

## 6.7 Reinforced Grid Paving

### Overview

#### Description

Reinforced grid paving consists of concrete or plastic grids used in areas that receive occasional light traffic (i.e., < 7,500 lifetime 18,000-lb equivalent single axle loads or a Caltrans Traffic Index < 5), typically overflow parking or fire access lanes, when placed over compacted Caltrans Class 2 or Class 2 permeable base or similar materials. Class 2 permeable base should use an underdrain in silt and clay soils. The surfaces of these systems can include a layer of gravel as shown in Figure 6-41 below or be planted with topsoil and grass in their openings or installed over a bedding layer that rests over a compacted, dense-graded aggregate base (see Figure 6-42 and Figure 6-43). When planted with turf grass, they also assist in providing a cooler surface than conventional pavement. Some of these systems are also known as turf block or grasscrete. Reinforced grid paving can also be designed with aggregate in the openings.



Figure 6-41. Reinforced grid paving in an overflow parking lot in Napa. (Credit: EOA, Inc.)

Reinforced grid paving can be installed over open-graded aggregate bases for additional water storage, infiltration, and outflow via an underdrain in low permeability soils if needed. However, such designs should see limited automobile traffic and no truck traffic other than rarely occurring emergency vehicles. Reinforced grid pavings are not considered an impervious area and can function as “self-treating areas” when supported by an aggregate base sufficient to hold the C.3.d amount runoff. Reinforced grid pavings with dense-graded bases are not generally designed to accept runoff from adjacent areas.

#### Best uses

- Overflow parking areas
- Emergency access lanes
- Common areas
- Lawn/landscape buffers
- Pathways

#### Advantages

- Flow attenuation
- Removes fine particulates
- Reduces need for treatment

#### Limitations

- May clog without periodic cleaning
- May allow weed growth
- Lightly trafficked areas only
- Higher installation costs than conventional paving

The Countywide Program gratefully acknowledges the contributions of Mr. David Smith, Technical Director of the Interlocking Concrete Pavement Institute, to this section of the Guide, including pavement sections, design details, and specifications.

### Siting

Contrary to most other treatment measures, small areas of reinforced grid paving do not need as much maintenance so they can be located in remote sections of private property such as backyards and pathways. However, if the areas total 3,000 sq. ft. or more, they are considered regulated treatment systems and they require an O&M agreement, with municipal inspections at least once every five years. Therefore, they should only be constructed in front yards, driveways, parking lots and other areas visible from the public right of way so that municipal inspectors can see and verify the existence of the systems.

Table 6-10: Recommended locations for reinforced grid paving

Recommended Locations	Reinforced Grid Paving
Parking Lot	●
Roof	
Driveway	●
Podium-level	
Close to building	
Away from Buildings	●
Underground	

### *Design and Sizing Guidelines*

To provide satisfactory performance, the following criteria should be considered:

#### Subgrade and Site Requirements

- The soil subgrade should be able to sustain anticipated traffic loads without excessive deformation while temporarily saturated.
- The soil subgrade should have sufficient permeability to meet the requirements in this manual, or include an underdrain(s) to remove detained flows within the aggregate base. The surfacing and bedding materials are not used to store water.
- Depth to seasonal high groundwater level should be at least 5 feet from the bottom of the base of the reinforced grid paving system, unless a different separation is recommended by the geotechnical engineer.
- Reinforced grid paving systems should not be used where site conditions do not allow infiltration.
- Grading of the soil subgrade below the reinforced grid paving should be relatively flat to promote infiltration across the entire area or berms should be used. Underground slopes of reinforced grid paving should not exceed 5%. Slopes exceeding 3% typically require berms or check dams placed laterally over the soil subgrade to slow the flow of water and increase infiltration.
- A slope of 1% is recommended for the pavement surface.

#### Aggregates

- When subject to vehicular traffic, all dense-graded aggregate bases should conform to Caltrans Class 2 or similar specifications as directed by the municipality. All open-graded aggregates should be crushed material, minimum 50% with one or more fractured faces conforming to Caltrans test method CT 205; have Los Angeles Rattler no greater than 45% loss at 500 revolutions per Caltrans test method CT 211; and a minimum Cleanness value of 75 per Caltrans test method CT 211. Sieve analysis should conform to Caltrans test method CT 202.
- If the subbase/base layer is sized to hold at least the C.3.d amount of runoff, the area of reinforced grid paving is not considered an impervious surface and can function as a self-treating area as described in Section 4.1.
- If an underdrain is used, position the perforated pipe within the subgrade enveloped on all sides by at least 4 inches of open-graded aggregate and provide non-perforated, upturned elbow pipe for outflows. A cleanout with surface access is recommended at the upturn. To be considered a self-treating area or self-retaining area, the underdrain raised outlet should be positioned above the portion of the base layer that stores and infiltrates the C.3.d amount of rainfall onto the reinforced grid paving (and runoff from adjacent areas, if self-retaining).
- Design calculations for the base should describe and quantify the following:
  - Soil type/classification and soil permeability rate; for vehicular areas, k-values (psi/cubic inch) or R-values characterizing soil strength when saturated
  - Fill type if used, installation, and compaction methods plus target densities

- Lifetime expected traffic loading in 18,000 lb. equiv. single axle loads or Caltrans Traffic Index
- Drainage routing of detained flows within the aggregate base as well as expected infiltration into in-situ soils, or collection in underdrain if the permeability cannot meet design criteria

### Reinforced Grid Paving Materials

- Concrete grids should conform to the dimensional tolerances, compressive strength, and absorption requirements in ASTM C1319 and should be a minimum of 3 1/8 in. thick.
- Aggregates used for bedding and filling the grid openings should be No. 8 stone or similar sized crushed materials.
- If topsoil and grass are used in the grids, they should be placed over a 1 in. thick layer of bedding sand and over Caltrans Class 2 base compacted to a minimum 95% standard Proctor density. Do not use topsoil, grass, sand bedding and geotextile over an open-graded aggregate base as the surface has a low permeability.
- Reinforced grid paving should have edge restraints to render them stationary when subject to pedestrian or vehicular traffic.

### *Construction and Maintenance Plans*

#### Design and Installation Recommendations

- All designs should be reviewed and approved by a licensed civil or geotechnical engineer or as directed by the municipality.
- Design for plastic reinforced grid paving should be done per the manufacturer's recommendation. Such designs should be reviewed by the manufacturer or as directed by the municipality.
- Installation of reinforced grid paving should be done by contractors who have constructed projects similar in size to that under consideration.
- Protect excavated area from excessive compaction due to construction traffic and protect the finished pavement from construction traffic.
- ***For additional construction guidelines, see Chapter 4 of the GI Design Guide.*** Specifically, see Sections 4.3 through 4.9 of the GI Design Guide for construction strategies for dealing with slopes, overflows, poor soils, utilities, runoff capture, etc.

#### Remember

#### Maintenance Considerations

- See Chapter 8 for specific maintenance guidance. Specifically, see Section 8.3.6 for maintenance concerns specific to reinforced grid paving.
- A Maintenance Agreement should be provided for Regulated Projects with installations of 3,000 square feet or more of reinforced grid paving.
- The Maintenance Agreement should state the parties' responsibility for maintenance and upkeep.
- Prepare a maintenance plan and submit with the Maintenance Agreement. Maintenance plan templates are in Appendix G.

*Typical Design Details*

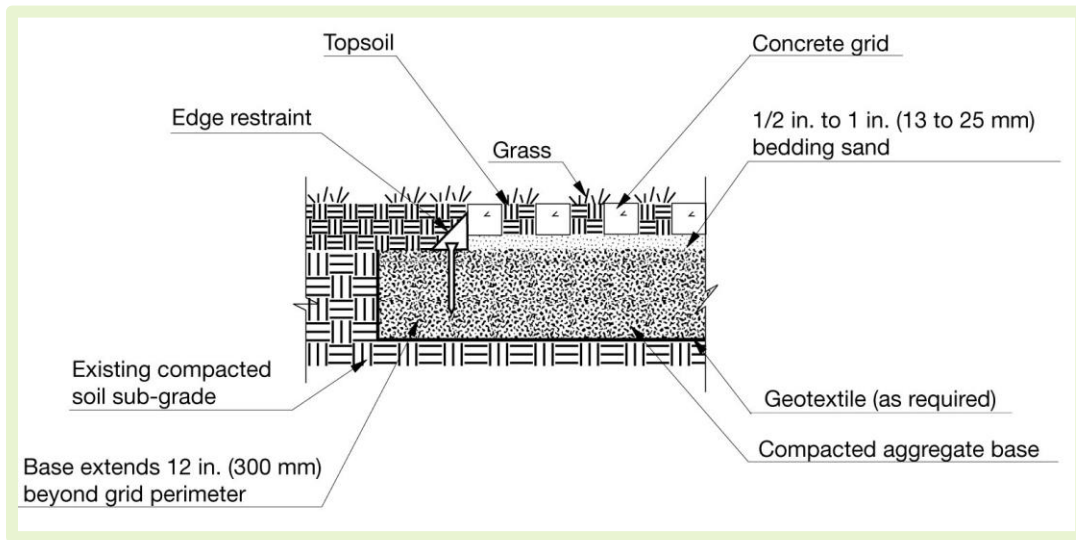


Figure 6-42: Concrete Reinforced Grid Paving for Occasional Vehicular Use or for Emergency Access Lanes. (Credit: Santa Clara Valley Urban Runoff Pollution Prevention Program)



Figure 6-43: Plastic Reinforced Grid Paving for Occasional Vehicular Use or for Emergency Access Lanes (Credit: Santa Clara Valley Urban Runoff Pollution Prevention Program). Note: Sand and turf grass can be replaced with ASTM No. 8 aggregate in cell openings.