

# TS<sup>2</sup> CONSULTING INC. <

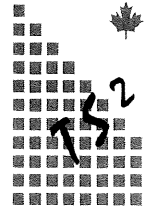
(British Virgin Islands Incorporated) website: <http://ts2.stormloader.com>

## **China** (Office)

Suite 201, Building 3-5  
No 147 Hung San Dong Lu,  
Kunming, Yunnan,  
Peoples Republic of China,  
650223,  
Phone/Fax: (86-871)-533-6767  
Mobile: (86)-1362-949-8994  
Email: speed\_cny@yahoo.co.uk

## **Hong Kong** (Liaison Office)

2/F 81 Po Wah Yuen,  
Lamma Island,  
Hong Kong  
Phone (85-2)-2142-3500  
Fax: (85-2)-2390-5465  
Cellular: (85-2)-9157-6693  
Email: speed\_cny@yahoo.co.uk



**November 29, 2004**

## **INSPECTION OF RJSeal™ TEST STRIP IN PARKING LOT NO.3 HONG KONG INTERNATIONAL AIRPORT**

### **1. Scope of Work**

An inspection of the RJSeal™ Test Strip that was completed on November 7, 2004 in Parking Lot No. 3, at Hong Kong International Airport, adjacent to the Regal Airport Hotel was undertaken on November 23, 2004.

The intent of the inspection was to ascertain the physical attributes of the RJSeal™ Test Strip and compare them to the existing asphalt pavement adjoining the test strip. It was also intended to determine the results of RJSeal™ test patches that had been applied as an overlay on neighboring portions of the parking lot, where an asphalt sealant had previously been applied. This asphalt sealant will hereinafter be referred to as "Seal Coat". See appended sketch (Figure 1) for specific location of this parking lot, which is dedicated to cross-border, tour group buses with respect to the Regal Hotel. Also shown is the location of the RJSeal™ test strip, the two RJSeal™ test patches atop the Seal Coat and the extent of the greater portion of the parking lot that was treated with the Seal Coat product.

### **2. General Conditions of the Road Surface**

The asphalt pavement in the parking lot is probably of 1997 or 1998 vintage (co-incident with the opening of the airport), although it might be one year older. The surface of the asphalt pavement is quite grey and this is attributable to oxidation of the bitumen, which is due to the normal weathering process in the sub-tropical climate in Hong Kong.

The bitumen is hard and brittle and certainly not ductile. When a sharp screwdriver was driven into the pavement with a hammer, penetration was limited to about 5 mm.

### 3. RJSeal™ Test Strip

In the late evening of November 7 a test strip was undertaken with RJSeal™ in Parking Lot No. 3 with particulars as shown in the table that follows:

Test Length (m)	Total Area (m <sup>2</sup> )	RJSeal™ Applied (kgs)	Application Rate (m <sup>2</sup> /kg)
30	120	30	4.00

The RJSeal™ was applied with paint rollers. The drying time was approximately 2 hours.

In addition to the test strip, two test patches were also applied as an overlay on the existing Seal Coat. The particulars of the two test patches are shown in the table that follows:

Test Patch	Size	Application Rate
No. 1	2.2m x 3.6m	4.5sq m/kg
No. 2	2.7m x 3.7m	4.5sq m/kg

The RJSeal™ for the test patches was applied using a 50 mm wide paint brush a manual method. The intent of the test patches was to determine if there was any incompatibility with the Seal Coat material.

### 4. Seal Coat

In parking lot No. 3, the area immediate to the designated parking for the tour group buses, had been treated with the Seal Coat material (specific age unknown, but suspected to be within the last 12 months or generally at the same time as Parking Lots No. 1 and No. 2 were treated with a similar product). This Seal Coat material had been placed with squeegees and the depth of the coating was not uniform. Some areas had excessive material which was now cracking and spalling and some areas had insufficient coverage and were now "bleached" to a lighter colour, especially in the area used as a travel-way by the buses on entering and exiting the parking lot.

## 5. Testing of RJSeal™

As a follow up to the application of the RJSeal™ test strip and the two RJSeal™ test patches a determination of the macrotexture depth was undertaken using the sand patch test (ASTM Standard E965-96 OR China Standard T 0961-95). Comparison was undertaken at several locations on both the untreated and RJSeal™ treated strip as well as on the two test patches on the adjoining Seal Coat as shown on Figure 1.

See Figures 2, 3 & 4 for a graphic image showing the sand patch testing locations. The results of the sand patch tests are shown in the table that follows:

Sand Patch Test					
Location	Sample No.	Diameter of Sand Patch		Texture Depth	Remarks
		D1 (mm)	D2 (mm)	mm	
Left wheel track	1	300	300	0.35	RJSeal treated
Middle	2	290	260	0.42	RJSeal treated
Right wheel track	3	280	275	0.41	RJSeal treated
Refer to picture	4	300	300	0.35	untreated
Refer to picture	5	290	295	0.37	untreated
Refer to picture	6	285	300	0.37	untreated
Test patch No.1	7	290	>300	<0.35	RJSeal overlaid on Seal Coat area
Test patch No.1	8	285	300	0.37	Seal Coat treated
Test patch No.1	9	290	300	0.37	Untreated
Test patch No.2	10	290	300	0.37	RJSeal overlaid on Seal Coat area
Test patch No.2	11	>300	>300	<0.35	Seal Coat treated

The sand patch tests undertaken on the RJSeal™ test strip and also on the adjoining asphalt pavement indicate that the RJSeal™ does not diminish the Texture Depth thus it does not change the road surface friction. The asphalt surface is sufficiently rough, to minimize problems with skidding, given the fact that vehicular traffic is usually less than 15 km/hr. The sand patch test on the two RJSeal™ test patches atop the Seal Coat indicates that there is also no concern with reduction in the macro texture depth.

Water penetration tests were conducted to determine the ability of the RJSeal™ and also the untreated asphalt pavement to resist water penetration. Water Penetration Tests (China Testing Standard T 0730-2000) undertaken at several locations on the RJSeal™ test strip, as well as adjoining treated portion of the parking lot and on the two RJSeal™ test patches atop the Seal Coat are shown in the table that follows. See Figures 2, 3 & 4 for a graphic image showing the testing locations.

Furthermore, tests were undertaken with an “Outflow Meter” manufactured in the U.S.A. by Humble Equipment Company of Ruston, Louisiana to measure the asphalt pavement’s capability to dissipate water, as concern has been expressed about hydroplaning on the RJSeal™ treated surface, (The procedure is described in ASTM working paper WK-364) The Outflow Meter gives readings in seconds for the dissipation of a known quantity of water. It is suggested that any readings between 3 and 10 seconds are satisfactory results for an asphalt surface, if hydroplaning is to be minimized.

Location	Sample No.	Water Penetration Inflow MI/min	Outflow Meter Time Sec	Remarks
Left wheel track	1	0		RJSeal treated
Middle	2			RJSeal treated
Right wheel track	3	0	11	RJSeal treated
Refer to picture	4	0	11	untreated
Refer to picture	5			untreated
Refer to picture	6	0		untreated
Test patch No.1	7	0	17	RJSeal overlaid on Seal Coat area
Test patch No.1	8	0	8	Seal Coat treated
Test patch No.1	9	0	7	Untreated
Test patch No.2	10	0	18	RJSeal overlaid on Seal Coat area
Test patch No.2	11	0	25	Seal Coat treated

## 5 Summary - RJSeal™ Test Strip and Test Patches

A summary of the results of the testing to determine the physical attributes of the treated pavement follows:

Criteria	RJSeal™	RJSeal™ on Sealcoat	Seal Coat
Macrotexture	Acceptable	Acceptable	Unacceptable
Water Penetration	Acceptable	Acceptable	Acceptable (if it is not cracked)
Skid Resistance ‘HydroPlaning’	Acceptable	Unacceptable	Unacceptable

## 6 Conclusion

The tests demonstrate that when RJSeal™ was applied to the asphalt pavement in the Parking Lot No. 3, the outcome is acceptable from three physical attributes, namely Macro Texture Depth, Water Penetration and Skid (Hydroplaning) Resistance. One significant characteristics of RJSeal™ is its rejuvenation. It seals the road surface and prevents water penetration, and does not change the surface macro texture depth and skid resistance.

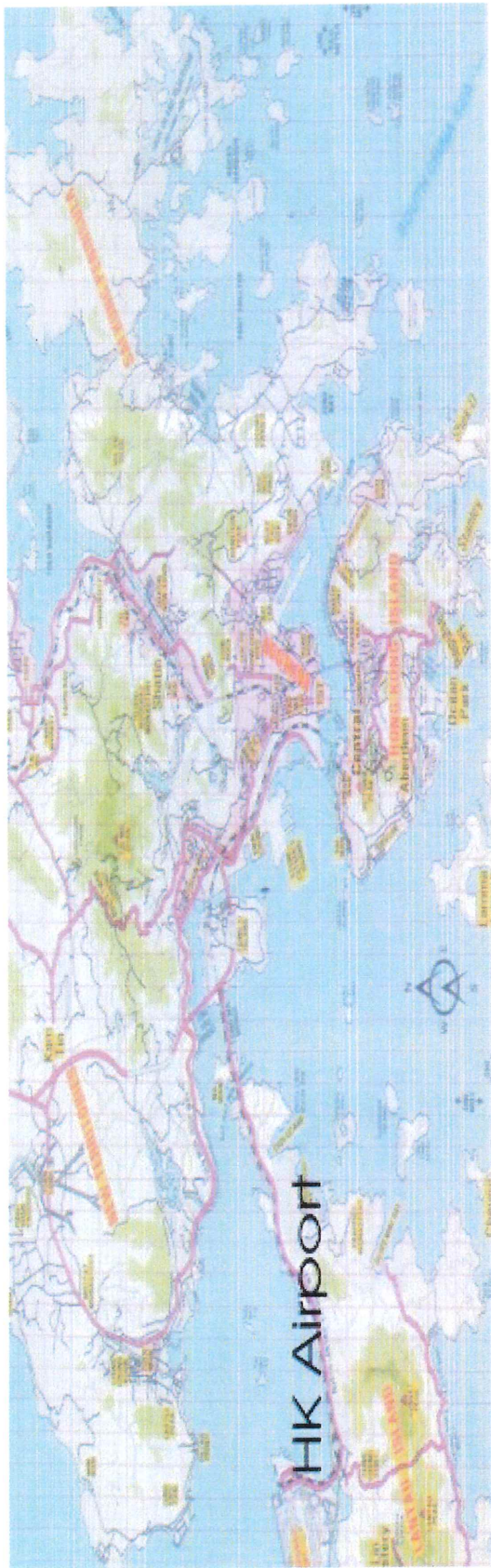
The bitumen is now much more ductile and it is relatively easier to drive a sharp screwdriver into a pavement with a hammer for more than 10 mm. No doubt if the site tests and hand feels would show the difference, laboratory tests will certainly shows the rejuvenation of the old asphalt. Core Samples can be taken at a later date (i.e. 90 days) and the top 10mm of each core should be sliced for ductility, viscosity and penetration tests to compare the rejuvenated bitumen and the untreated.

It is also recommended to the Airport Authority to contact the Shanghai Hungqiao Airport for the RJSeal™ treatment on their runway more than a year ago.

Sincerely  
Anthony G. Speed, P. Eng (Canada)

Enclosures: Figures 1, 2, 3 & 4





Enlarged Detail of Parking Lot No. 3

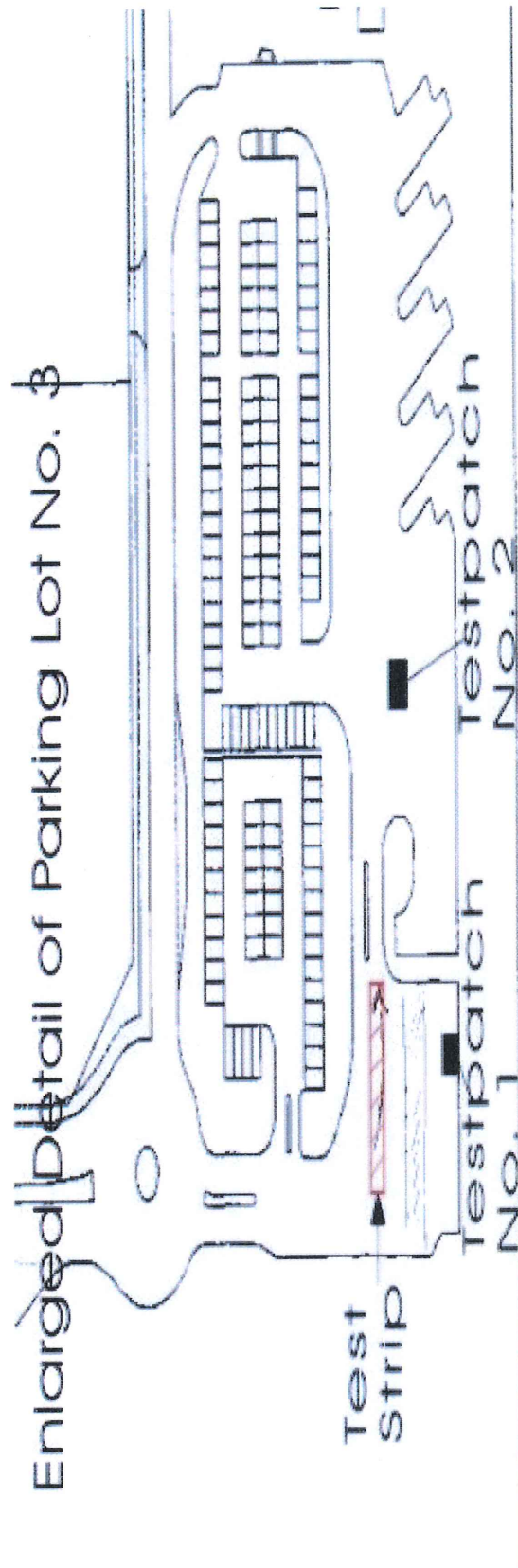


Figure 1 - Location of Parking Lot No. 3  
Hong Kong International Airport

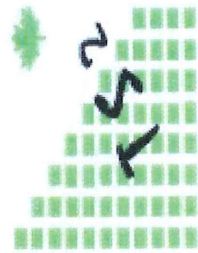






Figure 2 - Mottled Appearance of SealCoat  
in Parking Lot No. 3





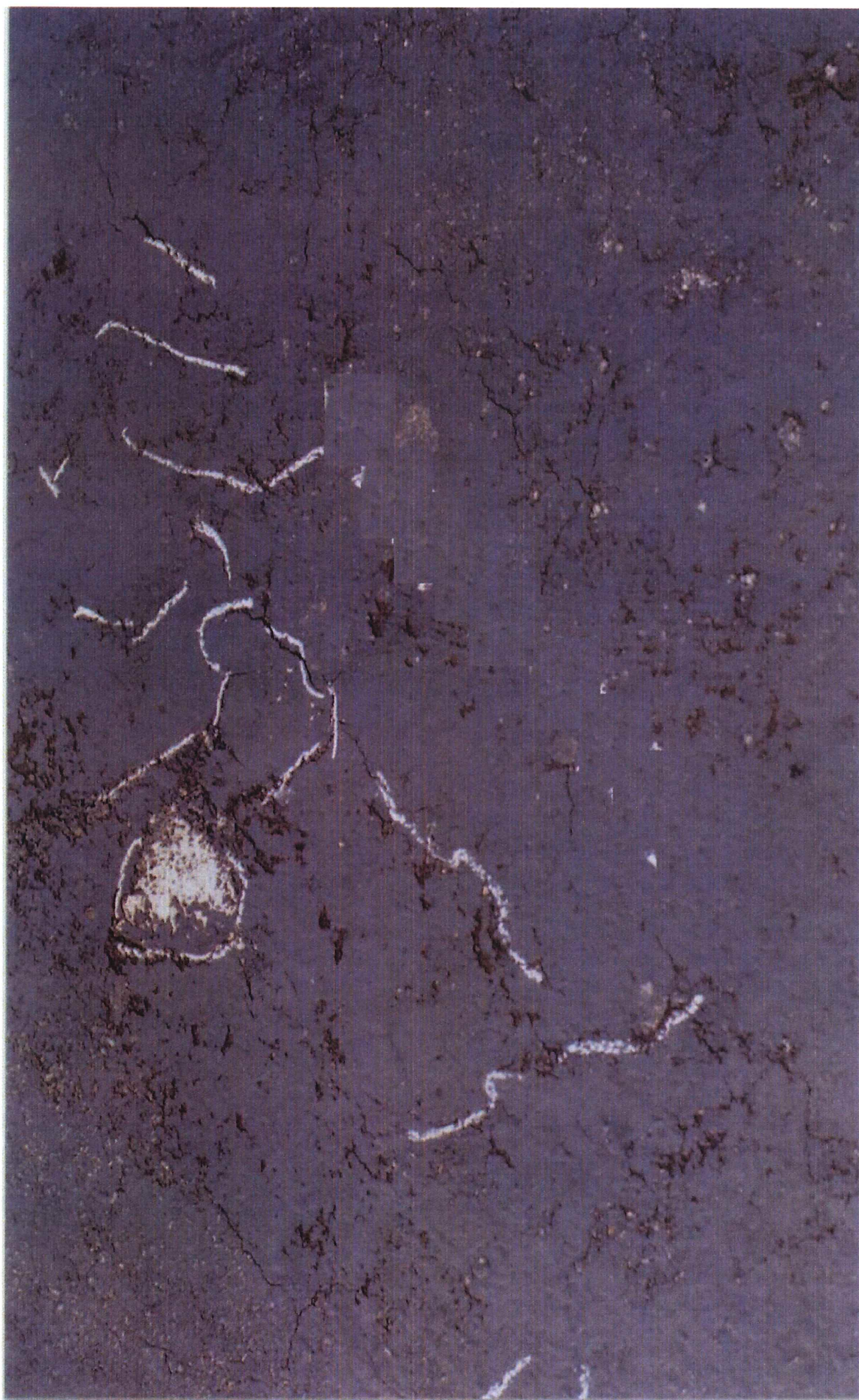


Figure 3 - Cracks in SealCoat - Parking Lot No. 3





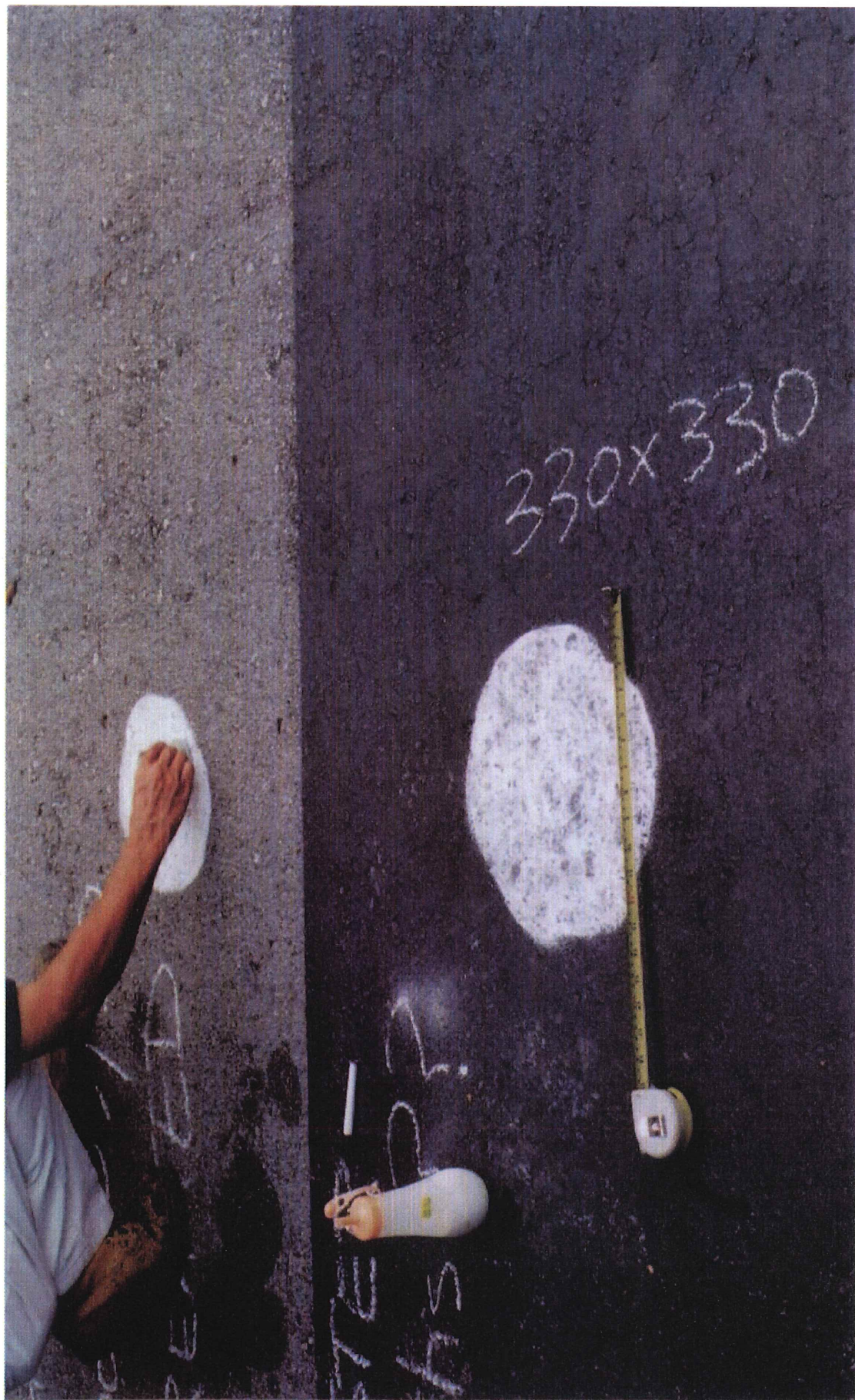
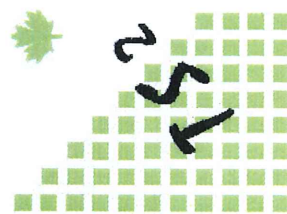


Figure 4 - SealCoat Test Patch Area & Sand Patch Test





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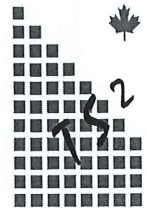
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Suite 201, Building 3-5  
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**November 29, 2004**

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The intent of the inspection was to ascertain the physical attributes of the RJSeal<sup>TM</sup> Test Strip and compare them to the existing asphalt pavement adjoining the test strip. It was also intended to determine the results of RJSeal test patches that had been applied as an overlay on neighboring portions of the parking lot, where an asphalt sealant had previously been applied. This asphalt sealant will hereinafter be referred to as "sealcoat". See appended sketch (Figure 1) for specific location of this parking lot, which is dedicated to cross-border, tour group buses with respect to the Regal Hotel. Also shown is the location of the RJSeal test strip, the two RJSeal test patches atop the sealcoat and the extent of the greater portion of the parking lot that was treated with the sealcoat product.

#### **2. General Conditions of the Road Surface**

The asphalt pavement in the parking lot is probably of 1997 or 1998 vintage (co-incident with the opening of the airport), ~~although it might be one year older.~~ The surface of the asphalt pavement is quite grey and this is attributable to oxidation of the bitumen, which is due to the normal weathering process in the sub-tropical climate in Hong Kong. The bitumen is hard and



not ductile. When a sharp screwdriver was driven into the pavement with a hammer, penetration was limited to about 10 mm. 305

### 3. RJSeal Test Strip

In the late evening of November 7 a test strip was undertaken with RJSeal™ in Parking Lot No. 3 with particulars as shown in the table that follows:

Test Length (m)	Total Area	Total Area	RJSeal™ Applied			Application Rate			
	m <sup>2</sup>	yd <sup>2</sup>	US gals	litres	Kgs	USGal /yd <sup>2</sup>	Litres/m <sup>2</sup>	m <sup>2</sup> /Litre	m <sup>2</sup> /Kg
30.0	120	143	7	28	30	0.048	0.23	4.29	4.00

The RJSeal™ was applied with paint rollers. The drying time was approximately 2 hours.

In addition to the test strip, two test patches were also applied as an overlay on the existing sealcoat. The particulars of the two test patches are shown in the table that follows:

Test Patch	Size	Application Rate
No. 1	2.2m x 3.6m	4.5sq m/kg
No. 2	2.7m x 3.7m	4.5sq m/kg

The RJSeal for the test patches was applied using a 50 mm wide paint brush. The intent of the test patches was to determine if there was any incompatibility with the sealcoat material.

### 4. "Sealcoat"

In parking lot No. 3, the area immediate to the designated parking for the tour group buses, had been treated with the "sealcoat" material (specific age unknown, but suspected to be within the last 12 months or generally at the same time as Parking Lots No. 1 and No. 2 were treated with a similar product). This sealcoat material had been placed with squeegees and the depth of the coating was not uniform. Some areas had excessive material which was now cracking and spalling and some areas had insufficient coverage and were now "bleached" to a lighter colour, especially in the area used as a travel-way by the buses on entering and exiting the parking lot.

### 5. "Testing of RJSeal"

As a follow up to the application of the RJSeal test strip and the two RJSeal test patches a determination of the macrotexture depth was undertaken using the sand patch test (ASTM Standard E965-96 OR China Standard T 0961-

95). Comparison was undertaken at several location on both the untreated and and RJSeal treated strip as well as on the two test patches on the adjoining Sealcoat as shown on Figure 1.

See Figures 2, 3 & 4 for a graphic image showing the sand patch testing locations. The results of the sand patch tests are shown in the table that follows:

<b><u>Sand Patch Test</u></b>					
<b><u>Location</u></b>	<b><u>Sample No.</u></b>	<b><u>Diameter of Sand Patch</u></b>		<b><u>Texture depth</u></b> <b><u>mm</u></b>	<b><u>Remarks</u></b>
		<b><u>D1(mm)</u></b>	<b><u>D2(mm)</u></b>		
Left wheel track	1	300	300	0.35	RJSeal treated
Middle	2	290	260	0.42	RJSeal treated
Right wheel track	3	280	275	0.41	RJSeal treated
Refer to picture	4	300	300	0.35	untreated
Refer to picture	5	290	295	0.37	untreated
Refer to picture	6	285	300	0.37	untreated
Test patch No.1	7	290	>300	<0.35	RJSeal overlaid on Sealmaster area
Test patch No.1	8	285	300	0.37	Sealmaster treated
Test patch No.1	9	290	300	0.37	Untreated
Test patch No.2	10	290	300	0.37	RJSeal overlaid on Sealmaster area
Test patch No.2	11	>300	>300	<0.35	Sealmaster treated

The sand patch tests undertaken on the RJSeal test strip and also on the adjoining asphalt pavement indicate that the RJSeal does not diminish the Texture Depth. The asphalt surface is sufficiently rough, to minimize problems with skidding, given the fact that vehicular traffic is usually less than 15 km/hr. The sand patch test on the two RJSeal test patches atop the sealcoat indicates that there is also no concern with reduction in the macrotexture depth.

Water penetration tests were conducted to determine the ability of the RJSeal and also the untreated asphalt pavement to resist water penetration. Water Penetration Tests (China Testing Standard T 0730-2000) undertaken at several locations on the RJSeal test strip, as well as adjoining treated portion of the parking lot and on the two RJSeal test patches atop the sealcoat are shown in the table that follows. See Figures 2, 3 & 4 for a graphic image showing the testing locations. Furthermore tests were undertaken with an "Outflow Meter" manufactured in the U.S.A. by Humble Equipment Company of Ruston, Louisiana to measure the asphalt pavement's capability to dissipate water, as concern has been expressed about hydroplaning on the RJSeal<sup>TM</sup> treated surface, (The procedure is described in ASTM working paper WK-364) The Outflow Meter gives readings in seconds for the dissipation of a known quantity of water. It is suggested that any readings



between 3 and 10 seconds are satisfactory results for an asphalt surface, if hydroplaning is to be minimized.

<u>Location</u>	<u>Sample No.</u>	<u>Water Penetration Inflow ml/min</u>	<u>Outflow Meter Time Sec</u>	<u>Remarks</u>
Left wheel track	1	0		RJSeal treated
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Test patch No.1	7	0	17	RJSeal overlaid on Sealmaster area
Test patch No.1	8	0	8	Sealmaster treated
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## 5 Summary - RJSeal™ Test Strip and Test Patches

A summary of the results of the testing to determine the physical attributes of the treated pavement follows:

<u>Criteria</u>	<u>RJSeal™</u>	<u>RJSeal™ on Sealmaster</u>
Macrotexture	Acceptable	Acceptable
Water Penetration	Acceptable	Acceptable
Skid Resistance 'HydroPlaning'	Acceptable	Unacceptable

## 6 Conclusionn

The tests demonstrate that when RJSeal was applied to the asphalt pavement in the Parking Lot No. 3, the outcome is acceptable from three physical attributes, namely Macrotexture Depth, Water Penetration and Skid (Hydroplaning) Resistance. One significant characteristics of RJSeal™ is its rejuvenation and from these tests this cannot be intuitively deduced. Core samples must be submitted for ductility and penetration testing.

Sincerely  
Anthony G. Speed, P. Eng (Canada)

Enclosures: Figures 1,2,3 & 4

Figure No. 1 Sketch showing location of Parking Lot No. 3 and SealCoat Test Patch



Figure No. 2 - Photo showing Location of Testing sites for the Sand Patch, Water Penetration and Outflow Meter Tests.

Figure No. 3 Photo showing Location of Testing sites for the Sand Patch, Water Penetration and Outflow Meter Tests.

Figure No. 4 Photo showing Location of Testing sites for the Sand Patch, Water Penetration and Outflow Meter Tests.