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Water Efficiency Measures: How to make Green Building Greener

Sumateja Reddy Vanakuru

Student (IGBC Accredited Professional), Department of Architecture, AU College of Engineering, Andhra University,

AP, India

ABSTRACT: Water is the elitist of all form of life. Water covers 71% of the Earth's surface. It is vital for all known forms of life. On Earth, 96.5% of the planet's crust water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds, and precipitation. Only 2.5% of this water is fresh water, and 98.8% of that water is in ice (excepting ice in clouds) and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products. A greater quantity of water is found in the earth's interior. The population of world between 1950 and 2000 doubled. However at the same time public demand for water more than tripled. The average world household uses about 50 gallons per person per day. World Health Organization (WHO) declares good health and cleanliness require a total daily supply of about 8 gallon per person. Buildings are major users of our potable water supply. The goal of the Water Efficiency is to encourage smarter use of water, inside and out. Water reduction is typically achieved through more efficient appliances, fixtures and fittings inside and water-wise landscaping outside. The main objective of this paper is to highlight the rising need for water conservation in today's world and its importance as a part of green building designing and construction.

KEY WORDS: Water Efficiency technology, Water Reduction, Water Sustainability and smart appliances

I. INTRODUCTION

The main objective of this paper is to highlight the rising need for water conservation in today's world and its importance as a part of green building designing and construction. Water is a limited resource that is essential to all life. There is a demand for expanding freshwater resources to provide drinking water for increasing population, in the mean time preventing pollution and leaving enough water for natural ecosystem functions. These combined describe the need for sustainable waster resource management. The world's population, currently estimated at 7.4 billion and it would hit the 10 billion mark in 2053 (2016 World Population Data Sheet), is growing by about 80 million people each year, which means demand for freshwater is increasing by 64 billion cubic meters a year. Global per capita water supplies by 2001 were one -third lower than they were in 1970 due to the increase in population and the degeneration of water quality in many areas. In addition, by 2050 two-third of population or as many as 5 billion people will face shortage of clean freshwater. Water problem may become serious even in the wealthy countries. The World Health Organization declares good health and cleanliness require a total daily supply of about 8 gallon per person per day. Annual fresh water withdrawal is 3.91 thousand billion cubic meters. The increasing development of worldwide green building projects is an important strategy for water conservation. As access to clean water continues to be a source of concern in many areas of the world, water efficiency strategies in green building practices are becoming paramount to new and existing construction efforts. Given the scope of terms associated with water efficiency in green building, there are numerous terms that describe key elements in the design and implementation of water conservation strategies.

Trends that will affect freshwater use

- 1. Population growth
- 2. Increasing affluence
- 3. Expansion of business activity
- 4. Rapid urbanization



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- 5. Climate change
- 6. Aging infrastructure

II. THE ROLE OF WATER EFFICIENCY IN GREEN BUILDING

Greater water efficiency is an important aspect of sustainability and is relatively easy to implement. Beyond conserving water, additional benefits include reduced water payments, minimized effect on ecosystems, reduced infrastructure costs from rainwater harvest, offsetting treatment and pumping costs, less runoff/ overwatering. There are many fixtures to choose from that help save billions of gallons of water without compromising performance. Water efficiency means the reducing usage of water and reducing waste. The key for efficiency is reducing not restricting. Examples of water efficient steps includes fixing leaking taps, taking showers rather than baths, installing displacements devices inside toilet, and using dishwashers and washing machines with full loads. These are things that are part of definition of water efficiency, which to obtain the desired result or level of service with the least necessary water. By using water efficiency we can help preserve water supplies from future generations, save money and protect the environment.



Fig: 1 House holds water use in existing buildings

The average US household uses about 50 gallons per person per day a rate more than seven times the per capita average in the rest of the world yet the World Health Organization declares good health and cleanliness require a total daily supply of about 8 gallon per person per day. Two third of residential interior water is used for toilet flushing (4gal/flush) and bathing (15-50 gal/ shower or bath) while a dishwasher uses 8-12 gallon and a top loading clothes washer 40-55 gallon

The increasing development of worldwide green building projects, especially those related to the Leadership in Engineering and Environmental Design (LEED) &Indian Green Building Council (IGBC) standard provide the contextual basis for the implementation of water conservation strategies. As access to clean water continues to be a source of concern in many areas of the world, water efficiency strategies in green building practices are becoming paramount to new and existing construction efforts. Given the scope of terms associated with water efficiency in green building, there are numerous terms that describe key elements in the design and implementation of water conservation strategies.



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III. ADAPTED STRATEGIES THAT INCREASE WATER EFFICIENCY

Green building encourages innovative water-saving strategies that help projects use water wisely. Project teams can follow an integrated process to begin assessing existing water resources, opportunities for reducing water demand, and alternative water supplies. Effective strategies include:

A. SWITCH TO HIGH-EFFICIENCY PLUMBING FIXTURES

Toilets are often the source of the most water use (and water wasting) within a home; accounting for nearly 30 percent of an average home's indoor water consumption. Low-flow fixtures have been on the market for a while. These days, there are also many *ultra*-low-flow fixtures that conserve even more water without compromising performance. If you have a toilets that uses more than 1.6 gallons of water per flush —as do almost all toilets installed before 1994—replace it with one of the following:

- 1. High efficiency toilet model uses no more than 1.28 gpf or use dual flush toilets or installing a Composting toilet, which uses little to no water for flushing
- 2. Showerheads- Showering accounts for up to 20 percent of the average household's indoor water use. You can cut your shower water use by as much as 70 percent by switching to an ultra-low-flow showerhead.
- 3. Faucets-If you have inefficient faucets (which use more than 2.5 gpm), either replace them with highefficiency faucets that have a flow rate of no more than 1.5 gpm or add a water-saving aerator or flow restrictor to the existing faucets
- 4. waterless urinals, water-efficient dishwashers and washing machines

B. INSTALL SUB METERS.

Water conservation efforts are the first step in controlling increasing water costs; however, the ultimate solution is water sub metering. American Water & Energy Savers can assist you in sub metering your multi-family property. Individual meters are installed in each apartment and linked through a wireless RF (radio frequency) system allowing for daily meter reading from anywhere in the country.

Benefits

1. Sub metering eliminates utility costs from the rent equation so your property stays more competitive.

2. Owner can recover all if not most of the entire monthly utility bill thus increasing cash flow.

3. Water sub metering encourages residents to report leaks so you can take care of small problems before they become major repairs.

4. Sub metering enables residents to be directly responsible for their own energy and water consumption leading to a "greener" property.

C. CHOOSE NATIVE AND ADAPTED PLANTS

Native plants are defined as the species that exist in a region without human introduction. Unfortunately, native plants are disappearing at an alarming rate. Botanists are concerned about the survival of one in every five of this country's native plants—and these plants provide critical habitat for countless other creatures. Fortunately, many native plants can play leading roles in our home landscapes.

Benefits of using native plants

Native plants can add beauty to a garden, just as they do in natural landscapes. The great variety of plants native to any region give gardeners options that work well in any type of garden design. But native plants also do much more.

- 1. Native plants that are well suited to the site conditions do not require soil modifications or fertilizers and once established can thrive without regular watering. That reduces maintenance costs associated with irrigation, fertilizers, and pesticides.
- 2. Native plants are the foundation of the biodiversity that maintains our own life support systems. They nurture important pollinators like bees, butterflies, and hummingbirds.
- 3. Native plants create a distinctive sense of place, preserving the natural character of your region



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D. USE XERISCAPING.

Xeriscaping refers to the conservation of water through creative landscaping. Originally developed for droughtafflicted areas, the principles of xeriscaping have an ever broadening appeal. With water now considered an expensive and limited resource, all landscaping projects, residential or commercial, can benefit from this alternative. Xeriscapes do not have a single look - almost any landscaping style can be achieved. The principles can be applied to all or part of a yard, in any geographic region of world.

Xeriscaping Benefits:

A).It can reduce water use by 50 - 75%. B). Less Maintenance. Aside from occasional pruning and weeding, maintenance is minimal. Watering requirements are low, and can be met with simple irrigation systems .C).Using plants native to your area will eliminate the need for chemical supplements. Sufficient nutrients are provided by healthy organic soil. D).A good Xeriscape can raise property values which more than offset the cost of installation. Protect your landscaping investment by drought-proofing it. E). Fossil fuel consumption from gas mowers is minimized or eliminated with minimal turf areas. Small turf areas can be maintained with a reel mower. F).Use of native plants, shrubs and trees offer a familiar and varied habitat for local wildlife.

E. SELECT EFFICIENT IRRIGATION TECHNOLOGIES-

Adapt efficient Irrigation and landscaping measures like water-efficient irrigation systems, irrigation control systems, low-flow sprinkler heads, water-efficient scheduling practices, and Periscope. Apart from that discourages the use of potable water for landscaping. Use rain water and gray water for landscaping purpose.

F. WATER RECYCLING OR REUSE MEASURES

Potable Water, Gray water, Black water, and Process Water; all of which provide different utilities in green building water efficiency processes. Below are several definitions related to each type of water in the LEED standard in order to provide greater understanding of utility in the green building process

- 1. **Potable Water:** Discourages the use of potable water in non-potable applications such as landscaping or indoor plumbing needs.
- 2. **Gray water:** To protect the unnecessary use of potable water, green building practices emphasize the use of gray water for a variety of non-potable applications such as landscaping and indoor plumbing.
- 3. **Black water:** It is not suitable for any human contact (either direct or indirect) given the contents that constitute its definition: wastewater from water closets and urinals. However, it is important to note that in some state and local codes, wastewater from showers, kitchen sinks, and bathtubs are considered black water as well, thereby expanding its definition and illuminating the need to identify its presence on a green building project.
- 4. **Process Water:** The use of process water, especially in the LEED rating systems, is not regulated for water efficiency processes, given its utility in cooling towers, chillers, and boilers. The most important element of process water, however, is the limited use of potable water to be used as process water.

G. METHODS TO REDUCE WATER USE IN HVAC SYSTEMS

The Heating Ventilation and Air-Conditioning (HVAC) system is the largest user of energy and water in a typical commercial building. In the past, energy costs overshadowed water costs. However, recent droughts and the need to expand municipal water supplies to support growth have led to increased water costs nationwide. Combined with the focus on water conservation in green building, the payback associated with reducing building water usage is greater than ever. Most commercial buildings use water cooled chillers to provide air conditioning because they are much more energy efficient than air cooled chillers. However, achieving these efficiencies requires large quantities of water to operate a cooling tower. Most buildings also use re-circulating hot and chilled water loops to distribute heating and cooling throughout the building. Although not designed to routinely use water, these systems can use large amounts of water if undetected leaks occur. As the major consumer of water, the building HVAC system is an obvious target for water conservation efforts and often provides significant savings

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operate a cooling tower. A building HVAC system can be a major consumer of water. But with the right plan planning, facilities professional can ensure greater water conservation and reduced water costs

H. RAINWATER HARVESTING SYSTEMS

Traditionally, rainwater harvesting systems have been used in arid and semi-arid areas as part of everyday life, to provide drinking water, domestic water, and water for livestock, small irrigation and a way to replenish ground water levels. Broadly there are two ways of harvesting rainwater. They are

- 1. Surface runoff harvesting
- 2. Roof top rainwater harvesting
- Benefits of Rainwater Harvesting
 - 1. Can reduce Domestic water consumption by >50%
 - 2. Can reduce Commercial water consumption by >75%
 - 3. Reduces the volume of surface water to drainage
 - 4. Reduces the level of flood risk
 - 5. Reduces the demand volume on water from reservoirs
 - 6. Ideal for Garden Irrigation no chlorine
 - 7. Reduces the amounts of detergents used in washing
 - 8. Soft Water can increase lifespan of washing machines
 - 9. Ideal for Vehicle Washing
 - 10. Commercial Applications will have a Pay-back Period

IV. CONCLUSION

The main objective of this paper is to highlight the rising need for water conservation in today's world and its importance as a part of green building designing and construction. The necessity for water conservation has become so much significant that recently LEED rating system has doubled the points under the water efficiency category to ten from the previous quantity of five. Several countries around the world have already started devising green building designs in all their construction works with special emphasis on water conservation and are encouraging their citizens to use water efficient technologies. Numerous rating systems to evaluate the efficient use of water in buildings have been brought into practice. Protection of the remaining fresh water resources around the world has become a matter of global significance and measures are being taken to preserve them so as to avoid facing the problem of water scarcity in the future. Water is a finite resource. While both population and demand on freshwater resources are increasing, supply remains constant. Water efficiency helps preserve our water supply for future generations. Efficient practices and 3 products such as grey water treatment and low flow plumbing fixtures and rain water harvesting provide significant opportunities. Apart from retrofitting existing buildings use high-efficiency toilets, water-saving sinks, and waterless urinals. To adapt Green Building construction globally is the only measure with mandatory by the countries. This is the right time to take decision whether we save water or ready to face crises. Hence, it has been concluded that by using these water efficient techniques, the precious water can be saved in an economic way so that our future generations don't face the curse of water scarcity.

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