Module 4-8

Diamond Grinding and Grooving

Objectives

- Describe diamond grinding and grooving
- Describe conditions under which the methods will be beneficial
- Describe equipment and construction problems
- Distinguish from cold milling

Diamond Grinding

- Uses closely-spaced, diamond saw blades mounted on a rotating drum
- Removes weathered concrete
- Corrects surface irregularities
- Provides smooth riding surface

Diamond Grooving

- Uses diamond saw blades spaced 19 mm (0.75 in) apart
- Cuts grooves into the concrete
- Reduces incidence of hydroplaning
- Used on flexible and rigid pavements

Cold Milling

- Uses drum-mounted carbide steel cutting bits
- Chips off the pavement surface
- Removes deteriorated areas
- Prepares surface for an overlay
- More common on HMA pavements

Benefits of Diamond Grinding

- Removes faulting
- Removes wheel path wear
- Removes joint warping
- Provides texture to polished surface
- Improves slope and drainage

Selection of Projects for Diamond Grinding

IGGA / ACPA Criteria

- PSI between 3.8 and 4.0
- Before faulting reaches critical levels

Does not address structural problems

Need to address the cause of distress

Not effective for durability problems

Hardness of aggregate affects costs

Selection of Projects for Diamond Grooving

Potential locations for wet weather accidents

- Horizontal curves
- Interchanges
- Entire project

Pavements should otherwise be structurally and functionally sound

Selection of Projects for Diamond Grooving

Selection of Projects for Cold Milling

Not recommended for final texturing

- Produces a rough surface
- Creates spalls at transverse joints

Uses on concrete pavements

- Restore surface friction (modified)
- Provide surface for bonding overlays
- Remove material for partial-depth repairs

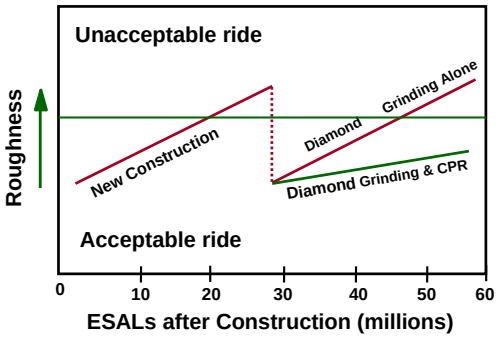
Cold Milling

Cold Milling

Effect of Diamond Grinding on Roughness

Location	Before	After 2 Years
AL	1.86	0.92
AZ	1.99	0.58
GA	1.55	0.63
NY	2.35	0.60
SD	1.45	0.58
Average	1.85	0.66

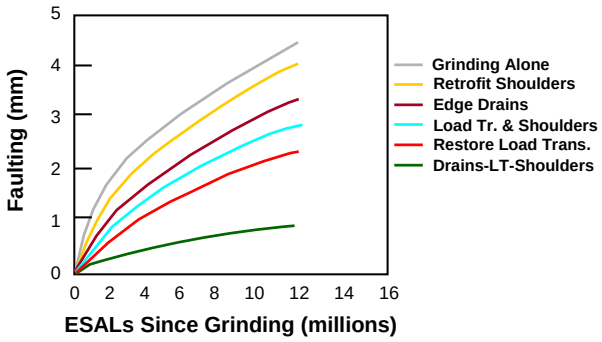
Effect of Diamond Grinding on Roughness



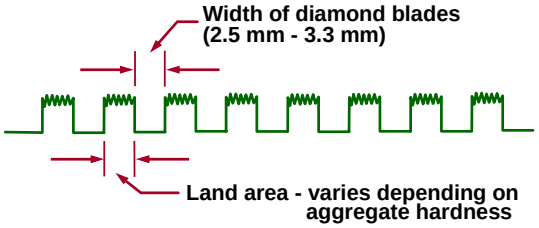
Effect of Diamond Grinding on Friction

Year	NB Lane	SB Lane
0 (before)	31	29
0 (after)	40	44
1	49	45
2	40	42
3	34	34
4	34	33
5	33	33

Effect of Concurrent Restoration Techniques

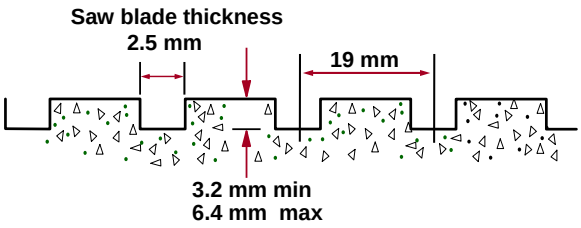


Dimensions for Diamond Grinding



- 2.0 mm typical for hard aggregate
- 2.8 mm in typical for soft aggregate

Dimensions for Diamond Grooving



Acceptance Criteria for Diamond Grinding

Similar criteria as for new construction
Profile measurements

- California profilograph
- K.J. Law Profilometer
- Mays Ridemeter

Skid resistance

- Ribbed tire (ASTM E 501)
- Smooth tire (ASTM E 524)

Cost Considerations

Diamond grinding

- Soft aggregate $2.40-3.60 /m^2
- Med. aggregate $3.60-6.00 /m^2
- Hard aggregate $6.00-9.60 /m^2

Diamond grooving

- Depends on hardness of aggregate
- Range from $1.80-3.00 /m^2

Construction Considerations for Diamond Grinding

Disposal of slurry (vacuum)

New equipment produces smooth surface

Continuous operation for best results

Begin and end perpendicular to centerline

Maximum overlap of 50 mm (2 in)

Transverse Diamond Grooving

Longitudinal Grooving

Longitudinal Grooving?

Construction Considerations for Diamond Grooving

Disposal of slurry (no vacuum)

Groove dimensions

- Width = 2.5-3.3 mm
- Depth = 3.2-6.4 mm
- Spacing > 19 mm

Conducted in longitudinal direction

Most often performed only in localized areas

Construction Considerations for Cold Milling

Should use micro-milling specifications

Spalling of transverse joints

Carbide bits require frequent maintenance and replacement

Conducted in longitudinal direction

Requires close monitoring of equipment

Summary

Diamond grinding and grooving correct surface deficiencies

Do not address structural problems

Most effective with other restoration techniques

Cold milling is not widely used on concrete pavements