

ABSTRACT

In this poster, different pavement marking removal technologies available in the road industry are explored and evaluated based on the marking material type, pavement surface characteristics such as macrotexture and membrane integrity, degree of removal, rate of removal and scarring potential. As the research was in Dunedin context, the comparisons and results were mainly based on asphalt pavement surface. Road surveys were completed and quantitative analysis (i.e. digital images) were utilized to examine the removal technologies.



Fig. 1. Presence of ghost markings on Great King Street, Dunedin

WHAT ARE ‘GHOST’ ROAD MARKINGS?

The main goal prior to commencement of pavement marking removal process is to maximize the removal of marking material while minimizing pavement degradation. However, attaining this goal can be challenging as the contractor has to find the perfect balance between leaving residual markings, creating ghost markings and causing damage to the pavement.

Ghost markings appear as faint white lines resulting due to severe scarring of the pavement surface, incomplete removal of redundant markings or surface discoloration resulting in a significant colour or texture contrast with the surrounding road pavement surface. Image 1 presents an example of ghost markings due to a local change in macrotexture allowing for ponding of water which under the beam of a headlight at night may present itself as a road line sometimes more visible than the intended road markings.

Source: Table summarized from University of Nebraska, Lincoln research study.

Removal technology	Marking material	Marking material size	Degree of Removal	Degree of scarring
Non-MeCl Chemical	Water based	20 mil	5	1
	Solvent based	12 mil	5	1
Water blaster	Water based	12 mil	5	5
	Solvent based	20 mil	3	5
	Tape	4 inches	5	1
Scarifier	Tape	4 inches	5	1
Grinder	Water based	12 mil	5	5
PCD	Solvent based	20 mil	5	5



Fig. 2. Pedestrian symbol on George street, Dunedin.

DEGREE OF REMOVAL

This refers to the completeness of the line removal process. An important factor for the grinding removal technology to produce satisfactory results is the flatness of the pavement surface. Fig. 3 shows satisfactory removal (relatively flat surface) of paint marking system using the Scarifier grinder equipment.



OBJECTIVE

The objective of this research was to determine the most effective pavement marking removal technologies according to the requirements mentioned in the abstract.

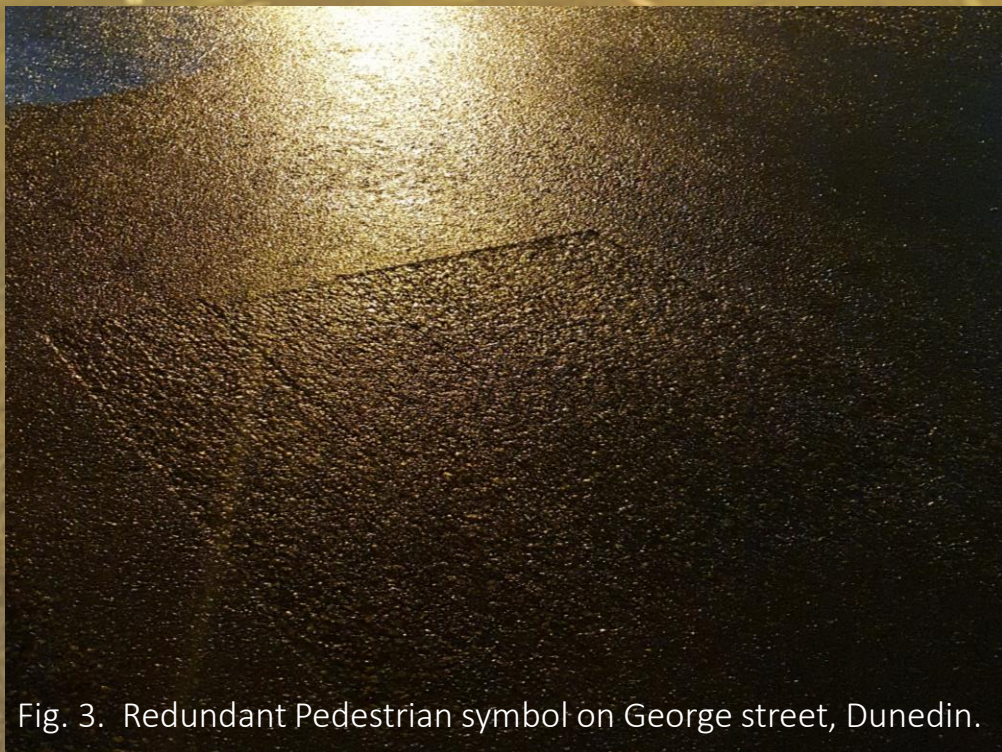


Fig. 3. Redundant Pedestrian symbol on George street, Dunedin.

ASPHALT PAVEMENT SURFACE

These pavements are useful for high volumes of traffic (over 15,000 vehicles/day) or sections with high turning stress, for e.g.- T junctions. Dense Graded Asphalt is the mostly used variant on Dunedin roads.

COST ANALYSIS

An NZTA employee reported that temporary methods such as black paint and chipseal can cost up to \$15/m² whereas pavement marking technologies like high-pressure water blasting cost around \$120/m². The use of Scarifier grinder removal technique in Dunedin costs approx. \$34/m².

High-pressure water blasting system has an approximate price range of \$45-\$75/m² However, due to unavailability of the equipment in Dunedin, additional establishment and accommodation costs could be included.

PAVEMENT SURFACE CHARACTERISTICS

Ineffective removal can compromise the surface characteristics related to change in surface texture or chip loss and membrane integrity. Fig. 2 shows severe pavement degradation after ‘light’ applied paint marking removal.

The macrotexture i.e. the gaps between the stones must be like the prevailing pavement otherwise inconsistency would amplify the chances of ‘ghost’ pavement markings particularly during wet weather.

A membrane is constructed between the wearing course and the underlying base courses with a minimum application rate of 1L/m² to aid waterproofing beneath the asphalt layer. The integrity of this membrane is crucial for sustenance of the pavement. This membrane is particularly sensitive to damage from several line removal technologies and/or “over enthusiastic” line removal.

Source: Table summarized from Pike & Miles 2013 research study.

Marking Material	Removal method	Degree Removal	of Removal Rating	Removal Rate (ft/hr)
High-build paint	Flailing	9	3	3300
	Orbital flailing	8	3	780
	Water blasting	10	3	3300
Preformed Thermoplastic	Flailing	10	2	1200
	Orbital flailing	5	2	420
	Water blasting	10	2	1620
	Combined	9	1	3600 (F) 3660(HPW)
Thermoplastic	Flailing	9	2	2400
	Orbital flailing	8	3	420
	Water blasting	10	2	1800
	Combined	10	1	2880 (F) 3300 (HPW)
Waterborne paint	Flailing	10	3	2580
	Orbital flailing	8	3	840
	Water blasting	10	4	2760

RATE OF REMOVAL

Grinding is reported to be the most effective removal method in terms of removal rate, however, with the advent of modern large truck units, high-pressure water blasting, the latter is becoming more common as more equipment makes its way to the field.

CONCLUSIONS

- Fig. 2 and Fig. 3 proves that the efficiency of grinding is highly influenced by the flatness of pavement. Therefore, it can be concluded that the markings shall be installed where the surface is relatively flat. This could improve the quality of the marking removal process.
- An alternative can be the use of grinder for the marking material above the surface and then water/soda blast the remaining marking material in deeper depths. This could prevent degradation of the pavement, thus safeguard pavement characteristics.
- For temporary installations such as the pedestrian/pram symbols, stickers could be used instead of paint marking systems. This could eventually save costs as there would not be marking removal required and the pavement surface will not be damaged.
- For small marking removal jobs, soda blasting, hand-operated water blasting or the non-MeCl chemical stripper removal technology could be considered.
- High-pressure water blasting system could be considered for bigger jobs such as the cycle lane project etc. Combined method (grinding and water blasting) can be a better option if faster removal rates and efficiency is required. However, it must be kept it mind that this combination is effective for only thick pavement marking materials.

REFERENCES

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