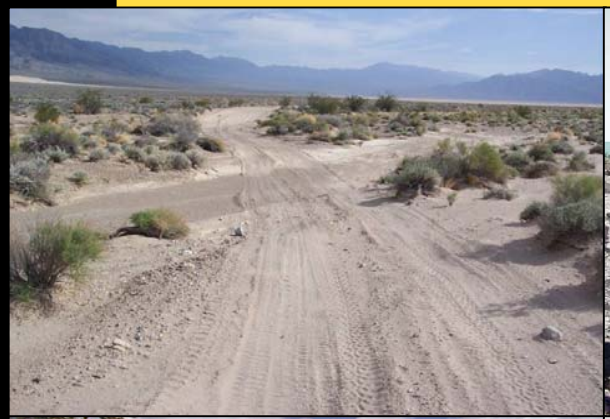
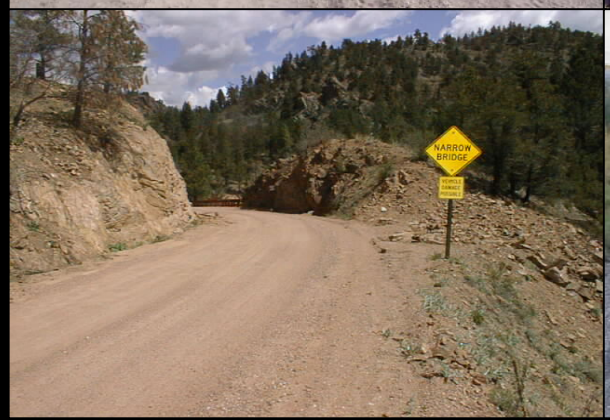
Unbound and Mechanically Stabilized Surfacings

4.0





Traffic Range:

Typical AADT<200 to 1,000 when used as a road surfacing. No limitations on traffic volumes when used as a engineered base or subbase.

Life Expectancy:

Many unbound roadway surfacings must be reconstructed every 4 to 10 years, although some will last much longer with regular maintenance.

Unit Price:

Material and installation cost are generally less than for paved or sealed surfacings.

Appearance:

Appearance is influenced by the aggregate color and gradation.

Pros:

Low initial cost; Rustic appearance; Material is widely available.

Cons:

Dust generation; Material losses into surrounding environment; Vehicle damage from loose particles; Frequent regrading required.

Product Description: Unbound and mechanically stabilized surfacings make up a significant portion of the rural low volume road system in the United States. Unbound surfacings typically have the lowest initial cost and can provide a durable riding surface when constructed with quality materials and adequately maintained.

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Cellular Confinement

4.1

Cellular confined aggregate surfacing.

Photo Source: Presto Products Company

Traffic Range:

Typical AADT<1,000 when used as a road surfacing. No traffic limitations when used as a reinforced base.

Life Expectancy:

15 to 20 years, assuming the aggregate surface course is maintained.

Unit Price:

Material & Installation: \$36 to \$42/m^2 (\$30 to \$35/yd^2) for a 150 mm (6 in.) thick layer.

Appearance:

The geocells are normally covered by a wearing surface, so they do not affect the aggregate surface appearance.

Pros:

Increases aggregate layer strength; Can reduce surface erosion; Does not affect appearance of gravel fill; Soil/aggregate mix can be used to support grass growth.

Cons:

Initial cost is higher than gravel surfacing alone.

Product Description: Cellular confinement systems, sometimes referred to as geocells, are constructed with a geosynthetic product that forms a honeycomb-like cellular structure that is infilled with aggregate to create a stabilized aggregate layer. Some aggregate cover is required to protect the geocells from traffic abrasion.

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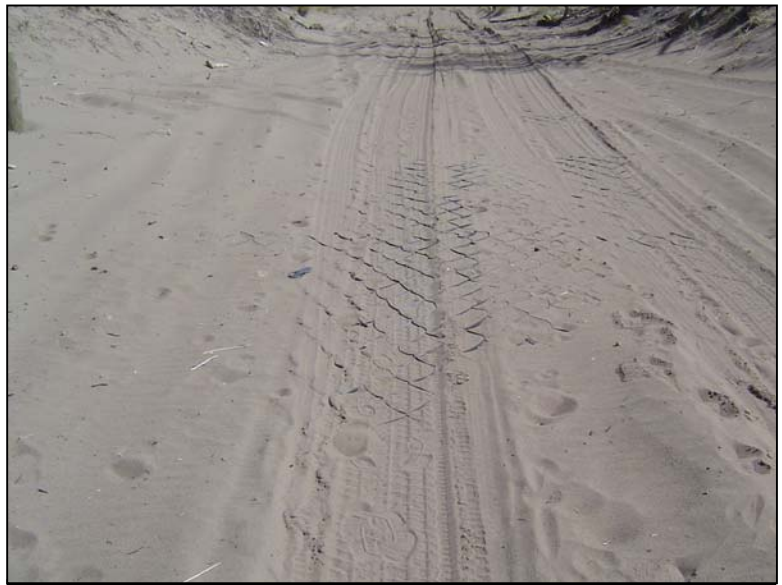
Cellular Confinement

Geocell framework.

Photo Source: FHWA-CFLHD



Cellular confined sand surfacing.

Photo Source: FHWA-CFLHD

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Fiber Reinforcement

Fiber reinforced soil.

Photo Source: Fiber Reinforced Soils LLC

Traffic Range:

Typical AADT<200 when used as a roadway surfacing.

Life Expectancy:

4 to 6 years; afterwards, another treatment of fiber reinforcement is typically required.

Unit Price:

Material & Installation: $10.00 to $16.00/$m^2$ ($7.70 to $12.30/$yd^2$) for 200 mm (8 in.) layer. Unit price does not include soil.

Appearance:

The fibers will be visible in the surfacing material, with strands of fiber protruding from the soil mixture.

Pros:

Increases soil strength.

Cons:

Initial cost is higher than for untreated material; Relatively new technology.

Product Description: Materials that have been used for fiber reinforcement include metallic, polypropylene, glass, wire, cellophane, straw, and hemp fibers. The fibers are mixed with the soil to create a uniformly reinforced soil mix with discrete, randomly oriented fibers. The soil is then placed and compacted.

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Geotextile/Geogrid Reinforcement

Spreading aggregate base over geogrid layer.

Photo Source: Tensar Earth Technologies

Traffic Range:

Typical AADT<400 for roadway surfacing applications. No limitations on traffic volumes for base reinforcement applications.

Life Expectancy:

6 to 10 years or more until the aggregate surfacing is reconstructed, when used for surface reinforcement. When properly covered with aggregate, the geotextile/geogrid will last indefinitely.

Unit Price:

Material & Installation: \$2.80 to \$5.00/m^2 (\$2.30 to \$4.20/yd^2). Unit price does not include aggregate material cost.

Appearance:

Does not significantly alter the appearance of soil/aggregate materials since it is covered.

Pros:

Increases layer strength or reduces required layer thickness; Reduces aggregate/subgrade mixing.

Cons:

Does not improve the roadway surface characteristics.

Product Description: Geotextiles and geogrids belong to a group of synthetic products collectively referred to as geosynthetics. Geosynthetic products can be used to reinforce soils and to act as filter or separation layers in pavement construction.

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Geotextile / Geogrid Reinforcement

Geogrid placement for base reinforcement.

Photo Source: Mirafi Construction Products

Geotextile for subgrade stabilization.

Photo Source: Missouri Petroleum

Gravel (Crushed and Uncrushed)

Unbound gravel surfacing.

Photo Source: Golder Associates Inc.

Traffic Range:

Best suited for AADT<250.

Life Expectancy:

Many gravel roads will last indefinitely with regular regrading and reapplication of gravel. Some require reconstruction after 6 to 10 years, even with regular maintenance.

Unit Price:

Material & Installation: $22.20 to $32.70/$m^3$ ($17.00 to $25.00/$yd^3$).

Appearance:

The color will depend on the material type and source. Texture depends on aggregate gradation and maximum particle size.

Pros:

Low initial cost; Widely available; Rustic appearance.

Cons:

Requires more frequent maintenance than if material was stabilized.

Product Description: Unbound gravel/crushed aggregate surfaced roads make up a significant portion of the rural low volume road system in the United States. Unbound surfaces typically have the lowest initial cost and can provide an acceptable riding surface when constructed with quality materials and adequately maintained.

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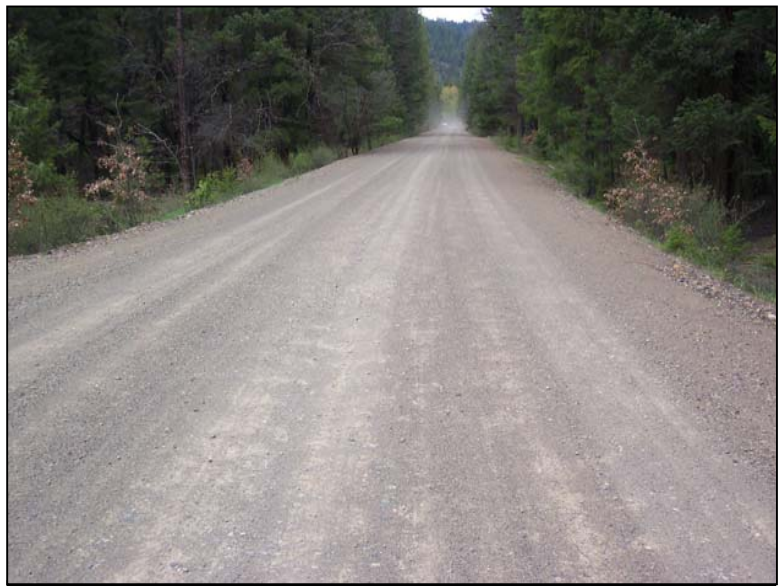
Gravel (Crushed and Uncrushed)

Unbound crushed gravel surfacing.

Photo Source: Golder Associates Inc.



Unbound crushed gravel surfacing.

Photo Source: FHWA-CFLHD

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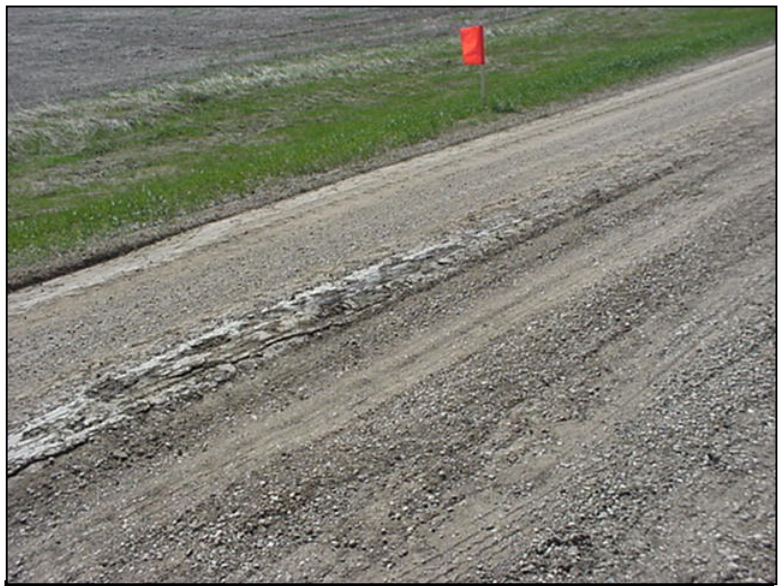
Gravel (Crushed and Uncrushed)



Rutting of gravel road.

Photo Source: FHWA-WFLHD

Gravel loss in wheel paths.

Photo Source: FHWA-WFLHD

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Sand

Sand roadway surfacing.

Photo Source: FHWA-CFLHD

Traffic Range:

Typically AADT<200 when used as a roadway surfacing.

Life Expectancy:

4 to 6 years.

Unit Price:

Material & Installation: $7.30 to $10.90/Mg ($6.60 to $9.90/ton).

Appearance:

Color and texture will be determined by sand type and source.

Pros:

Low initial cost and readily available, in some regions.

Cons:

Lower quality material and performance than gravel; Lacks stability; Frequent regrading required.

Product Description: When used as a subgrade or subbase material, dense sand can provide good support for a pavement system, although not as good as a well graded gravel and sand mixture. When used as a road surfacing, clean, dry sands are subject to severe rutting, shoving, and erosion.

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Sand

Sand roadway surfacing.

Photo Source: Golder Associates Inc.

Sand roadway surfacing.

Photo Source: Golder Associates Inc.