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INSTALLATION DATA

1. PRODUCT NAME
TURF STONE

2. PRODUCT DESCRIPTION
Basic Use:
Turf Stone emerged from Europe in the 1960's as a method of providing a grass surface capable of surviving vehicular traffic. The surface was developed as an alternative to runoff and heat-producing parking surfaces of asphalt and poured concrete. Turf Stone was further developed in the United States and Europe to reduce erosion along lakes, drainage ditches, streams, and rivers.

The uses are as follows:

*Primary and overflow parking areas
*Multi-use open areas
*Driveways
*Airfield runway and taxiway shoulders
*Highway shoulders
*Medians and median crossovers
*Trailer parks
*Boat launching ramps
*Emergency access roads and fire lanes adjacent to buildings
*Ditch liners
*Stream bank and lakeside erosion protection

Composition and Materials:
Turf Stone is manufactured from Portland cement (coarse and fine aggregate and admixtures) to improve its strength and durability. The ingredients are combined with water to form "no slump" (low water content) concrete. Units are machine-manufactured under intense pressure and vibration to produce a dense, durable paving unit.

Turf Stone Types:
There are several configurations of concrete Turf Stone, all of which can be classified as either “lattice” or “castellated.” Lattice paving stones have a flat grid-like appearance where the concrete forms a continuous pattern when installed. Castellated grid paving stones are distinguished by concrete knobs that protrude slightly through the grass surface. Length and width dimensions vary between 1' (300 mm) to 2' (600mm). Thickness ranges from a minimum of 3 1/8" (80mm) to 4 1/2" (115mm). Weights range from 45 lbs. (20kg) to 90 lbs (40kg). Western Interlock manufactures lattice type paving stones and markets them under the name of Turf Stone.

3. TECHNICAL DATA
Physical Characteristics:
Concrete grid paving stones either meet or exceed the strength durability requirements of NCMA A-15-82, the specification for grid paving stones. This standard requires a minimum average compressive strength of 5000 psi (35 MPa) and proven field performance in resisting freeze-thaw cycles, or resisting at least 50 freeze-thaw cycles with material loss no greater than 1%. Water absorption should not exceed an average of 7%. The grid is proportioned at 35% open and 65% concrete surface.

Application Standards:
A typical grid paving stone system installation consists of a soil subgrade, an aggregate base, a layer of bedding sand, and the grids. Either topsoil and grass or aggregate is placed in the openings. The intensity of use by vehicles over the life of the paving stone must be carefully assessed when selecting grass or aggregate. Grass must be exposed to light for 5 hours each day to survive. Cars parked on the grass every day for extended periods of time will kill the grass beneath the cars. If parking is continuous, aggregate should be used in the openings instead of topsoil and grass. Aggregate should also be used if oil dripping from continuously parked cars is expected to be excessive. For intermittently used lots, overflow lots, or fire lanes, grass is recommended.

Design for Storm Water Management:
Many municipalities have ordinances that regulate the quantity and rate of storm water draining into sewers and streams. Concrete grid paving stones are one of several techniques for reducing rate and volume of drainage from a site. Concrete grid paving stones can reduce or eliminate storm sewers and drainage appurtenances such as inlets, curbs, grates, etc., thereby saving expense. For drainage calculations using the Rational Method, an average runoff coefficient of 0.3 can be used for grids with established grass or aggregate in the openings. This is substantially lower than the 0.9 to 1.0 for conventional asphalt and concrete pavements.

Grid paving stone systems retain storm water and allow for partial treatment of pollutants in the water, especially if the base is made of open-graded aggregate. Grid paving stones have been shown to improve water quality by reducing sediment and pollutant that enter lakes and streams.

Concrete grid paving stones generate lower temperatures than asphalt. Asphalt and concrete surfaces hold heat in the summer and aggravate heat and air pollution in cities. Research has shown that grid paving stones with grass have 2ºF to 4ºF (1ºC to 2ºC) lower local air temperatures than asphalt and 4ºF to 6ºF (2ºC to 4ºC) lower radio-metric temperatures than asphalt. Lower temperatures mean more comfortable micro-climates for pedestrians in urban surroundings.

Design Guidelines for Erosion Control Embankments:
Concrete grid paving stones have been successfully used to control the erosion of embankments. Grid paving stones provide immediate stabilization until grass or other vegetation is established. The recommended maximum angle for embankment stabilization is 70 degrees. Grid paving stones can be placed directly on graded and compacted soil, working from the bottom to the top of the embankment. For slopes over 45 degrees, the units should be staked every third row to secure them while vegetation is being established.

Stream Banks and Lake Sides:
Research by the US Government demonstrated the efficiency of grid paving stones for stream bank stabilization. They are a cost-effective alternative to 17" (425mm) stone rip-rap. Grid paving stones with aggregate in the openings reduce shear stress against the finer soil, as well as holding it in place. Grid paving stones can also accommodate riparian plants that further stabilize the soil.

Concrete grid paving stones are recommended for stream velocities of no greater than 11 ft/sec. (3.3m/sec.). The maximum bank slope for grids should be 45 degrees. Manning's "n" (roughness coefficient) is estimated to be 0.024-0.26. The stream bank should be graded and compacted prior to placing the units. Aggregate is often placed on stream banks subject to water in order to prevent erosion. This should be at least 4" (100mm) thick. A layer of filter fabric should be placed prior to installing the units. The filter fabric should be anchored with large aggregate at the "toe" and sides of the installation.

Aggregate should be placed in the voids of the grids if the stream is continually flowing. Topsoil and grass can be used in installations or areas not subject to frequent inundation, such as drainage ditches. The upstream, starting edge of the grids should be protected with aggregate so that stream debris does not break or lift the leading units.

Concrete grid paving stones make excellent boat ramps in parks and recreation facilities. They can be installed without partitioning the area and removing the water prior to construction. The design guidelines for stream banks and lakesides should be followed.