Aam Aadmi Series - 10

HOUSE BUILDING DIGEST

(Water Supply)

bmtpc

Creating Enabling Environment for Affordable Housing for All

This is an attempt by BMTPC to provide useful but often ignored information about multifarious activities involved in house construction and other technical and non-technical matters associated with building materials and construction technologies. The series is being brought out with a specific rationale to reach out to common people of our nation and make them acquainted about building construction. Every individual has a dream of owning a house and through this series which is aptly named Aam Adami Series, we will slowly unravel myths and misconceptions about building construction. The language used here is lucid and simple to comprehend. The complicated technicalities are explained in a parlance which can be understood by one and all.

Water Supply

Safe drinking water is linked closely to the well-being of human life. In India, the primary sources of drinking water includes surface water and groundwater, which are tapped to supply water in rural and urban areas. Central and State Governments have made considerable strides to provide quality water in adequate quantity, to the people of the country. However, due a large number of reasons, including rapid increase in population, it has not been possible to provide access to safe drinking water to each and every household in the country.

The quality of water being supplied for domestic purposes is also a cause of great concern. Water gets contaminated by different physical impurities, agricultural & industrial wastes and underground chemicals & minerals. This leads to water borne diseases which are widespread in our country, especially among the low income groups of the society. Regular testing of water quality and using an appropriate water purification system is, therefore, essential for supplying quality water.

Water quality is the physical, chemical and biological characteristics of water. The most common standards used to assess water quality relate to drinking water, safety of human contact, and health of ecosystems. Taking care of various factors influencing water quality is very important, as human health is largely dependant on the quality of water available for use.

1. Water Supply in Urban Areas

In urban areas the municipal corporation or the municipalities and urban local bodies are responsible for providing public water supply system. It includes collection of water from source of supply, giving necessary treatment to water for making it hygienically safe and potable and finally distributing water through a

network of piping works (trunk mains, street mains etc). Water from the street main is supplied to the individual buildings through service connections. Within the building, the water is distributed to different fixtures through pipes which run through the surface or are concealed in walls or below the flooring.

Daily Water Requirement

Water for domestic purposes is required for drinking, bathing, washing of clothes, cleaning of the house and utensils, flushing of toilets etc. However, the water requirement varies from place to place, depending upon the geo-climatic conditions, living habits etc. In any case, some standards have to be resorted to, so as to have adequate quantity of water for the household to carry out their daily domestic chores.

It is generally assumed that the requirement of water per day is 135 liters per person. Accordingly, for a family of 6 persons the water requirement per day would be 810 (6x135) liters.

Water Distribution System

The house owner should know that any of the following two distinct types of systems are most commonly provided for supply of water to a house, starting from the service mains:-

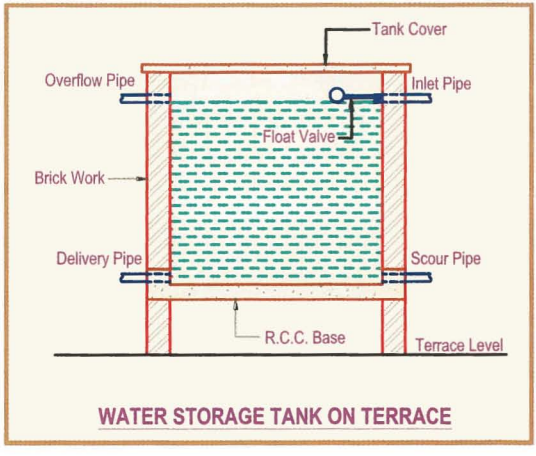
a. Direct System

b. Indirect System

In the direct system, also known as the 'upward distribution system', water is given to various floors in a building directly from the mains with sufficient pressure to feed all the floors and upto the highest point of the building.

In the indirect system, also known as the 'down take supply' or 'downfall distribution system', the water from the mains has to be drawn either by:-

a. Feeding water directly into the overhead water storage tank provided at the roof of the building, from where the water is supplied to different floors by gravity, or



WATER STORAGE TANK ON TERRACE

b. Feeding the water into a underground water storage tank. The water is then pumped to overhead storage tank from where the water is supplied by gravity.

Water supply in a building could be continuous or intermittent. Normally the local body plans distribution of water in different city zones in shifts. Thus provision is made in a building to ensure availability of water during the non-supply hours.

Plumbing

A proper plumbing system is provided to supply water in the house (as also to drain out the waste water). It is a good idea to understand how your plumbing system works in the house.

Plumbing is a term which is most commonly used in relation to water supply, sanitary and drainage provisions in a house. For the purpose of basic understanding, plumbing is a general term which broadly includes the system, materials, fittings and fixtures etc. used in a building. The plumbing system broadly includes the following:-

a. The entire system of water supply and distribution pipes, including fittings and fixtures like taps, valves, tanks etc used in connection with the water supply, and

b. Entire system of sanitary, drainage including fittings and fixtures like wash basins, sinks, water closets, urinals, traps, soil pipes, waste pipes, vent pipes, septic tanks, sewers etc.

c. Entire system of storm water drainage including collection and carrying of rain water (roofs, paved areas and ground surface) in a public storm water drain or to a pond or river etc.

Here, plumbing related to water supply only has been dealt with. Others will be dealt in the subsequent digests.

Water Supply Connection for the House

It is advisable for the prospective house owner to get acquainted with the method of supplying water into the house, from the service mains of the Municipal Corporation/Municipality which run along the street. It would help in understanding the provision of water supply during the construction process as also the measures required during subsequent maintenance.

To start with, it may be understood that the pipe extending from the service main to the water meter in the house is known as the service pipe, whereas the pipes within the consumer's premises are known as supply pipes. (Refer Figure at the end).

Water Meter

For providing water in the house, a hole is drilled in the service pipe and a brass ferrule is screwed in a watertight box. The size of the ferrule is dependent upon the size of the service pipe. A 40 to 50 cm long flexible curved pipe (termed as Goose Neck) is usually inserted between the ferrule and the service pipe. A stop cock is normally inserted in the service pipe between the ferrule and the service pipe leading to the water meter. The connection from the service pipe to the water meter is known as Service Connection.

The Service Connection is provided by the local authority whereas the home owner has to provide the water supply pipes, fittings and fixtures within the house.

Water enters the house via the service connection. Typically, the water supply is then split, with one line going to the sump/overhead water tank in the house and the other directly to the floor(s).

For the house the main supply lines are typically 1" to ¾" in diameter. The lines that branch off to individual fixtures are usually ½" in diameter. These diameters are only illustrative and can vary with the actual design of the plumbing system.

The work for the system should be ideally done by a licensed plumber.

Type of Pipes

Lead plumbing was an established practice in earlier times; however it was replaced by galvanized iron water pipes which were

attached with threaded pipe fittings. For the purpose of higher durability, brass pipe and fittings were used, although they involved higher costs. Plastic supply pipes have become increasingly common since about 1970, with a variety of materials and fittings employed. However, plastic water pipes do not keep water as clean as copper and brass piping does, unless the joints are properly provided and sealed.

Presently there are a number of types of pipes which can be used for providing water within the house. For the benefit of the house builder information on the following types of pipes, which are commonly used in a water supply system is given:-

a. Cast Iron (CI) pipes

b. Steel Pipes

c. Galvanised Iron (GI) pipes

d. Copper Pipes

e. PVC pipes

Cast Iron pipes are extensively used in water distribution mains as they are comparatively cheaper in cost, highly resistant to corrosion and have a long life.

Steel pipes are used in water mains in situations where water is subjected to very high pressures and the diameter required is large. These pipes are stronger and lighter in weight as compared with CI pipes.

GI pipes are wrought iron pipes provided with zinc coating. They are most commonly used for water supply works inside the building.

Copper pipes are generally used for hot water supply installations in the house.

PVC pipes are being used increasingly for supply of cold water for external and internal plumbing works. They are light in weight, non-corrosive, lower in cost and do not require any threading for connections.

Fittings, Fixtures and Appliances

Fittings, Fixtures and Appliances are essential features in a domestic water supply system. The house owner should have a basic knowledge of these to understand their utilities as also their performance.

Fittings

Fittings are very important components of a water supply system. They are used at different places in the supply system to provide the desired flow of water as well as facilitating maintenance.

Fittings are used in plumbing system to connect the pipes to adapt to different sizes or shapes of pipes in the system as also to facilitate and regulate the flow of water therein. The materials for fittings are more often of the same base material as that of the pipe, depending upon the requirements of the system. However, at times the two materials may be different; viz. brass-bodied fittings in copper pipes.

The most common fittings used in the system are given herein for information of the prospective house owner.

Elbow

An elbow is a fitting installed between two lengths of pipe where a change in direction of flow is required which is usually 90°, 45° or as the case may be.

Tee

A tee is used to either to split the flow of water in two directions or to combine them. Most of the tees have the same inlet and outlet diameters, however 'reducing' tees are available which may be installed, if need be.

Cap/Plug

A cap or a plug is a type of a fitting used to cover the end of the pipe.

Fittings

Valves

A valve is a type of a fitting which is commonly used for controlling the flow of water along a pipeline. With the introduction of the valve it is possible to isolate any sections of a pipeline for inspections, repairs etc.

Following types of valves are commonly used in a building for domestic water supply system:-

a. Globe Valve

b. Gate Valve

c. Float Valve

A Globe Valve is a most commonly used valve for manually controlling or closing the flow of water in domestic water supply. They are also used for controlling flow of water to wash basins, shower, kitchen sink etc.

Similarly, Gate Valve is used to control water flow or for completely stopping the flow of water in a pipeline. Gate Valve is commonly used to control flow of water from a storage tank.

A Float Valve is used to supply water to a storage tank or flushing cistern and to automatically shut off the supply when the predetermined level of water has been reached.

Taps

Taps are provided at the end of the pipeline to draw off the water. A tap is also known as Bib Cock. A variant of a Bib Cock is the Stop Cock which is used for controlling or stopping the flow of water in a particular section of the pipe line.

A Typical Tap

Fixtures

A fixture is a device in a water supply system for delivering and draining away water to enable a particular use. The most common water supply fixtures include kitchen sinks, utility sinks, bathtubs, showers etc.

Appliances

Appliances are gadgets which run on water and help in carrying out the daily chores. These include the geyser and washing machine etc.

Storage Tanks

Colony OHT

In most of the cities in the country, having a population of more than ten lakhs, water is distributed each day for a few hours only. The supply is given through a large Over Head Tank (OHT) in the colony. This also helps in regulating the water supply to the individual houses.

Where piped water supply is not available for individual houses, community taps are provided in the colony and people store water in large utensils. On the other hand where piped water supply is available for individual houses people adopt alternate means of storage. In such cases it has become a common practice to have storage tanks in the houses in the form of a sump at the ground level or an overhead tank on the terrace or a combination of both.

The storage tanks in the house can be made from brick masonry, GI sheets, Ferrocement, PVC or RCC etc. Nowadays storage tanks of different materials and sizes are available in the market which can be installed readily.

The capacity of the overhead storage tank (OHT) at the terrace and/or sump depends on the number of users in the building, frequency and duration of supply of municipal water etc. The capacity of both the storage tanks has to be decided with care in order to have water supply in the house on a continuing basis. Generally the capacity of the sump is kept less (around 50% or so) of the capacity of the OHT. These capacities should be decided in consultation of the architect/engineer/ plumbing professionals.

Having decided upon the capacity of the OHT at the terrace and the sump, a booster pump for pumping the water from the sump to

the OHT has to be installed. The horsepower of the booster pump should be enough to lift the water upto the inlet level of the OHT.

If the house is more than single storey, it is a common practice to provide a single diameter pipe for lifting water from the sump to the OHT. It is however advisable to reduce the pipe diameters at the higher floors.

Similarly, the dia of the down take pipe from the OHT to different floors should be maximum for the top floor and gradually reduced for each floor below. This ensures uniform water pressures at each floor.

Depending upon the requirement of the client, separate pipeline can be provided for WC/bath and separate for the kitchen.

Gadgets are also available nowadays which give an alarm as and when the OHT/sump is getting emptied. This of immense convenience for the house owner, as otherwise the house owner has to continuously check the levels of water in the sump/OHT.

Contamination of Water

The quality of water available to the house owner should be potable water meaning therby that it should be suitable for drinking, pleasant to taste and usable for domestic purposes. Basically, it should not be contaminated as contaminated water leads to ill health of the residents of the house.

Drinking contaminated water is harmful to the human body and leads to various diseases like dihorrea, jaundice, typhoid etc.

Contamination of water can take place in a number of ways. Water can get contaminated at the level of the water supply lines/mains or at the level of the domestic lines laid within the house.

At the domestic level, contimanation may be due to intermittent supply, leakage in underground pipes and improper storage in the house. Faulty joints, valves and corroded pipes are sources of contamination. Water supply lines, placed in the vicinity of sewage drains, sullage and manholes, increase the chances of water getting contaminated.

Removing contamination in the water supply mains is the responsibility of the authority supplying the water. However, contamination of water within the house has to be taken care of by the house owner.

The services of a licenced plumber should be arranged to remove the cause of contamination within the house.

Testing of Water

Water needs testing if it smells foul, the taste gets changed, becomes brackish, gets coloured, mud or such other materials come alongwith the flow etc. It is advisable to test the water at certain intervals or as and when it is felt that the water is getting contaminated.

Presently some kits are also available which help in testing the domestic water supply. Water samples can also be sent to authorized testing labs who would advise further in this regard. Steps for making the water potable should be taken, accordingly.

If no other alternatives are available, the simplest way of improving the quality of water is to boil the same, allow it to cool, enabling the impurities to settle and then use the same. However, it is advisable that the root cause of contamination should be removed to make the water potable.

2. Water Supply in Rural Areas

Clean drinking water is a basic necessity of life, be it urban area or rural area. Supply of clean drinking water in the rural areas has always been one of the highest priorities of Central and State Governments. In the past a number of schemes and missions have been launched to enable access to drinking water in rural areas.

Providing access to water to individual households in rural areas requires a different approach than that for the urban areas. Piped water supply is available only in a limited number of villages. Accordingly, the source of water supply in rural areas is primarily a village pond, flow from an acquifer (ground water), wells, handpumps etc.

Potability of water has always been a cause of concern from such sources. Where water is scarce or where individuals cannot afford to have a water point within their premises, water is provided through community hand pumps, community taps etc. In deserts water is supplied in far flung areas through tankers.

Groundwater

Groundwater is water located beneath the ground surface or an aquifer when it can yield a usable quantity of water. In plain areas, this water is available below the natural ground level. This water can be tapped in a

Natural flow of water

variety of ways, viz. digging a well, installing a handpump etc. In hilly areas water starts seeping out at different locations and can be a source of supply for the village or the individual. The supply can be regulated by installation of a pipe etc.

Water wells

A Village Well

A water well is an excavation or structure created in the ground by digging, driving, boring or drilling to access groundwater in underground aquifers. The water can be drawn by an electrical pump, handpump, buckets etc. At times the ground may contain impurities including minerals and accordingly, it has to be treated before use.

Dug wells

Such wells are most common in rural areas and are a source of water supply for drinking and other purposes. It is advisable to line the wells with stones, bricks etc, depending upon the local practices.

Hand dug wells provide a cheap and low-tech solution for having access to groundwater in rural locations. Such wells are cheap as they mostly use unskilled labour for its construction. Hand dug wells have low operational and maintenance costs.

Driven wells

Driven wells are made by driving a hole into the ground at a point where water is available below the ground level and then driving a pipe (preferably having screens). Water is drawn out of the pipe with the help of a pump.

Drilled wells

Drilled wells can be made by simple hand drilling methods or machine drilling. Drilled wells can get water from a much deeper level than by dug wells.

Such wells having electric pumps for lifting water are currently used at many places, typically in rural or sparsely populated areas. They can be shallow or deep in nature depending upon the depth at which water is available below the ground level.

Hand pump

Hand pumps are widely used both in rural as well as urban areas for lifting the water for drinking and other purposes. Many different types of hand pumps are available in the market and the house owner can select the same as per his requirements.

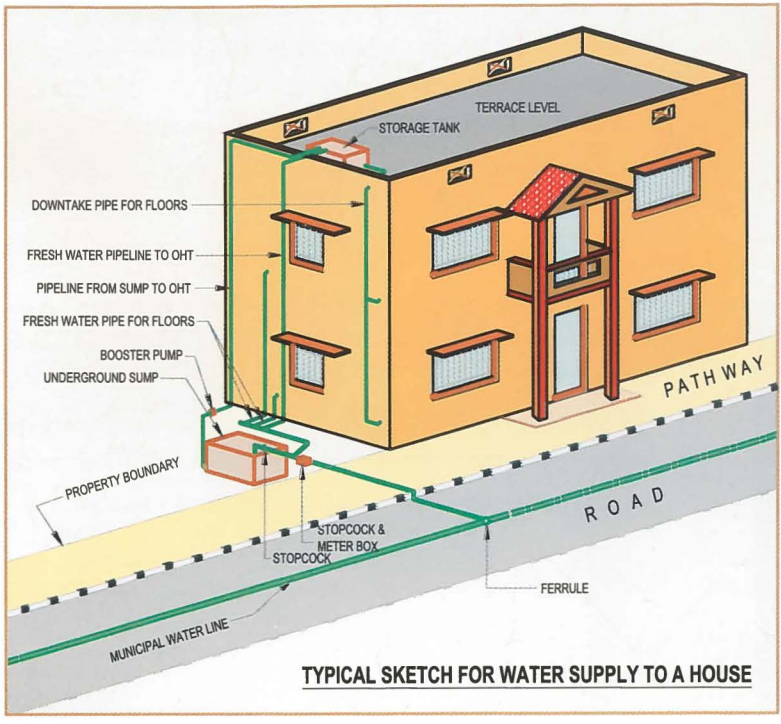
The height to which a hand pump could lift water is governed by the ability of the pump and the operator to lift the weight of water in the delivery pipe. Typically, suction pumps can lift water upto 7 meters, Low lift pumps and direct action pumps upto 15 meters, intermediate lift pumps upto 25 meters. High lift pumps can lift water more than 45 meters below the ground level.

Hand Pump

In Conclusion

Water has become a scarce commodity and is no longer a free gift of nature. Accordingly, it is essential that the plumbing system for water supply should be installed with great care such that water is available to the house owner in the right quantity and time for carrying out the domestic chores.

The system should be such that leakages therein are rare. Any leakage would not only waste water but would also lead to contamination. It is also the responsibility of the house owner to consume water with care and not to leave the taps open after the chore has been performed.



TYPICAL SKETCH FOR WATER SUPPLY TO A HOUSE

This is the Tenth of BMTPC 'HOUSE BUILDING DIGEST SERIES' for creating awareness about construction of a house.

BMTPC

The Building Materials & Technology Promotion Council (BMTPC) was setup in 1990 as an inter ministerial organisation under the Ministry of Housing and Urban Poverty Alleviation to bridge the gap between the laboratory research and field level application.

VISION

BMTPC to be world class knowledge and demonstration hub for providing solutions to all with special focus on common man in the area of sustainable building materials, appropriate construction technologies & systems including disaster resistant construction.

MISSION

To work towards a comprehensive and integrated approach for promotion and transfer of potential, cost effective, environment-friendly, disaster resistant building materials and technologies including locally available building materials from lab to land for sustainable development of housing.

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