

Federation of Myanmar Engineer Societies (Fed.MES)
Myanmar National Building Code (MNBC) (2020)

PART. 5D (WATER SUPPLY, DRAINAGE AND SANITATION)

16 Sep 2023

Fed.MES (Yangon)

Presented by

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PE (Water Supply and Sanitation)

MYANMAR NATIONAL BUILDING CODE (MNBC -2020)

PARTS of MNBC (2020)

Myanmar National Building Code – 2016 Provisional

- (1) Legislation and Administration on Planning, Building and Environment,
- (2) Architecture and Urban Design
- (3) Structural Design
- (4) Soil and Foundation
- (5) Building Services
 - (A,B,C) Lighting, Electrical and Allied Installations, Installation of Lifts and Escalators
 - (D) Water Supply, Drainage and Sanitation**
- (6) Building Materials
- (7) Constructional Practices and Safety

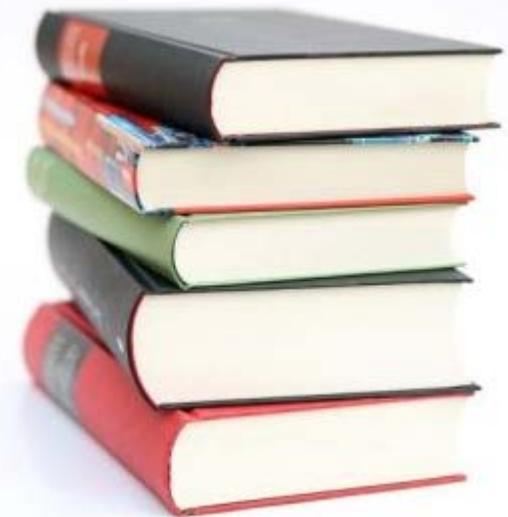
Additional

- (5) Building Services
 - (E) Heating, Mechanical Ventilation and Air Conditioning Services
 - (F) Fire Protection Systems

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

LIST OF COLLECTED DOCUMENTS – MNBC 2012 (Draft)

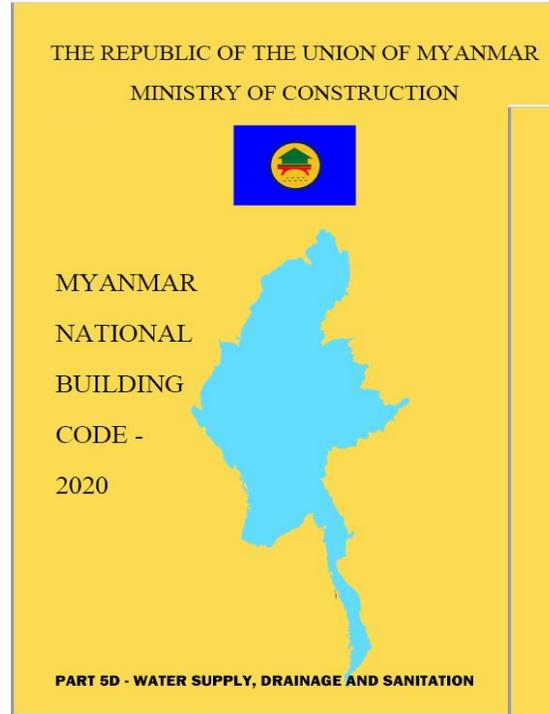
1. Nepal National Building Code (1994)
2. Code of Practice on Sanitary Plumbing, Drainage System(1976)
3. Uniform Building Code (1997)
4. Code of Practice on Water Services (CP48, 1989)
5. National Building Code of Philippine (2005),
6. National Building Code of India (2005), (2016)
7. International Building Code (2006)
8. Uniform Building by-law (2009) Malaysia



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

STRUCTURE

1. SCOPE
2. TERMINOLOGY
3. GENERAL
4. WATER SUPPLY
5. DRAINAGE AND SANITATION
6. SOLID WASTE MANAGEMENT



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

PLUMBING SERVICES PART-5D WATER SUPPLY, DRAINAGE AND SANITATION (INCLUDING SOLID WASTE MANAGEMENT)

The following codes are made with reference to the activities covered under central product classification. (here in after referred to as 'CPC' Version 2.1) Code 8672 – Subclass 86724, of the provisional CPC Version 2.1 of the United Nation.

1. SCOPE

- Water Supply
- Drainage
- Sanitation

Scope of Building Code - Definition

As the purpose of code, to provide minimum standards for safety, health, and general welfare including structural integrity and other types of integrity (such as sanitation, water supply, light, and ventilation), means of egress, fire prevention and control, and energy conservation.

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

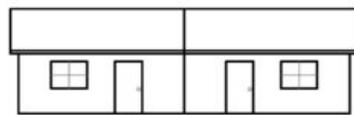
1. SCOPE

- Covers the basic requirements of water supply for buildings, deals with general requirements of plumbing connected to public water supply system and design of water supply system
- Covers the design, layout, construction and maintenance of drains for foul water, surface water and sewage - together with connections, manholes and inspection chambers used within the building and from building to the connection to a public sewer, private sewer, individual sewage disposal system, etc.

(Buildings - residential, business, **high rise buildings** and other types of buildings, including traffic terminal stations) (Not including - industrial purposes.)



Residential
Building



Business Building



High rise Building



Others Types of
Building

2. TERMINOLOGY

There are 159 definitions in terminology.

- **Water Quality**

Chemical, physical and biological condition of water.

- **Potable**

Water quality suitable for drinking, cooking and personal bathing.

- **Non – Potable**

Water for purposes other than drinking , cooking , bathing and laundry : eg. irrigation of garden.

- **Black Water**

Toilet wastewater that contains organic matter

- **Greywater**

Combination of wastewater from laundry , bathroom and kitchen.

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

2. TERMINOLOGY

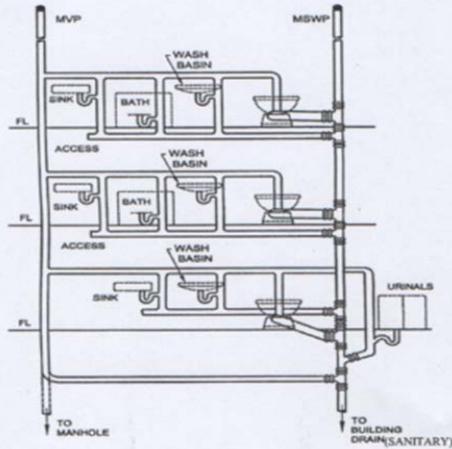


FIG. 4 DIAGRAM OF ONE-PIPE SYSTEM

- **One Pipe System**

Wastes from sinks, baths & wash basins, and the soil pipe branches are all collected into one main pipe.

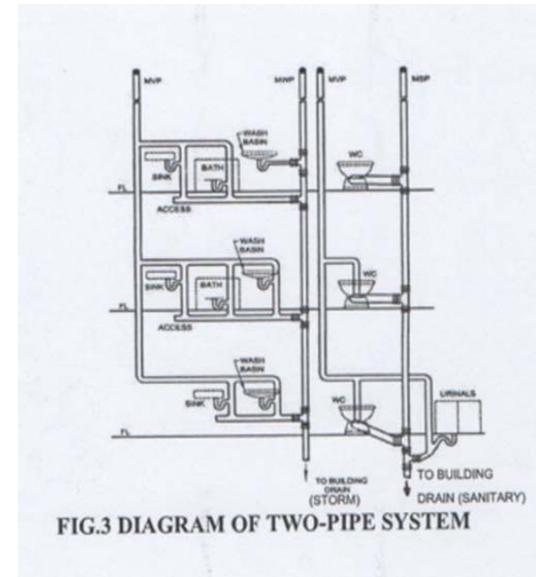


FIG.3 DIAGRAM OF TWO-PIPE SYSTEM

- **Two Pipe System**

Soil and waste pipes are distinct and separate.

2. TERMINOLOGY

- **Branch Soil Pipe (BSP)**
Soil appliances to main soil pipe.
- **Branch Soil Waste Pipe (BSWP)**
Soil and/or waste appliances to main soil waste pipe (1 pipe system).
- **Branch Waste Pipe (BWP)**
Waste appliances to main waste pipe.
- **Main Soil Pipe (MSP)**
Pipe connecting one or more branch soil pipes to drain (to Manhole).
- **Main Soil and Waste Pipe (MSWP)**
Pipe connecting one or more branch soil and waste pipes to drain (to Manhole).
- **Main Waste Pipe (MWP)**
Pipe connecting one or more branch waste pipes to drain.

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

3. GENERAL

- Basic Principles
- Water Supply Connection
- Drainage and Sanitation
- Licensing/ Registration of Plumbers

Basic Principles

Plumbing Fixtures – Each family dwelling unit

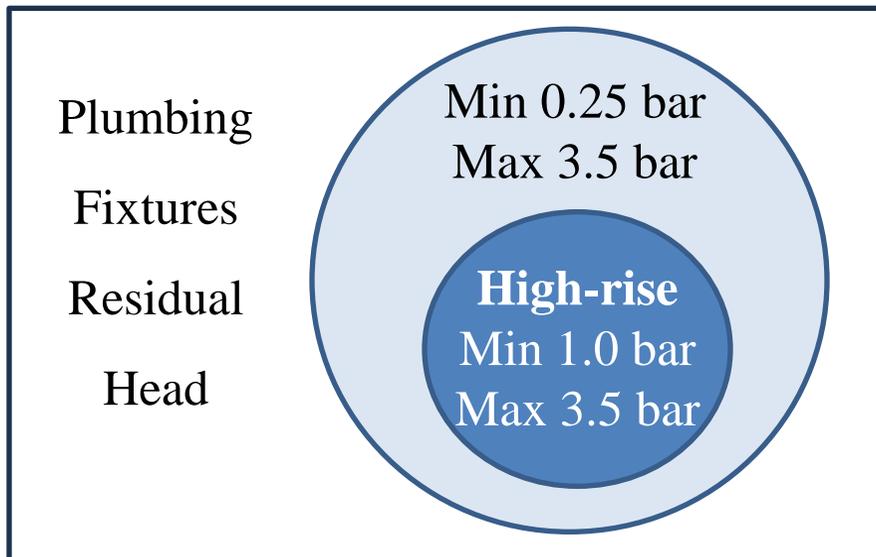
- (1) Water Closet,
- (1) Basin,
- (1) Kitchen Wash Place (or) Sink,
- (1) Bathing Wash Place (or) Shower

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

3. GENERAL

Basic Principles – Water Provisions

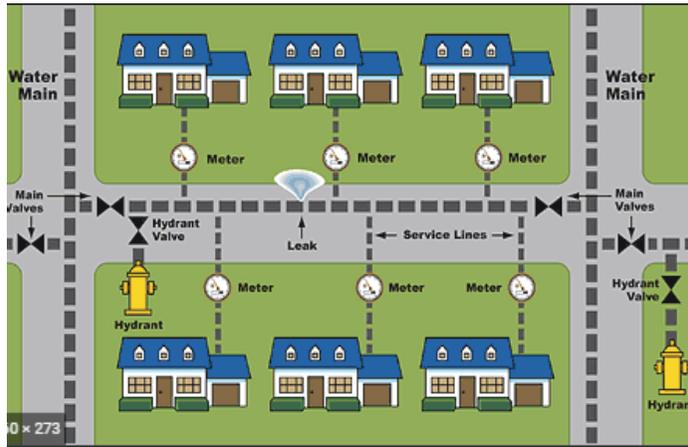
- Plumbing fixtures, devices and appurtenances – with water in sufficient volume and at adequate pressure
- Residual head – highest/ farthest outlets in building
- PRV – installed to avoid unnecessary high pressure



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

3. GENERAL

Water Supply Connection



Drainage and Sanitation



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4. WATER SUPPLY

- 4.1 WATER SUPPLY REQUIREMENTS FOR BUILDINGS
- 4.2 WATER SOURCES AND QUALITY
- 4.3 ESTIMATE OF DEMAND LOAD
- 4.4 STORAGE OF WATER
- 4.5 MATERIALS, FITTINGS AND APPLIANCES
- 4.6 DESIGN OF DISTRIBUTION SYSTEMS
- 4.7 DISTRIBUTION SYSTEMS IN MULTI-STOREYED BUILDINGS
- 4.8 GENERAL REQUIREMENTS FOR PIPE WORK
- 4.9 JOINTING OF PIPES
- 4.10 BACKFLOW PREVENTION

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4. WATER SUPPLY

- 4.11 CONVEYANCE AND DISTRIBUTION OF WATER WITHIN THE PREMISES
- 4.12 LAYING OF MAINS AND PIPES ON SITE
- 4.13 HOT WATER SUPPLY INSTALLATIONS
- 4.14 INSPECTION AND TESTING
- 4.15 CLEANING AND DISINFECTION OF THE SUPPLY SYSTEM
- 4.16 WATER SUPPLY SYSTEMS IN HIGH ALTITUDES
- 4.17 GUIDELINES TO MAINTENANCE

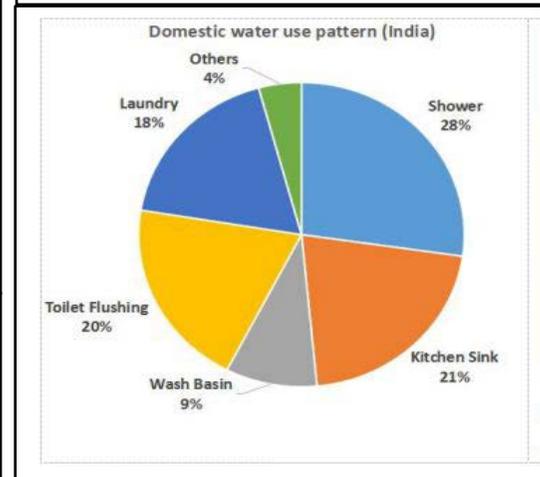
MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.1. WATER SUPPLY REQUIREMENTS FOR BUILDINGS

Water Supply Requirements For Residence

Sr No.	Type of Building	Consumption per Day, gallons
1	For communities with population up to 20000 and without flushing system (a) Water supply through stand post (b) Water supply through house service connection	9 gpcd (min) 15 to 20 gpcd
2	For communities with population 20000 to 100000 together with full flushing system	20 to 30 gpcd
3	For communities with population above 100000 together with full flushing system	30 to 40 gpcd

Domestic Water Use Pattern
(Sample - India)

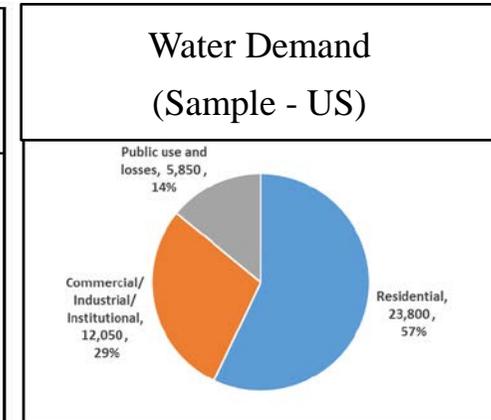


MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.1. WATER SUPPLY REQUIREMENTS FOR BUILDINGS

Water Supply Requirements for Buildings Other than Residences

SI No. (1)	Type of Building (2)	Consumption per Day, gallons (3)
i)	Factories where bath rooms are required to be provided	20 gpcd
ii)	Factories where no bath rooms are required to be provided	10 gpcd
iii)	Hospital (including laundry):	
	a) Number of beds not exceeding 100	80 gpcd
	b) Number of beds exceeding 100	100 gpcd
iv)	Nurses' homes and medical quarters	40 gpcd
v)	Hostels	30 per head
vi)	Hotel (up to 4 Star)	80 gpcd
vii)	Hotel (5 Star and above)	100 gpcd
viii)	Offices	10 gpcd
ix)	Restaurants	16 gpd per seat
x)	Cinemas, concert halls and theatres	3 per head
xi)	Schools:	
	a) Day schools	10 gpcd
	b) Boarding schools	30 per head



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.1. WATER SUPPLY REQUIREMENTS FOR BUILDINGS

Population
Equivalent (P.E)

- 1 P.E – 40 gpcd
- 30% of water supply
– Soil Water

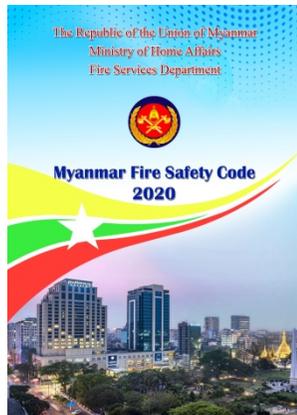
No.	Type of Premises/ Establishment	Population Equivalent (recommended)
1	Residential	5 – 6 per apartment
2	Commercial (includes entertainment, recreational centres, theatres)	3 – 5 per 1000 square feet gross area
3	Shopping Centre	3 – 5 per 1000 square feet gross area
4	Schools/ Educational Institutions - Day School/ Institutions - Fully residential - Partial residential	0.25 per student 0.75 per student 0.5 per student
5	Hospital - Number of beds not exceeding 100 - Number of beds exceeding 100	2 per bed 2.5 per bed
6	Clinic	0.5 per patient
7	Hotels (with dining and laundry facilities) Hotels (without dining and laundry)	4 per room 2 per room
8	Market (wet type)	5 – 7 per 1000 square feet gross area
9	Market (dry type)	3 – 5 per 1000 square feet gross area
10	Beauty Saloon	0.5 per client
11	Restaurants, cafeteria	0.4 per seat
12	Office	0.25
13	(i) Factories where bath rooms are required (ii) Factories where no bath room are required	0.5 0.25
14	Nurse's homes and medical quarters	1

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.1. WATER SUPPLY REQUIREMENTS FOR BUILDINGS

Water Supply Requirement for Traffic Terminal Station

Sr No.	Nature of Station/ Terminal	Where bathing facilities are provided gallons/ capita	Where bathing facilities are not provided gallons/ capita
1	Terminal Stations	10	10
2	International and Domestic Airports	15	15



Water Supply Requirement for Fire Fighting

- In accordance with Authority Concerned -
Myanmar Fire Safety Code (2020)

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.2. WATER SOURCES AND QUALITY

Water Source

Origin of all sources of water – Rainfall, Surface Water, Ground Water

High Rise Buildings - between the tip of the deepest pile or the bottom of the shallow foundation and the top of the aquifer from which ground water will be tapped shall not be less than 150 feet.

Water Quality

Drinking Water Quality –

- Updated WHO Guidelines (or)
- National Drinking Water Quality Standard

For purpose other than drinking – Safe from bacteriological contamination



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.2. WATER SOURCES AND QUALITY

Myanmar Standard –
Drinking Water
Quality Standards
(MMS 2:2019)

Sr No	Priority Parameters	Value	Unit of Measurement
1	Total Coliforms	0	MPN/ 100 ml
2	Faecal Coliforms	0	MPN/ 100 ml
3	Taste		Acceptable
4	Odor		Acceptable
5	Color	15	TCU
6	Turbidity	5	NTU
7	Arsenic	0.05	mg/ L
8	Lead	0.01	mg/ L
9	Nitrate	50	mg/ L
10	Manganese	0.4	mg/ L
11	Chloride	250	mg/ L
12	Hardness	500	mg/ L as CaCO ₃
13	Iron	1	mg/ L
14	pH	6.5 to 8.5	
15	Sulphate	250	mg/ L
16	Total Dissolved Solids	1000	mg/ L

4.3. ESTIMATE OF DEMAND LOAD

Estimate of Demand Load

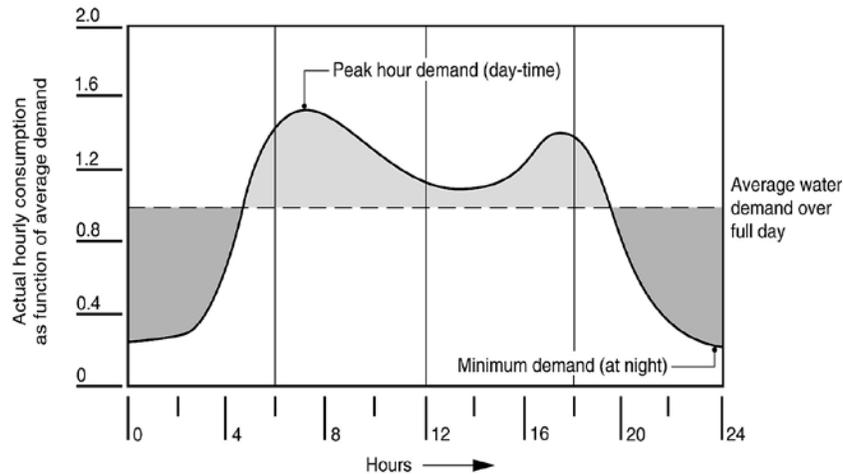
- For Residential Buildings - 5 to 6 Occupants for each dwelling
- For Large Complexes, Future occupant load estimating method
 - a) demographic method of population projection,
 - b) arithmetic progression method,
 - c) geometrical progression method,
 - d) method of varying increment or incremental increase,
 - e) logistic method,
 - f) graphical projection method, and
 - g) graphical comparison method.



4.4. STORAGE OF WATER

Reason for Storage of Water

- (a) To provide against interruptions of supply
- (b) To reduce max: rate of demand on main
- (c) To tide over periods of intermittent supply
- (d) To maintain storage for fire fighting requirement

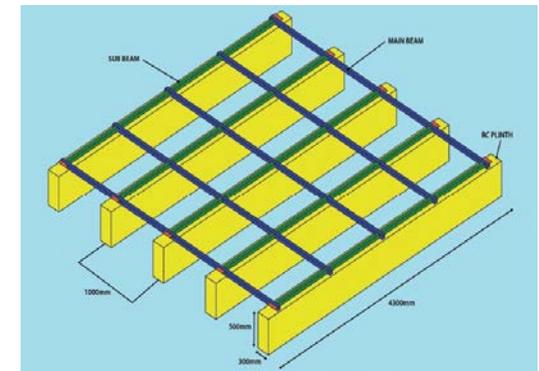


MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.4. STORAGE OF WATER

Tank requirements

- Adequate number of manhole for access and repair
- Tank higher than 3 ft, to provide catch rings, steps or ladders
- Provide overflow pipe, Normally one size higher than inlet pipe
- To provide vent Pipe - Larger than 1200 gal tank
- Overflow and Scour Pipe connect to drain
- Top slab – slope away from its center
- Tank on terraces and above ground – supported by appropriate structural members



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.4. STORAGE OF WATER

Tank requirements

- Outlet Pipe above 2” to 3” above the bottom of tank, fitted with strainer
- Large storage tank – Outlet – end opposite of inlet to avoid stagnation of water
- Underground tank – not located in low lying areas (or) near any sewer, septic tank, leaching pool or soakage pit
- Storage tank under floor slab – at least 2 ft space from perimeter of the tank and 3 ft vertical space between floor slab and cover slab of tank
- Bottom of OHT – placed clear off the terrace slab
(elevation difference between outlet pipe of tank and highest fixture – minimum 6 feet)
(prevent leakage into the structural slab)

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

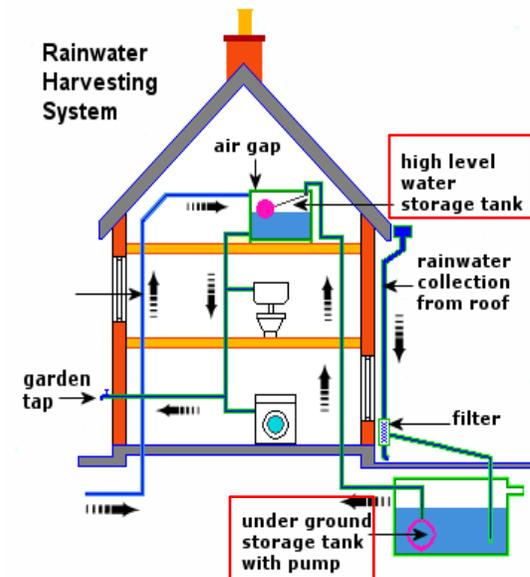
4.4. STORAGE OF WATER

Factors – take account for the quantity of water storage

- Hours of supply at high pressure to fill up the tanks
- Frequency of replenishment (24 hr)
- Consequences of exhausting storage (Public Building like Hospitals)

General guidelines for capacity of storage tank

- Only Overhead Tank -
minimum 1 day requirement
- Only Underground Tank -
minimum 150 % of 1 day requirement
- Combined Storage Tank,
minimum 100 % of 1 day requirement for UGT and 50% of OHT



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.4. STORAGE OF WATER

In case of high rise building, the capacity of the reservoir -

(a) Down Feed System

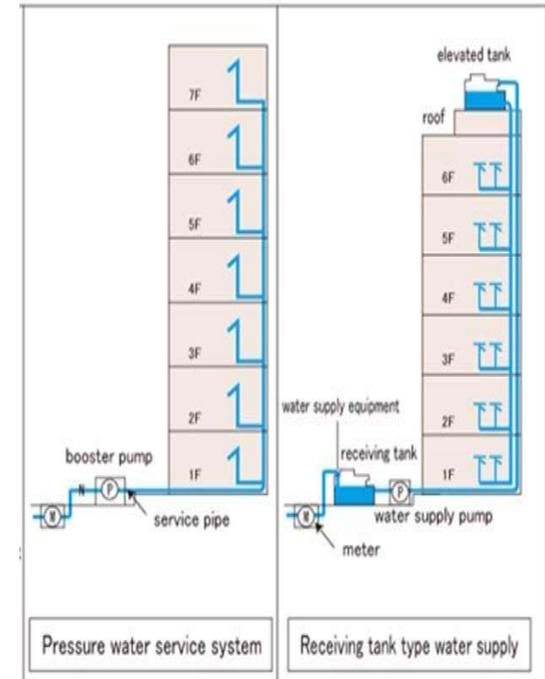
- Raw Water Tank - Minimum 50% of 1 day requirement
- Clear Water Tank - Minimum 100% of 1 day requirement
- Roof Tank - Minimum 50 % of 1 day requirement

(b) Up Feed System

- Raw Water Tank - Minimum 50% of 1 day requirement
- Clear Water Tank - Minimum 150% of 1 day requirement
- Transfer Tank - Minimum 50 % of 1 day requirement

(c) Public Buildings like Hospitals

- Overhead Tank - Minimum 50% of 1 day requirement



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.5. MATERIALS, FITTINGS AND APPLIANCES

4.5.1 Standards for Material, Fittings & Appliances – MNBC Part (6) “Building Materials”

4.5.2 Choice of Materials

- Cast Iron Pipe
- Reinforced Concrete Pipe
- Galvanized Mild Steel Pipe
- Copper
- Brass
- Polyethylene Pipe
- uP.V.C Pipe
- Stainless Steel Pipe



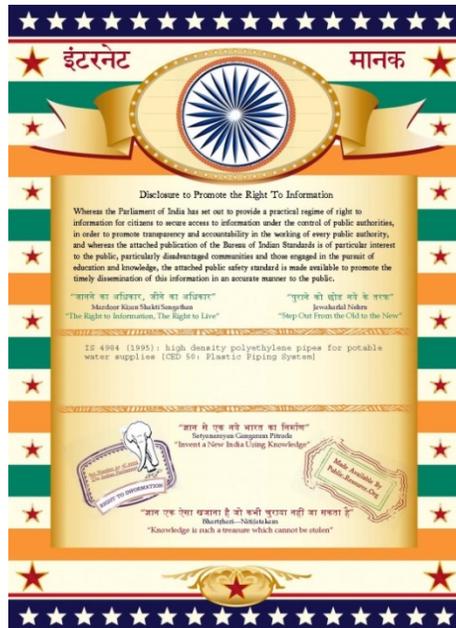
Material chosen – resistant to corrosion,
inside and outside – protected against corrosion.

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

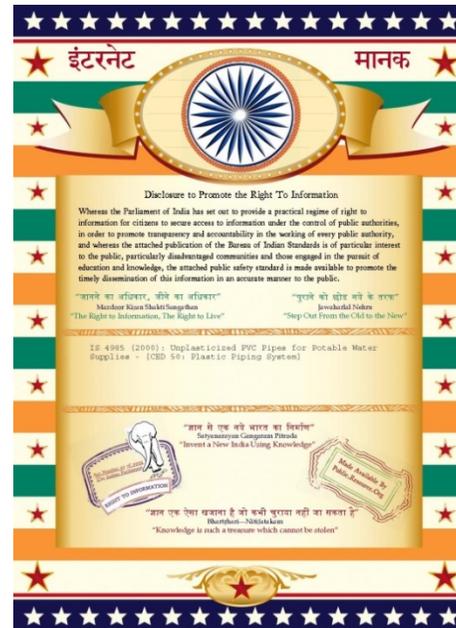
4.5. MATERIALS, FITTINGS AND APPLIANCES

uP.V.C pipe and polyethylene pipe – not installed near hot water pipes or near heat sources.

For the use of temperature limitations, to convey water – standard (IS 4984, IS 4985).



IS 4984:1995
HDPE Pipe
For Water Supply



IS 4985:2000
uP.V.C Pipe
For Water Supply

- Grade of Material
- Pipe Color
- Pipe Material
- Dimensions of Pipes
(Wall of Thickness, Pipe Length)
- Visual Appearance
- Performance Requirements
- Sampling, Frequency of Tests and
Criteria for Conformity
- Marking

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

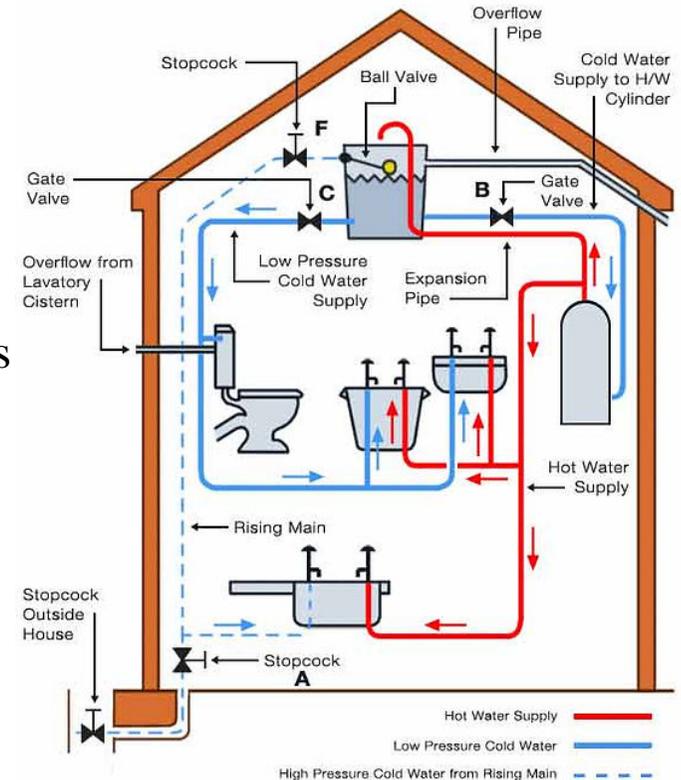
4.6. DESIGN OF DISTRIBUTION SYSTEMS

The data required for determining the size of the communication and service pipes are -

- (a) The rate of discharge required
- (b) Length of the pipe
- (c) The head loss by friction of pipes, fittings and meters

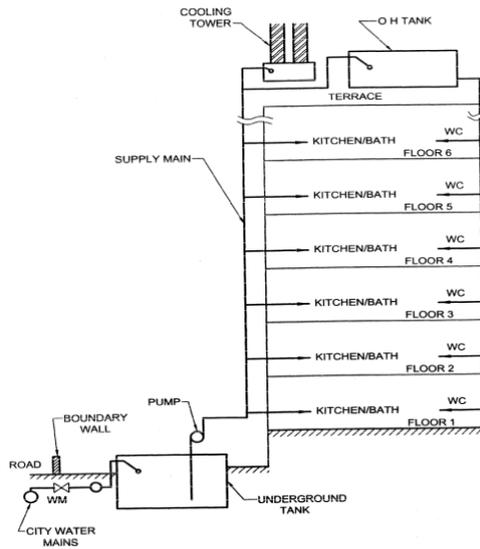
(a) The rate of discharge required

- The number and kind of fixtures installed
- The fixture unit flow rate
- The probable simultaneous use of these fixtures

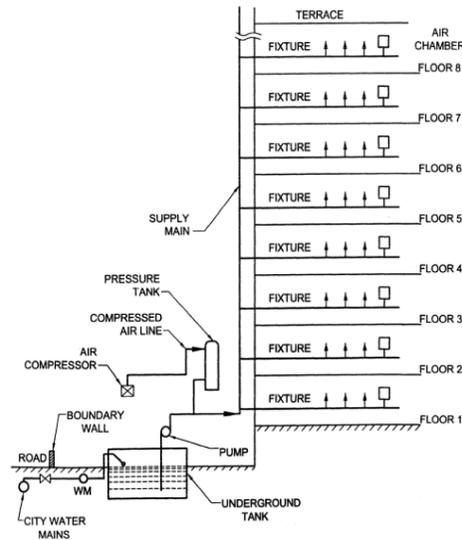


4.7. DISTRIBUTION SYSTEMS IN MULTI-STOREYED BUILDINGS

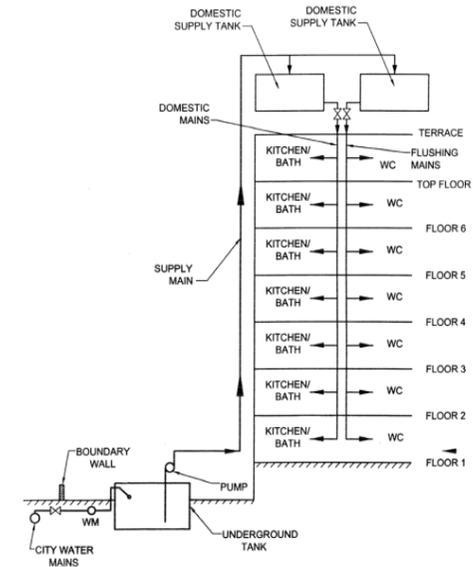
- Direct Supply System
- Direct Pumping System
- Hydro-Pneumatic Systems
- Overhead Tank Distribution



Direct Pumping System



Hydro-Pneumatic System



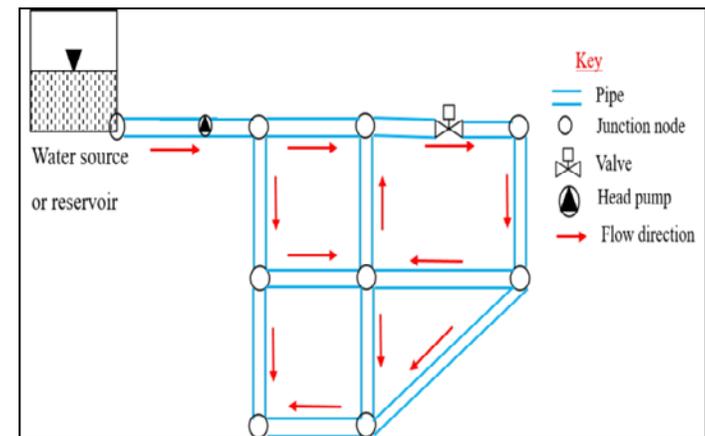
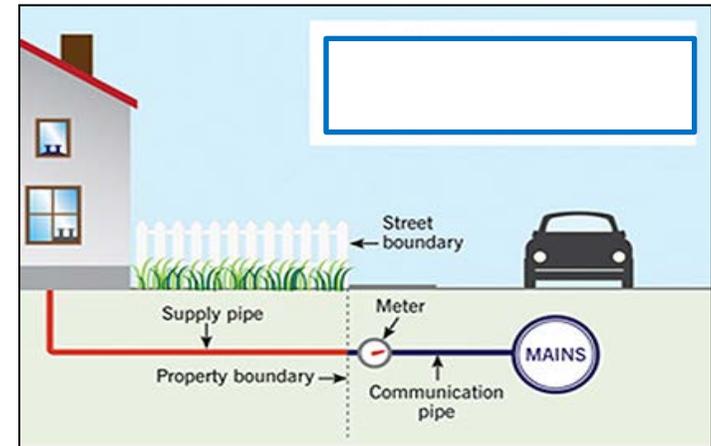
Overhead Tank Distribution

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.8. GENERAL REQUIREMENTS FOR PIPE WORK

Mains

- Mains – divided into sections (provisions of sluice valve or other valves) for repairs.
- To avoid dead ends – in a grid formation or in a network.
- Cover of main – at least 3 ft under roadways, 2.5 ft in case of footpaths.
- Mains – not laid at unvarying gradients, follow general contour of the ground.
- Air valves – at all summits, wash-out at low points between summits.



4.8. GENERAL REQUIREMENTS FOR PIPE WORK

Communication Pipes

- Provided the size does not exceed one-third the size of the water main.
- Shall be laid at right angles to the main and in approximately straight
- Every communication pipe shall have a stopcock and meter inserted in it.

Consumer Pipes

- No consumer pipe – be laid in the premises to connect the communication pipe w/o the approval of Authority.
- No direct boosting – be allowed from the service pipes.
- Consumer pipe within the premises – be laid underground with a suitable cover to safeguard against damage.

4.9. JOINTING OF PIPES

uP.V.C Pipes, Steel pipes, Concrete Pipes, etc.

(List of Standards)

4.10. BACKFLOW PREVENTION

Pump or similar apparatus to increase the pressure or rate of flow from the supply pipe – **Not** be connected unless the permission

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.11. CONVEYANCE AND DISTRIBUTION OF WATER WITHIN THE PREMISES

- All pipe work – designed and fixed to be watertight, avoiding wastage and risk of contamination.
- No water supply line – be laid to pass into or through any sewer, scour outlet or drain or any manhole.
- Lines be laid to close electric cables or corrosive soils, adequate protection – taken to avoid corrosion.
- To reduce frictional losses, piping – be smooth as possible inside, methods of jointing – be to avoid internal roughness and projection.
- Change in diameter and in direction – be gradual rather than abrupt to avoid undue loss of head



Diameter expansion		Diameter reduction					
Type	I	II	III	IV			
Type		d/D	0,5	0,6	0,7	0,8	0,9
I		$\zeta \approx$	0,56	0,41	0,26	0,13	0,04
II for	$\left\{ \begin{array}{l} \alpha = 8^\circ \\ \alpha = 15^\circ \\ \alpha = 20^\circ \end{array} \right.$	$\zeta \approx$	0,07	0,05	0,03	0,02	0,01
		$\zeta \approx$	0,15	0,11	0,07	0,03	0,01
		$\zeta \approx$	0,23	0,17	0,11	0,05	0,02
III		$\zeta \approx$	4,80	2,01	0,88	0,34	0,11
IV for $20^\circ < \alpha < 40^\circ$		$\zeta \approx$	0,21	0,10	0,05	0,02	0,01

4.12. LAYING OF MAIN AND PIPES ON SITE

- Pipe – true to line and gradient, – surrounded with fine selected material.
- Gradient pipe – laying in uphill direction to facilitate joint making
- Pipes - cleared of all foreign matter
- Anchor blocks - provided to withstand the hydraulic thrust.
- Iron surface box – to give access to valves and hydrants
- Water service pipe or any underground water pipes - not be laid in same trench as the drainage pipe, if this is unavoidable, -
 - ✓ Bottom of water service pipe – at least 1 ft above the top of sewer line
 - ✓ Number of joints in the service pipe – be minimum
 - ✓ Service pipe – depth not less than 2 ft 6 inches below ground level

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.13. HOT WATER SUPPLY INSTALLATIONS

Storage Temperature (150°F - 85°F)

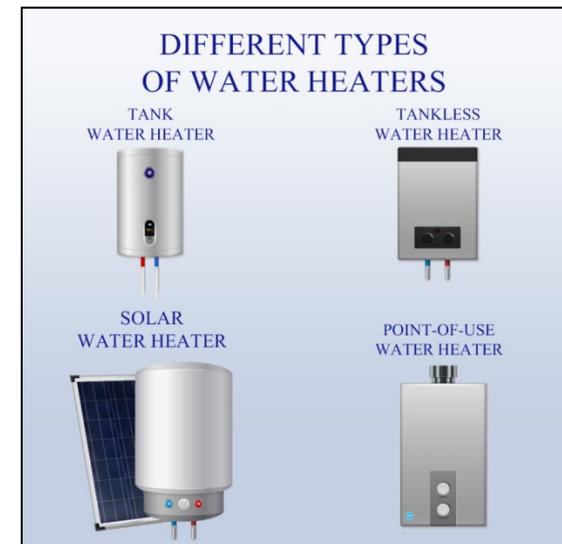
- Sink - at 140°F
- Hot bath – As run - 110°F, For use -105°F, Warm bath - 98°F

Storage Capacity

- Dwelling with a bath tub – 10 gal to 15 gal at 140°F
- A Shower or a tap – 5 gal at 140°F
- Capacity of storage vessel -
> 20% in excess of required maximum

Location of Storage Vessel -

Length of pipe between the vessel and outlet- as short as possible



MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.14. INSPECTION AND TESTING

1) Testing Mains before Commencing

- Inspected and tested by manufacturers at their factory
- Tested hydraulically under a pressure equal to 1.5 times of maximum permissible working pressure or greater pressure as be specified



2) Testing Mains after Laying

- Test pressure – 168 ft or double the maximum working pressure whichever is greater
- Pump – been stopped, test pressure maintain w/o loss for at least 5 min

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.14. INSPECTION AND TESTING

3) Testing of Service Pipes and Fittings

- Inspected under working conditions of pressure and flow
- Absolutely water-tight
- Protection from damage and corrosion
- Cisterns – retested for water tightness on arrival at the site, before mixing

4) Testing of Hot Water Supply Installations

- Test pressure – 168 ft or double the maximum working pressure whichever is greater
 - Observed for leakage in pipes due to expansion or overheating
 - Thermostats of appliances – checked and adjusted to specified temperatures
- (4.13)

4.15. CLEANING AND DISINFECTION OF THE SUPPLY SYSTEM

1) Cleaning

- Pipes – periodically cleaned at intervals depending upon the quality of water
- Storage Cisterns – cleaned at least once every year to remove suspended impurities

2) Disinfection

- 50 parts of chlorine to one million parts of water
- Bleaching powder – 0.33 lb of powder to 220 gallons of water

4.16. WATER SUPPLY SYSTEMS IN HIGH ALTITUDES

- Pump house – arranged for heating inside P.H, built directly on water structure
- Water storage – insulation and protection, proper heating of the enclosure
- Adequate facilities for heating the water distribution system does not exist, the use of tank trucks or barrels for delivery of water – only for cold weather.

MNBC PART-5D.4 (WATER SUPPLY, DRAINAGE AND SANITATION)

4.17. GUIDELINES TO MAINTENANCE

1) Storage Tanks

- Regularly inspected, periodically cleaned.
- Showing signs of corrosion – be emptied.

2) Record Drawings showing pipe layout and valve positions – kept up to date

3) Valves – periodically be operated to maintain free movement of working parts

4) All taps and ball valves – be watertight

5) Overflow pipes – be examined and kept free from obstructions



THANK YOU
FOR YOUR KIND ATTENTION!