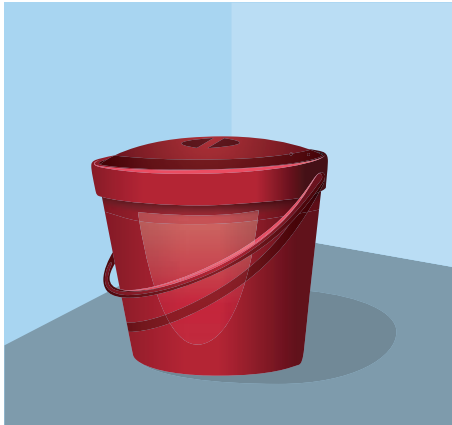


Figure 6.20 : Plastic bucket for making solution

BOX-3: Disinfectant Preparation
 Preparation should be done in a covered bucket and mix it by wooden stirrer. Water should be poured prior to given sodium hypochloride solution of powder

6.10.2 Frequency of Cleaning:

- **High touch surfaces:**
 Decontaminate high touch surfaces like (doorknobs, telephone, call bells, bedrails, stair rails, light switches, lift-buttons, arm rests tables, air/ light controls, keyboards, switches, basin, wall areas around the toilet) to be done every 3-4 hours.
- **Low-touch surfaces:**
 For Low-touch surfaces (walls, mirrors, etc.) mopping to be done at least once daily.
- **In between patient care*:**
 Use 70% alcohol containing hand sanitizer.
- **Triage area:**
 Disinfection of high touch surfaces by 1% sodium hypochlorite solution to be done in every 3-4 hours. Hand sanitization to be performed.
- **Mop floor** with routinely (at least three times in a day at fixed time) available disinfectant (1% sodium hypochlorite solution, phenol etc) daily and the contact time is 20-25 minutes (https://vikaspedia.in/health/sanitation-and-hygiene/swachhta_abhiyaan_guidelines/frequency-of-cleaning)
- **Remove used curtains/ fabrics/ quilts** for washing in washing machine (preferable using hot water cycle).
- **Place wet floor caution sign** for safety of staff and visitors in the HCF (figure 6.20)

* Non-suspected, suspected or confirmed patients care area



Figure 6.21 : Caution Signboard for Wet Floor

6.10.3 Guidance Notes for Environmental cleaning

- Use 1% chlorine solution or other disinfectant In cholera treatment settings for cleaning floors, walls and beds daily and whenever soiled. Soiled clothing and bedding should be soaked in 0.5 % chlorine solution for 10 minutes and then rinsed, before being washed and dried as usual.
- Blood or body fluids: Use 1% chlorine solution for cleaning and disinfecting blood or body fluid spills. Large spills should first be removed with absorbent material which should then be properly disposed of before disinfecting and cleaning.
- Cleaning soiled linen: Soiled linen should not be sorted in patient-care areas, and should be handled with minimum agitation to avoid releasing pathogens. Soiled linen should be cleaned and autoclaved before being supplied to operating rooms or theatres. Woolen blankets should be washed in warm water (WHO, 2004b).
- Transporting soiled linen: Securely closed impermeable bags should be used for transporting linen heavily soiled with body substances or other fluids (WHO, 2004b).
- Beds and bedding: Beds should be wiped with a disinfectant solution (e.g. .05% chlorine solution) following each hospitalization.
- Mattresses should have waterproof protective covers for easy cleaning. Mattresses and pillows should be treated, as required, to control lice, bedbugs and other nuisances or disease vectors. If woven mats are used instead of, or on top of, mattresses, they should be destroyed (burned) and replaced between patients.
- If insecticide-treated nets are used on beds, they should be washed and impregnated every 6 months if used only for patients with non-infectious diseases. If used for patients with infectious diseases (cholera, haemorrhagic fevers, etc.), they should be washed and impregnated between patients and whenever soiled. Non insecticide-treated net should be impregnated.
- Kitchen: Food can become contaminated at any point during preparation and distribution within the kitchens. Food handlers have a role to play to ensure the prepared food does not cause disease transmission.

- HCF kitchens should be well designed with good drainage system and ventilation;
- It should be easy to clean and should conform to standards and procedures for running food premises as stipulated by Bangladesh Standard Testing Institute (BSTI).
- The kitchen should have separate toilets for male and female with adequate hand washing facilities and proper waste collection.
- kitchen services should be closely monitored by HCF manager or BSTI or DoE for quality assurance.

6.11 GUIDELINE – 11: WASTEWATER DRAINAGE

Wastewater Drainage

Wastewater is produced from wash basins, showers, sinks, etc. (greywater) and from flushing toilets (blackwater) and should be removed through WASA/City/Municipality drainage system and sewerage systems respectively. In absence of drainage and sewerage system nearby, Septic tank system can be built for black water and for grey water Horizontal Flow Roughing Filter, Figure-6.22 can be built to treat them on-site. Grey water cannot be disposed of in an open environment. For managing wastewater, HCF may adhere to the following guidelines:

- Use BNBC, 2015 recommended building drainage pipes, vent pipes and other pipes and fittings (Annexures-13-15);
- Treat wastewater from HCFs before final disposal. The treatment should be either onsite by using septic tanks, soakage pit Horizontal roughing filter or offsite by connecting to municipal sewerage network;
- Drainage systems should be connected for management of ablution waste for all Health Care points, delivery rooms, dressing rooms, lavatories, sluice rooms, laundry with points where grey water is produced;
- For HCFs located in urban areas the most appropriate option for wastewater disposal is connection to the existing sewer systems.

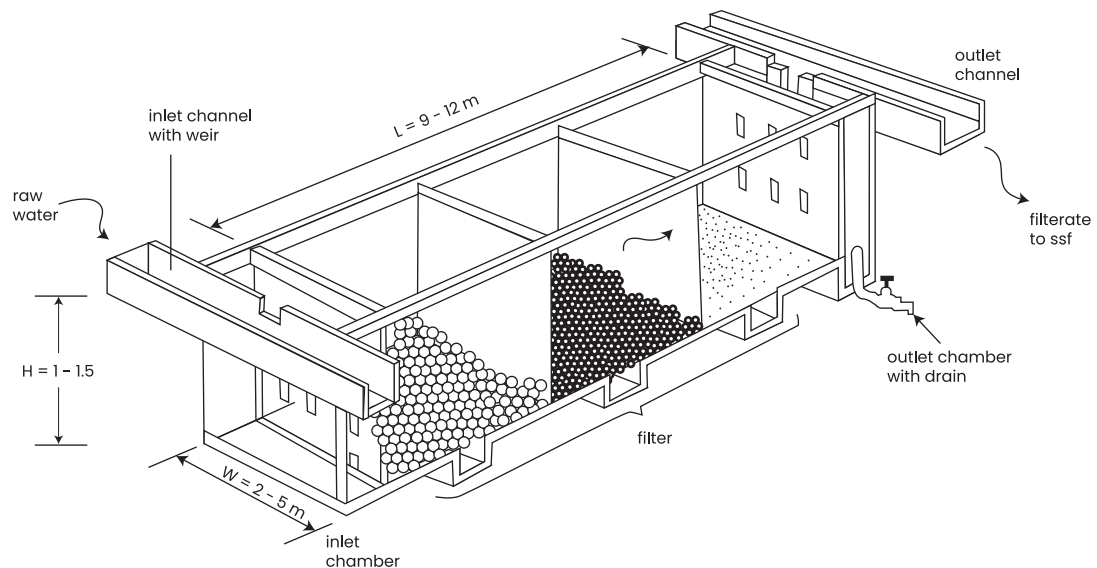


Figure-6.22 : Horizontal flow Roughing Filter

6.11.1 Guidance Notes for waste water drainage system

Wastewater

- All open wastewater drainage systems should be covered, to avoid the risks of disease vector breeding and contamination from direct exposure.
- Toxic wastes (e.g. reagents from a laboratory) should be treated as medical waste. They should not be poured into sinks or toilets that drain into the wastewater system.
- The most appropriate wastewater disposal option is connecting the health-care setting to a functioning sewer system leading to a treatment plant.
- If the sewer does not connect to a treatment plant, HCF should install an on-site retention system with treatment (e.g. horizontal roughing filter) before wastewater is discharged.
- In absence of municipal sewerage system, Black water should be treated in a septic tank, with the effluent discharged into a soak way pit or infiltration trench.
- Grey and black water may be treated in the same septic tank and soak away system.
- There should be at least 1.5 meters gap between the bottom of the infiltration system and the groundwater table.
- Rainwater and surface run-off
- Rainwater and surface run-off may be drained and disposed of separately.
- Build separate soak pit so it does not carry contamination from the health-care setting to the outside surrounding.
- Separate drainage for rainwater is particularly important for settings such as cholera treatment centers where there is a high prevalence of enteric pathogens that might be washed out of the isolation area into the local environment.

6.12 GUIDELINE -12: MEDICAL WASTE MANAGEMENT

Hospital waste is a potential reservoir of pathogenic micro-organisms, radioactive and toxic substances (for example chemical waste from solvents and reagents, sterilants, disinfectants; pharmaceutical waste from unused drugs) and requires appropriate, safe and reliable handling (<https://www.who.int/en/news-room/fact-sheets/detail/health-care-waste>). The main hazard associated with infection is sharps contaminated with blood. Health-care waste is segregated, collected, transported, treated and disposed of safely. There should be a person or persons responsible for each HCF and management of waste collection, handling, storage and disposal. Different types of waste require different handling, treatment and disposal. Segregation must start at the source, i.e. where waste is generated. Waste management should be conducted in coordination with the infection control team. Steps in the management of hospital waste include:

- Generation
- Segregation/Separation at source
- Storage and Collection
- Transportation
- Treatment and
- Final disposal

Waste management practices must meet national (Medical wastes management guidelines, 2015)² and the SOP for COVID-19 related hospital wastes, 2020 of DGHS⁶ and the local requirements (Table 6.4). A waste management plan is necessary based on an assessment of the current situation and which minimizes the amount of waste generated.

6.12.1 Waste Management

- Keep waste in biohazard bag/waste bag in waste bins (Figure 6.23)
- Close/secure waste bag when two third to be filled up
- Decontaminate waste by autoclave or chemical (1% sodium hypochlorite)
- Incineration (ideal), if not available, do burning.

Table 6.4: Waste management in hospital

Type of waste	Example	Color of waste bin/container
General waste	Leftover meals, administrative rubbish and paper, sweeping	Black
Clinical/lab waste without sharp objects	Materials used in lab/patient care	Yellow
Clinical waste with sharp objects	Needles or scalpel blades, knives, broken glass materials etc.	Red
Recyclable waste	Saline kits	Green
Liquid waste	Vomiting, blood	Blue

Table 6.4: Waste management in hospital

According to the SOP of COVID 19 related medical waste management the waste disposal flow chart is given below.

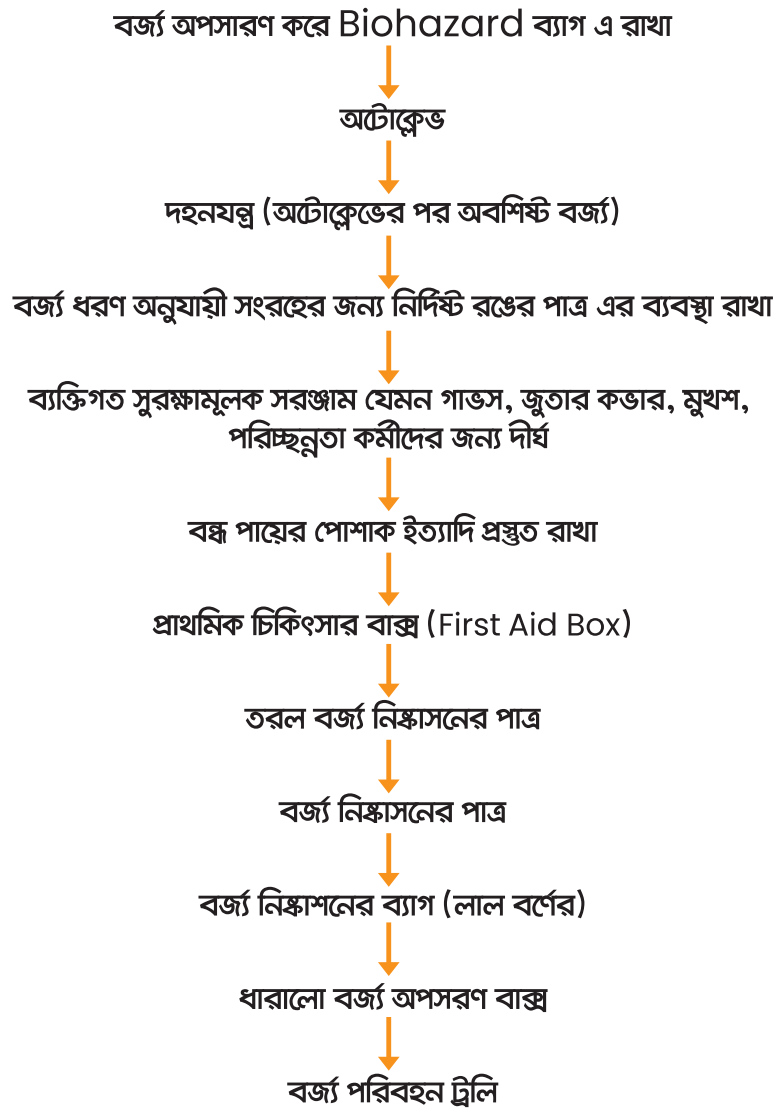
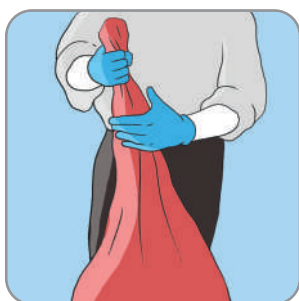
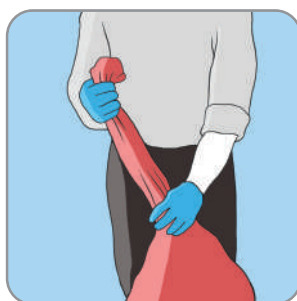




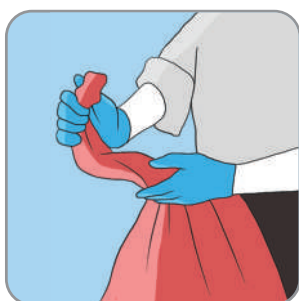
Fig-6.23 Color Bins and Biohazard Symbol



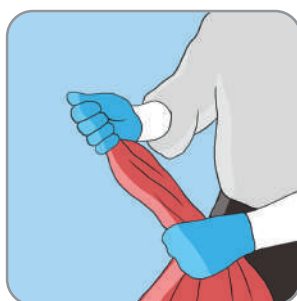
1. Always wear gloves.



2. Bag shouldn't be more than half full.



3. Twist the top.



4. Tie a knot.



Figure 6.24 : Correct way to tie the Biohazard bag

6.12.2 Guidance Notes for Guideline-12

Segregation	<p>The four major categories of health-care waste recommended for organizing segregation and separate storage, collection and disposal are:</p> <ul style="list-style-type: none"> • sharps (needles, scalpels, etc.), which may be infectious or not; • non-sharps infectious waste (anatomical waste, pathological waste, dressings, used syringes, used single-use gloves); • hazardous waste (expired drugs, laboratory reagents, radioactive waste, insecticides, etc.). • general waste - non-sharps non-infectious waste (paper, packaging, etc.);
--------------------	---

Storage and Collection	<ul style="list-style-type: none"> Sharps should be placed immediately in yellow puncture-proof and covered safe sharps containers, which are regularly collected for disposal; Non-sharps infectious yellow or red waste bags or containers (15–40-litre capacity, with lids) should be collected, emptied, cleaned, disinfected and replaced after each intervention (e.g. in an operating or maternity unit) or twice daily; Non-sharps non-infectious black waste containers (20–60 litre capacity) should be collected, emptied, cleaned and replaced daily; alternatively, plastic bags may be used inside the containers.
	<p>For the above categories of waste, it is recommended that waste containers are a maximum of 5 meters from the point of waste generation for a minimum of three types of waste. At least one set of waste containers should be provided per 20 beds in a ward. Hazardous waste should be collected and stored in appropriate and labelled containers placed in secure location.</p> <p>Radioactive waste should be stored in containers that prevent dispersion, behind lead shielding. National legislation should be followed for disposal.</p>
Treatment and disposal	<ul style="list-style-type: none"> Sharps should be disposed of in a sharps pit (buried drums in small health centers or emergency structures; concrete-lined pits in other settings). Off-site treatment in a decentralized facility in charge of collection, treatment and disposal is not advisable for safety reasons but may be necessary in an urban area where on-site treatment is not feasible because of lack of space; Non-sharps infectious waste should be buried in a pit fitted with a sealed cover and ventilation pipe for on-site treatment in small health-care settings or, should be high- temperature incinerated or steam sterilized on-site or off-site. Special arrangements may be needed for disposing of placentas, according to local custom. The preferred option for specific infectious waste (such as blood samples, plastic syringes and laboratory tests) is steam sterilization before disposal, if available. This avoids environmental pollution from incineration. One autoclave should be dedicated for waste sterilization, different from the autoclave used for sterilizing medical devices within the laboratory; Non-sharps non-infectious waste should be buried in a pit, a landfill site or preferably recycled in non-food and non-medical items. If space is limited, non-sharps non-infectious waste should be incinerated. Ashes and residues should be buried in a pit; and There are several kinds of hazardous waste and each requires specific treatment and disposal methods, which include encapsulation, sterilization, burial, incineration and long-term storage. Some wastes, such as pharmaceutical wastes, cannot be disposed of in low-cost settings and should be sent to a large centre for destruction or returned to the supplier. In all cases, national legislation should be followed.
Waste-disposal zone	<ul style="list-style-type: none"> The waste-disposal zone should be fenced off and mark the storage areas with a biohazard symbol (Figure-6.23). It should have a water point with soap or detergent and disinfectant for handwashing or to clean and disinfect containers, It should have facilities for wastewater disposal into a soak away system or sewer. The waste-disposal zone should also be located at least 30 meters from groundwater sources. Where an incinerator is used, it should be located to allow effective operation with minimal local air pollution in the health center, nearby housing and crops, and it should be large enough for extension if new pits or other facilities have to be built.

6.13 GUIDELINE -13: BUILDING DESIGN, CONSTRUCTION AND MANAGEMENT

A clean environment plays an important role in the prevention of hospital- associated infections (HAIs). Many factors, including the design of patient care areas, operating rooms, air quality, water supply and the laundry, can significantly influence the transmission of HAIs. Buildings are designed, constructed and managed to provide a healthy and comfortable environment for patients, staff and Care giver.

6.13.1 Guidance Notes

Ventilation:

Ventilation systems should be designed and maintained to minimize microbial contamination. The air conditioning filters should be cleaned periodically (at least once in every year) and fans that can spread airborne pathogens should be avoided in high-risk areas.

High-risk areas such as operating rooms, coronary/critical care units (CCU) and intensive care units (ICU) require special ventilation systems. Filtration systems (air handling units) designed to provide clean air should have high efficiency particulate air (HEPA) filters in high-risk areas. Unidirectional laminar airflow systems should be available in appropriate areas in the hospital construction. Ultra clean air is essential in some types of cardiac surgery/neurosurgery/implant surgery theatres and transplant units.

For the operating room, the critical parameters for air quality include:

- frequent maintenance/cleaning/validation of efficacy of filters (in accordance with manufacturer's requirements);
- pressure gradient across the filter bed and in the operation theatre;
- temperature should be maintained between 20°C and 22°C and humidity between 30% and 60% to inhibit bacterial multiplication;
- general areas should be well ventilated if they are not air-conditioned.

Special air handling for airborne precautions

An air-conditioned single room with an exhaust or a well-ventilated room are adequate options for health care facilities. If an air-conditioned single room is not available as in many resource poor settings, a fan can be placed in the room to direct airflow towards an outside window. The door/s to the aisle or other rooms should be kept closed at all times.

Protective environment

A protective environment may be required for some neutropenic patients. Ultra clean unidirectional air may be required in some units such as haematology or intensive care due to the level of immunosuppression of the patients. To minimize airborne particles, air must be circulated into the room with a velocity of at least 0.25m/sec through a high efficiency particulate air (HEPA) filter. The HEPA filter removes particles to a certain defined size. Other important ways of protecting patients with severely lowered immune systems include:

- Health care workers and visitors should avoid contact with the patient if they have any infections (for example, upper respiratory tract infections or herpes simplex blisters).
- Where appropriate, staff and visitors should wear personal protective equipment to protect the patient from micro-organisms.
- Do not put flowers or plants in the room.
- Ensure a tidy environment.
- Environmental cleaning should be done at least in every hour.
- Do not use aerosol
- Use strict aseptic techniques for all clinical procedures.

Lighting

Natural light may be sufficient in outpatient settings that operate only during the day. However, some form of lighting should be available for night-time emergencies. In isolated inpatient settings (such as rural hospitals) and in temporary structures (such as cholera treatment centres), generators or solar panels and batteries are likely to be required and provision for these should be made. As a minimum, a safe type of kerosene or gas lantern and powerful hand torches should be available.

Movement between areas

Given the size and complexity of the health-care setting and the resources available, activities should be organized in zones, with the flow of people, equipment and materials managed so as to minimize movements from “dirty” to “clean” zones. Services should be located in relation to each other so as to facilitate hygienic management. For instance, the sterilization service should be close to the operating theatre.

Water

The health care facility should provide safe water. Water storage tanks should be cleaned regularly and the quality of water should be sampled periodically to check for bacterial contamination. Where safe water is not available for drinking, boil water for 1 minute to render it safe (Centre for Diseases Control, CDC). Alternatively, use water purification units. Store water in a hygienic environment. Do not allow hands to enter the storage container. Dispense water from storage container by an outlet fitted with a closure device or tap. Clean the storage containers and water coolers regularly.

Cleaning

All surfaces should be easy to clean by wet mopping and should be able to withstand repeated exposure to hot water, detergents and disinfectants.

Walls, floors and ceiling surfaces should be smooth and made of non-porous materials that are easy to clean and that do not provide a suitable environment for pathogen survival or development. The same is true for furniture and equipment used for patient care.

Building design

The building of new health-care settings or the improvement of existing ones should be in line with national building codes and standard health-care setting building designs. For example, beds for patients should be separated by a minimum of one meter and should be easily accessible by people with disability and/or elderly.

6.14 GUIDELINE -14: CONTROL OF VECTOR-BORNE DISEASE

Patients, staff and Care giver are protected from potential disease transmitting vectors.

6.14.1 Guidance Notes for Guideline -14

Minimizing disease vectors

- Appropriate and effective methods for excluding or reducing vector numbers depend on the type of vector, the location and number or size of breeding sites, vector habits, including places and times of resting, feeding and biting, and resistance of specific vector populations to control chemicals;
- Mosquitoes and flies can effectively be excluded from buildings by covering opening windows with fly screens and fitting self-closing doors to the outside; and
- Use of chemical controls, such as for residual insecticide spraying, in and around the health-care setting requires advice and advice may be seek from the MoH&FW or the department of agriculture extension (DAE).

Protect patients and staff from vector-borne disease

Once inside the health-care setting, patients, staff and Care giver may be protected from certain vectors through the use of barriers (e.g. insecticide bed nets against mosquitoes or covered food storage to prevent contamination by rats and flies) or repellents.

Patients with vector-borne diseases, such as malaria, Lassa fever and typhus, should be treated or protected to ensure that the related vectors do not transmit the disease from them to other people in the health-care setting. This may require removal of the vectors (e.g. insecticide dusting to remove lice from typhus patients) or the use of a barrier (e.g. insecticide bed nets to isolate malaria patients from mosquitoes).

Prevent spread of vectors

Infectious substances such as excreta and soiled dressings should be disposed of immediately and completely to prevent flies and other mechanical vectors from carrying pathogens to food, eyes, wounds, etc., or distributing them to the environment.

6.15 GUIDELINE-15: AWARENESS AND HYGIENE PROMOTION

Hygiene promotion and awareness has vital role to ensure proper use of water, sanitation and waste facilities and there by achieve the intended benefit from their use. HCF Managers, doctors, nurse and staff have important role in hygiene promotion and can:

- assess training needs of the staff and provide required training through awareness programmes, in-service education and on-the-job training;
- organize regular training programmes for the staff for essential infection control practices that are appropriate to their job description;
- provide periodic re-training or orientation of staff; and review the impact of training.

6.15.1 Guidance Notes for Hygiene promotion

- Infection control should be a core part of any refresher trainings
- Ensure training to be carried out on regular basis to sustain knowledge and awareness of staff
- Health care staff, who has time should provide information and explain to patients and care giver about the desired behaviors for limiting disease transmission.
- Posters and other visual information should be used to promote disease control among patients and care giver.
- Senior staff should play role models for others by complying consistently with procedures.
- Visual information should be relevant to risk practices, it should be understood by the target audience and it should provide practical and realistic advice and information.
- Patients' and Care giver' contact with the health-care setting should be used as a means to promote hygiene in the community. Both during normal periods and during epidemics, health-care settings should be actively involved in preventive health care through hygiene promotion.
- Build facilities to practice health and hygiene behaviors. For example, staff are unlikely to comply fully with handwashing procedures if there are no handwashing facilities close to where they care for patients.

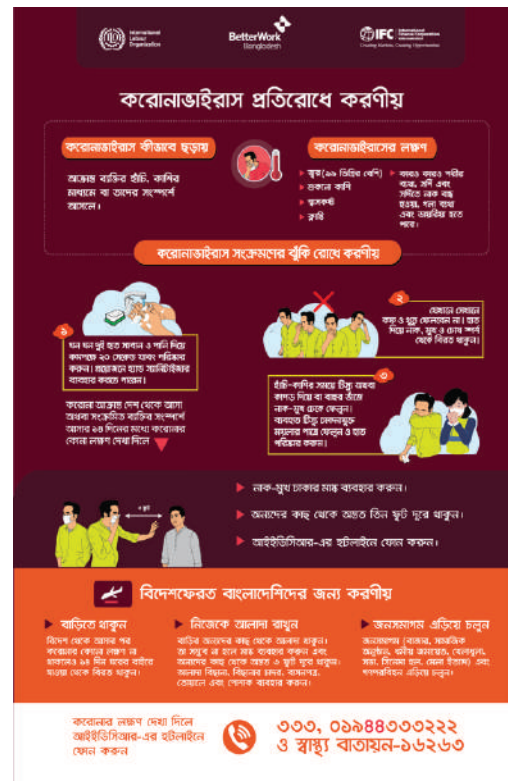


Figure 6.25 : Communication poster for COVID-19

6.16 GUIDELINE-16: WASH SERVICES DURING EMERGENCY

In implementing the immediate emergency response actions on WASH, HCFs should aim at addressing the critical and priority needs resulting from an emergency. In this regard, they will be required to item wise the common priority needs of WASH depending on the nature of the emergency. First priority response actions should aim at reducing chances of:

- Infections to health care workers who are providing services at the HCFs or designated emergency centers.
- Infections amongst the affected communities being attended at the HCF or in designated emergency centers.

6.16.1 Rationale of WASH Services in Emergencies

Emergency situations referred to in these guidelines are any emerging and re-emerging diseases that disrupt routine functioning of HCFs which need urgent or immediate attention. The disruption may lead to a total or partial suspension of WASH related services. These diseases include; SARS (COVID 19), diarrhea, Cholera, dysentery, malaria etc. An overwhelmingly surge in the number of patients resulting from these incidences may significantly increase the risks of infection transmission specifically if there is inadequate water supply, sanitation facilities and hygiene to cope with the influx of the patients. Furthermore, HCFs may find themselves having insufficient numbers of staff to deal with control, cleaning, disinfection and waste collection requirements. It is a common phenomenon for many HCFs to face challenges and difficulties in meeting the WASH needs during such emergencies mainly due to:

- (i) Lack of preparedness and mitigation response plans;
- (ii) Lack of collaborative primary assessment of the event in all hazard approach; and
- (iii) Lack of a proper emergency management framework

This chapter therefore, provides procedures in a stepwise manner to be implemented by the HCFs in collaboration with respective Government departments/agencies, Local Government Institutions (districts, upazilas, unions and wards) and other related organization such as humanitarian agencies (UN, INGOs, LNGOs, DPs), Private Organizations (POs), water supply and sewerage authorities (WASA), City Corporation and Municipality/Pourashava in addressing WASH issues during emergencies. It needs minimum WASH standards during emergencies regardless of type or size of HCFs in order to maintain their daily operations and patient care services. In other words, it is imperative for HCFs to have in place an emergency plan to respond to and recover from total or partial interruption of WASH services.

6.16.2 Preparedness and Response Planning

The appropriate response to WASH in emergencies will depend on the nature of the emergency and the effectiveness of mitigation measures of the HCFs. This response will be largely determined by the availability of the appropriate response plan that has been validated through various simulations during preparedness phase. Hence, it is very much encouraged to have the response plan detailing roles and responsibilities of various sectors/actors involved.

6.16.3 Conduct Rapid Assessment of WASH

A thorough needs assessment is crucial for informing authorities and different actors on the requirements and for a successful emergency response. The needs assessment results will inform the responsible authorities at national, regional, district, upazila, union/wards HCF levels of the priorities and the magnitude of the problems/impacts as well as on the needs requiring external support. In this regards, the WASH in HCF coordination committees at different levels in collaboration with other members or other committees (if exist) will be responsible to carry out the need assessment during emergency.

6.16.4 Infection, Prevention and Control of COVID 19 in HCFs

The virus get transmitted mainly from person-to-person through:-

COVID-19 spreads primarily from person to person. This can be via droplets released (within about 3-6 feet) when people sick with the new coronavirus cough or sneeze. It can also spread when you're in close contact with someone who's sick – e.g. when you hug or shake hands.

Video link: [https://www.youtube.com/watch?v=amhGusq3esM\(1m29s\)](https://www.youtube.com/watch?v=amhGusq3esM(1m29s))



Figure 6.26 : COVID-19 Transmission

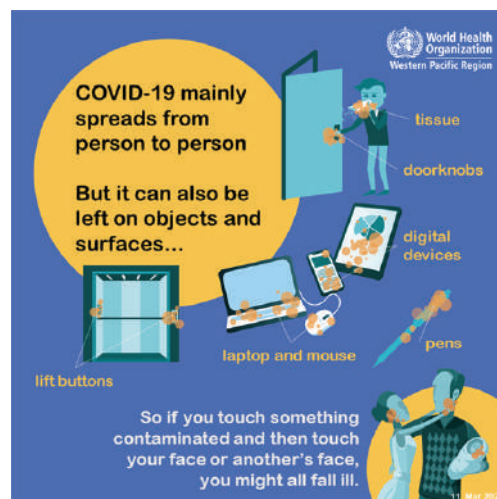


Figure 6.27 : COVID-19 Transmission

- COVID-19 spreads primarily through close contact with someone who is infected, but it can also spread if you touch contaminated objects and surfaces

See video link: <https://www.youtube.com/watch?v=WfJSVbQtHsk>

6.16.4.1 Prevention of COVID-19:

1. By preventing exposure to the virus through:
 - Personal protection- use PPE, wash/sanitize hands
 - Decontamination of surfaces/rooms/equipment/items
 - Decontamination, management and dispose of waste
2. By using vaccine or specific antiviral when available.

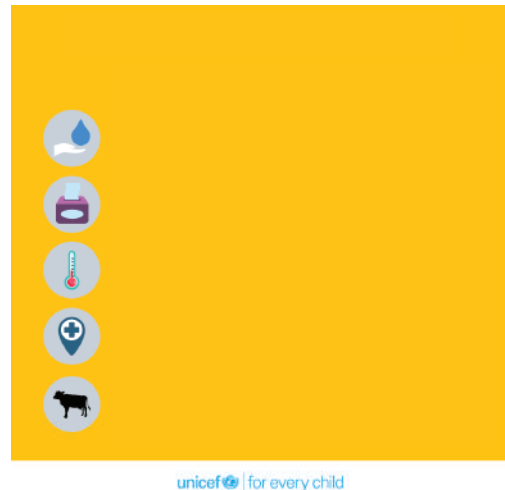


Figure 6.28 : COVID-19 Prevention

6.16.4.2 Personal Protection: Steps

- Perform hand hygiene (hand wash and/or hand rub)
<https://www.youtube.com/watch?v=L-QWai6n1Bk&feature=youtu.be>
- Avoid touching of eyes, nose and mouth during work



Figure 6.29: Symbol of avoid touching eyes, nose or mouth.

- Ensure wearing PPE during patient care
- Avoid travel to COVID-19 outbreak area
- Limit mass gathering or avoid crowd

Protect others: Steps

If sick/infected, report to authority, follow treatment-management

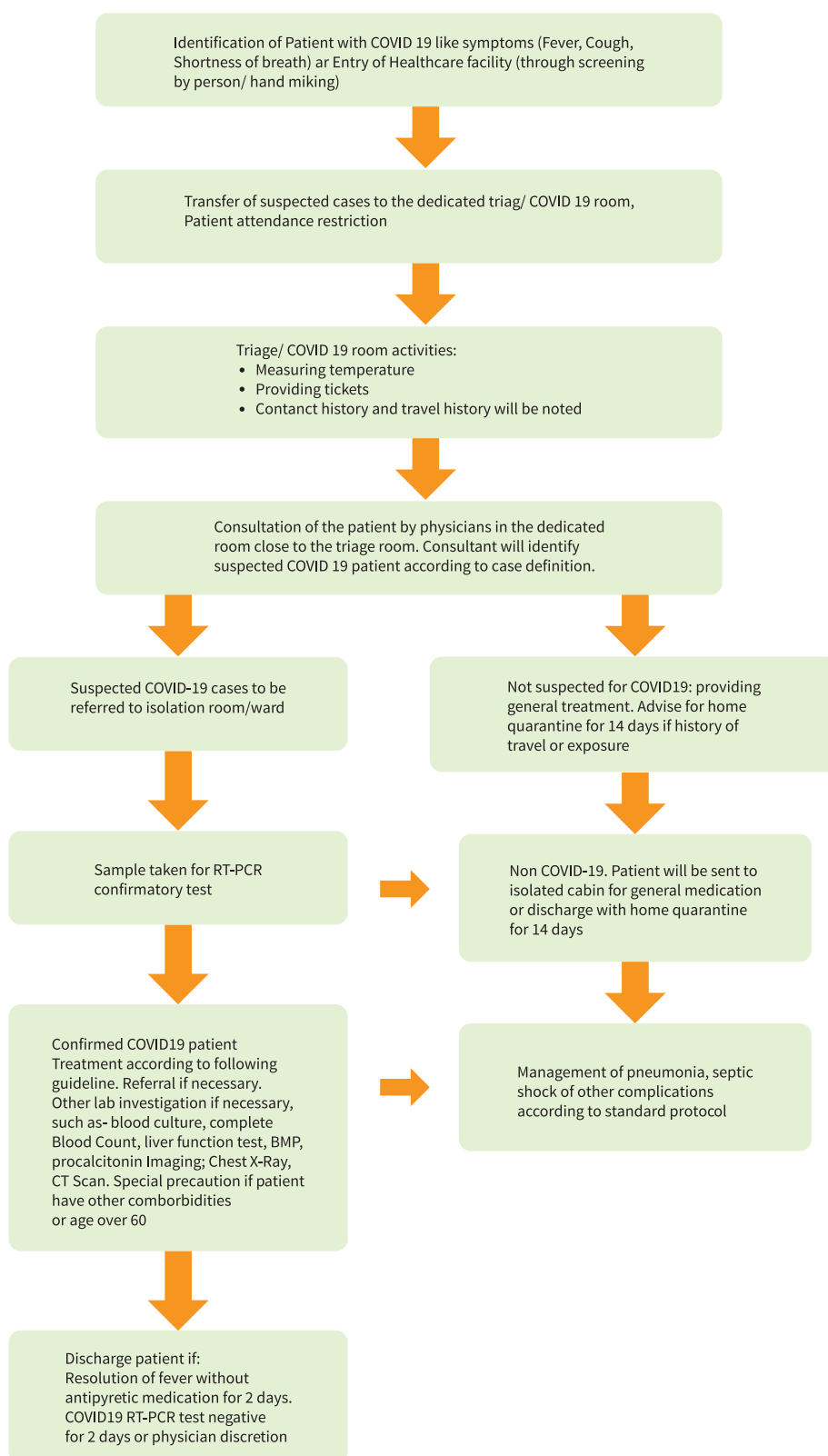
- Stay at home or isolation facilities
- Wear mask
- Wash hand before or after work
- Maintain at least 3 feet distance from other
- Decontaminate surface/equipment/material



Figure 6.30 : COVID-19 protection steps

This video link: <https://www.youtube.com/watch?v=9Ay4u7OY0hA> explains 6 steps to prevent from COVID 19

6.16.4.3 Flow Chart of COVID 19 Management in Hospital



6.16.5 Guidance Notes

Effect suspected	Essential Emergency Control Measures
Excreta disposal	<ul style="list-style-type: none"> • Provide sufficient numbers of staff toilets for both male and female; • Provide sufficient toilets for patients and Care giver for both male and female; • Provide toilets for people with special needs for both male and female; • Provide female toilet with MHM with disposal facilities; • Avoid contamination of water sources; • Provide properly functioning septic tanks and soakage pit or public sewer. • Dispose properly wastewater from hand washing facilities, bathing, cleaning and
Wastewater disposal	<ul style="list-style-type: none"> • Provide sound drainage system; • Provide properly functioning septic tanks and soakage pit or public sewer.
Storm water management	<ul style="list-style-type: none"> • Design storm water drainage to prevent carrying potentially infectious material away from the health care facility into the community; • Frequently clean storm water drainage to avoid blockage.
Health-care waste management	<ul style="list-style-type: none"> • Safely segregate, store, collect, transport, treat and dispose of health-care waste; • Provide adequate coloured coded containers with liners and covers for health care waste segregation; • Provide HCWs with appropriate personal protective equipment (PPE) • Construct a fence around HCF waste collection point; • Empty collection bins whenever necessary; • Orient/ re-orient HCWs on health care waste management.

Some of the video links

<https://www.youtube.com/watch?v=9Ay4u7OYOhA>

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>

<https://www.youtube.com/watch?v=7srwrF9MGdw>

<https://www.youtube.com/watch?v=WfJSVbQtHsk>

<https://www.youtube.com/watch?v=9pVy8sRC440>

<https://www.youtube.com/watch?v=d914EnpU4Fo>

<https://www.youtube.com/watch?v=uOtg3C8dqLY>

<https://www.youtube.com/watch?v=Dh2dCWk85Zw>

<https://youtu.be/L-QWAI6n1Bk>

CHAPTER 7

7.0 ASSESSMENT CHECKLIST

The following checklist (Table 7.1) provides a set of assessment questions for each of the major guidelines presented in Chapter-6, to measure the service level available in a health care facility. The indicators under the relevant guideline can be measured or monitored through answering the questions below. The assessment will also help the hospital management or authority where the actions have to be taken immediately to improve the service delivery to the service seekers and service providers.

Table 7.1: Assessment Checklist

Item	Question	Indicator
Water	• Is water available from an improved source	Advanced service: (Q1,2 and 3 are Yes)
	• Is water source located on HCF premise?	
	• Are water facilities/points easily accessible and water available round the year?	Basic Service: (Q1 and 2 are Yes)
		Limited Service (Q1 Yes; Q2 No) No service (Q1 is No)

Item	Question	Indicator
Sanitation	• Are toilets improved and usable?	Advanced: (Q1, 2 & 3 are Yes)
	• Are separate toilets available for staff, females (with MHM) and disabled people?	Basic Service: (Q1 and 2 are Yes)
	• Are the toilets hygienic or clean all the time to use?	Limited Service (Q1 is Yes only)
		No service (Q1 is No)
Hygiene	• Do the HCF has functional hand washing facilities with water and soap or alcohol-based hand rub?	Advanced: (Q1, 2 & 3 are Yes)
	• Are hand washing facilities available both at the points of care and within 5 meters of toilet?	Basic Service: (Q1, & 2 are Yes)
	• Do the HCF has available hand sanitizer points at the wards or at critical points?	Limited Service (Q1 Yes, Q2 partly Yes)
		No service (Q1 & 2 are No)
Health Care Waste	• Are wastes segregated at source and collected into at least three colored bins?	Advanced: (Q1, 2, 3 & 4 are Yes)
	• Are there appropriate treatment and disposal facilities for sharp and infectious wastes in place?	Basic Service: (Q1 and 2 are Yes)
	• Are cleaners or the staff for collection and handling wastes trained?	Limited Service (Q1,2 are partly Yes)
	• Are there handwashing facilities at waste management sites?	No service (Q1 is No)
Waste Water	• Is there appropriate drainage system in place?	Wastewater is disposed of rapidly and safely.
	• Is the drainage system functioning?	
Environmental Cleaning	• Are basic protocols for cleaning available?	Advanced: (Q1, 2, & 3 are Yes)
	• Did the staff with cleaning responsibilities receive training?	Basic Service: (Q1 and 2 are Yes)
	• Is the floor surface and surroundings of HCF visibly clean?	Limited Service (Q1, or Q2 is Yes)
		No service (Q1 & Q2 are No)

CHAPTER 8

8.1 MONITORING OF WASH IN HEALTH CARE FACILITIES – WHY?

The primary objective of monitoring WASH services in HCFs is to measure the extent to which the set guidelines (i.e. minimum WASH standards in HCFs) are observed to and identify areas for remedial actions. Through the process of monitoring, key stakeholders at different levels and HCFs at wards (urban), union, upazila, district, divisional and national level HCFs/Medical Academic Institutes will be informed of the WASH status and actions needed for improvement. The periodic feedback on the WASH status in HCFs is critical in making informed decisions aimed at maintaining improved WASH in health care facilities in the country and reporting the national achievements. In this context, monitoring will involve:

- Measuring the level of adherence by the HCFs in maintaining the minimum standards of WASH services as prescribed in these guidelines;
- Identifying any shortfalls in the O&M of WASH facilities; and
- Alerting actors at different levels of the needed remedial actions either in the design or construction of the WASH facilities.

8.2 WHAT TO MONITOR?

Monitoring of WASH in HCFs will be a regular and continuing function that will primarily aim at providing the HCF health management teams and other stakeholders with information on the provision of minimum

standards of WASH services. In order to achieve this, several indicators have been developed to guide the monitors on what they should look for during the process (see chapter 7). In this regard, indicators have been developed around water, sanitation, hygiene, health care wastes, waste water and environmental cleaning in HCFs. These indicators should be included in the DHIS2 of DGHS.

8.3 WHO AND WHEN TO MONITOR?

Institutionally, the health sector at all levels is responsible for monitoring and following up of implementation and progress as well as status of WASH services in all HCFs in the country. However, in order to ensure ownership of the process a bottom-up participatory approach will be adopted in accessing the data, starting from ward (urban), union HCFs to upazila, district, division and eventually through national level.

WASH monitoring will therefore, be undertaken at three levels of HCFs namely, Upazila, District and central or national levels. In this way monitoring teams will be structured in a cascading manner from the ward/union to the national level. The Focal Person of the HCF or the responsible information technology (IT) person will upload the respective verified data on DHIS2 system.

8.4 REPORTING

Reporting of progress in the implementation of WASH in HCFs and the minimum national standards should be done monthly by the respective authority of HCFs and different stakeholders at different levels and forwarded to their respective reporting authority. Report will also reflect the corrective measures those need to be addressed for future correction or modification of the implementation plan.

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Annexure-1

WHO Minimum WASH Standards in Health Care Facilities, 2008

Item	Recommendation	Explanation
Water quantity	5-100 litres/person/day	Outpatient services require less water, while operating theaters and delivery rooms require more water. The upper limit is for viral haemorrhagic fever (e.g. Ebola) isolation centres.
Water access	On-site supplies	Water should be available within all treatment wards and in waiting areas.
Water quality	Less than 1 Escheria coli/ thermotolerant total coliform per 100 ml. Presence of residual disinfectant. Water safety plans in place.	Drinking- water should comply with WHO Guidelines for water Quality for microbial, chemical and physical aspects. Facilities should adopt a risk management approach to ensure drinking-water safe.
Sanitation quantity	1 toilet for every 20 users for inpatient setting. At least 4 toilets per outpatient setting. Separate toilets for patients and staff.	Sufficient number of toilets should be available for patients, staff and visitors.
Sanitation access	On-site facilities.	Sanitation facilities should be within the facility grounds and accessible to all types of users (females, males, those with disabilities).
Sanitation quality	Appropriate for local technical and financial conditions, safe, clean, accessible to all users including those with reduced mobility	Toilets should be built according to technical specifications to ensure excreta are safely managed.
Hygiene	A reliable water point with soap or alcohol based hand rubs available in all treatment areas, waiting rooms and near latrines for patients and staff.	Water and soap (or alcohol based hand rubs) should be available in all key areas of the facility for ensuring safe hand hygiene practices.

Annexure-2

BNBC Water Requirements for Health Care Facilities

Class of Occupancy	Occupancy Group	Full Facilities (lpcd)*	Restricted Facilities (lpcd)
D: Health care Facilities	D1		
	: Normal Medical Facilities (small hospitals)	342	225
	: Big Hospitals (Over 100 beds)	450	250
	D2		
	: Emergency Medical Facilities	300	135
	: Nurses & Medical Quarters	250	135

* For full facility in occupancy classifications A, B, C and D, the water requirement value includes 25% hot water.

Annexure-3

BNBC Sanitation and Hygiene facilities requirement

Type of building occupancy	Water closet*	Wash basin***	Bathtus or shower	Urinals (for men)**	Drinking fountains	Other fixtures
D: Health Care Facilities						
D1 : Normal Medical Facilities (Indoor patient ward)	MALE			-	1 per 75 patients	Service sink: 1 per each ward Bedpan washing sink: 1 for each ward Kitchen sink: 1 per each kitchen
	1 per 8 patients	2 for 30 patients and add 1 fixture per additional 30 patients	1 per 8 patients			
	FEMALE					
	1 per 8 patients	2 for 30 patients and add 1 fixture per additional 30 patients	1 per 8 patients			
D1 : Normal Medical Facilities (Outdoor patient ward) D2 : Emergency Medical facilities	MALE			1 per 50	1 per 500	Service sink: 1 per each ward
	1 per 100 patients	1 per 100 patients				
	FEMALE					
	2 per 100 patients	1 per 100 patients				

*Some of the water closets may be of European style. The water closet(s) shall not be oriented in the east-west direction.

** The urinal(s) shall not be oriented in the east-west direction.

*** Toilet(s) of public use shall have at least one water tap with adequate drainage arrangement per ablution purpose when the numbers of devotees exceed twenty.

Annexure-4

Minimum Vent Stack Size in Bedpan Drainage

No of Bedpan Washer	Diameter (mm)
Up to 3 bedpan washers at different floors	50
4 to 6 bedpan washers	75
7 to 12 bedpan washers	100

Annexure-5

Minimum Vent Stack Size in Bedpan Drainage

Committee	TOR	Configuration of Committee
District Coordination Committee (DCC)	<ul style="list-style-type: none"> Facilitating collaboration among partners; Oversee and Review progress and resolve bottlenecks that impede activities progress; Facilitating the integration of new standards/ guidelines and monitoring mechanisms Regular reporting of WASH monitoring data through DHIS 2 ; Mobilizing resources for implementing the WASH related activities; Sustain advocacy for local resource mobilization Sustain advocacy for the WASH in HCFs related activities; Provide strategic technical support as necessary; and Providing opportunities for sharing learning. Working closely with Quality Improvement Committee. 	<p>Chairperson-Civil Surgeon</p> <p>Members:</p> <p>Representative from DDFP;</p> <p>Superintendent of District hospital;</p> <p>Representative from EE, PWD;</p> <p>Representative from EE, HED;</p> <p>Representative from EE, DPHE;</p> <p>All UHFPO;</p> <p>Related NGO representative;</p> <p>Representative from private hospital;</p> <p>Representative from City Corporation/Pourashava</p> <p>MO of the CS office will work as member-secretary</p>
Upazila Coordination Committee (UCC)	<ul style="list-style-type: none"> Facilitating collaboration among partners; Oversee and Review progress and resolve bottlenecks that impede activities progress; Facilitating the integration of new standards/ guidelines and monitoring mechanisms Regular reporting of WASH monitoring data through DHIS 2 ; Mobilizing resources for implementing the WASH related activities; Sustain advocacy for local resource mobilization Sustain advocacy for the WASH in HCFs related activities; Provide strategic technical support as necessary; and Providing opportunities for sharing learning. Working closely with Quality improvement Committee. 	<p>Chairperson-UHFPO</p> <p>Members:</p> <p>Representative from UHFWC;</p> <p>;</p> <p>Representative from EE, PWD;</p> <p>Representative from EE, HED;</p> <p>Representative from AE, DPHE;</p> <p>Representative from all UHC, CC;</p> <p>Related NGO representative;</p> <p>Representative from private hospital/Clinic; and</p> <p>Representative from Upazila/Union</p> <p>RMO of Upazila hospital will work as member secretary</p>

Annexure-6

BNBC Sanitation and Hygiene facilities requirement

Materials	Standards
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D1527, ASTM D2282
Brass pipe	ASTM B43
Cast iron water pipe	ASTM D377
Copper or Copper-alloy pipe	ASTM B42, ASTM B302
Copper or Copper-alloy tubing	ASTM B75, ASTM B88, ASTM B251, ASTM B447
Chlorinated polyvinyl chloride (CPVC) pipe	ASTM D2846, ASTM F441, ASTM F442
Galvanized steel pipe	ASTM A53
Polybutylene (PB) plastic pipe and tubing	ASTM D2662, ASTM D2666, ASTM D3309
Polyethylene (PE) plastic pipe and tubing	ASTM D2239, ASTM D2737
PVC plastic pipe	ASTM D1785, ASTM D2241, ASTM D2672

Annexure-7

Water Distribution Pipe

Materials	Standard
Brass pipe	STM B43
Copper or Copper-alloy pipe	ASTM B42, ASTM B302
Copper or Copper-alloy tubing	ASTM B75, ASTM B88, ASTM B251, ASTM B477
CPVC plastic pipe and tubing	ASTM D2846, ASTM F441, ASTM F442
Galvanized steel pipe	ASTM A53
PVC plastic pipe	ASTM D1785, ASTM D2241, ASTM D2672

Annexure-8

Working Pressure Range of Different Types of uPVC (Un-plasticized PVC) Pipes

Material;	Type/Class	Bar	Kg/cm2
uPVC	Class - B	6.0	6.12
uPVC	Class - C	9.0	9.19
uPVC	Class - D	12.0	12.15
uPVC	Class - E	15.0	15.3

Annexure-9

Water Supply Pipe Fittings

Material	Standard
Cast iron	ASME B16.4, ASME B16.12
Copper or copper alloy	ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.23, ASME B16.26, ASME B16.29, ASME B16.32
Grey iron and ductile iron	AWWA C110, ISO 2531
Malleable iron	ASME B16.3
Plastic , uPVC	ASTM D2464, ASTM D2466, ASTM D2467, ASTM D2609, ASTM F409, ASTM F437, ASTM F438, ASTM F439
Steel	ASME B16.9, ASME B16.11, ASME B16.28

Annexure-10

Recommended Standards for Sanitary Appliances

Appliances	Standard
Ceramic wash basin and pedestals	BDS 1162-87
Ceramic wash down water closet pans	BS 1213
Foot rest vitreous china	BDS 1163-87 part 1, 4
Integrated squatting pans vitreous china	BDS 1163-87 part 1, 5
Metal hand rinse basin	BS 1329
Metal sink for domestic purpose	BS 1244, 3
Urinals (bowl type) vitreous china	BDS 1163-87 part 1
Wash-down water closet pans, vitreous china	BDS 1163-87 part 1, 2
Water closet seat plastic	BS 1254
Water closet flushing cisterns and pipes	BS 1125

Annexure-11

Table 8.6.3(b): Recommended Standards for Building Drainage and Vent Pipe

Materials	Standard
Acrylonitrile butadiene styrene (ABS plastic pipe)	ASTM D2661, ASTM F 628
Aluminum tubing	ASTM B429, ASTM B745M
Brass pipe	ASTM B43
Cast iron pipe	ASTM A74
Copper or Copper-alloy tubing	ASTM B75M, ASTM B88M, ASTM B251M, ASTM B306
Galvanized steel pipe	ASTM A53
Polyvinyl chloride plastic pipe	ASTM D2665, ASTM D2949, ASTM F891

Annexure-12

Specification of Hand Washing Facilities in HCFs (WHO, 2005)

HW Facility	Specifications
Handwashing basin	<ul style="list-style-type: none"> Hand washing facilities (sink, water, soap, antiseptic and paper towel or drier) should be provided for all toilet compartments and sections/rooms which provides services; Should be made of non-porous material, round shape inside with dimensions of 25cm by 35cm depth and without overflow; Should be of elbow, foot or automatic operating taps, uPVC traps and plastic gadgets; Should be a wall-mounted basin fixed at 120cm above floor.
Soap/detergents dispenser	Should be soap dispenser (manual or automatic);
Hand drying equipment/ materials	<ul style="list-style-type: none"> Should be a centered feed hand towel dispenser; Hand drying material should be a disposable paper towel.
Water supply	Both hot and cold water should be provided.
Sanitizer	Should be used when hands are visibly clean and should be placed at suitable location so that it can be used at the time of needs.
Waste bin	Should be a round black/blue pedal bin of 12 liters (340mm (height) x 270mm (diameter)).
Hand washing basin for dis- abled people	Wheel chair accessible hand wash basin which is wall mounted with dimensions of 510 mm (length) by 685mm (width).

Annexure-13

Table 8.6.3(e): Recommended Standards for Joints between Different Pipes and Fittings

Material	Standard
ABS plastic pipe and fittings	ASTM D2235, ASTM D2661, ASTM D3212, ASTM F628 ASME B1.20.1
Aluminum tubing	ASTM C564
Brass pipe and fittings	ASME B1.20.1
Cast iron pipe and fittings	ASTM C564
Copper or Copper-alloy pipe and fittings	ASTM B32, ASME B1.20.1
Copper-alloy tubing and fittings	ASTM B32
CPVC plastic pipe and fittings	ASTM F493, ASME B1.20.1
Galvanized steel pipe and fittings	ASME B1.20.1
PE plastic pipe and fittings	ASTM D2657
PVC plastic pipe and fittings	ASTM D2657, ASTM D2855, ASTM D3139, ASTM D3212, ASTM F402, ASTM F656, ASME B1.20.1

Annexure-14

Recommended Standards for Building Drainage and Vent Pipe

Materials	Standard
Acrylonitrile butadiene styrene (ABS plastic pipe)	ASTM D2661, ASTM F 628
Aluminum tubing	ASTM B429, ASTM B745M
Brass pipe	ASTM B43
Cast iron pipe	ASTM A74
Copper or Copper-alloy tubing	ASTM B75M, ASTM B88M, ASTM B251M, ASTM B306
Galvanized steel pipe	ASTM A53
Polyvinyl chloride plastic pipe	ASTM D2665, ASTM D2949, ASTM F891

Annexure-15

Table 8.6.3(e): Recommended Standards for Joints between Different Pipes and Fittings

Material	Standard
ABS plastic pipe and fittings	ASTM D2235, ASTM D2661, ASTM D3212, ASTM F628 ASME B1.20.1
Aluminum tubing	ASTM C564
Brass pipe and fittings	ASME B1.20.1
Cast iron pipe and fittings	ASTM C564
Copper or Copper-alloy pipe and fittings	ASTM B32, ASME B1.20.1
Copper-alloy tubing and fittings	ASTM B32
CPVC plastic pipe and fittings	ASTM F493, ASME B1.20.1
Galvanized steel pipe and fittings	ASME B1.20.1
PE plastic pipe and fittings	ASTM D2657
PVC plastic pipe and fittings	ASTM D2657, ASTM D2855, ASTM D3139, ASTM D3212, ASTM F402, ASTM F656, ASME B1.20.1

Annexure-16

Laboratory Grade Water (CAP / CLSI)

	Type I	Type II	Type III
Conductivity (Micro Siemens)	<0.1	<0.5	<10.0
Resistivity (Megohm-cm)	>10.0	>2.0	>1.0
Bacteria (CFU/ml)	<10.0	10	N/A
Silicate (mg/L)	<0.05	<0.1	<1.0
Total Solids (mg/L)	0.1	1	5
TOC (mg/L)	<0.05	<0.2	1
PH	-	-	5.0 – 8.0

Annexure-17

ASTM Standard for Reagent Grade Water (D1193-99e1)

	Type I	Type II	Type III	Type IV
Electrical Conductivity (Micro Siemens)	0.056	1	0.25	5
Electrical Resistivity (Megohm-cm)	18	1	4	0.2
Endotoxin (EU)	<0.03	0.25		
TOC (ug/L)	50	50	200	No Limit
Sodium (ug/L)	1	5	10	50
Chlorides (ug/L)	1	5	10	50
Total Silica (ug/L)	3	3	500	No Limit
PH				5.0 – 8.0
Special Requirements	0.2 um membrane filter*	Prepared by distillation	0.45 um membrane filter	

Pharmacopeia Grade Water

	USP 24 – Purified	EP – Purified
Conductivity (Micro Siemens)	<1.3 uS/cm at 25°C	<4.3 uS/cm at 20°C
Bacteria	<100 CFU/ml	<100 CFU/ml
Endotoxin (EU)	-	<0.25 EU/ml
TOC	<500 ug/L	<500 ug/L
Nitrates	-	<0.2 ppm
Heavy Metals	-	<0.1 ppm

Annexure-18

Water Quality for Medical Device Reprocessing AAMI TIR34:2007

Contaminant	Level
Bacteria	<10 CFU/mL
Endotoxin	<10 EU/mL
Total Organic Carbon (TOC)	<0.05 mg/L (ppm)
PH	N/A
Water Hardness	<1 ppm as CaCO ₃
Resistivity	>1,000,000 ohm/cm
Conductivity	<1 uS
Ionic Contaminants	
Chloride	<0.2 mg/L (ppm)
Iron	<0.2 mg/L (ppm)
Copper	<0.1 mg/L (ppm)
Manganese	<0.1 mg/L (ppm)

Annexure-19

CLSI Guide Line

CLRW (Clinical Laboratory Reagent Water) Type Water

Resistivity	10 megohm-cm
Bacteria	10 CFU/mL
TOC	500 ppb (ng/g)
Particulate and Colloid	Final 0.22 um Absolute Filter

Annexure -20

ASTM Standard for Biomedical Grade Water (D5196)

Electrical Resistivity (Megohm-cm)	
Measured at production point (no air)	10.0
Measured at storage tank (with air)	1.0
TOC (ug/L)	20.0
Heterotrophic Bacteria Count	<10/1000 mL
Endotoxin (EU/mL)	<0.03
Volatile Chlorinated Hydrocarbon (ug/L)	5.0
Arsenic (ug/L)	0.1
Cadmium (ug/L)	0.1
Chromium (ug/L)	1.0
Cobalt (ug/L)	1.0
Copper (ug/L)	1.0
Fluoride (ug/L)	1.0
Iron (ug/L)	1.0
Lead (ug/L)	1.0
Nickel (ug/L)	0.1
Potassium (ug/L)	2.0
Silica (Total) (ug/L)	6.0
Sodium (ug/L)	0.5
Titanium (ug/L)	1.0
Zinc (ug/L)	0.5
Acetate (ug/L)	3.0
Ammonia (ug/L)	1.0
Chloride (ug/L)	1.0
Chloroform (ug/L)	6.0
Formate (ug/L)	2.0
Nitrate (ug/L)	1.0
Phosphate	1.0
Phthalates (ug/L)	0.1
Sulfide (ug/L)	1.0
Sulfate (ug/L)	1.0

Dialysis Grade Water

	AAMI
Calcium (mg/L)	2 (0.2 mEq/L)
Magnesium (mg/L)	4 (0.3 mEq/L)
Potassium (mg/L)	8 (0.2 mEq/L)
Sodium (mg/L)	70 (3.0 mEq/L)
Antimony (mg/L)	0.006
Arsenic (mg/L)	0.005
Barium (mg/L)	0.1
Beryllium (mg/L)	0.0004
Cadmium (mg/L)	0.001
Chromium (mg/L)	0.014
Lead (mg/L)	0.005
Mercury (mg/L)	0.0002
Selenium (mg/L)	0.09
Silver (mg/L)	0.005
Aluminum (mg/L)	0.01
Chloramines (mg/L)	0.1
Free Chlorine (mg/L)	0.5
Copper (mg/L)	0.1
Fluoride (mg/L)	0.2
Nitrate (as N) (mg/L)	2
Sulfate (mg/L)	100
Thallium (mg/L)	0.002
Zinc (mg/L)	0.1
Total Viable Microbial Counts	<100 CFU/ml
Endotoxin	<0.25 EU/ml
Resistivity (Deionization Only)	>1 Megohm-cm at 25°C

Annexure-21

Table 4.4.1: Fire Protection Flow Requirements

Building Type	Sprinkler System (litre/min.)*	Standpipe and Hose System (litre/min.)*	Duration in Minutes for Building Heights		
			Upto 51m	51 m to 102 m	Above 102 m
Light hazard- I	1000	1000	30	38	45
Light hazard- II	1900	1900	50	62	75
Ordinary hazard- I	2650	1900	75	95	112
Ordinary hazard – II	3200	1900	75	95	112
Ordinary hazard – III	4800	1900	75	95	112

***Notes: Values will be for one riser serving floor area of 1000 m2.**

Light hazard – I: Occupancy groups, A1, A2, A3, E1

Light hazard – II: Occupancy groups, A4, A5, B, C, D, E2, E3, I2, I4,

Ordinary hazard – I: Occupancy groups, I1, I3, I5, F2, F3, G1

Ordinary hazard- II: Occupancy groups, G2, H1

Ordinary hazard- III: Occupancy groups, H2

Extra hazard: Occupancy group J- pressure and flow requirement for this group shall be determined by Fire Department but shall not be less than required value for Ordinary hazard - III

Capacity of Under Ground Reservoir = $1 \times \text{Total daily demand of water (m}^3\text{)} + 1 \text{ hr. reserve (m}^3\text{)}$ for firefighting (for tall building). For emergency requirement 2-3 days daily demand of water is sometimes stored

1 Calculation for 50 beds hospital at Upazila Level

Type	Nos. Patient (+one attendant per patient), considering 100% bed occupancy	Normal use, 120 lit/patient/day	Outpatient-10 lit / consultation/day	OT/Maternity unit (2 case / day), 150lit/day/case	Dry (15 consultation/day), 10 lit/consultation/day	wet (15 Consultation /day), 15 lit/ consultation/day	Inpatient therapeutic feeding centre 10 case / day, 100 lit/ patient/day)	Emergency -50 consultation (30 lit/ consultation/day), BNBC	Total water requirement	Grand Total- lit/day	Fire fighting requirement (1900lit/min for 50 min), BNBC
Inpatient	100	12000		300			1000		13300		
Outpatient	200		2000		150	225		1500	3875	17175	95000

	For single day	2 day storage in lit	2 day storage in m3
Capacity of the Ground Water tank	17125	34250	34.25
(consider reserve for 2 days)			
Add Fire fighting@1900lit/min for 50 min	95000	95000	95.00
Total		129250	129.25
			Say, 130 m3

2 Calculation for 100 beds hospital at Upazila Level

Type	Nos. Patient (+one attendant per patient), considering 100% bed occupancy	Normal use, 120 lit/patient/day	Outpatient-10 lit/ consultation/day	OT/Maternity unit (5 case / day), 150lit/day/case	Dry (20 consultation/day), 10 lit/consultation/day	wet (25 Consultation /day), 15 lit/ consultation/day	Inpatient therapeutic feeding centre 20 case / day, 100 lit/ patient/day)	Emergency - 50 consultation (30 lit/ consultation/day)	Total water requirement	Grand Total- lit/day	Fire fighting requirement (1900lit/min for 50 min), BNBC
Inpatient	200	24000		750			2000		26750		

Outpatient	300		3000		200	450		1500	5150	31900	95000
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	For single day	2 day storage in lit	2 day storage in m3
Capacity of the Ground Water tank (consider reserve for 2 days)	31900	63800	63.80
Add Fire fighting@1900lit/min for 50 min	95000	95000	95.00
Total		158800	158.80

Say, 159 m3

3 Calculation for 100 bed District Hospital

Type	Nos. Patient (+one attendant per patient), considering bed occupancy 137%	Normal use , 120 lit/patient/day)	Outpatient-10 lit/ consultation/day)	OT/Maternity unit (15 case / day), 150lit/ day/case	Dry (40 consultation/day), 10 lit/consultation/ day	wet (50 Consultation /day), 15 lit/ consultation/day	Inpatient therapeutic feeding centre 26 case /day, 100 lit/patient/ day)	Emergency -120 consultation (30 lit/ consultation/day),	Total water requirement	Grand Total- lit/day	Fire fighting requirement (1900lit/min for 50 min), BNBC
Inpatient	274	32880		2250			2600		37730	48480	
Outpatient	600		6000		400	750		3600	10750		95000

	For single day	2 day storage in lit	2 day storage in m3
Capacity of the Ground Water tank (consider reserve for 2 days)	48480	96960	96.96
Add Fire fighting@1900lit/min for 50 min	95000	95000	95.00
Total		191960	191.96

Say, 192 m3

4 Calculation for 250 beds hospital at district level

Type	Nos. Patient (+one attendant per patient), considering bed occupancy 137%	Normal use , 120 lit/patient/day	Outpatient-10 lit/ consultation/day	OT/Maternity unit (20 case / day), 150lit/ day/case	Dry (40 consultation/day), 10 lit/consultation/ day	wet (50 Consultation /day), 15 lit/ consultation/day	Inpatient therapeutic feeding centre 65 case /day, 100 lit/patient/ day)	Emergency - 120 consultation (30 lit/ consultation/day)	Total water requirement	Grand Total- lit/day	Fire fighting requirement (1900lit/min for 50 min), BNBC
Inpatient	685	82200		3000			6500		91700	102450	
Outpatient	600		6000		400		750	3600	10750		95000

	For single day	2 day storage in lit	2 day storage in m3
Capacity of the Ground Water tank	102450	204900	204.90
(consider reserve for 2 days)			
Add Fire fighting@1900lit/min for 50 min	95000	95000	95.00
Total		299900	299.90

Say, 300 m3

5 Calculation for 500 beds hospital at tertiary level

Type	Nos. Patient (+one attendant per patient), considering bed occupancy 153%	Normal use , 120 lit/patient/day	Outpatient-10 lit/ consultation/day	OT/Maternity unit (50 case / day), 150lit/ day/case	Dry (90 consultation/day), 10 lit/consultation/ day	wet (110 Consultation /day), 15 lit/consultation/ day	Inpatient therapeutic feeding centre 100 case /day, 100 lit/patient/ day)	Emergency - 120 consultation (30 lit/ consultation/day),	Total water requirement	Grand Total- lit/day	Fire fighting requirement (1900lit/min for 60 min), BNBC
Inpatient	1530	183600		7500			10000		201100	227250	
Outpatient	1850		20000		900		1650	3600	26150		114000

	For single day	2 day storage in lit	2 day storage in m3
Capacity of the Ground Water tank	227250	454500	454.50
(consider reserve for 2 days)			
Add Fire fighting@1900lit/min for 60 min	114000	114000	114.00
Total		568500	568.50

say, 569 m3

