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April 22, 2016

To: Dan Kern
21616 230th St SE
Monroe, WA 98272

Phone: (360) 805-5598
Cell: (206) 714-2865
Email: kernconstruction@gmail.com

Re: Cherry Ridge Estates Chip Seal

Dear Dan,

After sweeping and re-inspecting the roads in your community, we realized that the roads are in much worse condition than initially thought. Yesterday, Aaron, from my office, walked the roads to quantify the amount of roadway needing an additional layer of chip seal. Many problem areas became apparent after the roads were swept, including a few sub-grade issues. It is our recommendation to apply an additional chip seal layer or chip seal patches to 11,500 square yards of the roads (roughly 55% of your roads). We could do less, and try to pick out only the worst areas, but in our judgment, to give the roads the most longevity, this is what it needs. (See attached articles on the limitations of single layer chip seal and the benefits of double chip seal for certain situations).

There are many areas that the community (or another contractor) should improve before a chip seal is applied. Some of the biggest areas of concern are the following:

- Near the creek on 215th, a sink hole is beginning to form. This area will continue to grow until the source of the problem is located. There is a culvert located near here – it is possible that the culvert has a hole in it and is washing some of the soil around it away, and causing this hole to form. If left un-treated, this area will likely grow and become a larger problem.
- Areas with potholes need to be filled and/or leveled prior to installing the chip seal. Because chip seal will follow the contours of the existing pavement, it is not suitable for smoothing or leveling uneven areas. Additionally, the depressed areas will allow water to collect and may cause the chip seal to deteriorate prematurely.
- There are portions of roadway along 214th and 230th (near the log landings) that have pretty severe ruts. Chip seal will follow the contours of the existing pavement.
- Roadway longevity is primarily achieved by maintaining the drainage pathways to keep the water off the road. Removing the vegetation from the shoulders, cleaning the ditch lines, and maintaining a sealed shaped roadway that allows water to drain away will add years to the service life of the road.

I measured the square yards of the roads that we discussed at 20,500 SY. If we add in all the chip seal patching that we have painted on the road, the total is 32,000 SY. As we talked about before, the more volume that we have, the less it costs per square yard. For this quantity, the price would be **\$2.80 per SY**, plus sales tax, with all of the comments of my March 31st quote to you. Please call me with any questions.

Thank you,



Tom Doolittle
Doolittle Construction

Limitations of Chip Seal - A Guide for Determining What Treatment is Needed

Chip seal is most efficient when it is used as part of an ongoing road maintenance program. It rejuvenates the road, seals the cracks and adds another wearing surface. It offers better flexibility and better skid resistance than hot mix asphalt (HMA). If the roads were sealed on a regular basis (7-year rotation), very little additional maintenance would ever be required, minimizing life-cycle costs.

However, not all streets deteriorate at the same rate because of many factors (sub-grade, environment, traffic volume, vehicle weight, etc.). The pavement condition of each road should dictate what preservation method or **combination** of methods should be used. The following pictures offer an idea of the capabilities of chip seal and the preparation involved.



The picture, above, depicts a tight crack, less than 1/8" wide. Ideally, roads should be sealed before the condition gets any worse than this. Chip seal should seal hairline cracks like this for at least 7 years.



Wider cracks, shown above, should be sealed beforehand, with a hot applied rubberized asphalt sealant. Without sealing these cracks first, they will probably reflect through in two to four years.



This alligatored wheel rut (above) is too far gone to be saved by crack seal with a single chip seal. It could be repaired by grinding it out, then patching with hot mix asphalt (HMA).

But if the rutting is not too severe, it would be more cost efficient to place a chip seal patch first, then chip seal full width.

Unless there is a poor sub-grade, double chip seal or double bituminous surface treatment (DBST) is the most cost effective way to deal with asphalt pavement that has deteriorated too far to be saved by a single chip seal. The road shown below carries light to moderate traffic, and has not had any maintenance in over 30 years; an excellent candidate for double chip seal. This treatment will hold up better than a thin overlay because it bonds to the old pavement better, it seals better, it is much more flexible, and it will last longer.



The crack sealing that was done in the past doesn't begin to cover the widespread alligatoring, below. This street is a good candidate for double chip seal. That would bring this distressed pavement up to an acceptable pavement condition, which will last beyond the next maintenance cycle.



This busy Auburn arterial, 15th Street SW, westbound lanes, near C Street (above), should have had the pavement ground off and replaced with hot mix asphalt. The funds were not available for that, so we applied a double chip seal in 2006. It has had no maintenance since then, it is a little bumpy with a few cracks, but the DBST is holding it together in much better condition than it was.



2016 - 10 Years Later

DBST Procedure

When applying a double bituminous surface treatment, larger aggregate is placed on the bottom layer, such as 1/2"-#4 or a 3/8"-#4, with a top layer of 3/8"-#4 or 3/8"-#10. We have also had good success with 3/8"-#10 on the bottom and 1/4"-#10 on top. However, it is feasible to use the same rock for both layers. **Be sure to sweep thoroughly between layers.**

The asphalt application rate for the second layer should be 10% to 18% more than a typical single shot application, because the surface is rough and porous.

UPDATE: Proven Value from Double Chip Seal

(Fourth in a series of articles tracking the quality and longevity)

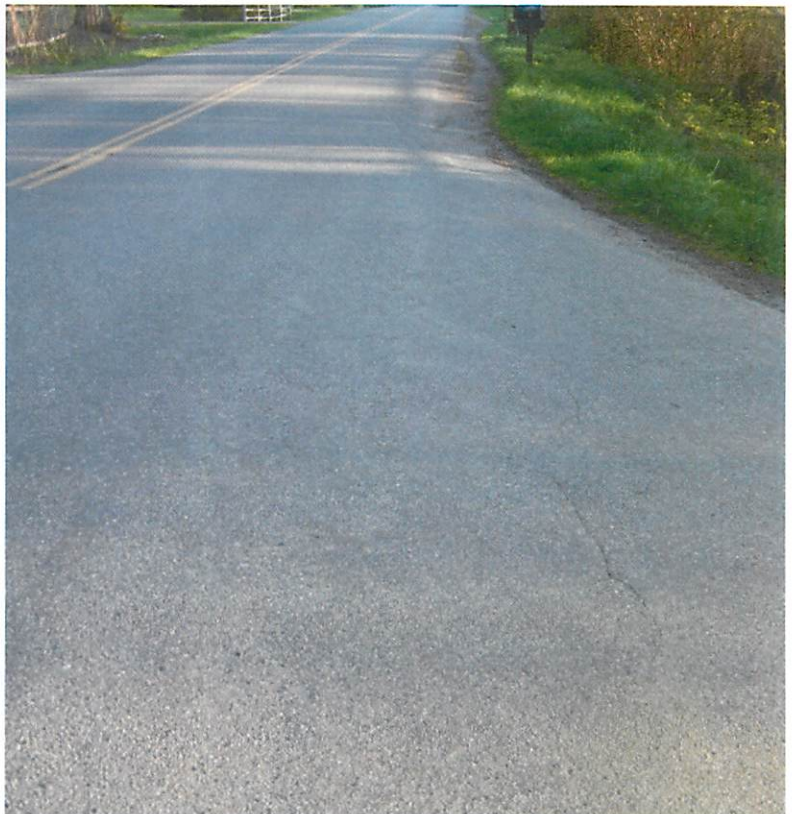
Double chip seal may be the most cost effective way to deal with asphalt pavements that have deteriorated too far to be saved by a single chip seal. It will hold up better than micro-surfacing or a thin overlay because it bonds to the old pavement better, it seals better, and is more flexible. To substantiate this, we continue to monitor the condition of past projects.

Bainbridge Island - Arrowpoint Drive NE @ intersection of Frey Road N.E.

In 2000, a double chip seal was applied to this road. 1/2"-1/4" crushed screenings were used on the first lift and 3/8"-#10 on the second lift. Prior to applying the two lifts, the road showed signs of extreme alligator cracking in this area. The road needs to be scheduled for another chip seal, as it is in fair condition with some cracks starting. The City of Bainbridge Island has done over 55 miles of double chip seal in the last 18 years; and many more miles of single chip seal, using chip seal patches beforehand where needed. The double chip seal has worked very well, staying flexible, and bridging over cracks and alligatored areas.



June 2000 –“Before”
Looking south from Frey Rd



April 2016 - **16 years** after double chip seal
A few cracks have started, but it is in **much**
better condition than it was.

Auburn - Kersey Road SE, from SE 53rd to south city limits - In 2006 this major arterial, between Auburn and Lake Tapps / Bonney Lake area, received chip seal patches in the wheel ruts, before applying a double chip seal using CRS-2P. The chip seal patches and first lift were installed using 1/2"-1/4" aggregate. The second lift used 3/8"-#10 aggregate, then fog sealed using CSS-1H, (mixed 60:40 with water).



AUBURN – 10 Years Later



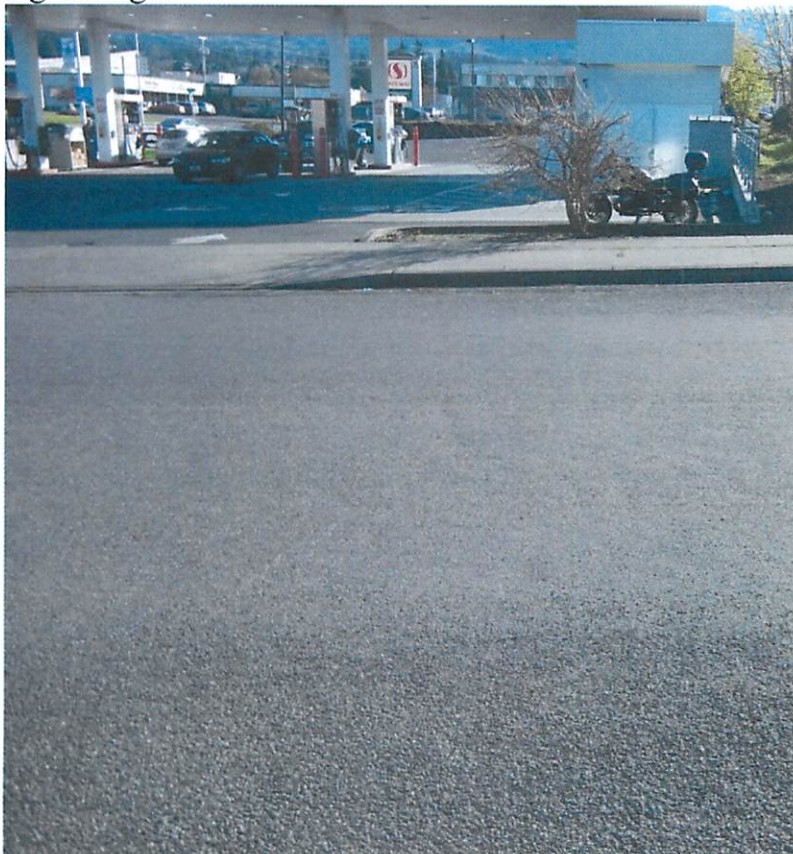
March 2016 - Ten years after wheel rut patching and double chip seal. The road surface looks good, considering the traffic and age. It needs a new chip seal, as a few hairline cracks have started.

Port Angeles - 3rd Street, off US 101

In front of a busy Safeway store and gas station we placed a double chip seal in 2005. The pavement was “alligatored” with cracking throughout the entire block. Liquid asphalt CRS-2P was applied, with 1/2"-1/4" aggregate on the bottom lift, 3/8"-#10 for the top lift, then a CSS-1h (diluted) fog seal was applied.



April 2016 - 11 Years Later. The pavement condition was good, especially considering the traffic. Recommend another chip seal at this time, but the previous “block” cracking is not reflecting through.



11 Years Later

Mukilteo - Harbor Point Blvd, west of SR 525.

2011 Single Chip Seal, with chip seal patches in the areas of deteriorated pavement. 1/2"-#4 chips were used for the chip seal patches, then 3/8"-#10 chips were placed full width, with a fog seal afterwards.



April 2016, 5 years later, No evidence of any cracks

