
**A GUIDE
FOR
DESIGN INTEGRATION
OF
CONCRETE PAVERS**

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GENERAL INFORMATION

Concrete pavers are individual precast concrete modular units that are assembled to provide larger areas of horizontal surfaces. The units are manufactured from a high strength "zero slump" mix of concrete and they have become a modern alternative to the monolithic scaleless extrusion of asphalt or concrete pavement.

Segmental pavers were historically the dominant method for the surfacing of roads, walks and plazas. The units were primarily bricks or stone and were used successfully for hundreds of years. These surfaces were eventually paved over by the new by-product of the petroleum industry, asphalt. The relatively new and inexpensive paving has dominated the paving industry for many years boasting as its primary sales point the low initial cost of installation. However, this single criteria for the selection of paving surfaces has been challenged and certain issues have been raised regarding servicability, lifespan, maintenance cost, aesthetic goals as well as environmental issues.

Concrete pavers are an excellent response to these issues, and they inherit the design character and traditions of the segmental pavers of the past while improving on the strength and servicability of this type of pavement.

This section of information serves as the introduction to the concept of concrete segmental pavers and structures basic information about them in three basic categories;

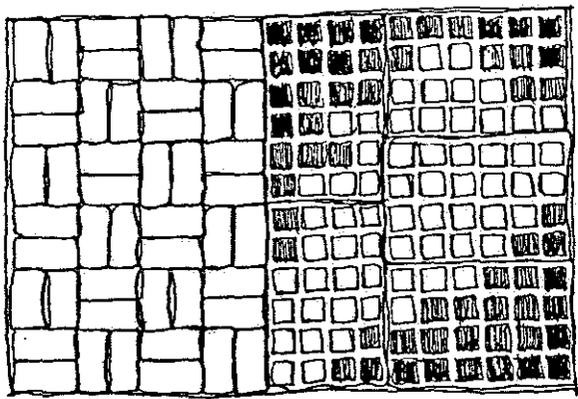
Generic Types

Applications

Advantages

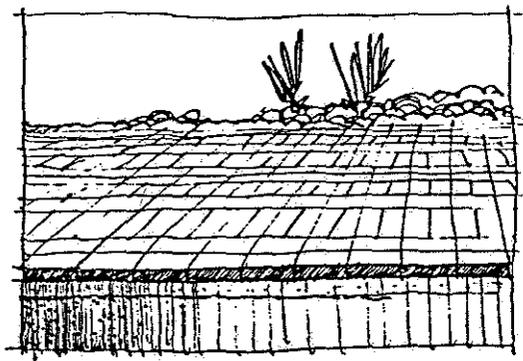
Generic Types

By definition, the precast, "unit" nature of concrete pavers results in a non-monolithically paved surface. The basic size of the units is designed so that an individual can place the element by hand. The small units can also be grouped together and mechanically installed. All precast concrete paving units fall into one of the two following basic categories;



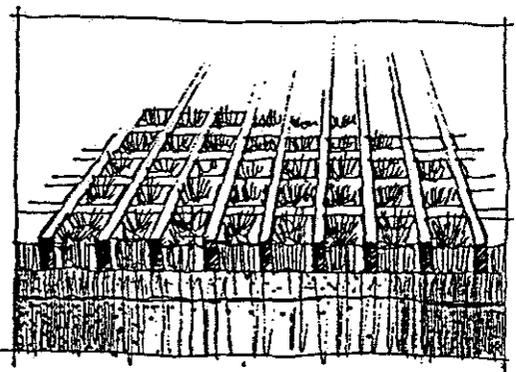
Solid Interlocking

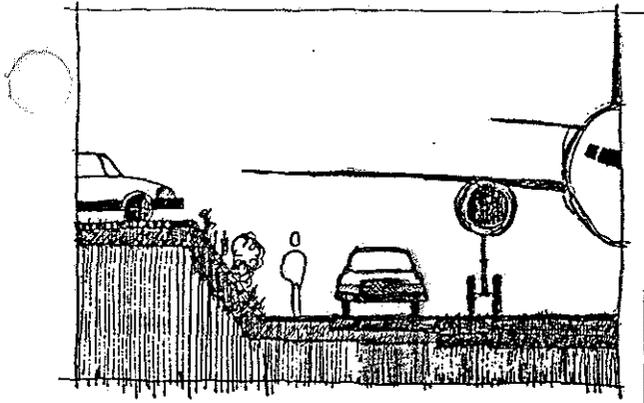
Solid interlocking pavers are relatively small in size. They are approximately the size of a brick and are considered the modern day replacement of the brick paver. The units all interlock to form an overall pattern for design purposes and for structural load transmission purposes. The units are traditionally installed over a prepared sub-surface of compacted aggregate and sand with sand in the joints. The sand and vertical surfaces of the pavers utilize shear force between them to transmit loads to a broader base beneath them. The most typical joint is filled with sand and ranges from 1/16" to 1/8" (.16mm to .32mm). However, there are wider joint systems with abutting tabs between the individual units available. These units support the growth of grass in the increases space of the joint.



Open Grid

Open grid pavers are much larger in size than the "hand held" size of the solid interlocking pavers. The size typically ranges from 15" to 24" (38cm to 61cm) on a side, weighing approximately 60 to 80 pounds (27kg to 36kg) each and can be square or rectangular. The units are precast with large cavities or holes through them which form an open grid when installed. These voids allow the immediate penetration of rain water to the earth's surface below thereby reducing runoff and soil erosion. The grid of holes can also support the growth of grass, therefore making their installation a desirable alternative in areas where a large permanently monolithically paved surface is inappropriate.





Applications

There are several different applications for the use of segmental concrete pavers. Both the solid interlocking pavers and the open grid pavers can be utilized in the applications, however, each of the two types have more common applications that they are typically associated with. The typical applications are separated by the type of paver and the list below includes the applications and some of their specific uses. Following this basic introduction to the various applications, each one will be expanded upon on the subsequent pages. Each of the uses contains design examples and diagrams that illustrate the design variety in their use.

Solid Interlocking

Pedestrian

- Sidewalks
- Patios
- Decks and roof ballast

Vehicular

- Driveways
- Roads and parking lots
- Plazas
- Service drives/walks

Industrial

- Airport taxi ways and aprons
- Loading docks
- Terminal Ports

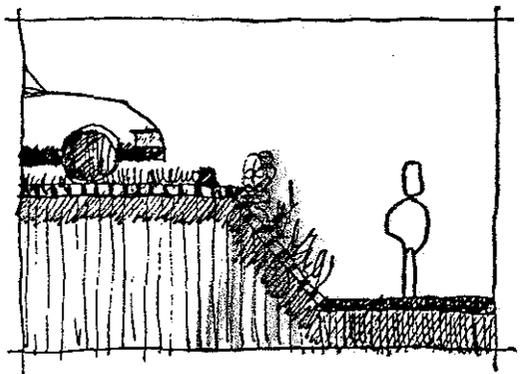
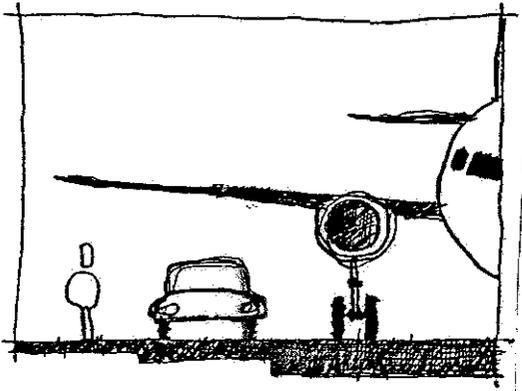
Open Grid

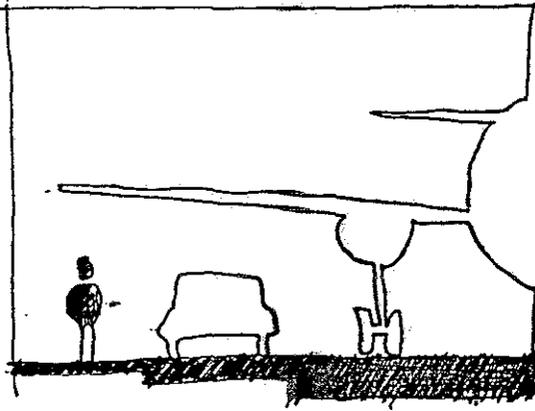
Vehicular

- Parking/Semi paved areas
- Highway shoulders
- Access ways

Landscape

- Soil stabilization
- Erosion control
- Runoff/Infiltration control





Solid Interlocking-Pedestrian Applications

Pedestrian scale uses of solid interlocking pavers are typically found in the horizontal paving of walks, patios and roofs. They are commonly used in these applications since they provide a sense of human scale and visual interest to a paved area while at the same time providing a skid-resistant surface that is easy to maintain.

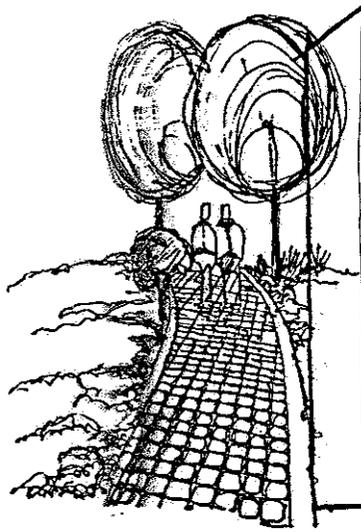
LINEAR PEDESTRIAN APPLICATIONS

SIDEWALKS/PATHS

The use of solid interlocking pavers for sidewalks and paths occurs at several scales ranging from residential walks to urban sidewalks. At each level of use, the pavers allow for the easy repair of damaged areas as well as the ability to alter the pattern to provide visual cues and variety along the way. In landscaped environments, the interlocking pavers can be used for a more harmonious fit between nature and human constructs.

BUILDING FRAMING

Although considered pedestrian scale, this use for interlocking pavers is primarily for aesthetic or functional reasons. The pavers act as a possible visual transition from a building to the parking or ground surface while providing a paved, accessible, clean area adjacent to the building.



PLANAR PEDESTRIAN APPLICATIONS

PATIOS

The planar use of interlocking pavers is typically associated with gathering places for people along a path or as an exterior space adjacent to a building. The segmental pavers allow for variety, visual interest and a sense of scale.

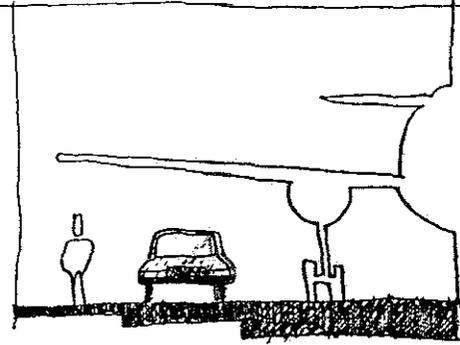
GROUND COVER

Planar uses of interlocking pavers can provide a consistent ground cover while allowing air and water to infiltrate the ground to support neighboring vegetation or grass in the joints.

ROOF DECK AND BALLAST APPLICATIONS

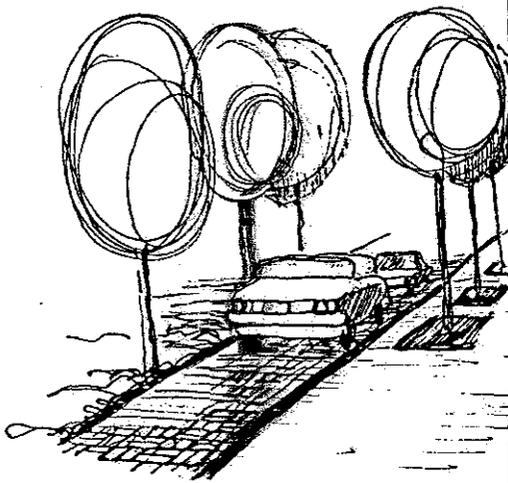
Interlocking pavers can offer protection from the sun and foot traffic while providing ballast for the roofing materials. They provide a visually pleasing surface when viewed from neighboring tall buildings.





Solid Interlocking-Vehicular Applications

The ability of interlocking pavers to disperse and transfer vertical loads to the ground allows for their use as pavement for intermediate loads and vehicular use. The primary applications for medium scale use include driveways, roads and plazas. The segmental nature of the pavers allows for easy repair and addition of underground services at a later date. The larger scale use also provides opportunities for large scale mosaics and design patterns that suggest zones of use and provide visual cues to the built environment.



LINEAR VEHICULAR APPLICATIONS

DRIVEWAYS AND ROADS

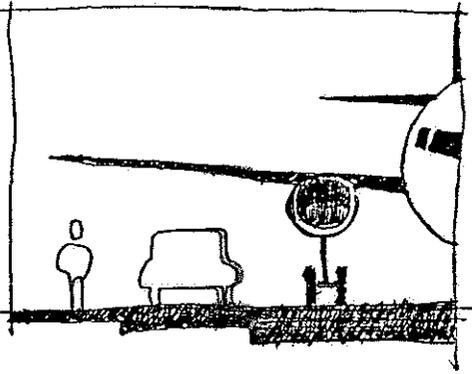
A primary medium scale use of solid interlocking pavers is for drives and roads. They can provide an elegant paved surface that can also double as a sidewalk in areas where a monolithic permanent drive is inappropriate. The medium scale use of these pavers can also be combined with pedestrian activities in areas where space is limited. An example of this is the "verkeersbehrurgung", a combination of street and pedestrian walk/play areas. Another example of this is the use of a sidewalk as an occasional service drive to a building.



PLANAR VEHICULAR APPLICATIONS

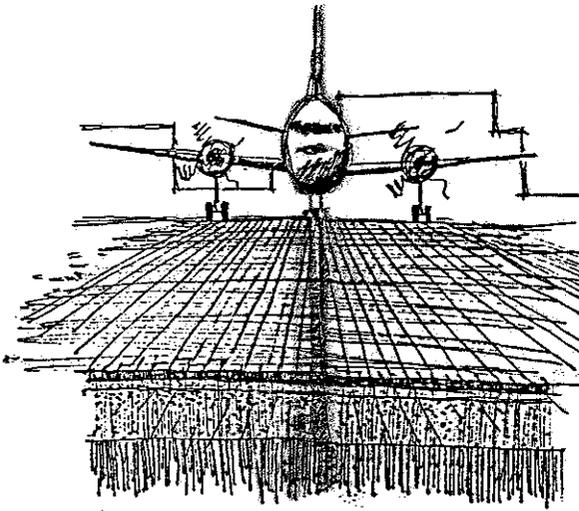
PLAZAS

Another application of solid interlocking pavers is for the horizontal surfacing of courtyards and plazas. The variety of patterns, colors and sizes can be incorporated in an overall design concept that reinforces a building or landscape. The designs can take many forms including mosaic murals or scale versions of city blocks. The altering of shape, pattern and color can also indicate different uses on a large otherwise monolithic, bland surface.



Solid Interlocking-Industrial Applications

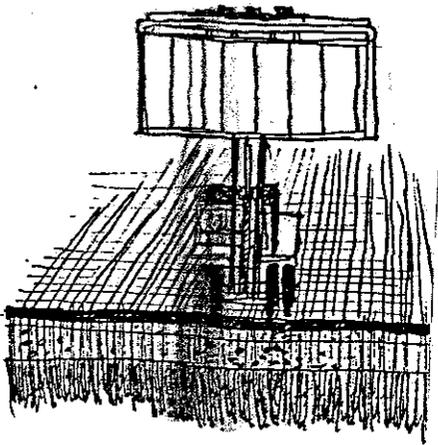
The individual unit strength of a solid paving unit allows it to be used for industrial applications. Given the proper sub-grade earth, sub-base and base preparation, interlocking pavers are capable of dispersing and transferring heavy vertical loads to the ground. This ability makes them suitable for use in heavy duty applications as an alternative to monolithic pavement systems. The high load bearing capacity and the ease of repair and maintenance makes them a viable long term pavement alternative. In very large scale applications, grid pavers offer much more runoff infiltration which in turn reduces the need for major storm water management systems and retention.



LINEAR INDUSTRIAL APPLICATIONS

TAXIWAYS, APRONS AND LOADING DOCKS

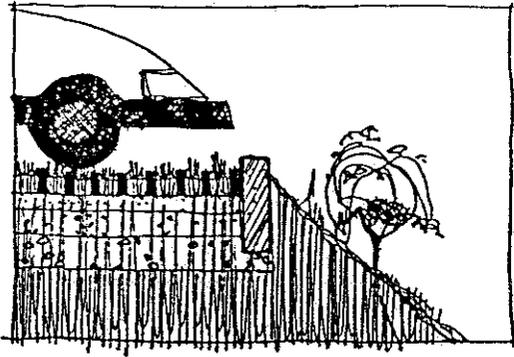
The segmental paving for taxi ways and loading docks provides a safe, skid-resistant surface that can be easily repaired when the ground below settles under extreme industrial load conditions. Unlike monolithic paving that cracks under deformation, the solid interlocking pavers can move freely, minimizing cracking. Any settling can be corrected by removing the units in the affected area, restoring the base, and then replacing the units.



PLANAR INDUSTRIAL APPLICATIONS

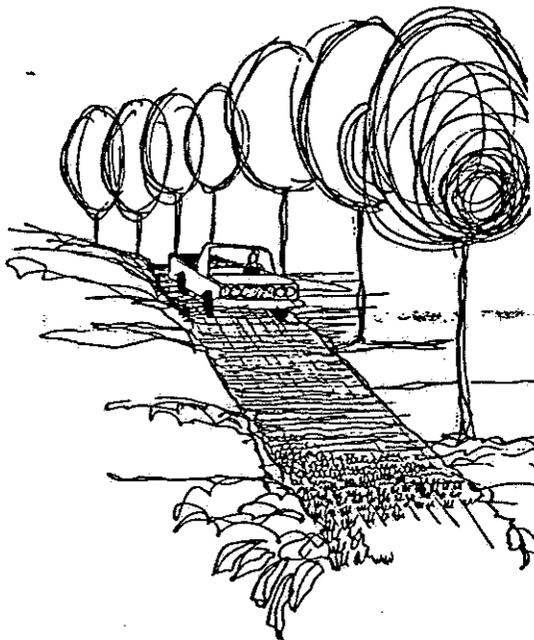
TERMINAL AND PORT APPLICATIONS

For extremely large scale horizontal heavy applications, the unit pavers provide a visual reduction in scale and respond very well to the wheel loadings of heavy industrial uses. These wheel loads can be as much as 10 times that of normal street loads which could cause deformation of an asphalt surface. The repetitive nature of these loads has also been known to crack or crush monolithic concrete surfaces. In a segmentally paved area, however, these problems can easily be repaired.



Open Grid-Vehicular Applications

The installation of the open grid paving units can be in a linear or planar arrangement. Because they are larger in size with open cells, they will support the growth of grass through them from below as well as allowing for light, air and water to pass through them from above. These characteristics make them the prime choice for paving where the visual impact of a monolithically paved surface is inappropriate and there is a need to support vegetation and reduce storm water runoff and its affects.



LINEAR VEHICULAR APPLICATIONS

ACCESS APPLICATIONS

Open grid pavers are frequently used for access roads where the construction of a solid and monolithic surface might be inconsistent with the building design and/or where air and water must be absorbed through the pavement to support existing vegetation. Due to the varied surface of these paving units, they have a tendency to reduce vehicular speed. Typical installations include access roads, boat launching ramps and fire/maintenance lanes adjacent to buildings.

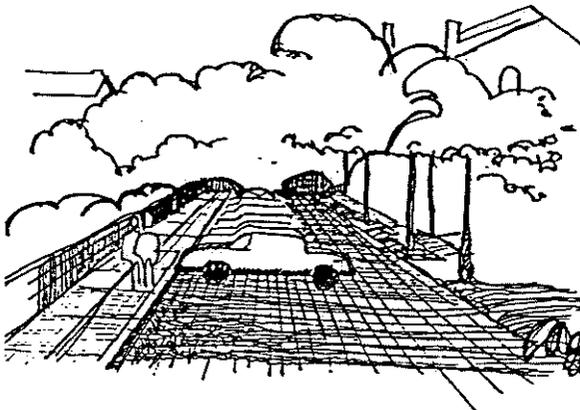
SHOULDER APPLICATIONS

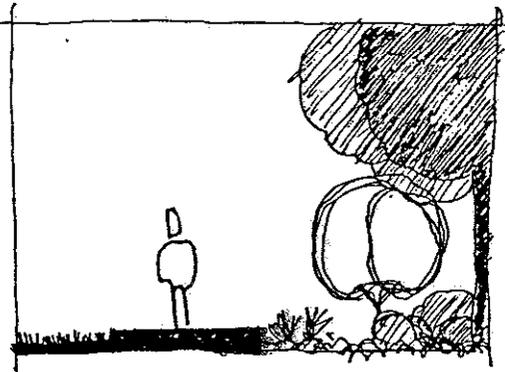
Open Grid pavers can be used in combination with solid paving as a shoulder to runways, taxiways, highways or roads. This application reduces the amount of runoff on large paved surfaces, provides a visual separation of the main vehicular surface from the shoulder, and can alert a driver or pilot to the edge due to the change in the surface.

PLANAR APPLICATIONS

PARKING

The most common vehicular use of open grid pavers is for traditional or overflow parking. In large paved areas, the use of open grid pavers will reduce runoff, reduce the temperature of a parking area and provide for a more visually stimulating surface. As overflow parking, an area surfaced with open grid pavers will have the same basic characteristics and will be less obtrusive than a solidly paved surface when not in use.





Open Grid-Landscape Applications

The use of open grid pavers as part of the landscape vocabulary is primarily for sensitive integration with the environment. The open nature of these pavers allows for the penetration of air and water thereby supporting the growth of vegetation while stabilizing the soil at the same time. Although the major use of these pavers is in a planar arrangement, there are linear uses that integrate open grid pavement in a landscape environment.

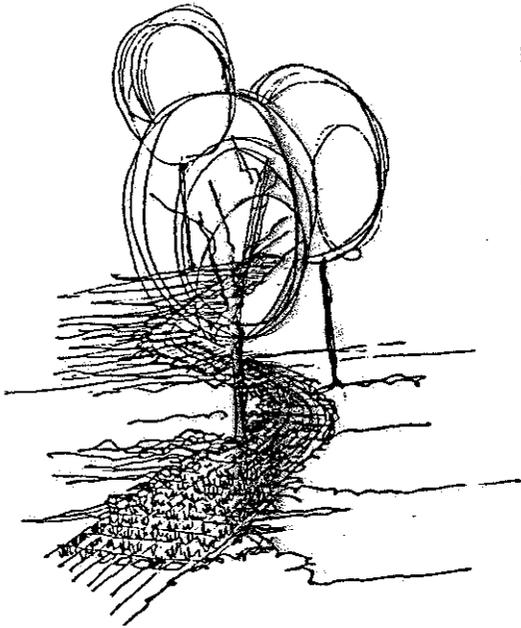
LINEAR LANDSCAPE APPLICATIONS

GARDEN PATHWAYS

Open grid pavers can provide a firm visually integrated path through a garden while supporting the need for water and air to reach the roots of the plants. Since the pavers themselves will support the growth of grass within their cells, there will be less solid paving exposed therefore reducing visual inconsistencies, temperature, and runoff.

NATURE TRAILS

In a natural environment, open grid pavers can provide a path that minimizes visual intrusion while at the same time provides a low maintenance, firm surface through the landscape.



PLANAR LANDSCAPE APPLICATIONS

SOIL STABILIZATION

The interlocking nature of open grid pavers allows for their use over poor soils in order to provide a firm surface. Since they are segmental, any base settlement can easily be repaired by removal of one or several units.

EROSION CONTROL

For steep slopes that are subject to erosion, open grid pavers provide stabilization to the earth below by introducing a surface above with a course texture. This rough surface reduces the velocity of the runoff and is not subject to erosion. Since the pavers are interlocked or stacked on a slope, they will also be forced to remain in the planar arrangement in which they were placed. The support of vegetation in the open cells also minimizes visual intrusion.

