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15.1 Introduction

Water scarcity is a growing concern in many parts of the world, and it is predicted that more than half of the global population will be living in water-stressed areas by 2050. Water is a precious and limited resource, and it is crucial to conserve it to ensure that we have enough to meet the needs of a growing population. Water-efficient fixtures and fittings are an essential componentsof sustainable water management, and they can help individuals and communities conserve water resources. In addition to the environmental impact of water scarcity, it also has economic and social implications, as it affects food production, energy generation, and human health.

15.2 The Need for Water-Efficient Fixtures and Fittings

Water-efficient fixtures and fittings can help address water scarcity by reducing water consumption. Traditional fixtures and fittings can use large amounts of water, often unnecessarily, which can contribute to water waste.

By replacing traditional fixtures and fittings with water-efficient ones, households and businesses can save water and money on their water and electricity bills. This is particularly important in areas with high water production and supply costs, where water-efficient fixtures and fittings can provide significant savings over time.

15.3 The Use of Water-Efficient Fixtures and Fittings

Water-efficient fixtures and fittings are designed to reduce water consumption while maintaining or even improving performance. The timely monitoring of fittings, joints, and rubber washers inserted in the various fitting should be done to reduce leakages. Some common examples of water-efficient fixtures and fittings include faucet aerators, low-flow showerheads, low-flow toilets, dual-flush toilets, high-efficiency washing machines, etc.

1) **Water Saving Faucet Aerators:** Water Saving Aerators are innovative water-saving solutions/ devices for washbasins, sink taps, or faucets that reduce the flow of water from faucets while maintaining the same water pressure. Figure 15.1 shows a water saving faucet aerator

Figure 15.1: Water Saving Faucet Aerator

These aerators are designed with the purpose of dispensing water at a defined flow rate, say 2 to 8 liters/minute. Faucet aerators are available in various sizes and flow rates so that they can fit any faucet, and they have the following characteristics;

- Save water up to 80%
- Easy to Install
- Convert existing taps into water saving taps

- Reduce water bill.

2) **Low-flow Showerheads:** These are designed to use less water while still providing a good shower experience. They work by reducing the flow of water through the showerhead while maintaining good water pressure. These showers could achieve massive water savings. Figure 15.2 shows Low-flow Showerheads. Regular showers flow at 15 to 20 liters of water per minute (LPM) or even more, whereas these new showers typically flow at 6 - 8 liters/minute (or less!), and they have the following characteristics;

Figure 15.2: Low-flow Showerheads

- Save water up to 60%
- Equivalent bathing experience.
- Easy to Install
- Different showerhead spray settings
- Reduce hot water demand and save power.
- Available in various styles and finishes, they can fit any bathroom décor.

3) **Low-flow toilets:** They use less water per flush than older models, which can save a significant amount of water over time. Low-flow toilets are available in various styles and designs, so they can fit any bathroom design.

4) **Dual Flush Water Efficient toilets:** Two arrangments/ buttons are provided for flushing, for use as per requirement, e.g., partial flush and full flush, which will save about 40% of flushing water. Figure 15.3 shows Dual Flush Water Efficient toilet. This arrangement;

Figure 15.3: Dual Flush Water Efficient Toilet

- Saves up to 75% of the water used for flush
- Water usage as low as 4 liters per flush
- Reduce water bills

5) **Tank bank to save on Toilet flushing:** Toilet flush tank banks are simple bags and can reduce almost 25-30% of total flush water usage. Figure 15.4 shows a Tank bank to save on Toilet flushing. By placing the Tank Bank (filled with water) inside the flush tank, we displace an amount of water equal to the water in the Tank Bank for every flush.

Figure 15.4: Tank bank to save on Toilet flushing

- Saves about 2 liters of water on every flush.
- No compromise on the performance of each flush

6) **Flow Restrictors:** These devices restrict and limit the amount of water that is let out of an existing shower. Flow restrictors are also recommended for taps, which do not have the option to install an aerator. Figure 15.5 shows Flow Restrictors.

Figure 15.5: Flow Restrictors

- Reduce water flow in taps and showers up to 60%
- Recommended For Taps, Showers, Health Faucet Guns/Hygiene Taps
- Available in different flow rates

7) **Waterfree Urinal Pots:** An average urinal could waste 80 to 100 Litres of water daily. Water waste in urinals can be prevented with the use of smart waterfree urinal pots that efficiently perform the same task without using any water. Figure 15.6 showsWaterfree Urinal Pots.

Figure 15.6: Waterfree Urinal Pots

- Save water up to 80%
- Recommended for Offices, Hospitals, Banks & public toilets
- Save money on maintenance time and cost

8) **High-efficiency washing machines**: They use less water per load than older models, which can save up to 50% of the water used by traditional washing machines. High-efficiency washing machines also use less energy, which can also reduce energy bills.

9) **Drip irrigation systems:** They deliver water directly to the base of plants, reducing water loss from evaporation and runoff. Drip irrigation systems can save up to 60% of the water used by traditional irrigation systems in residential gardening requirements.

10) **Use of 'Direct Acting Pressure Relief Valves (DAPRVs) in multistorey buildings:** The pressures are very high in the plumbing pipelines of the multistorey buildings causing damage/ruptures in the pipes and fittings, resulting in huge wastage of water. This can be avoided by providing DAPRVs at appropriate places in the plumbing system.

15.4 Benefits of Water-Efficient Fixtures and Fittings

Using water-efficient fixtures and fittings can provide a range of benefits, including:

- **Reduced water consumption**: Water-efficient fixtures and fittings use less water than traditional ones, which can help conserve water resources and reduce water bills.
- **Reduced energy consumption**: Using less water also means using less energy to pump and heat the water. This can help reduce energy bills and lower carbon emissions.
- **Reduced wastewater**: Using less water also means generating less wastewater, which can help reduce the load on wastewater treatment facilities and the environment.
- **Improved performance**: Water-efficient fixtures and fittings are designed to maintain or even improve performance, so they can provide the same or better experience than traditional fixtures and fittings.

15.5 BIS Standard for Water-Efficient Plumbing Products

Plumbing systems used in the country are mainly based on the water carriage system. In view of the problems of water scarcity and to reduce water wastage, these plumbing products are needed to be made water efficient. In order to meet such a growing need, the BIS has formulated two Indian standards, as mentioned in Table 15.1.

Table 15.1: Requirements for Water-Efficient Plumbing Products

<table>
<tr><th>IS 17650 (Part 1): 2021 Water Efficient Plumbing Products Requirements Part 1 - Sanitary ware</th><th>IS 17650 (Part 2): 2021: Water Efficient Plumbing Products-Requirements Part 2 - Sanitary Fittings</th></tr>
<tr><td>Water closets/Squatting pans</td><td rowspan="2">Faucets/Taps (Lavatory faucets and sink faucet)</td></tr>
<tr><td>Flushing cisterns</td></tr>
<tr><td>Flush valves</td><td rowspan="2">Showerheads (handheld showers, overhead showers &handheld ablution spray)</td></tr>
<tr><td>Urinals</td></tr>
</table>

The above standards cover additional requirements for assessment & water efficiency rating of sanitary wares and sanitary fittings for their water-efficient performance. These

standards are to provide three types of water efficiency ratings, namely 1 star, 2 star & 3 star; the higher the number of stars, the better shall be the water efficiency of the product.

Manufacturing industries are to comply with these two standards to manufacturing various plumbing products to conserve water & consumers will also become sensitized to the need for using water-efficient plumbing products.

The specific requirements for Rating Criteria are given in Table 15.2.

Table 15.2: Water Efficiency Rating Criteria for Sanitaryware in India

S. No.	Product	Water Consumption per Unit	Rating Criteria		
			1 Star	2 Stars	3 Stars
Part-I: Water Efficiency Rating Criteria for Sanitary Ware					
i)	Water closet / squatting pan for flushing cistern and or flush valve	a) Full flush, litres/flush	Not more than 6 L per flush	Not more than 4.8 L per flush	Not more than 4 L per flush
		b) Reduced flush litres/flush	Not more than 3 L per flush	Not more than 2.8 L per flush	Not more than 2 L per flush
ii)	Urinal	litre/flush	Not more than 3 L per flush (inclusive of pre-flush and post-flush, in case of sensor urinal)	Not more than 2 L per flush (inclusive of pre-flush and post-flush, in case of sensor urinal)	Not more than 1 L per flush (inclusive of pre-flush and post-flush, in case of sensor urinal)
Part 2: Water Efficiency Rating Criteria for Sanitary Fitting in India					
1	Metered Faucets for Basin Use	Litres/use	1.0	0.8	0.6
	Metered Faucets for Urinal-sensor or mechanical	Litres/use	3.0	2.0	1.0
2	Wash Basin/ Lavatory Faucets (Also applies to sensor faucets)	Litres/Min	8.0	6.0	3.0
3	Sink Faucets	Litres/Min	8.0	6.0	4.5
4	Over-head shower	Litres/Min	10.0	8.0	6.8
5	Handheld shower	Litres/Min	8.0	6.0	4.0
6	Handheld ablution	Litres/Min	6.0	5.0	4.0

S. No.	Product	Water Consumption per Unit	Rating Criteria		
			1 Star	2 Stars	3 Stars
	spray				

The House Service Connections (HSCs) are the main reason for high NRW in any water supply system. The details and the correct method for installing the HSCs can be referred in Chapter 12: Service Reservoir and Distribution of Part A of the manual.

15.6 Bharat Tap

AMRUT 2.0 mandates all the cities to carry out reforms like water conservation through the reduction of NRW, recycling & reuse of wastewater, rooftop rainwater harvesting measures, water-efficient plumbing fixtures, energy efficiency, etc. The BIS standards, as explained above, cover requirements to be complied with by the plumbing fixtures such as sanitary ware like water closets, flushing cisterns, urinals, etc., and sanitary fittings like showers, mixers, taps/faucets, etc. for their performance based on water efficiency. These plumbing fixtures were launched under the initiative called "**Bharat Tap**" by Ministry of Housing and Urban Affairs in May 2022 (Figure 15.7).

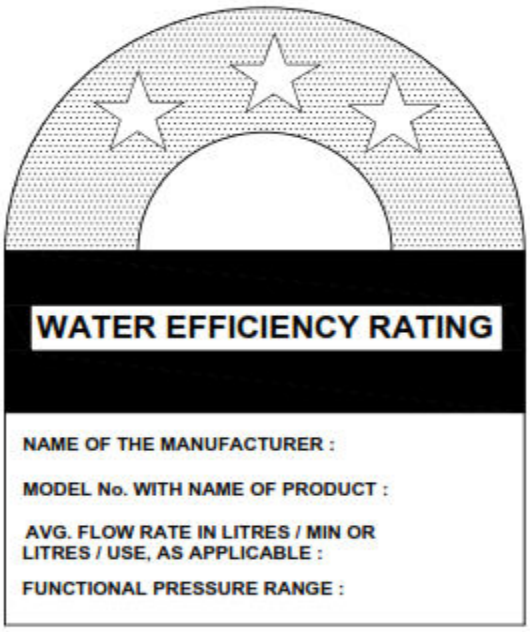
Figure 15.7: Bharat Tap Initiative

15.7 Strategies to Increase the Use of Water-Efficient Plumbing Fixtures

Major strategies that can help increase the use of water-efficient fixtures broadly include mandates, Labeling, and Tax Incentives, as described below:

(i) **Mandates**: Mandating water efficiency standards for manufacturers, new construction, replacement of old fixtures and appliances as well as mandating use of water-efficient products in all facilities.

(ii) **Labeling**: It is a certification system for water-efficient products, also known as a price tag to labels, as shown in Figure 15.8.



NOTE – The artwork of the label is only typical in nature.

Figure 15.8: Label for Water Efficiency Rating of Sanitary Fitting

(iii) **Tax Incentives**: For purchasing and installing efficient products, retrofitting, and replacing older fixtures.

The above mentioned strategies are important, but they are only a few examples of ways to reduce residential water usage. Equally important is educating water users to make informed decisions when selecting products. In addition, ICT activities will also play a crucial role.

15.8 Conclusion

Water-efficient fixtures and fittings play a crucial role in sustainable water management by conserving water resources, reducing water bills, and providing a range of other benefits. Installing water-efficient fixtures and fittings is an easy and cost-effective way to save water and money, and it is something that everyone can do to help address the growing concern of water scarcity.

Bibliography:

1. BIS, 2021, IS 17650 Water Efficient Plumbing Products — Requirements, Part 1 - Sanitaryware
2. BIS, 2021, IS 17650 Water Efficient Plumbing Products — Requirements, Part 2 - Sanitary Fittings