

REVIEW ON EVALUATION OF WATER EFFICIENCY IN BUILDINGS

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ABSTRACT

Water is the natural resource that is readily available to living beings. Fresh water availability is in great demand. But the requirement of water is increasing due to urbanization and development. A report from WHO reveals that nearly one billion people lack access to clean water and 2.5 billion people lack access to proper sanitation. This situation demands that water use and water wastage must be minimized. On account of it, water must be managed in an efficient manner. So suitable water efficiency management process must be implemented in the building and houses. Water efficiency not only deals with minimal use of water, it must also include efficient use of waste water after proper treatment. This study focuses on reviewing and suggesting different methods of efficient water management, including recycling and reuse of water.

KEY WORDS: *Water efficiency, Water Conservation Index, Reuse.*

1. INTRODUCTION

Water is an essential resource upon which all life depends. Even though water constitutes three quarters of the earth surface, not all this is available for human consumption. There is a great difference in availability of water from region to region, with extreme cases in deserts. Due to population growth, the challenge to meet user demands also increased which leads to water scarcity. Water scarcity is the lack of fresh water resources to meet water demand. It affects every continent and was listed in 2015 by the World Economic Forum as the largest global risk in terms of potential impact over the next decade. Around the globe availability of fresh water is utilized by, 70% for agricultural purposes, 19% for Industrial and 11% for municipal purposes. India's water management has been on an unsustainable path for centuries. The focus always has been on increasing supply. No effort has been made to manage demand and increase efficiencies. Demands for water are steadily increasing. Scarcity in the amount of water calls for efficient water management.

2. WATER EFFICIENCY IN BUILDING

Water efficiency is the planned management of water to prevent waste, overuse, and exploitation of the resource. Effective water efficiency planning seeks to "do more with less" without sacrificing comfort or performance. Water efficiency planning is a resource management practice that incorporates analysis of costs and uses of water; specification of water-saving solutions; installation of water-saving measures; and verification of savings to maximize the cost-effective use of water resources.

2.1 WATER USE EFFICIENT CATEGORIES

The water use efficiency categories within building include: Plumbing fixtures and fixture fittings, Residential appliances, Water treatment equipment, Water reuse and recycle. Metering & sub metering and Building water pressure.

2.2 WATER EFFICIENT PLUMBING FIXTURES

Enhance efficiency of plumbing fixtures, thereby minimizing potable water use. Using water efficient plumbing fixtures whose flow rates meet the baseline criteria aggregately leads to reduction in water use^[3]. Water conservation Index helps in identifying the efficiency of the fixtures.

2.3 WATER CONSERVATION INDEX

The water conservation index is the ratio of the actual quantity of water consumed in a building to the average water-consumption in general. The index is also called, "the water saving rate"^[1]. Evaluations of the water-consumption quantity include the evaluation to the water saving efficiency within kitchens, bathrooms and all water taps, as well as the reusing of rain water. The framework of the evaluation system is shown below in Equations ^[1],

$$WI = a + b + c + d + e \text{ within } (2 - 9)$$

WI: Water index of a green building's water resource indicator system.

a, b, c, d, e: Parameters of water closets, urinals, faucets, baths and of the reuse of rainwater and Grey water with the ranking value.

2.4 RAIN WATER HARVESTING

Enhance ground water table and reduce municipal water demand through effective rainwater management. Design rainwater harvesting system to capture at least 'one-day rainfall' runoff volume from roof and non-roof areas. One-day rainfall can be derived from 'percentage of average peak month rainfall'^[3]. To arrive at average peak month rainfall; consider an average of at least last 5 years peak month rainfall.

Runoff volume = Surface area × Runoff Coefficient × Rainfall.

In areas where the water infiltration is limited, collection tanks or water bodies may be provided to meet the requirement. Filtering of suspended solids shall be ensured by providing suitable

filtering media before letting the water into the collection tanks, water bodies, and municipal storm water drains.

2.5 GREY WATER RECYCLING AND REUSE

Grey water refers to the domestic waste water which is drained out excluding the waste water from kitchen sink and the water closet as they have high concentration of organic matters^[5]. In order to conserve water, this water cannot be just drained out but should be recycled and reused. The benefit of using recycled grey water as it is a large source with low concentration of organic matter^[4].

The bathroom grey water consists of waste water from showers, bathtubs and wash basins. It has a very low concentration of organic matter. The other sources of grey water are from washing of clothes, car washing, etc.

According to various studies, an average household produces 140 litre of grey water per day^[4]. The grey water from all these sources are collected and then treated to make them safe for non-potable use. These treatments include passing the grey water through sand filters or by using natural coagulating agents or by electro-coagulation techniques. Also other biological and chemical treatments. It has been found that using recycled grey water can support the quantity of water required for water closets, car washing and garden watering^[2].

3. CONCLUSION

Water efficiency management process must be implemented in the building and houses to minimize water use. Water efficiency deals with minimal use of water, it must also include efficient use of waste water with proper treatment. Water closets, urinals, faucets, baths, and the reuse of rainwater and grey water are the areas where the water efficient management can be done. Based on the living standard of the people, the requirement may vary. Awareness and education about the situation will be one of the efficient ways to minimize water usage, which will make the resource sustainable.

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