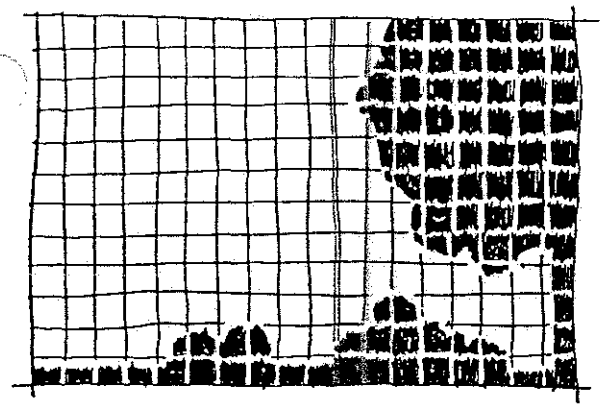
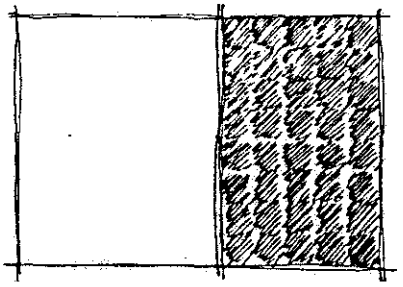


Green Structure

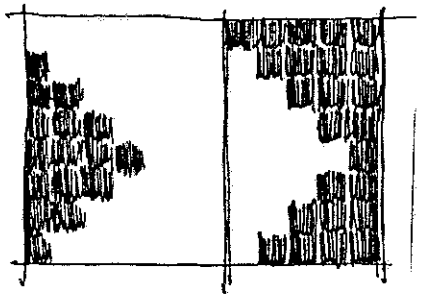
The term Green Structure is borrowed from the European planning model that links the natural "green" qualities of the environment with the organizing human "structure" of an urban or landscape design. The use of this concept can be applied to both urban and natural environments. In the urban environments, it promotes the view of the green component as an equal to the other built systems of the urban infrastructure such as roads, utilities and buildings. The green structure is a mechanism to control or maintain the natural environment when intervention or urbanization has caused an imbalance.

The green structure urban design principles are structured within two topics that are listed below;



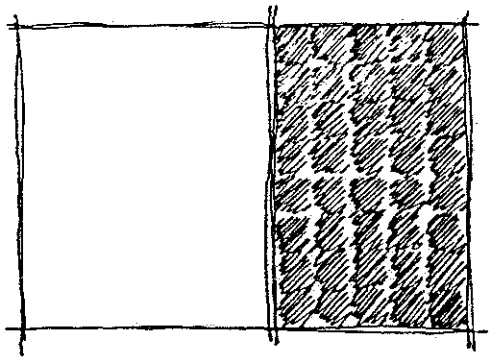
Gray-Green Balance

Presents ratio guidelines and approaches for succesful horizontal and vertical integration of green into sites, neighborhoods, and urban structures.



Distribution

Presents guidelines for distribution and variety of green within the horizontal plane of pavers.

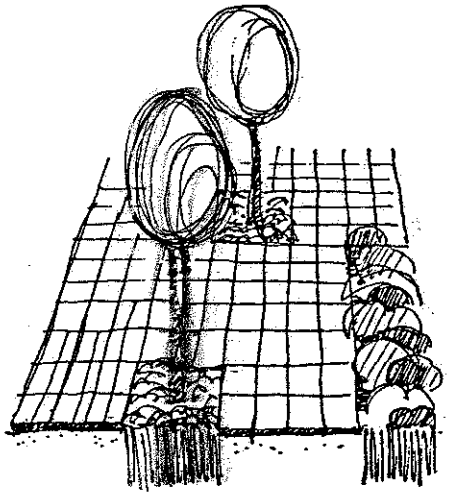


Gray/Green Balance

The gray/green balance focuses on the ratio and layering of the natural green within the human constructed, gray, urban environment. The amount of green in plan and the proper placement and development of the layers of green in section are critical for the proper growth and harmonic support of the plant materials. The benefits of the green structure include temperature reduction, runoff control, visual appeal and as a whole has been described as the "lung" of the city when properly designed and integrated. The basic principles of the gray/green balance concentrate on the integration of green at the site or paver scale, however, they can be utilized at the design scale of the neighborhood and city as well. The basic principles include;

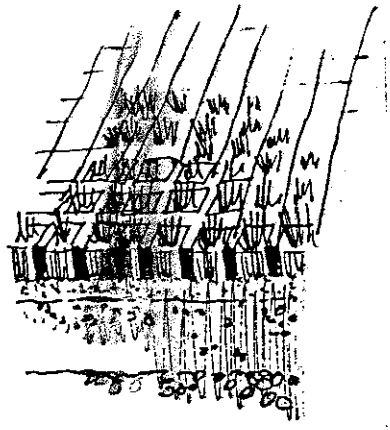
<u>THE 60/40 RATIO</u>

This describes the desired ratio of gray to green of the built environment (60 percent gray and 40 percent green), and applies to all scales of design. It can be applied to all horizontal and/or vertical surfaces of the urban fabric. The rule attempts to insure enough overall green within the urban structure to provide mutual support of plant life and the realization of the environmental benefits.



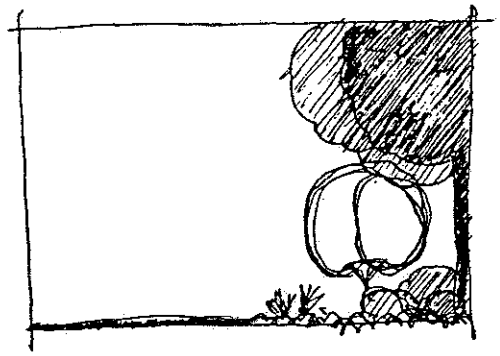
INTERUPTED

Green can be incorporated in the gray horizontal surface by interupting the pavers with points or lines of green. At the urban and neighborhood scale, point elements include parks, fields and playgrounds while line elements include continuous lawn areas, tree lined boulevards and medians. At the paver scale point or line interuptions are individual plantings such as trees or bushes. The paved surface and function is interupted to allow the introduction of a green element.



INTEGRATED

The integrated approach utilizes open grid pavers or widely spaced solid pavers for the support of green within the paved plane. The 40% of green exists within the same plane as the gray and therefore does not interupt the function of the horizontal surface but is obviously limited to ground cover scale green elements for achieving the balance.

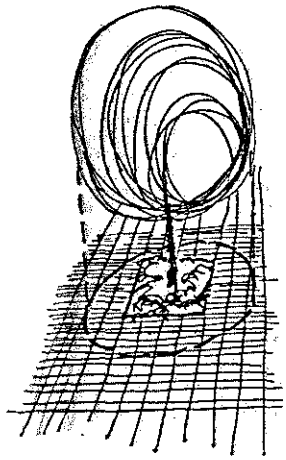


THE FIVE LAYER APPROACH

The five layer approach is a sectional response to the placement of green in the urban structure. The principle of providing five layers of green serves to improve the development of the vegetation and increases the sense of visual appeal and integration of the green. The layers include;

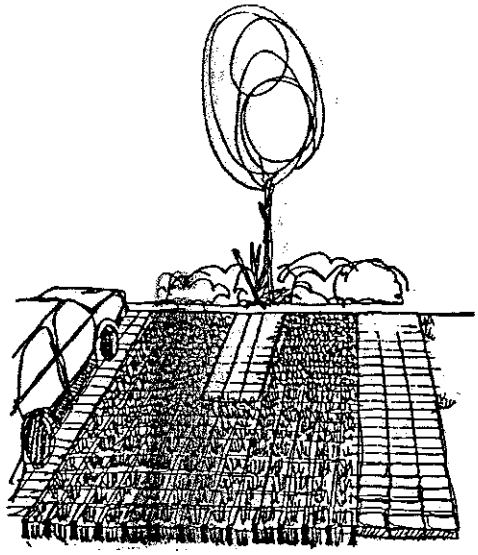
CANOPY, mature, full height, trees.
UNDERSTORY, immature or shorter species of trees.
SHRUBS, bushes and shrubs.
GROUND COVER, grass, ivy or other ground cover.
FLOOR, access of water and air to roots below.

Since the floor in the urban environment is typically paved, its treatment becomes a critical concern for the support of the layers above it. As a rule of thumb, it is desirable to provide as many of the five layers as possible and maximize the penetration of air and water to the root structure of the green below the paved surface. The principles concentrate on the design of green when it interupts the paved surface and when it is integrated with the paved surface.



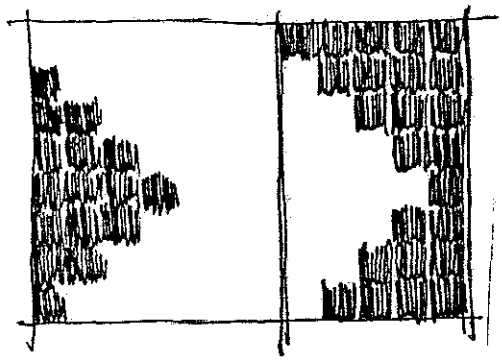
INTERUPTED

When green structures interupt a continuously paved horizontal surface, the correct amount of porosity below a green structure can be achieved by providing 40% of the area under the dripline as earth or ground cover. This can be accopmplished with a grate, open grid pavers or any 60/40 combination of green/ gray under the dripline.



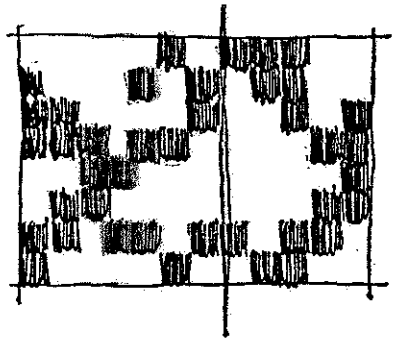
INTEGRATED

When green ground cover is integrated with the pavers it can provide a vast area of visual green while also supporting other layers above. In driving lanes, grass should be placed in the units between the tires. In parking areas, green can be used throughout but it is recommended that solid pavers be used under the engine area and between cars.



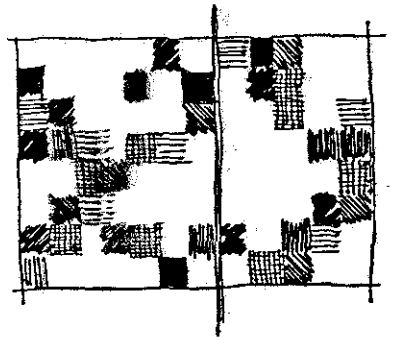
Distribution

This principle centers about the distribution and variety of the green within the gray/green balance. The concept suggests that there must be some variety in the green and that the green must be distributed at the various scales of implementation of city, neigborhood, and site. This allows the density of 60/40 to be varied across the application and insures the benefits of the green structure throughout. The basic principles for successful integration of the green structure include the following;



CONTINUOUS/CONTIGUOUS

The green should be distributed throughout the urban, neighborhood or site fabric. Concentration of the entire 40 percent of green in one will deny the environmental and visual benefits of the green from the other portions. The distribution should also attempt to be contiguous so that the green effects and mutual support can spread from one green area to another.



VARIETY/DIVERSITY

In order to avoid the possibility of losing the green structure it is important to distrubute different varieties of vegetation throughout. The rule of thumb suggests that there should not be more than 15 percent of any one variety of planting. The distribution of the various plant material should also be fairly even across the urban fabric. This will insure overall continuous disrtibution and general density should one variety perish.