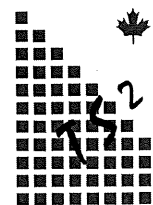


**CROWN CAPITAL ENTERPRISE LIMITED.**

**HONG KONG, SAR, CHINA**

**Application of RJSeal™  
Xin-Tai Expressway, Guangdong Province  
Peoples Republic of China**

**MARCH 2006**



**TS² Consulting Inc.  
Lamma, Hong Kong**

# **CROWN CAPITAL ENTERPRISE LIMITED.**

## **Application of RJSeal™ Xin-Tai Expressway, Guangdong Province Peoples Republic of China**

**MARCH 2006**

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**Application of RJSeal™  
Xin-Tai Expressway, Guangdong Province  
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**MARCH 2006**

## **APPENDICES**

<b><u>No.</u></b>	<b><u>Description</u></b>
A	RJSeal™ Descriptive Literature
B	Desco D200 Sprayer
C	Field Testing.



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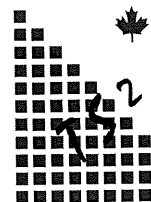
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# **CROWN CAPITAL ENTERPRISE LIMITED.**

## **Application of RJSeal™ Xin-Tai Expressway, Guangdong Province Peoples Republic of China**

**MARCH 2006**

### **1.0 INTRODUCTION**

The Xin-Tai Expressway Management Company, based in TaiShan, Guangdong Province, China entered into an agreement with Crown Capital Enterprise Limited, of Hong Kong in March 2006. This agreement requires that the performance of RJSeal™, a sealer/rejuvenator for asphalt pavement be analysed on a test strip on the Xin-Tai Expressway, a four lane, divided highway that runs south from XinHui to TaiShan and beyond, for a distance of 51 Kilometres. Subsequently RJSeal™ was applied to a segment of the Xin-Tai Expressway between Kilometre 24+000 to Kilometre 23+500, (northbound driving lane and shoulder) on March 3, 2006.

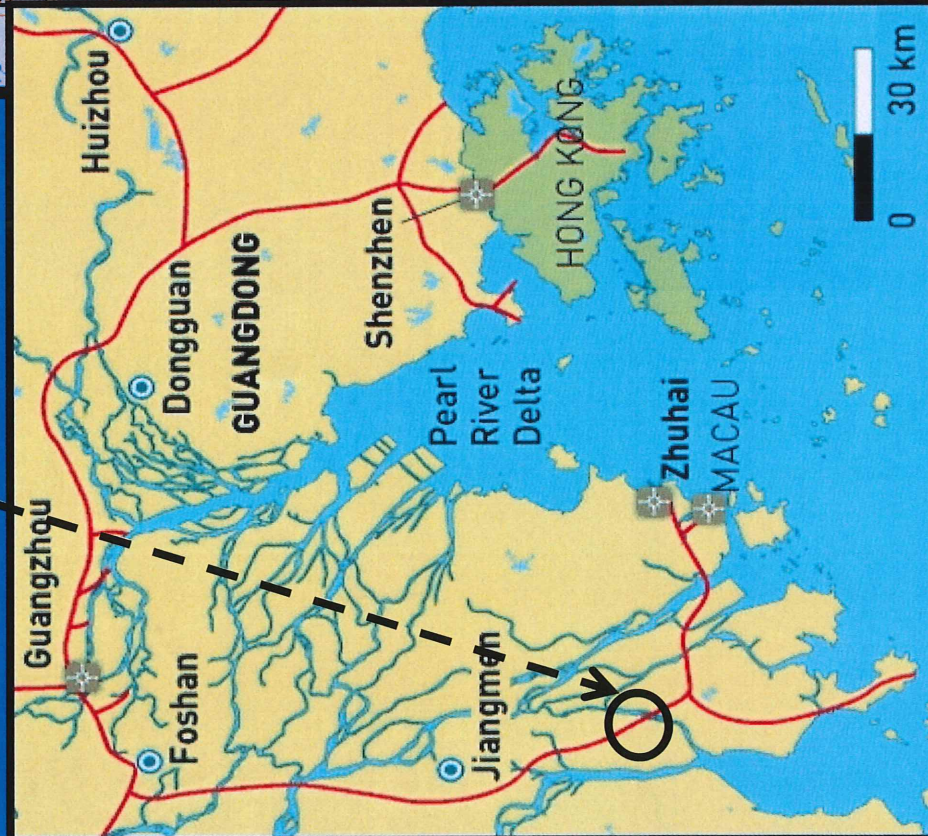
TaiShan is located in Guangdong province, west of Zhuhai and south of Guangzhou. Guangdong Province is located in the southeastern sector of the Peoples Republic of China, bordered by Fujian, Jiangxi, Hunan, and Guangxi Provinces. Guangzhou is the capital of Guangdong province and is located on the Pearl River. The Pearl River Delta in recent years has seen a major growth in population along with significant construction due to the transfer of manufacturing from Hong Kong. In particular, special economic development zones like the city Shenzhen and Zhuhai have experienced significant growth along with other cities like Dongguan and FoShan. This has resulted in an extensive network of toll highways being built to support the export and manufacturing business. See figure 1.0 for a map showing the location of TaiShan in Guangdong Province. The majority of the Pearl River Delta area lies at 20 to 25 metres in elevation, although mountains to the north hold some peaks that exceed 1,000 metres. The regions' latitude (22 degrees north), mean that there are four seasons, with temperatures ranging from 45 Celsius in the long, hot summer to 5 Celsius in the short winter. The rainy season is primarily May thru August, but can extend into September.

In the immediate TaiShan area, a sequence of sedimentary rocks predominates, although some metamorphic rocks also occur. Due to the rock cuts along the highways, numerous rock outcrop exposures are available. The asphalt in the area is manufactured from local materials, which is comprised of crushed and screened sandstone, diorite, phylites and granite, as well as washed gravels from the various rivers. The bitumen binder for the asphalt is probably sourced from offshore, with refineries in Singapore Saudi Arabia and Iran likely possibilities.





Job Site

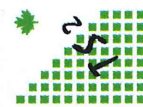
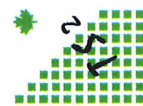


# Crown Capital Enterprise Limited

Xin-Tai Highway

General Location Map

Figure 1.0



## **2.0 CO-OPERATIVE PROGRAM**

The intent of the Agreement is to demonstrate RJSeal™ at a location, which will subsequently allow analysis of the performance of RJSeal™ on an asphalt surface typical of the Xin-Tai Highway. The application undertaken between Km 24+000 and Km 23+500 on March 3, some 3 Kilometres north of TaiShan, was undertaken for comparison with another other unspecified product produced locally, which has the appearance and similarity to a latex emulsion.

The section of the Xin-Tai Expressway selected for the demonstration by the Xin-Tai Expressway Maintenance Company at Km 24+000 to Km 23+500 was built in 2000 and officially opened in April 2001. The asphalt pavement is approximately 150 mm thick. The pavement is a Hot Mix Asphalt (HMA) and appears to be wearing quite well, with minimal loss of fines and little or no rutting. Although the bitumen binder is starting to show signs of aging, with some loss of the bitumen binder and hardening due to oxidation. No details are known about the sub grade, but inspection of the shoulders in the fill sections of the highway, show a sandy silty material. Knowing construction techniques in highways in China in general, minimal gravel would be used in the immediate coarse base, beneath the asphalt pavement.

The comparison of the performance of RJSeal™ versus the other pavement maintenance products will be undertaken, on the basis of visual appearance and comparison using field testing equipment, before and after the application, using the following tests:

- 1 Water Penetration, (China Testing Standard T 0730-2000)
- 2 Skid Resistance (China Testing Standard T 0964-03) and
- 3 Depth of Texture (China Testing Standard T 0961-95).
- 4 Friction Testing (China Testing Standard T 0964-95)

Core samples may be taken, but no specific tests have been specified in the terms of the engagement.



### **3.0 RJSEAL™**

RJSeal™ is a proprietary product that is supplied by Crown Capital Enterprise Limited of Hong Kong, Guangdong. RJSeal™ has been proven in numerous applications in China as well as North and South America to rejuvenate asphalt pavement at various stages of its life and economically extend the life of the pavement. RJSeal™ is a three component, asphalt sealer rejuvenator that is comprised of Coal Tar, Coal Tar Oils and Petroleum Solvents.

### **3.1 PRIOR EXPERIENCE**

Refer to Appendix A for a copy of the brochure compiled by Crown Capital Enterprise Limited of Hong Kong. This outlines the experience with RJSeal™ at various locations in North America and South America. Further information is available from CROWN CAPITAL ENTERPRISE LIMITED. RJSeal™ has been used at numerous airports in North and South America, as well as highways in Alberta, Canada; Cearo State, Brazil and North Dakota and Texas, as well as other locations in the U.S.A. Since 2000, RJSeal™ has been demonstrated successfully at over fifty six (56) locations in China and sixty four (64) commercial-scale applications have taken place at various locations, including Shanghai, Guangzhou, Kunming, DaQing, QinHuangDao and Wuhan

#### 4.0 TEST PROGRAM

Since Guangdong Province is located in a semi-tropical climate (Latitude: 22 - 25 North) at a low altitude (20-25 metres), it's a demanding setting for asphalt, given the year round warm climate (average of 25 Celsius, with extremes of 42 Celsius) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder. Experience elsewhere in similar settings indicate that on primary highways the life cycle of the asphalt requires that the traveling surface be planed and a new overlay of fresh asphalt be applied every five or six years.

The Xin-Tai Expressway Management is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, they contracted to apply RJSeal™ to the Xin-Tai Expressway from Km 24+000 to Km 23+500 on the northbound driving lane and shoulder (from TaiShan toward XinHui).

#### 4.1 Application Section – Xin-Tai Expressway

On March 2, 2006, the test strip was implemented at the following geographic location:

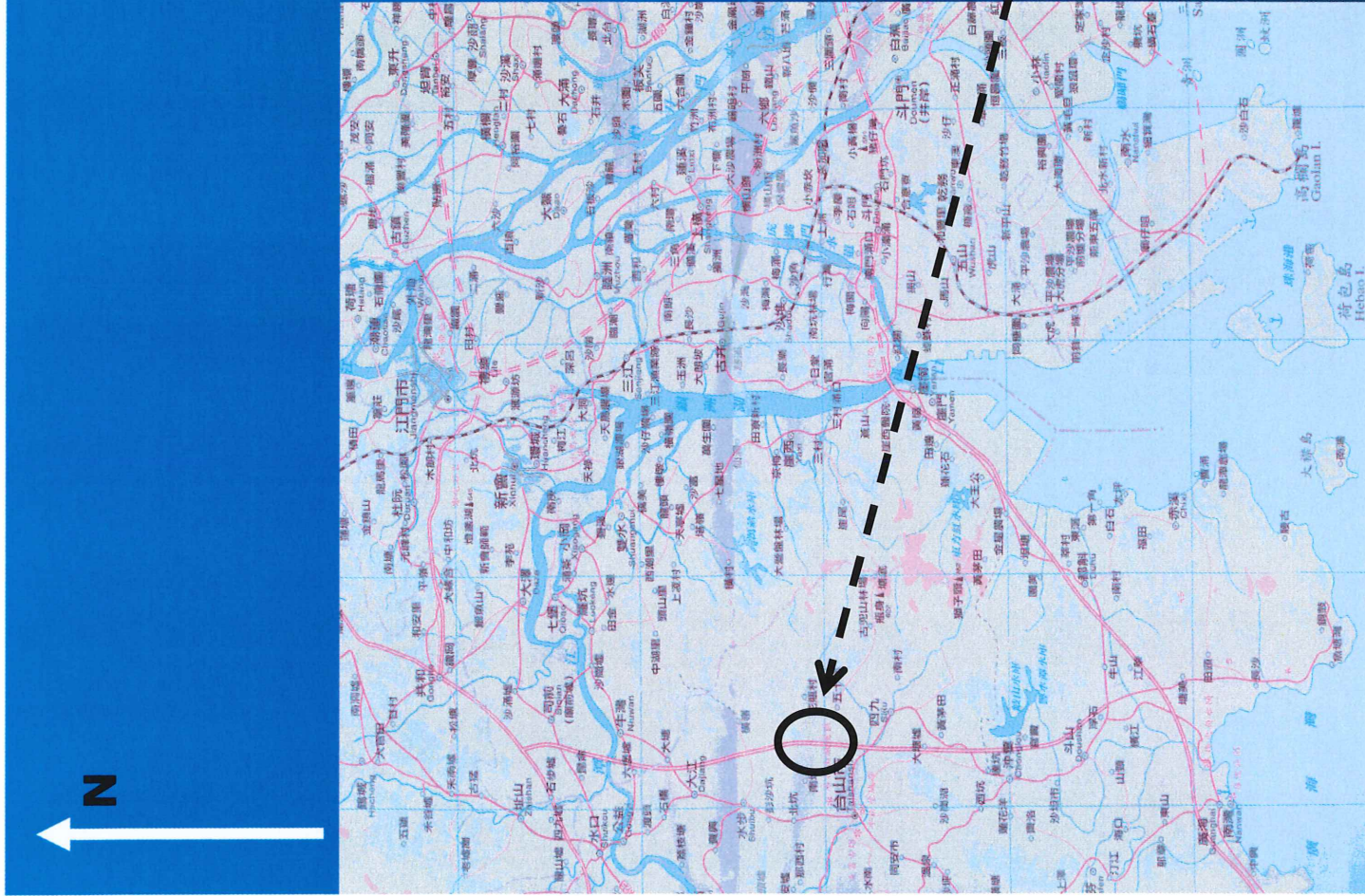
Table 4.1		System i.e. Geographic or Universal Transverse Mercator (UTM)	Northing	Easting
Test Strip,	Test Strip, Length			
Km 24+000 Start	500	Geographic (deg, min)	22° 17.545 '	112° 49.484'
		UTM Grid (49Q) (metres)	2466339	687985
Km 23+500 Finish		Geographic (deg, min)	22° 17.803 '	112° 49.566'
		UTM Grid (49Q) (metres)	2466816	688120

See Figure No 4.1 for a photo showing portions of the test strip as implemented. Particulars of the test strip at the aforesaid location are as follows:

Table 4.2				Particulars of the test strip						
Test Strip Location South End	Strip Length (m)	Strip Width (m)	Total Area m <sup>2</sup>	RJSeal™ Applied			Application Rate			
				US Gals	litres	Kgs	US Gal /yd <sup>2</sup>	Litres /m <sup>2</sup>	m <sup>2</sup> /Litre	m <sup>2</sup> /Kg
Km 24+000	500	5.95	2,975	275	1,038	1,100	0.077	0.35	2.87	2.70

The test strips on March 3, was undertaken at an application rate of 2.7 m<sup>2</sup>/kg and this appeared to be appropriate for the asphalt pavement at this location





Job Site

Crown Capital Enterprise Limited

Xin-Tai Highway

Specific Location Map

Figure 4.0

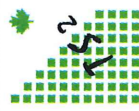
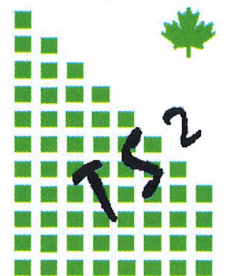






Figure 4.1 Test Strip at Km 23+000



Work commenced on the Demonstration section at 10:00 am on March 3 on a warm, humid, sunny day, where the mid-day temperature reached 23 Celsius. The test strip is located on a section with a slight curve to the left around the midpoint. There is a slight camber to the road which causes water to run off, rather than puddle on the road. The asphalt pavement was reputedly five years old (2000 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The highway surface was not noticeably worn and had about 35-40% of the surface composed of exposed aggregate, with a few minor lateral cracks and no rutting due to traffic wear. There was appreciable aging and oxidation of the bitumen, which extended to a depth of one to two millimetres.

The shoulder and driving lane were treated with RJSeal™ in the northbound lanes. The width of the driving lane is 3.65 metres, whilst the paved shoulder is 2.30 metres wide. The white lines were covered with adhesive tape prior to the RJSeal™ application and this tape prevented the white lines from being coated. This adhesive tape was stripped off, following the RJSeal™ application.

RJSeal™ was applied to the test strips using two Desco D200 Spraying Machines. This machine has 10 spray tips and covers a path some 2.2 metres wide. See Appendix B for the specifications of this machine. Several passes were made with this machine to cover the area, with a 10 centimetre overlap between passes.

Photos showing the test application of RJSeal™ follow in figures 4.2 and 4.3. on the following pages.



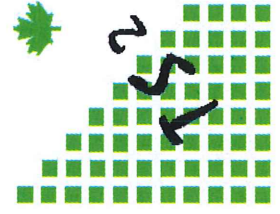


Figure 4.2 Typical Application Procedure.



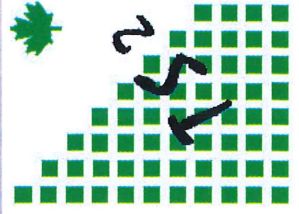


Figure 4.3 Finished Job.

## 4.2 RJSeal™ Testing

Technicians from Crown Capital Enterprise Limited conducted field testing on the RJSeal™ test strip on March 3, 2006 prior to the application of RJSeal and also immediately following the application. Testing equipment brought to the site for comparison on a disciplined, objective basis, was used to ascertain the following properties:

- Water Penetration
- Macro texture (Depth of texture)
- Hydroplaning Potential
- Friction Testing

The findings are documented in the following tables.

## 4.3 Water Penetration

Water Penetration Tests (China Testing Standard T 0730-2000) were undertaken at several locations on the Xin-Tai Expressway in the driving (slow) lane, adjacent to the shoulder, on March 3, 2006, immediately prior to the application of RJSeal™ and immediately following the application. The results are as follows

Table 4.3		Water Penetration Meter			Penetration ml/min	
Test Strip Commencement	Testing Location	Geographic Location Latitude/Longitude (Degrees)		Location relative to shoulder demarcation line	Untreated Pavement	RJSeal™ Treated
Km 24+000	Km 23+987	22 <sup>0</sup> 17.545 '	112 <sup>0</sup> 49.484'	1.4 m west	30	0

The reading taken on the RJSeal™ test strip indicates that the asphalt pavement does have a problem with water penetration. See Figure 4.4 that follows for a pictorial presentation of the Water Penetration Tests.

## 4.4 Macro texture (Depth of Structure)

The sand patch test (ASTM Standard E965-96 OR China Standard T 0961-95) was used to ascertain the Pavement Macro texture (Depth of Structure). Comparison was undertaken at several locations on the RJSeal™ treated section in close proximity to the Water Penetration Meter tests. The results are shown in the table that follows:

Table 4.4		Sand Patch (Macro texture)			Depth of Structure (mm)	
Test Strip Commencement	Testing Location	Geographic Location Latitude/Longitude (Degrees)		Location relative to shoulder demarcation line	Untreated Pavement	RJSeal <sup>T</sup> <sub>M</sub> Treated
Km 24+000	Km 23+987	22 <sup>0</sup> 17.545 '	112 <sup>0</sup> 49.484'	1.4 m west	1.011	0.871

The readings taken on the RJSeal<sup>TM</sup> treated section and untreated section indicate that the road surface at this location is sufficiently rough, to minimize problems with skidding. See Figure 4.6 which follows, showing the sand patch tests.

#### 4.5 Hydroplaning Potential

An "Outflow Meter" manufactured in the U.S.A. by Humble Equipment Company of Ruston, Louisiana and sold under the trademark "Outflow Meter" (see figure 4.5) was used to measure the asphalt pavement's macro texture, as concern has been expressed about hydroplaning on the RJSeal<sup>TM</sup> treated surface, versus the untreated surface. The procedure is documented in the ASTM Standard E2380-05. 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 pavement surface, if hydroplaning is to be minimized. The following readings were obtained on the application section:

Table 4.5		Outflow Meter			Reading (seconds)	
Test Strip Commencement	Testing Location	Geographic Location Latitude/Longitude (Degrees)		Location relative to shoulder demarcation line	Untreated Pavement	RJSeal <sup>TM</sup> Treated
Km 24+000	Km 23+987	22 <sup>0</sup> 17.545 '	112 <sup>0</sup> 49.484'	1.4 m west	3	n/a

These readings suggest that hydroplaning is not a problem on the section of highway where the RJSeal<sup>TM</sup> Application was undertaken. See Figure 4.7 which follows, showing the Outflow Meter Tests.



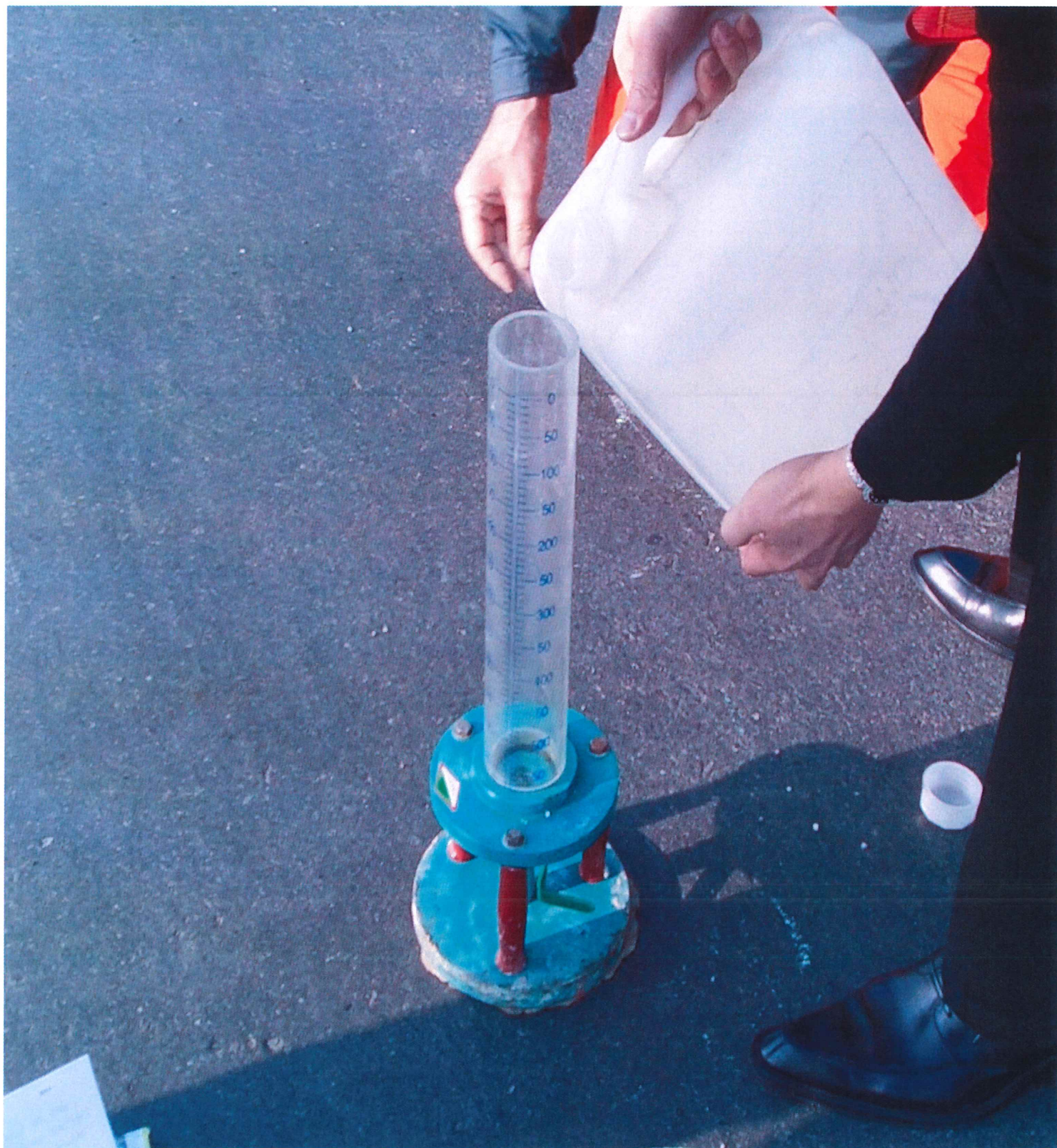
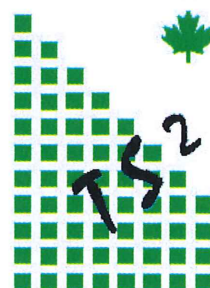


Figure 4.4 Water Penetration Test





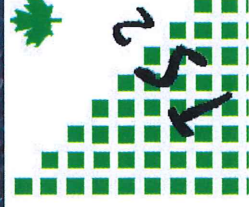
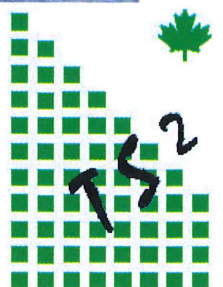


Figure 4.5 Sand Patch Test





Figure 4.6  
Humble Equipment Co. Outflow Meter



#### **4.6 Friction Testing**

A British Pendulum ASTM Standard E303-93 OR China Standard T 0964-95) was employed to determine the friction of the road surface prior to the application of RJSeal™ and also after the application.

<b>Table 4.6</b>		<b>British Pendulum</b>			<b>Reading (BP#)</b>	
<b>Test Strip Commence ment</b>	<b>Testing Location</b>	<b>Geographic Location Latitude/Longitude (Degrees)</b>		<b>Location relative to shoulder demarcation line</b>	<b>Untreated Pavement</b>	<b>RJSeal™ Treated</b>
Km 24+000	Km 23+987	22 <sup>0</sup> 17.545 '	112 <sup>0</sup> 49.484'	1.4 m west	55	53

The test results from the British Pendulum, are not correlateable with the sand patch test, nor the Outflow Meter. A BPN of 42 is indicative of an acceptable road surface from a skid resistance point of view. Whereas a BPN of 53 or 55 infers that the road surface is superior in terms of the friction.

See Figure 4.7 which follows, showing the British Pendulum Testing.

#### **4.7 Penetration/Ductility/Viscosity Testing**

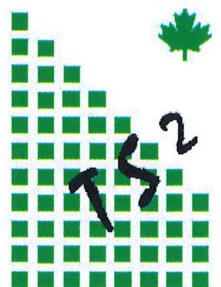
This aspect of the testing was beyond the capabilities of the field equipment available to both Crown Capital Enterprise Limited personnel.

It is understood that the Xin-Tai Highway Maintenance Department will acquire cores from the test strips and submit them for testing and as such, the results will be reported separately.





Figure 4.7 British Pendulum Test



## **5.0 Test Completion Schedule**

Technicians will be dispatched in mid-May to undertake testing on the section of highway where the Test Strips are located. The completion of this testing is scheduled as shown in the following chart.

# LiveProject - Xin-Tai Highway

Task Name		Qtr 1		February		Qtr 1		April		Qtr	
ID	Task Name	Duration	Start	Finish	Predecessors	Successors	W	T	F	S	M
1	Negotiate Agreement	2 days	28/2/2006	1/3/2006		2					
2	Site Inspection	1 day	2/3/2006	2/3/2006	1	4, 3					
3	RJSeal Application	1 day	3/3/2006	3/3/2006	2						
4	CCEL Field Inspection	1 day?	3/3/2006	3/3/2006	2	5					
5	Hiatus	6 days	6/3/2006	13/3/2006	4	6					
6	CCEL Draft Report Completat	11 day	14/3/2006	28/3/2006	5	7					
7	Hiatus	21 day	29/3/2006	26/4/2006	6	8					
8	CCEL Field Testing	1 day?	27/4/2006	27/4/2006	7	9					
9	CCEL Report Completion	4 days	28/4/2006	3/5/2006	8						

Normal task:



% complete:



Split task:



Summary task:



Critical task:



Rolled up Summary task:

Milestone:



External task:



Deadline:



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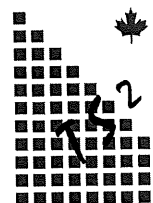
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**Appendix A**

**RJSeal™ Descriptive Literature**



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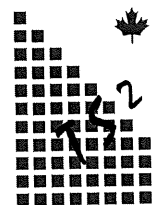
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**Appendix B**

**Desco D200 Sprayer**

**Technical Specifications**



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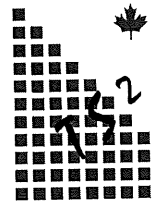
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**Appendix C**

**Field Testing.**



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