

## **GROWING GREENS ON WALL STRUCTURES USING WASTE WATER AND BIOFILTER**

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### **ABSTRACT**

The developing and developed nations witnessing urbanization in global wide. As that results its facing many changes and many of problems can be seen in city limits as the nation's grows, the over population, drinking and domestic water supply, solid wastes, housing, food, pollution, clean fresh air, good nature etcetera. Our surrounded concrete world is really needed of some spacing gardens near to housing, but due to lack of space within or in-between in the houses it can not be possible for many people. To overcome this problem, the green walls or vertical gardens are the simple technic. The growing of greens on walls or on roofs are possible by adopting some special technical design. By adopting of this green walls we can have the many uses, like getting fresh air near to our presence, we can grow of good, organic and fresh vegetables and fruits, we can also decorate our walls and buildings by growing greens on it. Here the growing of the greens on the walls is not only the concept, rather than that growing of this greens by using the waste water of the same house. Yes, this waste water which is leaved simple to sewage are to be prevented by adopting this method. And also the main other problem like waste water which is leaving to rivers or lakes, which is made to be the water treatment is done easily as basic treatment infiltration pass through the planter boxes. This same water which is filtered treated water can be leave to rivers or any other place, or it can be reused for the domestic purposes, the water recycling also be done by this method. The single modulation of design can achieve the many uses by the green wall project. To over come the many problems of urbanization this will be give good results and holds good stand.

**Key words:** *Green walls, Biofilter, Water recycle system, planter box.*

## INTRODUCTION

A 'Green Wall', also commonly referred to as a 'Vertical Garden', is a descriptive term that is used to refer to all forms of vegetated wall surfaces. In our planet plants have served humanity since the dawn of time, supplying food, clothing, building materials and a host of other goods. With the advent of the modern industrial city, now home to more than half of the world's population, planners, designers and urban advocates are once again turning to plants – green infrastructure - as a key strategy to provide cleaner air and water, while improving living environments, human health and mental well-being. The integration of the living, organic systems characterized by green walls and green roofs, with the inorganic and lifeless structures that have come to dominate modern architecture, holds the promise of a new type of 'living' architecture. Living architecture is multi-disciplinary, blending the talents of architects, landscape architects, engineers and horticulturalists.



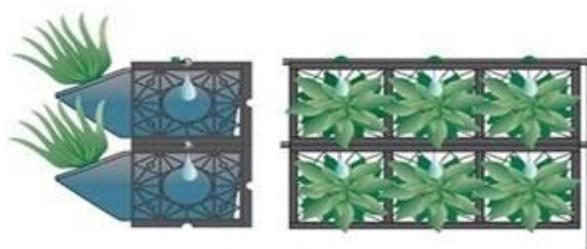
**Fig 1: Green wall house**

This vertical walls can be grown by using water flow through bathrooms or kitchen as waste water and this water can be recycled and purified the water. The method of harvesting of greens and recycling of waste water under a single architecture roof. Its practitioners are committed to the greening of cities and buildings and recognize that plants are an underutilized resource in the larger green building

movement. Green Roofs for Healthy Cities' (GRHC) mission is to increase the awareness of the economic, social, and environmental benefits.

## II CONCEPT

The main concept of green walls is not only growing plants on wall, and also get more benefits on this architecture, like getting fresh air, raw products like fibers, fruits, vegetable and also act like bio water filter for domestic waste water. The green hydroponics or other valuable daily life needed plants can be grown on the vertical walls and the top roofs of the architectural stretchers. This bio walls can be achieved by the using domestic waste water as a source, this waste water lead to flow on bio walls to make the plants grow. As water lead to flow on the bio wall this has to pass through more planter box, this act like integrated water filters.



cross section of planter box

**Fig2: Cross Section of Planter Box**

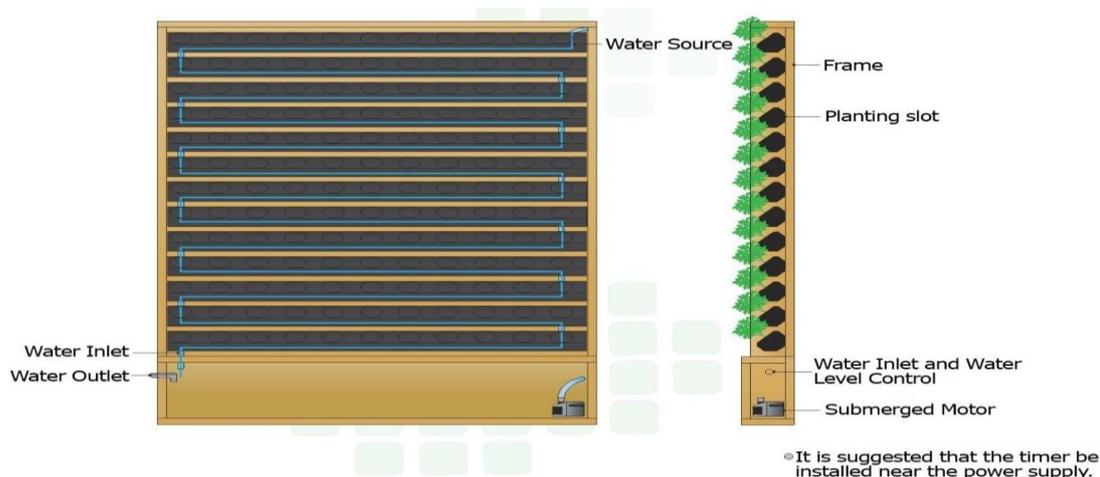
Which mean the plants gets its required water and also this water is get purified, the primary water treatment which is done in home its self as great responsible of preventing of water pollution. The green walls impact not only on prevents the water pollutions it also prevents the air pollutions and provides the fresh air to the surroundings.

## III ROLE OF GREEN WALL USING WASTE WATER

The constructing of green wall in the urban area and maintaining it with help of waste water will play very important role because, the city planning facing many problems like water scarcity, air pollution, water pollution, population growing. As population grows increases waste management will ahead for best solutions, so the water treatment can be done friendly way. The plastics can be recycled for growing green walls like it can be used for planting plants as planters on the walls and also in the

roofs of the houses. The green can be maintained in urban areas, the global warming will be reduced. The role of green walls details and say for recycling of waste in architectural designing.

#### IV WORKINGPRINCIPLE AND STRUCTURAL INFORMATION



**Fig 3: Working Principal of Green Wall**

After the constructing of wall or house compounds a simple modification is to make in growing greens on it. The growing greens by supply water using pipes is not issue the waste water should cleaned and purified and it is used for growing of greens on the walls, this method is explained later. Growing plants or green on the wall having different types of methods are used.

#### V Different types methods of growing green walls are

##### 5.1. Green Facades

Green facades are a type of green wall system in which climbing plants or cascading groundcovers are trained to cover specially designed supporting structures. Rooted at the base of these structures, in the ground, in intermediate planters or even on rooftops, the plants typically take 3-5 years before achieving full coverage. Green facades can be anchored to existing walls or built as freestanding structures, such as fences or columns. Self-clinging plants such as English Ivy have commonly been used to create green walls. Their sucker root structure enables them to attach directly to a wall, covering entire surfaces. These aggressive plants can damage unsuitable walls and/or pose difficulties when the time comes for building maintenance and plant removal.

Technological innovations in Europe and North America have resulted in the development of new trellises, rigid panels and cable systems to support vines, while keeping them away from walls and other building surfaces. Two green facade systems that are frequently used are Modular Trellis Panel and Cable and Wire-Rope Net systems. Each of these systems is described below.

## 5.2 Modular Trellis Panel System

The building block of this modular system is a rigid, light weight, three-dimensional panel made from a powder coated galvanized and welded steel wire that supports plants with both a face grid and a panel depth. This system is designed to hold a green facade off the wall surface so that plant materials do not attach to the building, provides a “captive” growing environment for the plant with multiple supports for the tendrils, and helps to maintain the integrity of a building membrane. Panels can be stacked and joined to cover large areas, or formed to create shapes and curves, are made from recycled content steel and are recyclable. Because the panels are rigid, they can span between structures and can also be used for freestanding green walls

## 5.3 Cable and Wire-Rope Net Systems

The cable and wire-rope net systems use either cables and/or a wire-net. Cables are employed on green facades that are designed to support faster growing climbing plants with denser foliage. Wire-nets are often used to support slower growing plants that need the added support these systems provide at closer intervals. They are more flexible and provide a greater degree of design applications than cables. Both systems use high tensile steel cables, anchors and supplementary equipment. Various sizes and patterns can be accommodated as flexible vertical and horizontal wire-ropes are connected through cross clamps.

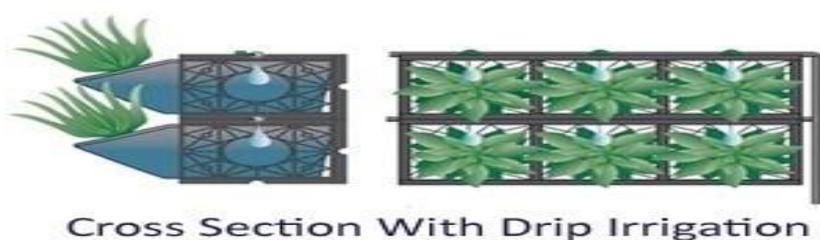
The selecting above methods to respective needs of architecture style and the design of the house is adopted.



**Fig 4: Waste Water Recycling System**

The water supplying design is the most important concept of this project as we mentioned in the starting of the working concept this concept is explained one by one in below.

1. The waste water is collected in the sumps which is come from bathrooms, kitchens in the underground. The sumps having the aerobic filters which give water to contact with the oxygen and reduce the bad odor in the water. The same sump is also consisting of water filter which purify the solid particles the flow through it.
2. This water from the sump is drawn lifted by the motor pumps to the top of the structure and supplied to the walls which is growing the greens on them.
3. As you see in the “figure 4” the water level control is adopted for controlling the level of the water in the water circuit, which achieve to the over coming of loss of water, at the center of the wall the pure water is collected because of the present of drip which is pass through layer of the planter as shown in the “figure 2” and “figure 5” is collected on the other sides.
4. this collected water can be used for many for proposes, it can be used for again for plants or any other uses any how this proses can also use as bio filters.



**Fig 5: Planter Box with Plants and Installation Process**

## VI ADVANTAGES

1. The temperature increase in urban areas caused by the replacement of “natural vegetation with pavements, buildings, and other structures necessary to accommodate growing populations.” This results in the conversion of sunlight to heat. Vegetation cools buildings and the surrounding area through the processes of shading, reducing reflected heat, and evapotranspiration.
2. Improves thermal insulation capacity through external temperature regulation. The extent of the savings depends on various factors such as climate, distance from sides of buildings, building envelope type, and density of plant coverage. This can impact both the cooling and heating.
3. Buildings are exposed to the weathering elements and over time some of the organic construction materials may begin to break down, as a result of contraction and expansion shifts due to freeze-thaw cycles and UV exposure.

4. For interior projects, green walls are able to filter the water and act like domestic water treatment plant.

5. Water can be recycled and used it for domestic uses, so that water problems are solved.

6. Contaminates that are regularly flushed out of buildings through traditional ventilation systems. The filtration is performed by plants, and in the case of bio-filtration, micro-organisms.

## VII LIMITATIONS

The limitation of growing green walls using waste water is some complicated problems in construction works, the initial cost is more if the plan is done proper way. The maintain cost is less but the maintaining it needed of skilled workers. The insects and the other organisms may lead life in the plants, so it may irritate the personal life style.

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