

Hard Pavement → Crown
Gravel Road → No Crown



Preservation Methods

How to Fix, Repair,
i.e., “Preserve” the
Gravel Road



Preservation Methods By Problem Type

- Poor Design & Construction (problem prevention)
- Corrugations
- Erosion (rills, gullies, piping)
- Soft Areas / Rutting – Springtime
- Soft Areas / Rutting – Summertime
 - Road surface dry
 - Road surface wet
- General Minor Rutting
- Potholes
- Embankment Slope Failures, Cracks, Bumps / Dips
- Poor Maintenance



Preservation Methods By Problem Type

See Pages 4 – 7 of Handout Titled:
***A Common Sense View Of Fairbanks,
Alaska Gravel Road Problems***



One Example of a Preservation Method:

Corrugations



Road Corrugation (Washboarding) Formation Isn't as Simple as Most People Think

“Scaling and Dynamics of Washboard Road”

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M5S 1A7

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Examples of Things That Washboard

- Gravel Roads
- Paved Roads
- Train Tracks
- Hard Drive Disks
- Snowpack



Wintertime Washboarding of Packed Snow in Bob's Driveway



Corrugation Repair Recommendations

- Recommended for Temporary Repair: Grade below bottom of corrugations, and re-compact. Deep corrugations may require addition of new surfacing material (see Appendix, surfacing material).
- Recommended for Permanent Repair: If existing materials are to be left in place, first grade to below bottom of existing corrugations, then add soil stabilization agent (see Appendix, soil stabilization) and re-compact. A better alternative is to first grade out the corrugations, and then add 4' to 6" inches of crushed, well graded gravel containing a cohesive binder (see Appendix, surfacing material). In areas where corrugations consistently reappear, permanent repair may ultimately require upgrading the offending roadway segment to asphalt concrete pavement.
- See Handout Page 6



Combinations of Problems

- When you evaluate gravel road condition, you will usually find that more than one problem exists. Common sense rules in deciding what sort of repairs to do.
- There are no hard, fast rules in this process, except that you are always trying to return the road to an acceptable standard at the least cost.



Considering Geosynthetics

- Many kinds of geosynthetics that might be usefully applied to construction and/or repairs of gravel roads.
 - geotextiles (cloth-like materials)
 - geogrids, geocomposites
 - geomembranes
 - geocells.
- Search Internet or textbooks on geosynthetics
 - Holtz, Christopher, and Berg, “Geosynthetic Engineering”, 1997
- Don’t use geosynthetics on your gravel road project without consulting an engineer knowledgeable and experienced in the use of those products.



Planning to Upgrade From Gravel to Paved Surface?

A Literature Reference:

McHattie R.L., ***Evaluating and Upgrading Gravel Roads for Paving***, Matanuska-Susitna Borough Engineering Guide, 2010

The Engineering Guide is a relatively small “PDF” file (less than 1 Megabyte). It is available for download from the Alaska University Transportation Center’s Internet URL:

[http://www.alaska.edu/uaf/cem/ine/autc/
gravelRoads_finalEval.pdf](http://www.alaska.edu/uaf/cem/ine/autc/gravelRoads_finalEval.pdf)



Evaluating and Upgrading Gravel Roads for Paving (Matanuska-Susitna Engineering Guide)

From Preface:

Fact: Given sufficient preparation, nearly any gravel road can be paved with a minimal-thickness hot mix asphalt concrete pavement or even a low cost asphalt surface treatment (AST), and it can be relied on to survive low-volume traffic for a decade or two. What does “sufficient” mean in terms of design and materials? And, perhaps more importantly, how much is “sufficient” going to cost?

This engineering guide provides tools to aid evaluation, development and management of Matanuska-Susitna Borough’s gravel-to-pavement projects.

The guide serves an additional purpose. It documents the engineering bases for design features and specification requirements used in certain Matanuska-Susitna Borough construction contracts in case of legal disputes.



Local Technical Assistance Program

- Provides assistance to local governments
- Run by Alaska DOT&PF
- Contact : David Waldo
(david.waldo@alaska.gov)
- Contact: Simon Howell
(simon.howell@alaska.gov)
- Webpage :
<http://www.dot.state.ak.us/stwddes/research/index.shtml>



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(if time permits)

More Examples of Preservation Methods:



See Pages 4 – 8 of Handout
Titled:

***A Common Sense View
Of Fairbanks, Alaska
Gravel Road Problems***



Poor Design and Construction

Read Page 5 of Handout



Erosion

(rills, gullies , piping)

Comments: This includes damage to the road surface as well as the embankment sideslopes. Lack of effective drainage. This problem can be minimized by simply getting stormwater or water from snow melt off of the roadway surface as quickly as possible without concentrating the flow.

Recommended: Establish or re-establish 3% crown wherever the road is not in superelevation. Late-winter maintenance should blade snow and hard pack to the embankment's sideslope area prior to Fairbanks' spring "breakup."



Very Soft Areas and Deep Rutting

Springtime only

Comments: Usually related to loss of pavement structure strength due to thaw weakening during the springtime breakup period. A less serious form (usually less serious) of springtime softening can be caused by poor drainage of snow melt from the roadway surface or ponding of thaw water adjacent to the roadway. Assume that thaw weakening is the culprit if surface drainage or ponding problem is not obvious. Vehicle action on very soft surfacing material will most likely destroy the design properties of that material and require replacement of surfacing material as part of the repair.

Recommended for Snow Melt or Ponding: Improve drainage of road surface by re-establishing crown. Make sure that late winter maintenance clears ice pack and snow from road surface to prevent damming of melt water.

Recommended for Thaw Weakening: Remove approximately 18" of existing material. Replace with new surface course material and the remainder of the 18" thickness with non-frost-susceptible fill material (see Appendix sections on non-frost-susceptible and surfacing material).



Summertime Very Soft Areas and Deep Rutting

(road surface usually damp or wet appearing)

Comments: Constant or repeatedly reoccurring damp or wet areas are usually drainage related.

Recommended: Evaluate drainage conditions. Re-establish a 3% crown if it has been lost. Check that existing drainage features are functioning properly in the vicinity of the problem area. Ditches may need cleaning or other repairs. Culverts may need repair or replacement. Ponding adjacent to the roadway should be drained if possible, or the road should be raised to provide a minimum 24" of freeboard between the nominal road and pond surfaces.



Summertime Very Soft Areas and Deep Rutting (road surface usually dry appearing)

Comments: Usually related to surface course degradation. Often presents a combination of visually-obvious problems. The following are almost always most noticeable during dry periods:

- airborne dust
- minor rutting of sandy or silty appearing surface material
- loose surfacing material
- loss of surfacing material
- breakdown of surfacing material (abrasion, crushing, dissolving)

Recommended: The surfacing material requires some form of cohesion (glue). The cohesive agent can act temporarily or permanently. Examples of cohesive agents include: water, calcium chloride, proprietary soil stabilization additives, and clays. Replace or augment existing surfacing material with better surfacing material. An alternative is to treat existing surfacing material with soil stabilization additives. See Appendix sections on surfacing material, dust palliatives, and soil stabilization.



General Minor Rutting

Comments: Normal occurrence for most gravel roads.

Recommended: Non-aggressive routine grading when rutting exceeds about $\frac{3}{4}$ "



Potholes

Comments: Usually associated with poor drainage of roadway surface

Recommended: Surface regrading is required that must include re-establishment of 3% crown (and re-establishment of correct superelevation wherever necessary).



Embankment Slope Failures, Cracks, Bumps/Dips

Comments: Caused by thawing of ice-rich permafrost foundation soils and subsequent settlements.

Settlements are often highly variable in depth and spacing, as is the ice content of most foundation soils before thawing.

Recommended: Replace fill materials in settlement areas with gravel fill materials. Fill within the non-frost – susceptible subbase and surfacing layers must be suitable for those purposes. See Appendix sections on non-frost-susceptible and surfacing materials.



Poor Preservation Practices

Read Page 8 of Handout



END



But Wait
There's More

Questions:

- What's the most important design & maintenance consideration for your gravel road?
- Why do higher gravel road layers have to be of better quality than lower layers?
- Why discourage a lot of heavy truck traffic on your gravel road?
- What does cohesion do for your surface material?
- Where can I get good materials specifications for my gravel road materials?