Grid pavements consist 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. The surfaces of these systems can be planted with topsoil and grass in their openings and installed over a sand bedding layer that rests over a compacted, dense-graded aggregate base (see Figures 6-33 and 6-34). When planted with turf grass, they also assist in providing a cooler surface than conventional pavement. These systems are also known as turf block or grasscrete. Grid pavements can also be designed with aggregates in the openings.

Grid pavements can be installed over open-graded aggregate bases for additional water storage, infiltration, and outflow via an underdrain in low permeability soils if needed. Grid pavements are not considered an impervious area and can function as “self-treating areas” when supported by an aggregate base sufficient to hold the volume of rainfall runoff specified in the Municipal Stormwater Regional Permit Provision C.3.d. Grid pavements with dense-graded bases are not generally designed to accept runoff from adjacent areas.

The Countywide Program gratefully acknowledges the contributions of Mr. David Smith, Technical Director of the Interlocking Concrete Pavement Institute, to this section of the C.3 Technical Guidance, including pavement sections, design details, and specifications.
Table 6-3: Grid Pavement Types and Possible Applications

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Possible Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick</td>
<td>Solid unit paver laid on a permeable base with sand joints.</td>
<td>Driveways, walkways, patios, public sidewalks, plazas, low volume streets</td>
</tr>
<tr>
<td>Natural Stone</td>
<td>Laid on pervious surface area in random pattern with wide sand, gravel, or soil joints (from 1/2 to 4 inches).</td>
<td>Driveways, walkways, patios, sidewalks, plazas, low-use parking stalls</td>
</tr>
<tr>
<td>Turf Blocks</td>
<td>Open celled unit paver filled with soil and planted with turf. Sometimes the cells are filled with crushed rock only.</td>
<td>Areas of low flow traffic and infrequent parking, residential driveways and overflow parking areas, emergency access roads, utility roads, street shoulders, and outer edges of commercial and retail parking lots where low-use spaces are located.</td>
</tr>
<tr>
<td>Permeable Interlocking Concrete Pavers (PICP)</td>
<td>Discrete units set in a pattern on a prepared base. Typically made of precast concrete in shapes that form interlocking patterns, some unit paver shapes form patterns that include an open cell to increase permeability. Solid unit pavers are made of impermeable materials, but can be spaced to expose a permeable joint set on a permeable base.</td>
<td>Parking stalls, private driveways, walkways, patios, low volume streets, and travel lanes, and bikeways.</td>
</tr>
</tbody>
</table>

Source: Design Guidelines for Permeable Pavements, Redwood City

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 infiltration rate 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 grid pavement system, unless a different separation is recommended by the geotechnical engineer.
- Grid pavement systems should not be used where site conditions do not allow infiltration.
- Grading of the soil subgrade below the pervious pavement should be relatively flat (not to exceed 2% slope) to promote infiltration across the entire area.
- A slope of 1% is recommended for pavement surface. Slopes of grid pavements 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 provide some infiltration.
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 Cleanliness 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 volume of runoff, the area of pervious 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 perforated pipe a minimum of 2 inches above the surface of the soil subgrade and provide non-perforated, upturned pipe for outflows. To be considered a self-treating area or self-retaining area, the outflow should be positioned above the portion of the base layer sized to meet the C.3.d sizing criteria.

- 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 infiltration rate cannot meet design criteria

GRID PAVEMENT 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 infiltration rate.

- Grid pavements should have edge restraints to render them stationary when subject to pedestrian or vehicular traffic.

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 grid pavements should be done per the manufacturer’s recommendation. Such designs should be reviewed by the manufacturer or as directed by the municipality.
Design for concrete grid pavements should be reviewed by the concrete paver manufacturer, the Interlocking Concrete Pavement Institute (ICPI) (www.icpi.org), or as directed by the municipality.

Consult ICPI Tech Spec 8 Concrete Grid Pavements available at www.icpi.org for additional design information and guide specifications.

Installation of grid pavements should be done by contractors who have constructed projects similar in size to that under consideration. Only contractors holding a certificate of completion in the Interlocking Concrete Pavement Institute's Commercial Paver Technician Course should be considered for concrete grid pavement construction, and such contractors should have at least one foreman with this certificate on the job site at all times. More information can be found at www.icpi.org.

Protect excavated area from excessive compaction due to construction traffic and protect the finished pavement from construction traffic.

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Figure 30: Concrete Grid Pavement for Occasional Vehicular Use or for Emergency Access Lanes (Source: Santa Clara Valley Urban Runoff Pollution Prevention Program)

Figure 6-31: Plastic Grid Pavement for Occasional Vehicular Use or for Emergency Access Lanes. Note: Sand and turf grass can be replaced with ASTM No. 8 aggregate in cell openings. (Source: Santa Clara Valley Urban Runoff Pollution Prevention Program)
MAINTENANCE

A maintenance plan shall be provided.

Standards for Ongoing Maintenance and Upkeep:

- Keep landscaped areas well maintained
- The surface of the unplanted turf block and permeable joint pavers shall be vacuum cleaned using commercially available sweeping machines at the following times:
  - End of winter (April)
  - Mid-summer (July / August)
  - After autumn leaf-fall (November)
- Planted turf block can be mowed, as needed.
- Inspect outlets yearly, preferably before the wet season. Remove trash and debris.
- When vacuum cleaning is conducted, inspect turf block and pavers for any signs of hydraulic failure.

As needed maintenance:

- If routine cleaning does not restore infiltration rates, reconstruct the part of pervious surface that is not infiltrating.
- The surface area affected by hydraulic failure should be lifted, if possible, for inspection of the internal materials to identify the location and extent of the blockage.
- Surface materials should be lifted and replaced if damaged by brush (or abrasive) cleaning.
- Deposits may need to be disposed of as controlled waste.
- Replace permeable joint materials as necessary.