A Practical Look at Dust Control on Gravel Roads in Cold Regions

By

Robert McHattie, MCE, P.E.

Summer Transportation Institute

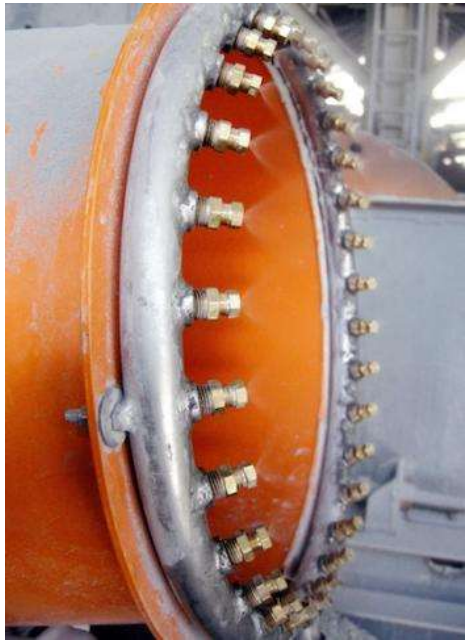
June 6 - 9, 2016

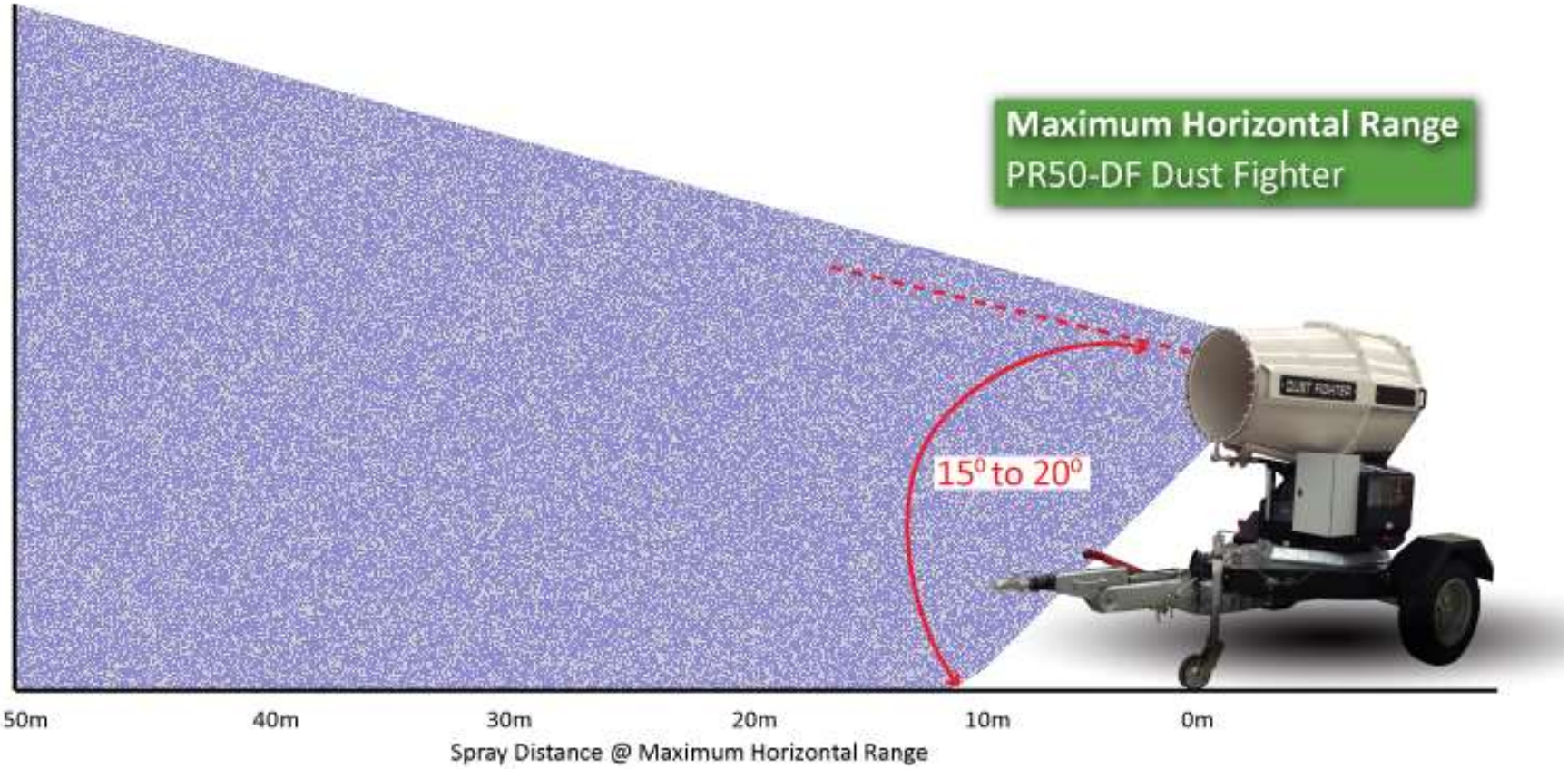
Alaska Department of Transportation & Public Facilities

Research, Development, & Technology Transfer

WANT TO CONTROL DUST?

Scale of dust control is important




Maximum Horizontal Range
PR50-DF Dust Fighter
15⁰ to 20⁰
DUST FIGHTER
50m
40m
30m
20m
10m
0m
Spray Distance @ Maximum Horizontal Range


Guangdong Fenghua Environment Protection Machinery Co., Ltd
2011/11/17 15:49

Outline (PowerPoint length is 70 slides)

1. Philosophize about dust control sustainability
2. Dust control is important
3. Importance of good road for dust control
4. Emphasize control of water
5. Economics of dust control (**<u>not easy</u>**!)
6. Selecting a dust palliative
7. Alaska experience
8. Summary

Only 29 pages of text plus few pages of references

83 pages

Alaska Department of Transportation & Public Facilities
Alaska University Transportation Center

UAF INE AUTC

Managing Dust on Unpaved Roads and Airports

David Barnes, Ph.D., P.E. and Billy Connor, P. E.

October 2014

Alaska University Transportation Center
Duckering Building Room 245
P.O. Box 755900
Fairbanks, AK 99775-5900

Alaska Department of Transportation
Research, Development, and Technology Transfer
2301 Peger Road
Fairbanks, AK 99709-5399

INE/ AUTC 14.14

Report No. 4000096

2014

2015

Dust Control Field Guide for Gravel Driving Surfaces

Alaska Department of Transportation, Research, Development & Technology Transfer

Alaska Local Technical Assistance Program

Alaska University Transportation Center

RD &T2

UAF INE AUTC

2014 Barnes & Connor Report 2+MB download

http://dot.alaska.gov/stwddes/research/assets/pdf/4000-096.pdf

2015 McHattie Field Guide <2MB download

HTTP://DOT.ALASKA.GOV/STWDDES/RESEARCH/ASSETS/PDF/DUST-CNTRL-FG.PDF

Sustainable Dust Control

Let’s think about some <u>philosophical</u> aspects of this for a minute

Keep in Mind

- Dust control is an actively developing technology.
- Health issues are continually being evaluated/reevaluated. Present "healthy" does not necessarily = future "healthy".
- Environmental regulations have changed with time and will continue to change—bet on it!

Some Warnings

(Regarding Sustainability)

- Most Critical Issues — Is your chosen dust control chemical, palliative, dust suppressant, “stuff” safe?
  - Health
  - Equipment
  - Changing Rules (dust suppression levels & environmental)
- Problems Determining Long-Term Lifecycle Costs
  - New Findings Regarding the Most Critical Issues
  - Changing Formulations (that good ol’ XQ297 product just doesn’t work as well any more)
  - Changing Surfacing Material (may require different application rate or even a different palliative)
  - Changing Prices
  - A Favorite Dust Palliative Becomes Unavailable

We've just discussed some of the reasons (*I believe)* the State of Alaska has been pretty careful:

1. investigating new dust control chemicals and

2. adopting new dust control chemicals for general use.

Most Alaska Experience for Gravel Roads

- Water
- Calcium Chloride Salt ($CaCl_2$)
- Thin (or Thick) Pavement Surfaces

AND

- **Used Motor Oil??**

(Whoa there! Carcinogenic, illegal, bad idea !!!)

A new standby for gravel surfaces where aircraft are operated*:

- The proprietary chemical *EK-35* for (because salts promote corrosion)

*at least in AKDOT&PF's Northern Region

What you need to know to enter many dust control chemical selection charts

1. Climate
2. Traffic (AADT)
3. Road Geometry
4. Fines Content of Surfacing Material (P_{200})
5. Plasticity Characteristics of Surfacing Material

View
“Dust Control”
Video (about 1½ min.)

Now let’s go through
the

Dust Control Field Guide For Gravel Driving Surfaces

Gravel Road Dust !!

Why is Dust Control Important?

Alaska is mostly a rural state and unpaved surfaces are the norm for a major portion of the State’s roadways, streets, and runways.

STATEWIDE TOTALS	Central Region				Northern Region				Southcoast Region				State Total
	Paved	Unpaved	Unknown	Total	Paved	Unpaved	Unknown	Total	Paved	Unpaved	Unknown	Total	
Interstate - TOTAL	**388**			**388**	**693**			**693**					**1081**
Interstate - Rural	334			334	668			668					1003
Interstate - Urban	54			54	25			25					79
Principal Arterial - TOTAL	**236**			**236**	**365**	**264**		**629**	**73**			**73**	**938**
Principal Arterials - Rural	136			136	343	264		607	59			59	802
Principal Arterials - Urban	100			100	22			22	14			14	136
Minor Arterial - TOTAL	**143**			**143**	**317**	**93**		**410**	**78**			**78**	**632**
Minor Arterials - Rural	39			39	276	93		368	21			21	429
Minor Arterials - Urban	104			104	41			41	57			57	203
Major Collector - TOTAL	**369**	**50**		**419**	**382**	**651**		**1034**	**318**	**81**		**399**	**1852**
Major Collectors - Rural	233	49		281	312	651		963	275	81		356	1600
Major Collectors - Urban	136	2		137	71	0		71	43	0		43	252
Minor Collector - TOTAL	**411**	**245**		**656**	**160**	**340**		**500**	**122**	**166**		**289**	**1445**
Minor Collectors - Rural	274	240		514	108	338		447	83	165		248	1209
Minor Collectors - Urban	137	5		142	51	2		53	39	1		41	236
Local - TOTAL	**1419**	**2549**		**3968**	**350**	**2867**		**3217**	**291**	**2305**		**2596**	**9781**
Local - Rural	413	2246		2659	172	2862		3033	126	2231		2356	8049
Local - Urban	1006	303		1309	178	5		183	165	75		240	1732
DOT Regional Totals	**2966**	**2845**		**5811**	**2267**	**4215**		**6482**	**882**	**2553**		**3435**	**15728**
Rural	1429	2535		3963	1879	4208		6087	565	2476		3041	13091
Urban	1537	310		1847	389	7		396	318	77		394	2637

Source: Alaska Department of Transportation and Public Facilities, Division of Program Development, 3132 Channel Dr., Juneau, AK 99801
Contact: Andrew Heist, phone: 907-465-5643, e-mail: andrew.heist@alaska.gov

(from 2014 CPRM data)

Unpaved Miles	2,845 C.R.	4,215 N.R.	2,553 SE.R.

9,613 Unpaved Miles
of 15,728 Miles Total ≈ 61%

Loss of fine particles—dust—from unpaved driving surfaces produces 3 significant problems.

1. Degradation of the Road Surface Itself

Fine soil particles act somewhat as a binder. Corrugations, potholes, and rutting are all evidence of loss of the fine particles, ultimately producing uncomfortable and unsafe driving conditions. Loss of fines from the surface requires frequent, expensive maintenance.

2. Poor Visibility

Poor visibility. Large, nearly opaque clouds of dust lofting from behind vehicles can quickly (sometimes completely) obscure a driver’s vision for several seconds or longer.

3. Health & Quality of Life

Particles 10 micron (μm) or smaller (PM10) can penetrate deep into lungs, **stay there**, and make you sick!

Fine particles in the air are a nuisance that degrades the quality of life. It invades all living spaces and eventually settles on, under, and into

EVERYTHING!

PM10 = PM 10 = PM-10 = PM_{10}

< 0.001 inch = < 25.4 μm = PM25.4

P_{200} = PM127
(1/200 inch = 127 μm)

Particles between 10 μm and 2.5 μm
Coarse dust particles

Particles finer than 2.5 μm
Fine dust particles

Some Size Comparisons (sizes in μm)

Burning Wood	0.2 - 3
Coal Flue Gas	0.08 - 0.2
Oil Smoke	0.03 - 1
Tobacco Smoke	0.01 - 4
Viruses	0.005 - 0.3
Typical Atmospheric Dust	0.001 to 30

The human eye can see particles down to about 40 μm, i.e., 1.5/1,000 inch

Sand size range from ~ 60 μm to 2,000 μm

PM1 particles don’t necessarily stay in the lungs.

They are said to be worse.

They can transfer through the lungs and get directly into the blood stream.

Yes. Dust control is important !

Good Dust Control Starts with a Good Road

- The right surfacing materials (well-graded gravel) is strong and stable
  - Incorrect surfacing gravel will not support traffic well and tends to produce huge quantities of dust

- The right cross section (crown) removes water from road surface to roadside

  - Too much crown can be hazardous and insufficient crown allows water to remain on the road surface and soften it

- Good drainage (ditch, culvert, etc.) removes water away from the roadside
  - Poor roadside drainage can soften the road embankment and driving surface

- Good year-to-year stability (foundation and embankment stable enough to support a permanent driving surface)
  - Unstable embankment or foundation conditions will lead to road deformation and MANY problems—some of which involve dust production

- If the existing road has not been properly designed or maintained, good dust control chemicals will likely do a poor job.

Problems require frequent re-grading and/or re-leveling, may require more surfacing gravel and more dust control agent.

- Improper maintenance will rapidly negate many of the benefits provided by even the best engineering and construction—and reduce the probability of successful dust control.

Good Surfacing Material (Alaska DOT&PF Specifications)

SIEVE	GRADATION			
	BASE COURSE		SURFACE COURSE	
	C-1	D-1	E-1	F-1
1-1/2 in.	100			
1 in.	70-100	100	100	100
3/4 in.	60-90	70-100	70-100	85-100
3/8 in.	45-75	50-80	50-85	60-100
No. 4	30-60	35-65	35-65	50-85
No. 8	22-52	20-50	20-50	40-70
No. 50	6-30	6-30	15-30	25-45
No. 200	0-6	0-6	8-15	8-20

PROPERTY	BASE COURSE	SURFACE COURSE	TEST METHOD
L.A. Wear,%	50, max.	45, max.	AASHTO T 96
Degradation Value	45, min.	45, min.	ATM 313
Fracture,%	70, min.	70, min., 1 Face	ATM 305
Liquid Limit	---	35, max.	ATM 204
Plastic Index	6, max.	10, max.	ATM 205
Sodium Sulfate Loss,%	9, max. (5 cycles)	9, max. (5 cycles)	AASHTO T 104

About Cohesion

Types of Cohesion:

1. Apparent cohesion (provided simply by water)
2. Real cohesion (just about any permanent or semi-permanent "glue"
   - MANY chemicals
   - If clay, not too much (need the correct Liquid Limit and Plastic Index)

Alaska examples of natural materials that contain a natural dust-fighting cohesiveness in the form of clay

“There was a little girl who had a little curl right in the middle of her forehead.

When she was good she was very, very good, but when she was bad she was horrid!”

~~Good~~ Very, very good: Brown's Hill crushed basalt

Origin—near Fairbanks, AK

Just the right amount of clay

~~Bad~~ Horrid: Clayey gravel

Origin—along south end of Richardson Highway

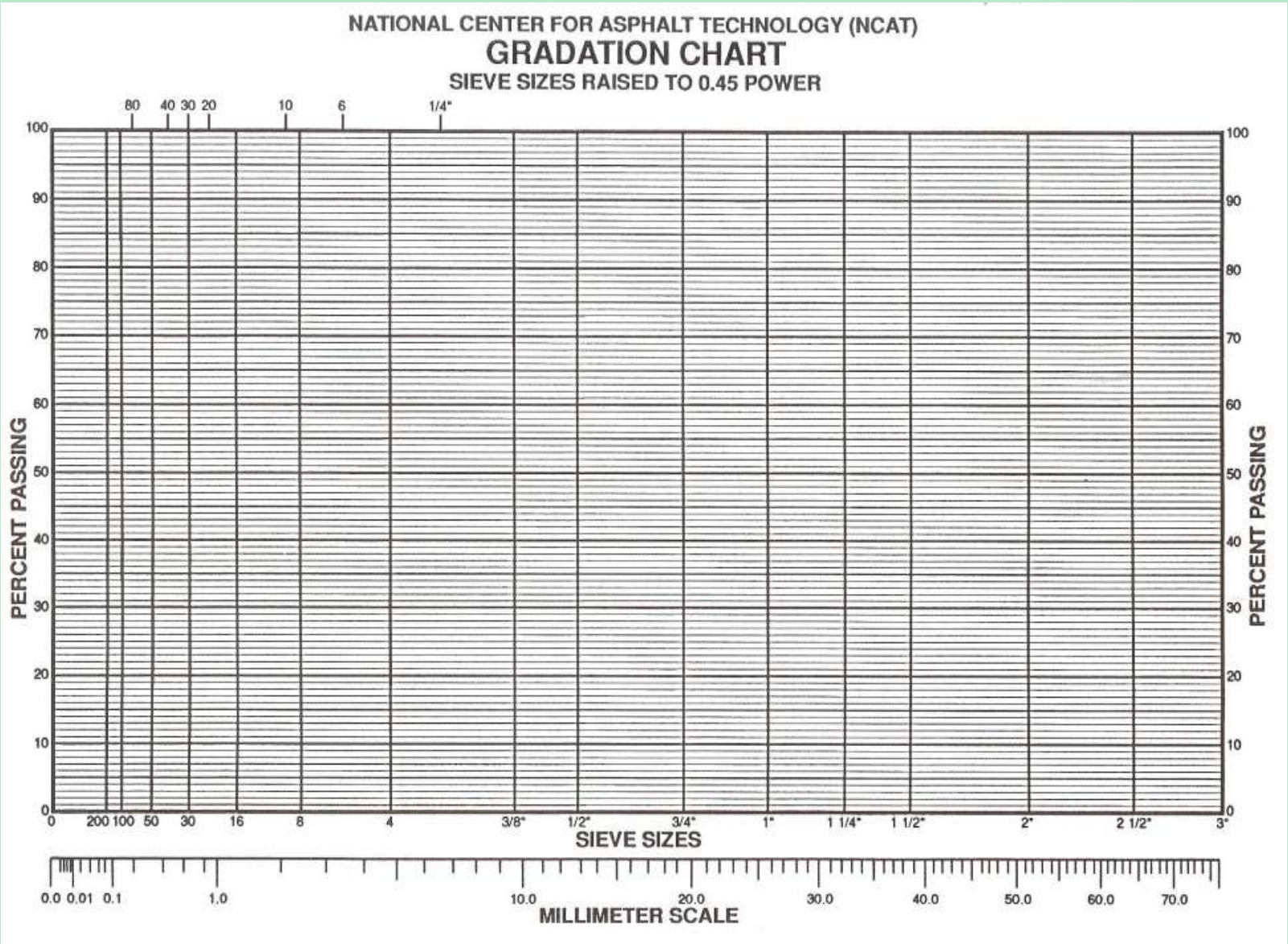
Too much clay

Rules of Thumb for Gravel Surface Course Materials in Alaska

- Use well graded gravel with a maximum particle size of 1 inch
- The P_{200} content should probably be in the 10% to 14% range although ADOT&PF allows 8% to 20% depending on grading.
- The best natural surface course materials contain a small percentage of natural clay (not more than 2 to 4%).

The “Magic” of the 0.45 Power Plot

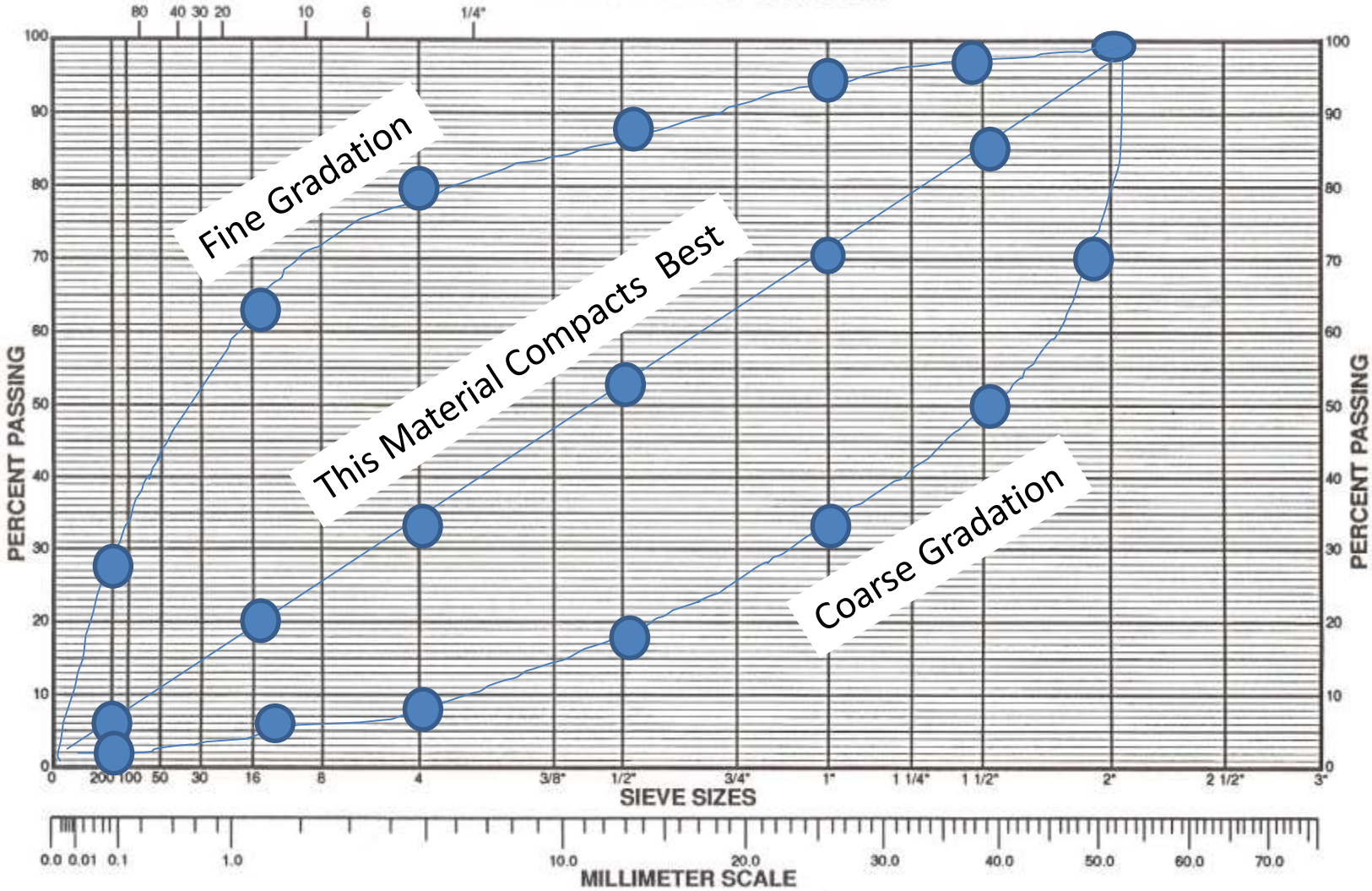
The “0.45 Power” Plot



NATIONAL CENTER FOR ASPHALT TECHNOLOGY (NCAT)

GRADATION CHART

SIEVE SIZES RAISED TO 0.45 POWER



All Dust Palliatives Don't Work with All Surfacing Materials

Check with palliative supplier (if possible) to verify that **THEIR** palliative will work with **YOUR** surfacing material.

They may request a sample of your surfacing material.

Cross Section & Drainage

Get water **off** of the road surface and **away** from the side of the road.

Rule of Thumb for Drainage

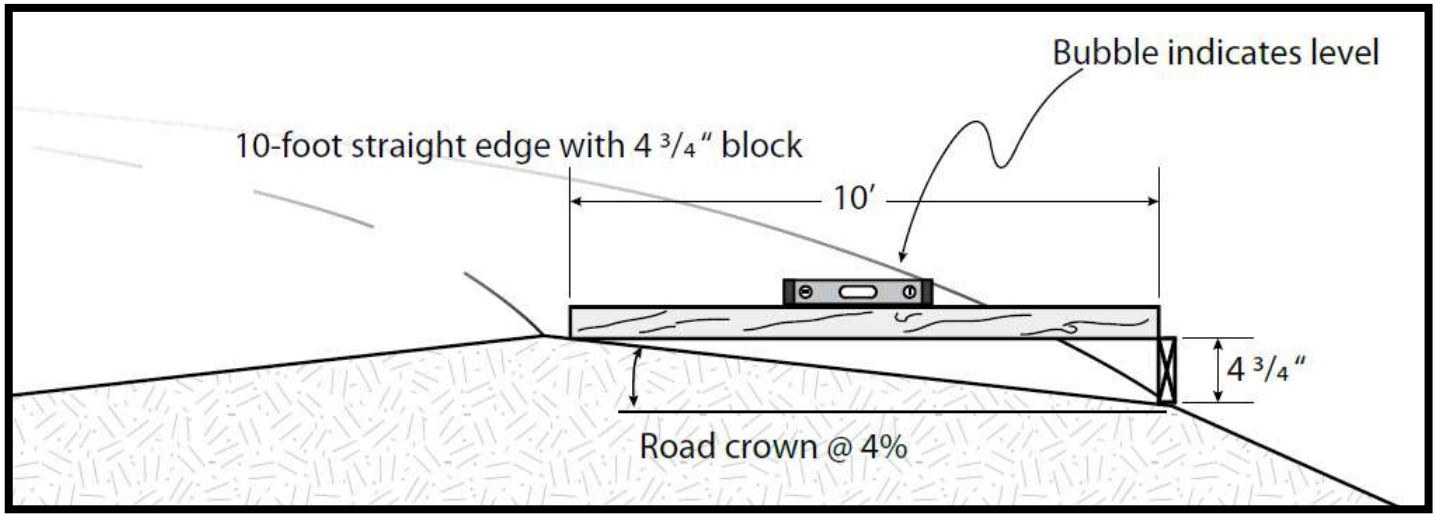
THE three most important points regarding preservation of a gravel road

"DRAINAGE, DRAINAGE. DRAINAGE"

(H. R. Cedergren)

Good Cross Secton

The recommended gravel road crown is 4 percent.



Crown Less Than 4% Does Not Get Water Off of Road Surface

Crown less than 4 percent will promote water ponding on the road surface.

Produces: Potholes and water running on road surface.

Too Much Crown Can be Unsafe & Produce High Flow Velocity

A crown significantly higher than 4 percent may negatively influence safety.

A very high crown may increase water runoff velocity during rain or seasonal thawing events, and some kinds of dust control agents may be flushed away.

Rules of Thumb for Getting Water Off of the Road Surface

- Proper cross section for road surface
- A crown with 4% cross slope (crown)
- Allow no berms to form along downhill edges of roadway.
  - summer—because of rain
  - spring—because of snow/ice melt

Good Roadside Drainage (Ditches)

The 4 percent crown **moves water from the road surface to the edge of the roadwa**y.

Roadside drainage in the form of properly designed ditches and culverts **moves water <u>away</u> from the roadway**.

Examples of Drainage Problems

Best times to examine a gravel road and recognize drainage problems

- During or immediately after heavy rain event (to evaluate drainage)
- During spring thaw (to evaluate drainage and thaw-related problems in particular)
- It makes sense to examine the gravel road during both conditions for a complete evaluation of drainage.

Rules of Thumb for Getting Water <u>Away from the Road</u>

- A good ditch is one of the road's best friends
- Design to insure freeboard.
  - 2 feet ±
- Select a good ditch shape and maintain it.
  - flat or "V" bottom is best

Rules of Thumb for Getting Water <u>Away from the Road</u>

- Culverts must be compatible with ditch design and remain free of blockage
- Keep ditches clean
- Be aware of environmental issues associated with ditch runoff—whatever the requirements today, they will be more strict tomorrow!

Is Dust Control Economically Worthwhile?

Short term versus long term

Practicalities regarding calculation of **long term** economics

Examples: Life cycle cost analysis, benefit/cost analysis (20 to 40-year time frame often recommended)

Or — why I like
a short term approach

Whether or not dust control provides long-term economic benefits to a community or agency is simple to discuss in principal, and extremely difficult to determine in practice. We "**know**" that it has community health, safety, and aesthetic benefits, although such benefits may not be economically quantifiable with legitimate accuracy.

The reality is that most dust control programs are initiated by policy (mandate), politics, or public demand — without regard for long-term economics. Such disregard creates a big potential for bias in calculating long-term economic benefits. Bias can occur when dust control managers or funding agencies try to “prove” that popular (or perhaps mandated) dust control programs have had quantifiable, positive economic benefits.

The following questions and comments shed additional light on why a standard engineering analysis of long-term benefits may be something of a waste of time.

Does your selected dust palliative work?

- It may work well, but there may be a better alternative that you never tested or a better one that becomes available in the near future.
- A good palliative today may become unavailable tomorrow.
- A favorite palliative's formulation may change with time and reduce its effectiveness.

Does your selected dust palliative do any harm to people and/or property?

- Something considered environmentally acceptable today may be considered quite unacceptable in the future—maybe after great quantities of the palliative have accumulated over many years.
  - New Term: “emerging pollutants/contaminants”
- Equipment or other property damage may be subtle and either not noticed or not correlated with use of a particular palliative for years.

USGS Definition:

"**Emerging contaminants**" can be broadly defined as any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and(or) human health effects.

Does your Department have the financial resources to support long-term dust control?

- This is a much better short-term than long-term question.
- Palliative selection/specification is inherently too variable for valid long-term economic analyses of specific palliatives.

Do you possess data concerning benefits and/or costs for road users or nearby residents regarding your dust control activities?

- Such data is critically important for a valid determination of long-term economics, but is usually unavailable.

Practicalities regarding calculation of **short term** economics

Short Term Evaluation of Dust Control Effectiveness

1. Quantified Measurement of Dust

2. Determining the Short-Term Viability (Desirability) of a Dust Control Candidate

Quantified Measurement of Dust — By "Eyeball"

Dust Reference Photos	Degree of Dust Cloud Opacity	Dust Levels (approx. $\mu g/m^3$ for PM10 size)	Qualitative Descriptions
	Degree 1	< 3,500 $\mu g/m^3$ Dust intensity Factor = 1	Minimal Dust
	Degree 2	3,500 – 23,500 Dust Intensity Factor = 4	Dust just visible behind vehicle
	Degree 3	23,500 – 45,000 Dust Intensity Factor = 10	Dust visible, no oncoming driver discomfort, good visibility
	Degree 4	45,000 – 57,500 Dust Intensity Factor = 14	Notable dust, windows closed in oncoming vehicles, visibility just acceptable, overtaking/passing hazardous

Quantified Measurement of Dust — By Machine

Figure 3.1. University of Alaska, Fairbanks – DUSTM setup (left) and dust intake detail (right) (from Eckhoff, 2012)

<u>DUSTM II:</u> used commercially available nephelometer, a TSI DustTrak Aerosol Monitor with an intake mounted behind the rear tires of a small all-terrain vehicle (ATV).

Determining the Initial Viability of a Dust Control Candidate

- **Short Term Effectiveness—**Is the dust control agent acceptably effective?
- **Initial Cost Estimate—**Can you afford the cost of the dust control material considering the manufacturer's recommended re-application schedule?
- **Apparent Handling Issues—**Are there known short or long-term negatives associated with use of the dust control material, i.e., with respect to transportation, application, and/or health?

Determining the Initial Viability of a Dust Control Candidate

Table 3.2. Initial evaluations of dust control methods

Name of Dust Control Agent	Short-Term Effectiveness (Good/OK/Poor)	Initial Cost ($/Year-Mile)*	Known Handling Issues (Yes/Slight/No)		
			Transport	Application	Health
Agent No. 1	OK	* $530	No	Slight	Slight
Agent No. 2	Poor	$750	Yes	No	Yes
Agent No. 3	OK	$610	No	Slight	Slight
Agent No. 5	Good	$660	No	No	No

<u>Result:</u> Select Agents No. 1 and No. 5 for further testing.

Finally

Let’s talk about
specific kinds of dust control

The Most Serious (expensive) Form of Dust Control

Thin (≈ ¾” thick) pavements such as:

- Double-layer emulsion BSTs (“double-shot chip jobs”)
- High float BSTs

And perhaps properly placed RAP

The Lowest-Cost Form of Dust Control

Vehicle Speed

the
low
hanging
fruit


SLOW
DOWN
10 MPH
DUST
CONTROL

Types of Dust Control Palliatives

Dust Suppressant Category	Attributes	Limitations	Application	Origin	Environmental Imp
Water	• agglomerates the surface particles • normally, readily available	• evaporates readily • controls dust generally for less than a day • generally the most expensive and labor intensive of the inorganic suppressants	• frequency depends on temperature and humidity; typically only effective from 1/2 to 12 hours	• any potable water source	• none
Water Absorbing: Calcium Chloride (deliquescent)	• ability to absorb water from the air is a function of temperature and relative humidity; for example, at 25°C (77°F) it starts to absorb water at 29% relative humidity, and at 38°C (100°F) it starts to absorb water at 20% relative humidity • significantly increases surface tension of water film between particles, helping to slow evaporation and further tighten compacted soil as drying progresses • treated road can be regraded and recompacted with less concern for losing moisture and density	• requires minimum humidity level to absorb moisture from the air • doesn't perform as well as MgCl in long dry spells • performs better than MgCl when high humidity is present • slightly corrosive to metal, highly to aluminum and its alloys, attracts moisture, thereby prolonging active period for corrosion • rainwater tends to leach out highly soluble chlorides • if high fines content in treated material, the surface may become slippery when wet • effectiveness when less than 20% solution has performance similar to water	• generally 1 to 2 treatments per season • initial application: flake: @ 0.5 to 1.1 kg/m² (1.0 to 2.0 lb/y²), typical application 0.9 kg/m² (1.7 lb/y²) @ 77% purity liquid: 35 to 38% residual @ 0.9 to 1.6 L/m² (0.2 to 0.35 g/y²), typical application is 38% residual concentrate applied undiluted @ 1.6 L/m² (0.35 g/y²) • follow-up: apply @ 1/2 to 1/3 initial dosage	• by-product in the form of brine from manufacture of sodium carbonate by ammonia-soda process and of bromine from natural brines • three forms: flake, or Type I, @ 77 to 80% purity pellet, or Type II, @ 94 to 97% purity clear liquid @ 35 to 38% solids	• water quality imp generally negligi the proper buffer zone exists betw treated area and water • fresh water aqua impact: may dev at chloride concentrations a low as 400 ppm trout, up to 10,0 ppm for other fis species • plant impact: sor species suscepti such as pine, hemlock, poplar, ash, spruce, and maple • potential concern with spills of liqu concentrate

5 Pages Total in Dust Control Guide

What you need to know to enter many dust control chemical selection charts

1. Climate
2. Traffic (AADT)
3. Road Geometry
4. Fines Content of Surfacing Material (P_{200})
5. Plasticity Characteristics of Surfacing Material

Selecting a Dust Control Palliative

Selection is Based on Road Characteristics Defined in 4 Areas

Palliative	Average Daily Traffic			Climate			Fines Content				Geometry		Sum
	Area 1			**Area 2**			**Area 3**				**Area 4**		
	<100	100 - 250	>250	Wet	Damp	Dry	<8%	8-15%	15 -25%	>25%	Steep Grades	Sharp Curves	
Water	7	50	50	1	7	1	50	1	7	10	7	1	
Water + Surfactant	7	50	50	50	7	1	50	1	7	50	1	1	
Salts (CaCl)	1	1	7	50	1	50	50	1	1	50	1	7	
Organic Non-Petroleum (Lignosulfonate)	1	1	7	50	1	1	50	1	1	10	1	7	
Organic Petroleum (Synthetic Fluids)	1	1	7	7	1	1	7	1	7	50	7	7	
Polymer	1	7	50	7	7	1	7	1	7	10	7	7	

Notes:

lowest score wins

1. Salts may not perform well when the relative humidity is less that about 35%.
2. If the palliative is to be stored over the winter unheated, ensure the product can withstand freezing.
3. The table addresses the most common palliatives used in Alaska. If other products are being considered, refer to Jones and Surdahl.

Selecting a Dust Control Palliative

Dust Palliative	Traffic Volumes, Average Daily Traffic			Surface Material								Climate During Traffic		
				Plasticity Index			Fines (Passing 75μm, No. 200, Sieve)							
	Light <100	Medium 100 to 250	Heavy >250 (1)	<3	3–8	>8	<5	5–10	10–20	20–30	>30	Wet &/or Rainy	Damp to Dry	Dry (2)
Calcium Chloride	✓✓	✓✓	✓	✗	✓	✓✓	✗	✓	✓✓	✓	✗ (3)	✗ (3,4)	✓✓	✗
Magnesium Chloride	✓✓	✓✓	✓	✗	✓	✓✓	✗	✓	✓✓	✓	✗ (3)	✗ (3,4)	✓✓	✓
Petroleum	✓	✓	✓	✓✓	✓	✗	✓ (5)	✓	✓ (6)	✗	✗	✓ (3)	✓✓	✓
Lignin	✓✓	✓✓	✓	✗	✓	✓✓ (6)	✗	✓	✓✓	✓✓	✓ (3,6)	✗ (4)	✓✓	✓✓
Tall Oil	✓✓	✓	✗	✓✓	✓	✗	✗	✓	✓✓ (6)	✓ (6)	✗	✓	✓✓	✓✓
Vegetable Oils	✓	✗	✗	✓	✓	✓	✗	✓	✓	✗	✗	✗	✓	✓
Electro-chemical	✓✓	✓	✓	✗	✓	✓✓	✗	✓	✓✓	✓✓	✓✓	✓ (3,4)	✓	✓
Synthetic Polymers	✓✓	✓	✗	✓✓	✓	✗	✗	✓✓	✓✓ (6)	✗	✗	✓	✓✓	✓✓
Clay Additives (6)	✓✓	✓	✗	✓✓	✓✓	✓	✓✓	✓	✓	✗	✗	✗ (3)	✓	✓✓

Legend

✓✓ = Good ✓ = Fair ✗ = Poor

Alaska Experience with Dust Palliatives

Palliative	Products	Applied in Alaska in the Past
Water	Fresh and saline	Yes
Salts and brines	Calcium chloride and magnesium chloride	Calcium Chloride
Petroleum-based organics	Asphalt emulsion, cutback solvent, dust oils, modified asphalt emulsion	Yes
Non-petroleum based organics	Vegetable oils, molasses, animal fats, ligninsulfonate, tall oil emulsions	Ligninsulfonate
Synthetic polymers	Polyvinyl acetate, vinyl acrylic	Several proprietary products
Electrochemical products	Enzymes, ionic products (e.g. aluminum chloride), sulfonated oils,	EMC^2, Permazyme
Clay additives	Bentonite, montmorillonite	Montmorillonite
Mulch and fiber mixtures	Paper mulch with gypsum binder, wood fiber mulch mixed with brome seed	Polyolyfin fiber reinforcement

Dust Control Most Commonly Used By Northern Region DOT&PF (2015)

- Water
- Calcium Chloride ($CaCl_2$) for gravel roads (spread as a solid or liquefied and spread with a tanker)
- EK 35 (a proprietary liquid chemical from Midwest Industries) for unpaved runways, etc., around aircraft

EK 35 MSDS Information

MIDWEST INDUSTRIAL SUPPLY, INC.
P. O. BOX 8431
CANTON, OHIO 44711 U.S.A.

Emergency Phone Numbers: 330-456-3121

EK®35

Intense Use Continuous Life Dust Control Agent

MATERIAL SAFETY DATA SHEET

SECTION I – IDENTIFICATION OF SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

TRADE NAME:	EK®35
CHEMICAL NAME:	INTENSE USE, CONTINUOUS LIFE DUST CONTROL AGENT
SYNONYMS:	DUST RETARDANT
CHEMICAL FAMILY:	N/A
MOLECULAR WEIGHT:	N/A
FORMULA:	N/A
CAS REGISTRY NO.:	PRODUCT A BLEND - NO NUMBER ASSIGNED

SECTION II – COMPOSITION/INFORMATION ON INGREDIENTS

NAME	%	CAS REG. NO.
Severely hydrotreated, high viscosity synthetic iso-alkane	Trade secret	Non-hazardous
Proprietary ingredients	Trade secret	Non-hazardous

SECTION III – HAZARDS IDENTIFICATION

Synthetic Product	May be irritating to breathing passages upon excessive heating, otherwise this product is essentially non-hazardous. Mist 8 hour TLV-TWA = 5mg/m^3 (ACGIH)

SECTION IV – FIRST AID MEASURES

EYES:	Flush eyes with flowing water at least 15 minutes, get medical attention. Do not use any eye ointment. Remove contact lenses.
INHALATION:	Move subject to fresh air. If victim is not breathing perform artificial respiration. Administer oxygen if available. Keep victim warm and at rest. Seek medical attention as soon as possible.
SKIN:	Flush with large amount of water or wash with soap and water. Seek medical attention if irritation persists.
INGESTION:	DO NOT induce vomiting because of aspiration into the lungs. EK®35 has a laxative effect and will be eliminated quickly. Seek medical attention.

NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAVING CONVULSIONS.

$13.00 Per Gallon (FOB FBKS, AK May 2015)

Practical Tips for Flying the Environmentally-Acceptable Skies

- Have an “expert” examine the MSDS sheet/s of dust control chemicals you intend to use.

- Use Google Scholar or other powerful Internet resources to occasionally verify that your favorite dust control chemical has not become the subject of negative research or—worse yet—news media.

Some Calcium Chloride Information

For the Dalton Highway, the ADOT&PF typically applies 8 to 9 tons/mile to previously untreated surface course material. In years 2 and 3, respectively, the rates are 6 then 4 tons/mile. Year 5 starts the cycle again beginning with 8 tons/mile (and rates may vary)

Summary

- Dust control is important
- Best to start with a good gravel road or runway with proper surfacing material
- Control water (4% cross section and good drainage)
- Decide which dust palliative to use
- Economic justification for dust control
  - Measure the amount of dust before and after treatment
  - Decide between dust control materials
- Be carful with your palliative selection—stay out of trouble

Thank you!

Questions?

Contact

Robert McHattie, MCE, P.E.

907-456-7485

rlmchattie@gci.net

Don’t Build Unintended Dams

Some Things to Know About Permafrost

- Hard to stop thawing after clearing
- Highest ice content usually in upper soil layers, so thawing and consolidating often lessens or stops in time (but not always)
- Thawing ~progresses with the square root of time
- Ice contents of permafrost vary a LOT
- Information from drilling is critical if you want to build on permafrost

Icings (Aufeis) Can Often Be Controlled Using “Underdrains”

Odd Thoughts Just for Fun

- Blood pressure
- Hail stones
- The “Monty Hall” problem