



Basics of Chip Seal

Presented by Chase Brockman

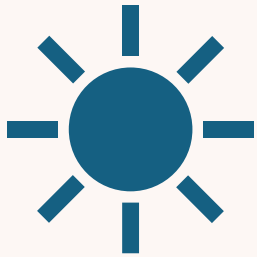


What is Chip Seal?

Chipseal is an application of bituminous liquid asphalt in combination with an aggregate chip surface.

In its most basic form, there are only two components.

Why are Chip Seals needed?



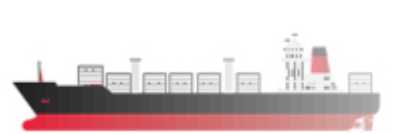
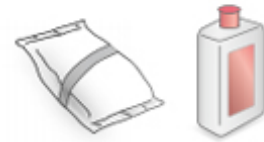
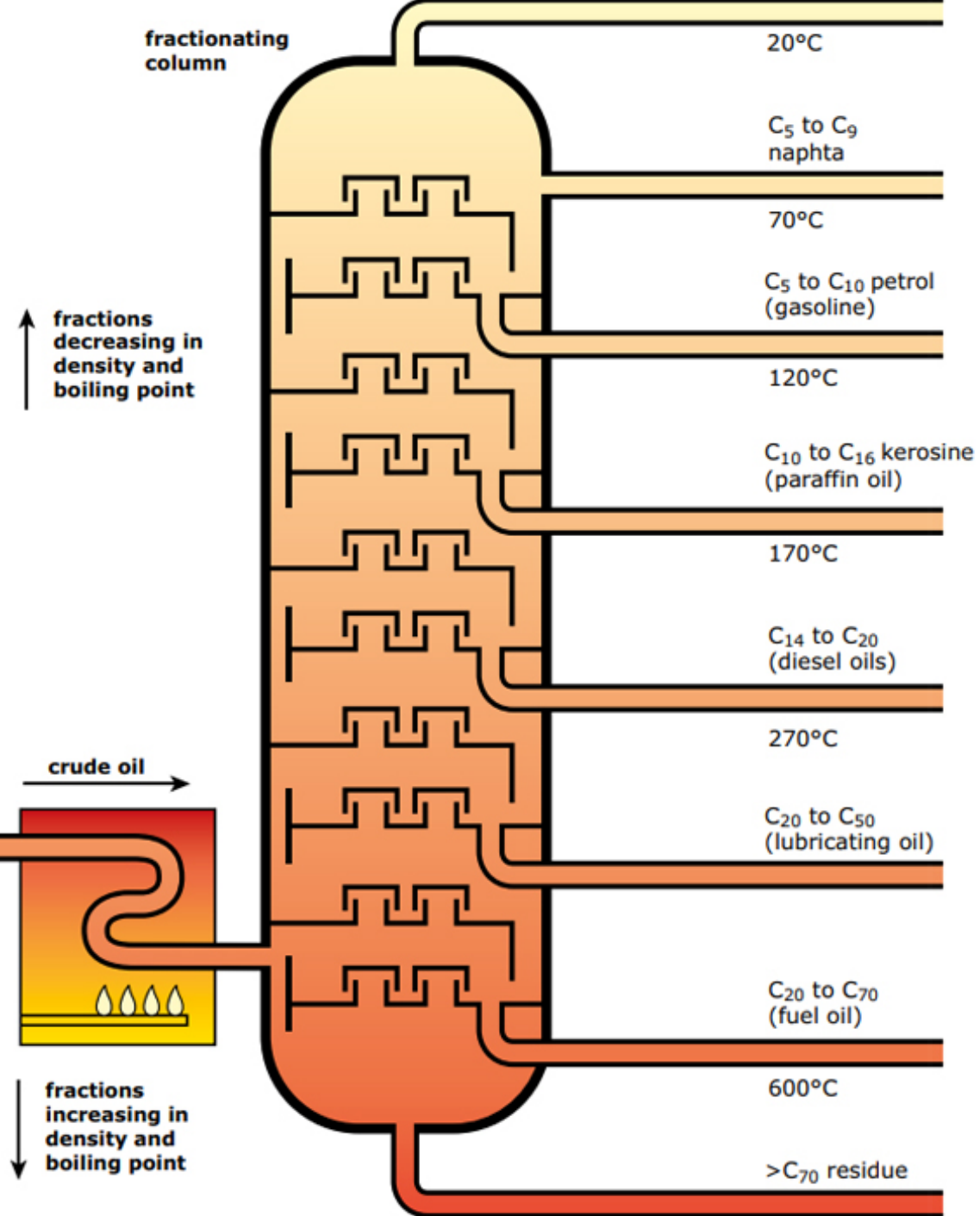
UV deterioration and Oxidation
of Paved Surfaces



Seasonal expansion and
contraction of Roadways



Prevent water infiltration of
surface causing base
deterioration



chemicals

petrol for vehicles

jet fuel
for heating

diesel fuel

lubricating oils
waxes, polishes

fuel oil

bitumen for
roads and roofs

What is bituminous liquid asphalt?

Liquid bituminous asphalt is what remains of crude oil after lighter oil distillates are removed for use in petroleum based industries.

Basic forms of liquid asphalt used in Chip Seal:

Hot Applied Liquid Asphalt:

- Applied at 320-360 degrees F
- 95%-100% PG58-28 Liquid Asphalt
- Remaining Liquid is Lighter Distillates
- Relies on heat to meet spraying viscosity
- 100% of applied product will remain after application

Emulsified Liquid Asphalt:

- Applied at 140-180 Degrees F
- 62%-67% PG58-28 Liquid Asphalt
- Remaining liquid is Chemicals and Water
- Relies on diluting with water to meet spraying viscosity
- 62%-67% of applied product will remain after application



Emulsified Liquid Asphalts:

- Most common emulsified liquid asphalt used for chip seal in Wisconsin are: HFRS-2 and CRS-2
- These emulsions can go through a process of Polymer Modification.
- Polymer modification will make the chip seal more resistant to flushing.

Emulsion Asphalt Comparison:

High Float Rapid Set (HFRS-2)

- Has a negative charge –
- Cured roads will be slightly softer
- Tolerates higher aggregate dust
- Cures through an evaporative process
- More susceptible to flushing due to adverse weather

Cationic Rapid Set (CRS-2)

- Has a positive charge +
- Cured Roads will be slightly firmer
- Tolerates very little dust
- Cures through a chemical process
- Less susceptible to flushing due to adverse weather

How to choose a liquid asphalt for Chip Seal:

- General rule of thumb is to use the softest asphalt your road and traffic will allow.
- Softer asphalt will help fill cracks over time with traffic and heat.
- Softer asphalts will age over the years better.
- Rural towns will usually benefit from softer asphalts.
- Some urban towns will need to use firm asphalts for best results.
- Make sure to take dust content in the aggregate into account when choosing a liquid asphalt.
- Charge of aggregate and asphalts do not appear to significantly effect results.



Liquid Asphalts From Soft to Firm:

- PG58-28 with 5% Cut-back: Hot Applied Liquid Asphalt:
- HFRS-2: High Float Rapid Set Emulsion
- CRS-2: Cationic Rapid Set Emulsion
- HFRS-2P: Polymer Modified High Float Rapid Set Emulsion
- CRS-2P: Polymer Modified Cationic Rapid Set Emulsion



Ideal Chip Seal Aggregates will be:

- Single Sized
- Fractured Chips
- Have a 1:1:1 Ratio (cube shaped)
- Durable
- Contain less than 1% Dust (P200 on sieve analysis)



Single sized
Aggregate



Single sized aggregate



Graded aggregate

Fractured
Chips:



Goal is to get 100% of the individual chips to have minimum of one fractured side.

Have 1:1:1
Ratio



Single sized aggregate



Graded aggregate

Durable Aggregate



- Best aggregate is both hard and durable.

Be low in
Dust
Content



- Should have lower than 1% passing a 200 Sieve
- Washed aggregate is preferred



Most Common Types of Aggregates used for Chip Seal in Wisconsin:

- Fractured Granite
- Fractured Limestone
- Round and/or Fractured Peastone
- Fractured Quartz
- Slag
- Fractured Trap Rock



Should Aggregate Color Be a Factor?

- The color of the aggregate will not increase the effectiveness of a Chip Seal
- The color of an aggregate will not increase the quality of a Chip Seal
- Dark aggregates will hide imperfections and plow damage
- Dark aggregates will give a new appearance
- Dark aggregates may reduce resident complaints

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- Single Sized
- Fractured Chips
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- Durable
- Contain less than 1% Dust (P200 on sieve analysis)

**Most aggregates in Wisconsin
will not fit all of these!**



Choosing aggregate size:

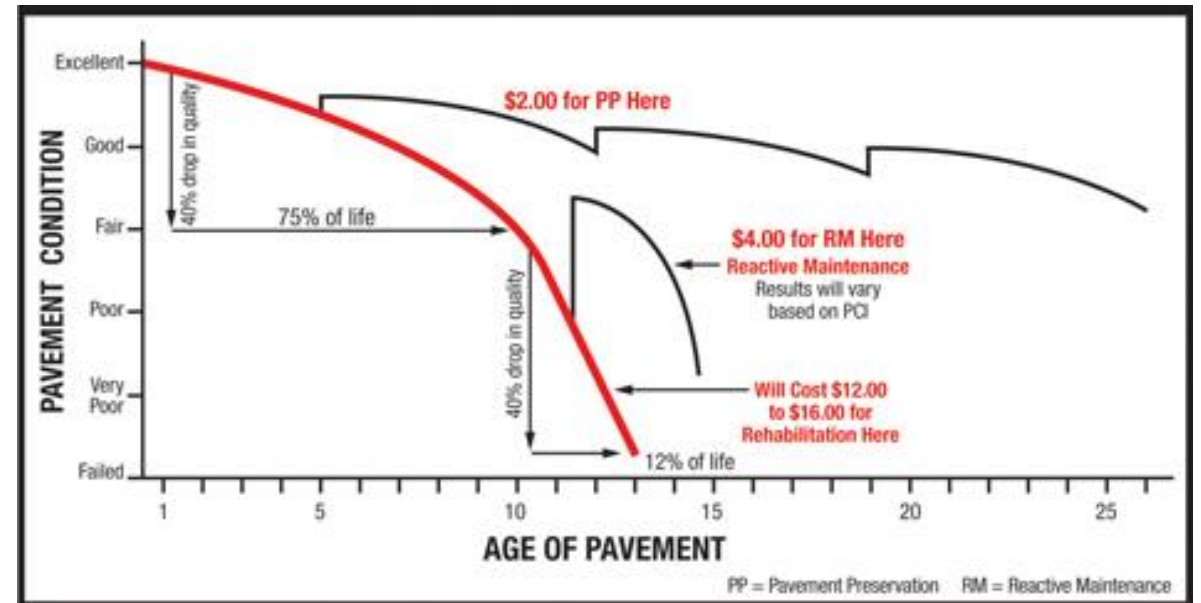
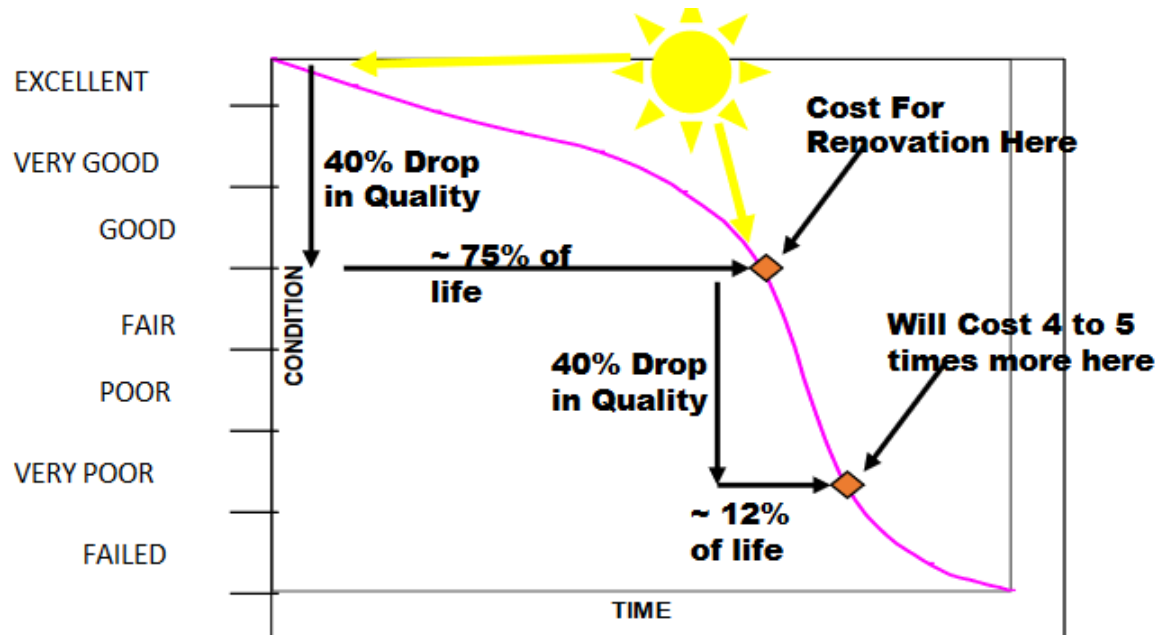
- Condition of the road and type of traffic will dictate aggregate size
- Roadways with higher wear are likely to need larger aggregates
- Traffic that is harmful to roadway will increase aggregate size needed
- Residential and walking traffic is likely to need smaller aggregate to avoid complaints
- Most common Aggregate sizes are 1/4" and 3/8"
- Other sizes include Man Sand, 5/16", and 7/16"
- Larger aggregates will mean more asphalt is needed




Chipseal Basic Design:

- Liquid asphalt should be applied so that the stone is 70% embedded in the asphalt once it is fully cured.
- Choose an aggregate and asphalt that are compatible with each other
- Apply the minimum amount of aggregate to achieve full coverage
- The asphalt is the sealing part of a Chip Seal & the chips are there to keep traffic out of the asphalt
- Keep in mind type of road, type of traffic, amount of traffic and road condition when choosing asphalt and aggregate

When should you Chip Seal?





How often should you Chip Seal?

MnDOT Chip Seal Suggestions:

- Chip Seals should be reapplied every 5-7 Years
- As early as year 2 for new pavement.
- Early intervention means Chip Seals will last longer and be more cost effective

Fog Seals:

Most common asphalts are diluted CSS-1H or CQS-1H
Application concentrations are 30%-35% Liquid Asphalt

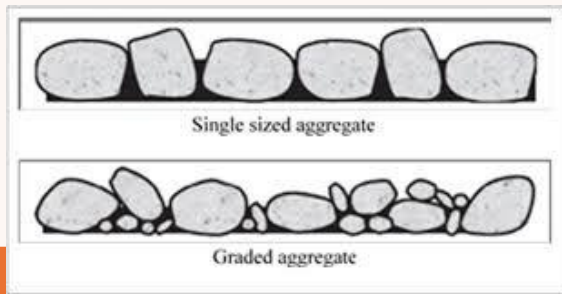


Fog Seals:

Most common asphalts are diluted CSS-1H or CQS-1H
Application concentrations are 30%-35% Liquid Asphalt

Pros:

- Can help reduce dislodging of chips
- Adds aesthetic appeal (makes it dark)
- Reduces loose aggregate after plowing
- Helps hold in partially embedded chips



Cons:

- High cost for residual asphalt applied
- Dark color does not last and is often not noticed after plowing
- Paint Striping will often come off with plowing
- Road will need to be closed while curing (2+ Hours)

Alternative Asphalt Seals:



Specialty Fog Seal Applications:

- Gilsonite seal, Rapid Penetrating Emulsion, Rejuvenating Seals, etc..
- Applied as early as right after paving up to year 5-7
- Should be applied before any raveling of road surface is present
- Lower cost than Chip Seal , but high cost for amount of residual asphalt



Micro-surface or Slurry Seal:

- Mixture of aggregate, cement & emulsified asphalts
- Higher cost than chip seal
- More brittle than chip seal and cracks easily



Scrub Seal:

- Chipseal that uses a broom to push asphalt into cracks
- Can reduce the need for crack filling
- Only appropriate for long stretches of road (3+ Miles)



Example of Raveling





**Loose
Gravel
Ahead**

Prepping for Chip Seal:

- Roads should be swept clean
- Potholed area should be patched
- Cracks should be sealed when possible
- Residents should be notified of upcoming work

When not to crack seal!



Bar Patching
(Double Seal)





How to lower Chip Seal cost?

- Chipseal sooner and more often
- Decrease the size of the aggregate
- Use Local aggregate when possible
- Forgo fog sealing
- Do not use Polymer Modified Asphalts

How to bid out Chip Seal to get what you want:

- Specify aggregate type, size and possibly aggregate source
- Specify type of asphalt
- Ask for dry sample of aggregate if aggregate source is not specified
- Specify if post sweeping or Fog seal is needed
- Make sure all bidders have detailed information of start and stop points
- Ask for references where aggregate and asphalt have been used
- Be open to suggestions by contractor but understand what is offered
- Choose the contractor that is offering best product for the Town

Questions?

