CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of RJSeal™
Shennanxinzhou LiJao Interchange,
Shenzhen, GuangDong Province,
Peoples Republic of China

September 2004

TS^2 Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RJSeal
Shennanxinzhou LiJao Interchange,
Shenzhen, GuangDong Province,
Peoples Republic of China

September 2004

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CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RJSeal
Shennanxinzhou LiJao Interchange,
Shenzhen, GuangDong Province
Peoples Republic of China

September 2004

APPENDICES

No.	Description
A	RJSeal™ Descriptive Literature
B	Copper Slag Specifications

TS² Consulting Inc.
Lamma, Hong Kong

Crown Capital Enterprise Limited.
RJSeal Application
Shenzhen - Shennan/Xinzhou rd. Overpass

Date of Work	Sept 25, 26 & 27, 2004
Prepared by	A.G. Speed
Updated by	A.G. Speed
Updated	28-Sep-04

Weather Conditions

Temperature	29 Celsius
Humidity	50%
Cloud Cover	Night Time - Clear Skies

Assumptions

Street Sector	Length metre	Width metres	Area sq metres
25-Sep-04	418.0	7.4	3,093.2
26-Sep-04	418.0	14.8	6,186.4
26-Sep-04	350.0	7.4	2,590.0
26-Sep-04	400.0	7.4	2,960.0
27-Sep-04	400.0	22.2	8,880.0
	1,986.0		23,709.6

Conversion Factors

US Gallon=	3.78	Litres
Sq Metre=	10.76	Sq Feet
Sq Metre=	1.20	Sq Yds
One Litre	1.04	kgs
One Full Drum	200	Kgs

Crew Consist	No
Desco Op	1
Desco Helper	1
Sand Spreader Op	1
Blower/Sweeper Operators	1
Labourers	13
Traffic Control	5
Truck Driver	3
Roller Operator	1
Supervisor	2
Total	28

Work Schedule sector	Work Time	Work Time	Test Length (m)	Total Area m^2	Total Area yd^2	RejuvaSeal Applied US gals	RejuvaSeal Applied litres	RejuvaSeal Applied kilograms	Application Rate USGal /yd^2	Application Rate Litres/m^2	Application Rate m^2 /Litre	Application Rate m^2/Kg	28 Man Crew m^2 /man hr	28 Man Crew yd^2 /man hr
25-Sep-04	21:30-01:30	4.00	418	3093.2	3,698	178	673	700	0.048	0.22	4.60	4.42	27.6	33.0
27-Sep-04	21:00-03:00	6.00	818	11,736	14,029	636	2,404	2,500	0.045	0.20	4.88	4.69	69.9	83.5
28-Sep-04	23:00-04:00	5.00	400	8,880	10,615	483	1,827	1,900	0.046	0.21	4.86	4.67	63.4	75.8
Totals		15.00	1636	23710	28342	1297	4904	5100	0.046	0.21	4.83	4.65	56.5	67.5
							bbls	25.5						

Note 1	tonnes of slag applied	kgs/sq metre
	5	0.21

Note 2 Drying time 2.5 hours

Shennan Road - Water Permeability test

Location	(Before RJSeal) Sample No.	Inflow ml/min	(After RJSeal) Sample No.	Inflow ml/min
East of Curb				
4.6 m	1	0	2	0
6.9 m	3	50	4	0
	Approximately 0.3 metres north of start of test strip		Approximately 0.3 metres south of start of test strip	

Shennan Road - Sand Patch Test

(Before RJSeal) July 26

Location	Sample No.	Diameter of Sand Patch D1 (mm)	D2 (mm)	Diameter Average (mm)	Texture depth (mm)
East of Curb					
4.6 m	1	320	270	295	0.37
6.9 m	3	260	280	270	0.44
	Approximately 0.3 metres north of start of test strip				

(After RJSeal) Sept 17

Location	Sample No.	Diameter of Sand Patch D1 (mm)	D2 (mm)	Diameter Average (mm)	Texture depth (mm)
East of Curb					
4.6 m	2	280	330	305	0.34
6.9 m	4	320	320	320	0.31
	Approximately 0.3 metres south of start of test strip				

Shennan Road - Outflow Meter Test

Location	(Before RJSeal) Sample No.	Inflow ml/min	(After RJSeal) Sample No.	Inflow ml/min
East of Curb				
4.6 m	1	18	2	10
	Approximately 0.3 metres north of start of test strip		Approximately 0.3 metres south of start of test strip	

Crown Capital Enterprise Limited.
RJSeal Application
Shennanxinzhou Lijao Interchange

Date of Work	Sept 25, 26 & 27, 2004
Prepared by	A.G. Speed
Updated by	A.G. Speed
Updated	28-Sep-04

Weather Conditions

Temperature	29 Celsius
Humidity	50%
Cloud Cover	Night Time - Clear Skies

Assumptions

Street Sector	Length metre	Width metres	Area sq metres
25-Sep-04	400.0	7.4	2,960.0
26-Sep-04	400.0	14.8	5,920.0
26-Sep-04	350.0	7.4	2,590.0
26-Sep-04	400.0	7.4	2,960.0
27-Sep-04	400.0	22.2	8,880.0
	1,950.0		23,310.0

Conversion Factors

US Gallon=	3.78	Litres
Sq Metre=	10.76	Sq Feet
Sq Metre=	1.20	Sq Yds
One Litre	1.04	kgs
One Full Drum	200	Kgs

Crew Consist	No
Desco Op	1
Desco Helper	1
Sand Spreader Op	1
Blower/Sweeper Operators	1
Labourers	13
Traffic Control	5
Truck Driver	3
Roller Operator	1
Supervisor	2
Total	28

Work Schedule	Work Time	Work Time	Test Length (m)	Total Area m^2	Total Area yd^2	RejuvaSeal Applied			Application Rate				28 Man Crew	
sector						US gals	litres	kilograms	USGal /yd^2	Litres/m^2	m^2 /Litre	m^2/Kg	m^2 /man hr	yd^2 /man hr
25-Sep-04	21:30-01:30	4.00	400	2960	3,538	153	577	600	**0.043**	**0.19**	**5.13**	**4.93**	26.4	31.6
27-Sep-04	21:00-03:00	6.00	800	11,470	13,711	661	2,500	2,600	**0.048**	**0.22**	**4.59**	**4.41**	68.3	81.6
28-Sep-04	23:00-04:00	5.00	400	8,880	10,615	509	1,923	2,000	**0.048**	**0.22**	**4.62**	**4.44**	63.4	75.8
Totals		15.00	1600	23310	27864	1323	5000	5200	**0.047**	**0.21**	**4.66**	**4.48**	55.5	66.3
							bbls	26.0						

Note 1

tonnes of slag applied	kgs/sq metre
5	0.21

Note 2 Drying time 2.5 hours

Shannon Road - Water Permeability test

Location	(Before RJSeal) Sample No.	Inflow	(After RJSeal) Sample No.	Inflow
East of Curb		ml/min		ml/min
4.6 m	1	0	2	0
6.9 m	3	50	4	0
	Approximately 0.3 metres north of start of test strip		Approximately 0.3 metres south of start of test strip	

Shannon Road - Sand Patch Test

(Before RJSeal) July 26

Location	Sample No.	Diameter of Sand Patch D1 (mm)	D2 (mm)	Diameter Average (mm)	Texture depth (mm)
East of Curb					
4.6 m	1	320	270	295	0.37
6.9 m	3	260	280	270	0.44

Approximately 0.3 metres north of start of test strip

(After RJSeal) Sept 17

Location	Sample No.	Diameter of Sand Patch D1 (mm)	D2 (mm)	Diameter Average (mm)	Texture depth (mm)
East of Curb					
4.6 m	2	280	330	305	0.34
6.9 m	4	320	320	320	0.31

Approximately 0.3 metres south of start of test strip

Shannon Road - Outflow Meter Test

Location	(Before RJSeal) Sample No.	Inflow	(After RJSeal) Sample No.	Inflow
East of Curb		ml/min		ml/min
4.6 m	1	18	2	10
	Approximately 0.3 metres north of start of test strip		Approximately 0.3 metres south of start of test strip	

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RJSeal™
Shennanxinzhou Lijiao Interchange,
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1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement with the Shenzhen Road & Bridge Maintenance Department of Shenzhen Special Economic Zone in Guangdong Province, China in September 2004. This arrangement calls for the analysis of the performance of RJSeal™, a sealer/rejuvenator for asphalt pavement on roads within the jurisdiction of the Shenzhen Road & Bridge Maintenance Department.

City of Shenzhen is located in a Special Economic Zone (SEZ) in Guangdong Province, immediately North of the border with Hong Kong SAR. Guangdong is bordered by Fujian, JiangXi, Hunan, and GuangXi Provinces. Guangzhou is the capital city and has a lengthy history and extensive archival records exist, which document the growth of the City. Shenzhen was a former fishing village and was created as a SEZ, some 20 years ago and has grown into a major city. The growth was spurred by tax concessions and the single minded will of Deng Xiao Ping, former leader of China. The transfer of manufacturing from Hong Kong to the Pearl River Delta and in particular special economic development zone like the neighbouring cities of Shenzhen and Zhuhai, has spurred the majority of the growth. The present population of Shenzhen and its suburbs and surrounding area is estimated at approximately 7 million. See figure 1.0 for a map showing the location of Shenzhen in Guangdong Province. The majority of the area lies at 10 to 15 metres in elevation, although mountains to the north and east hold some peaks that exceed 1,000 metres. The regions' latitude (23 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 Shenzhen 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 sourced from various locations. Since Shenzhen has the YanTian Container Terminal, second only to Hong Kong in terms of throughput of containers and other port facilities, also located on the South China Sea, the possibility of bitumen being sourced from offshore is a distinct possibility so

refineries in Singapore and Iran and other major oil refining countries should not be forgotten.

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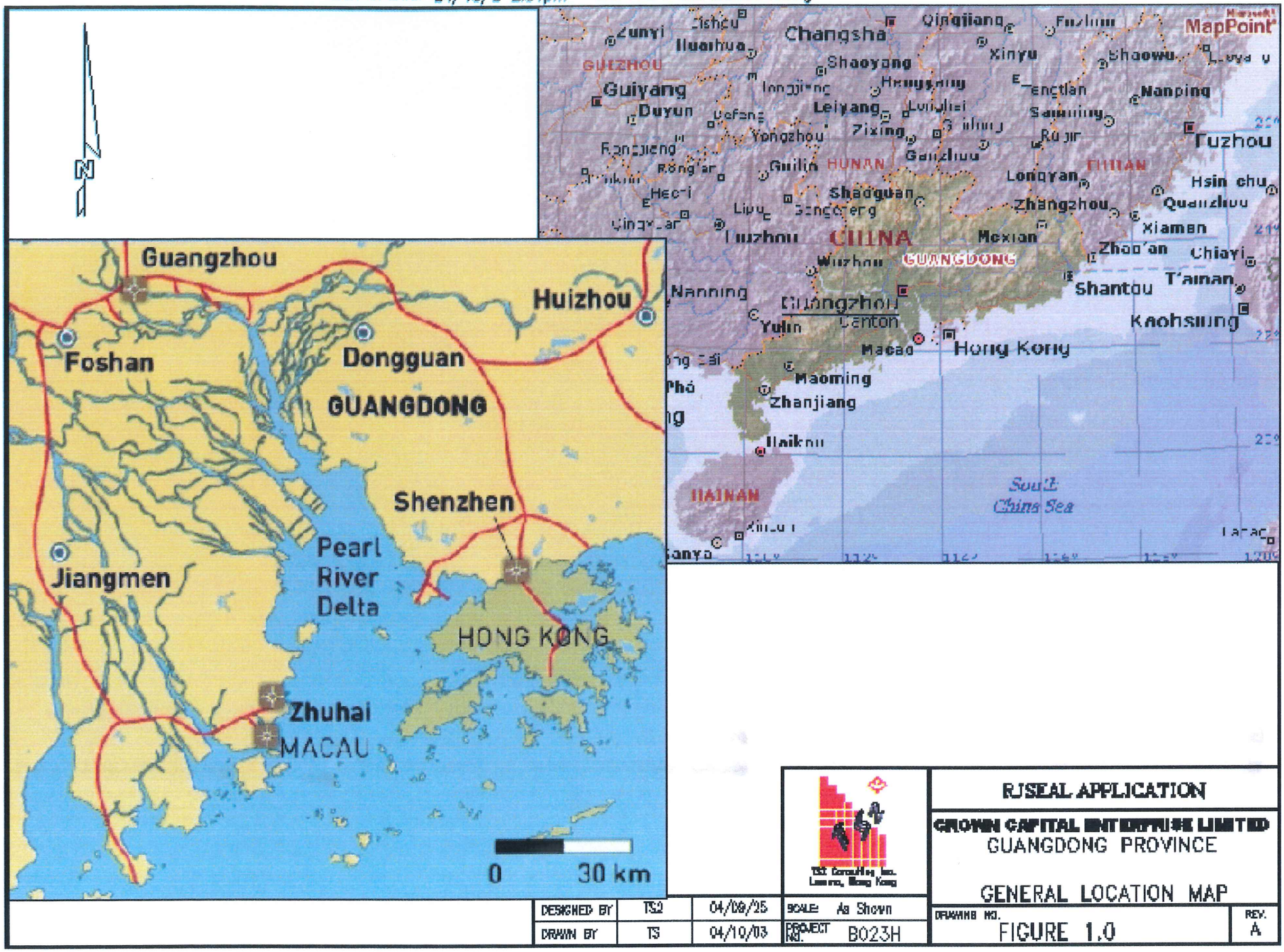


DESIGNED BY	TS2	04/09/25	SCALE: As Shown	
DRAWN BY	TS	04/10/03	PROJECT NO. B023H	

TSE Consulting Inc.
Lantau, Hong Kong

RJSEAL APPLICATION

CROWN CAPITAL ENTERPRISE LIMITED
GUANGDONG PROVINCE

GENERAL LOCATION MAP

DRAWING NO. FIGURE 1.0

REV. A

2.0 CO-OPERATIVE PROGRAM

The intent of the arrangement with the Shenzhen Road & Bridge Maintenance Department of Shenzhen is to demonstrate RJSeal™ at different locations selected by their road maintenance department, which will subsequently allow analysis of the performance of RJSeal™ on a variety of asphalt surfaces. A demonstration was undertaken on September 25, 2003 on Shennanxinzhou Lijiao Interchange, which permits traffic to change from Xinzhou Road, a six lane, divided thoroughfare to Shennan Avenue, a six lane divided thoroughfare. Both Shennan Avenue and Xinzhou Road have a merge/exit lanes in the immediate proximity to the interchange, making it 4 lanes wide on either side of the median, for a short section. The age of the original pavement is unknown, but suspected to be around 8 years. The demonstration strip was on a 400 metre long portion of Shennan Avenue that passed over Xinzhou Road, as well as a 418 metre long portion of Xinzhou Road that is beneath the overpass. The roads treated had several recent asphalt overlay patches and the portion of the Xinzhou Road immediately beneath the underpass, had a slurry seal overlay, placed in 2001 or thereabouts. No details are known about the subgrade, but inspection of the shoulder show a sandy-silty material. Knowing construction techniques in roads in China in general, minimal gravel would be used for an immediate coarse base, beneath the original pavement. At the site, inspection of the older asphalt pavement generally showed that there was not a significant amount of exposed aggregate although the bitumen was quite oxidized.

3.0 RJSEAL™

RJSeal™ is a proprietary product that is supplied by Crown Capital Enterprise Limited of Wanchai, Hong Kong. RJSeal™ has been proven in numerous applications in 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, bitumen and Petroleum Solvents.

3.1 PRIOR EXPERIENCE

Refer to Appendix A for a copy of the brochure prepared by Crown Capital Enterprise Limited. This outlines the experience with RJSeal™ at various locations in China, 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 forty two (42) locations in China and twenty five (25) commercial-scale applications have taken place at various locations, including Shanghai, Kunming, DaQing, QinHuangDao and Wuhan.

4.0 TEST PROGRAM

Since Shenzhen is located in a tropical climate (Latitude: 23 degrees North) at a low altitude (10 to 15 metres), it's a demanding setting for asphalt, given the year round warm climate (extremes of 46 Celsius in summer and 5 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

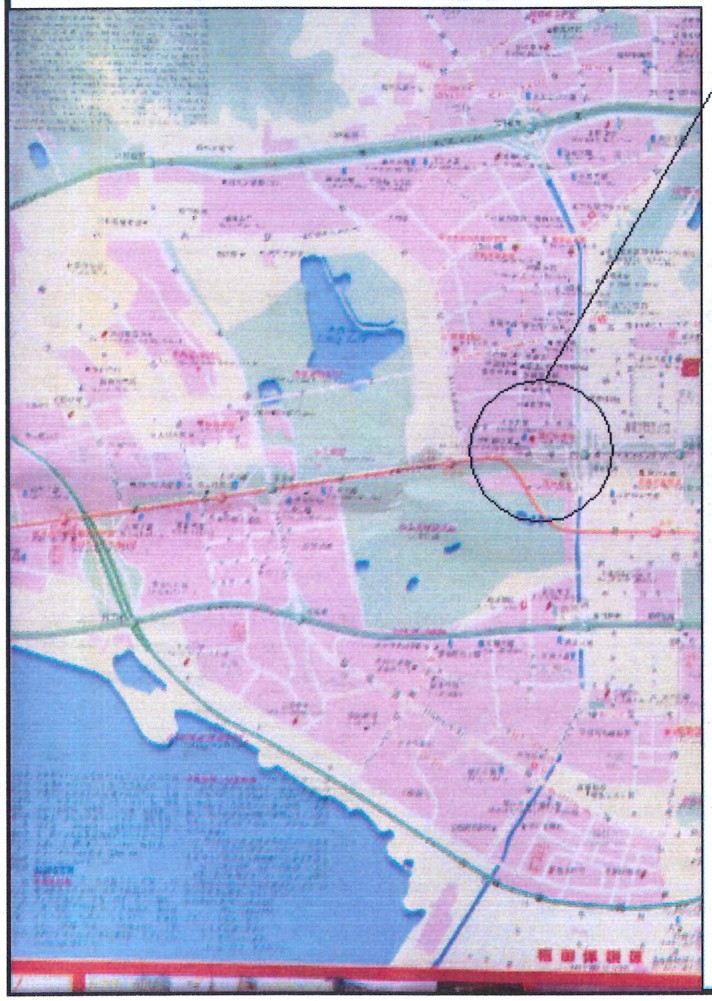
The Shenzhen Road & Bridge Maintenance Department of Shenzhen is responsible for approximately 500 kilometres of highway, The Shenzhen Road & Bridge Maintenance Department is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, the Shenzhen Road & Bridge Maintenance Department of Shenzhen has agreed to try RJSeal™ on the Shennanxinzhou Lijiao Interchange.

The demonstration section is located just north of the border with Hong Kong in the Futian District of the City of Shenzhen. See figure 4.0, which follows, for a map showing the general locale.

The section chosen for the demonstration is geographically located as follows:

Table 4.1		**Location of Demo Site**	
Location	**System**	**Northing**	**Easting**
North End Xinzhou Road	Geographic (deg, min)	22^0 32.536'	114^0 02.654'
	Universal Transverse Mercator Grid (50Q)(metres)	2495868	0195980
Midpoint Xinzhou Road	Geographic (deg, min)	22^0 32.463'	114^0 02.672'
	Universal Transverse Mercator Grid (50Q)(metres)	2495733	0196008

Demo Loc'n



RJSEAL APPLICATION

CROWN CAPITAL ENTERPRISE LIMITED

DETAILED LOCATION MAP

SCALE:	NTS
PROJECT NO.	B023E
DRAWING NO.	FIGURE 4.0
REV.	A

Work commenced on the demonstration section at 9:30 pm on September 25, on a warm, humid morning, where the temperature was approximately 28 Celsius. A strip, 400 metres long, on the two inside, southbound lanes of Xinzhou Road were treated this night. The width of each lane was 3.75 metres wide. The test section is located on a straight section, which passes beneath the Shennan Avenue Overpass. There is a slight camber to the road which causes water to run off toward the shoulder, rather than puddle on the road. The asphalt surface on the section treated, was reputedly 8 years old (1995/96 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. A slurry seal (probably 2001/2002 vintage) had been placed on that portion off Xinzhou Road, immediately beneath the overpass and was significantly worn, with various portions showing the underlying asphalt in the middle two lanes. In the outside northboundbound lane and inside northbound lane, the slurry seal overlay had been milled-off and a new asphalt overlay had been laid. Where the original pavement was exposed, beyond the limits of the slurry seal, the oxidation of the bitumen extended to a depth of several millimetres. The asphalt pavement was on a compacted silty-clay, sub-grade

The RJSeal™ was applied using a Desco D200 Sprayer, a crew of 18 men, two truck drivers and 2 supervisors. Refer to Appendix B for specifications on the Desco D200 Sprayer. Copper Slag was subsequently applied with a sand spreader and this was rolled using a 8-tonnes, pneumatic tired roller. Refer to Appendix C for details on the copper slag.

On the evening of September 26, work recommenced at 10:30 pm and the balance of the lanes on Xinzhou Road were treated with RJSeal™ and two of the inside, westbound lanes of Shennan Avenue were also treated with RJSeal™ for a distance of 400 metres. Again Copper Slag was applied and rolled, following the application of RJSeal™.

On the evening of September 27, work recommenced at 11:30 pm and the balance of the lanes on Shennan Avenue were treated with RJSeal™. Details of the application are summarized in the table that follows:

Table 4.2		**Details on RJSeal™ Application on Shennanxinzhou Lijiao Interchange**								
Work Schedule		Work Time (hrs)	Test Length (m)	Total Area m^2	RJSeal™ Applied			Application Rate		
					US gals	litres	Kgs	US Gal /yd^2	m^2 /Litre	m^2 /Kg
Sept 25	21:30-01:30	4.00	418	3,090	180	670	700	0.048	4.60	4.42
Sept 26	21:00-03:00	6.00	400	11,740	640	2400	2,500	0.045	4.88	4.69
Sept 27	23:00-04:00	5.00	400	8,880	480	1830	1900	0.046	4.86	4.67
Totals		15.00	n/a	23,710	1300	4900	5100	0.046	4.83	4.65

Ambient temperatures at the time of the application on all three days (September 25, 26 and 27) were in the 28 degree Celsius range in the late evening and early morning, but it warmed up to approximately 32 Celsius by mid-afternoon. Humidity was in the 65% range. Photos showing the test application of RJSeal™ follow in figures 4.1, 4.2 on the following pages.

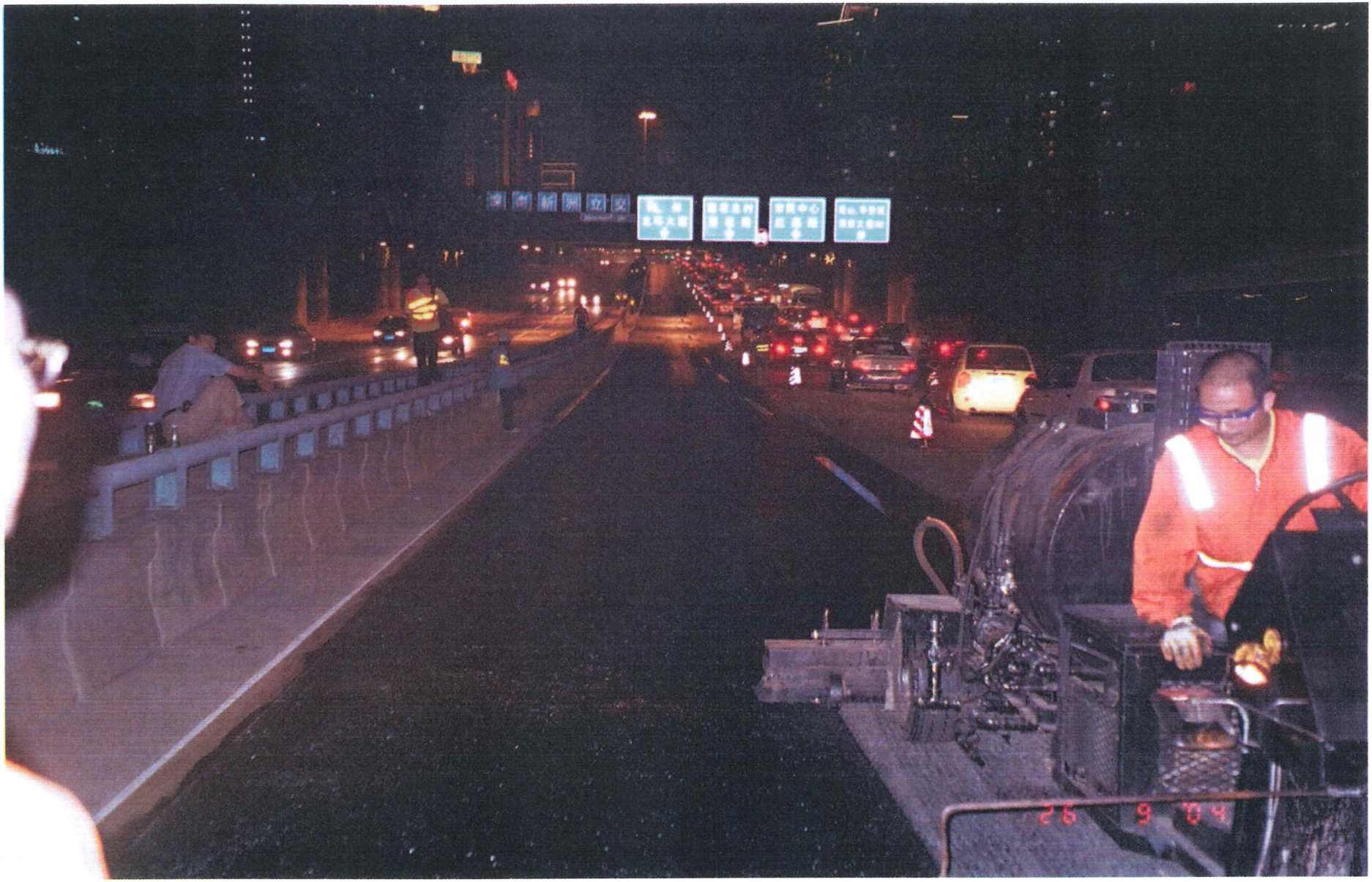


Figure 4.1 Typical Application Procedure for RJSeal

Figure 4.2 Finished RJSeal Surface.

Copper slag was applied to the treated surface shortly after the RJSeal™ was applied. Some 5 tonnes of copper slag was applied to the entire 23,710 square metre demonstration area. Refer to Appendix C for specifications of this copper slag. See figure 4.3 showing the spreading of the copper slag with Sno-Way Spreader.

Xinzhou Road and Shennan Avenue were visited on October 4 around 3:30 pm and a difference was readily perceived between the RJSeal™ treated section and the adjoining untreated portion. A jack-knife was used to dig two small holes in the asphalt pavement, to a depth of 3 centimetres, some 150 metres south of the start point (north end) of the demonstration section on Xinzhou Avenue, to determine the penetration of the RJSeal™. This was one week after the application of RJSeal™ and at these two locations the newly rejuvenated surface was evident, by the black resilient surface layer, which was now approximately 5 millimetres thick. Below that depth, the grey, oxidized layer of asphalt was evident. See figure 4.4 for details on the road on inspection, the week following the application of RJSeal™.

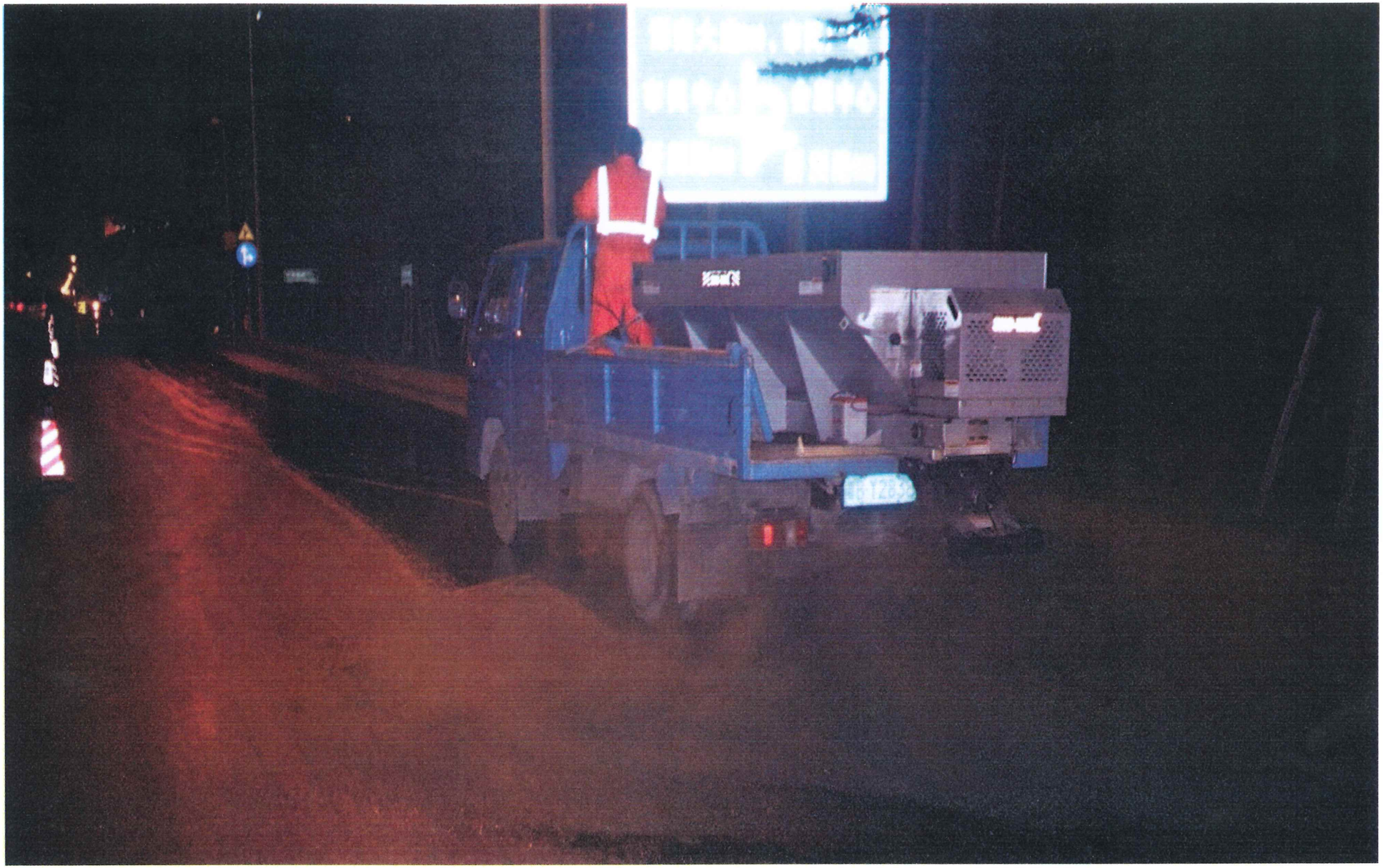


Figure 4.3 Slag Application

Figure 4.4 Inspection of RJSeal Surface on following day

TS2

4.1 RJSeal™ Testing

Testing equipment was brought to the site for comparison on a disciplined, objective basis, to ascertain the following properties, is document in the following sections:

- Macrotexture Depth
- Water Penetration
- Hydroplaning Potential

The technicians from the Hong Kong office of Crown Capital Enterprise conducted some preliminary testing on the application section in September 2004. Their findings are documented in the following tables in the report.

4.2 Water Penetration

Water Penetration Tests (China Testing Standard T 0730-2000) were undertaken at several locations on the Shennan Avenue portion of the road, in close proximity to the demonstration strip and later on the RJSeal™ treated section.

Table 4.3			**Water Penetration Meter Readings**		
Test No.	Test Date	Location relative to the curb	Location relative to start of demo section	Before RJSeal™ (ml/min)	After RJSeal™ (ml/min)
1	Sept 27	4.6 m north	0.3 m west	0	n/a
2	Sept 27	6.9 m north	0.3 m east	n/a	0
3	Sept 27	4.6 m north	0.3 m west	0	n/a
4	Sept 27	6.9 m north	0.3 m east	n/a	0

The readings taken before the application of RJSeal™ indicated that the asphalt pavement on Shennan Avenue does not have a problem with water penetration. See Figure 4.4 that follows for a pictorial presentation of the Water Penetration Tests.

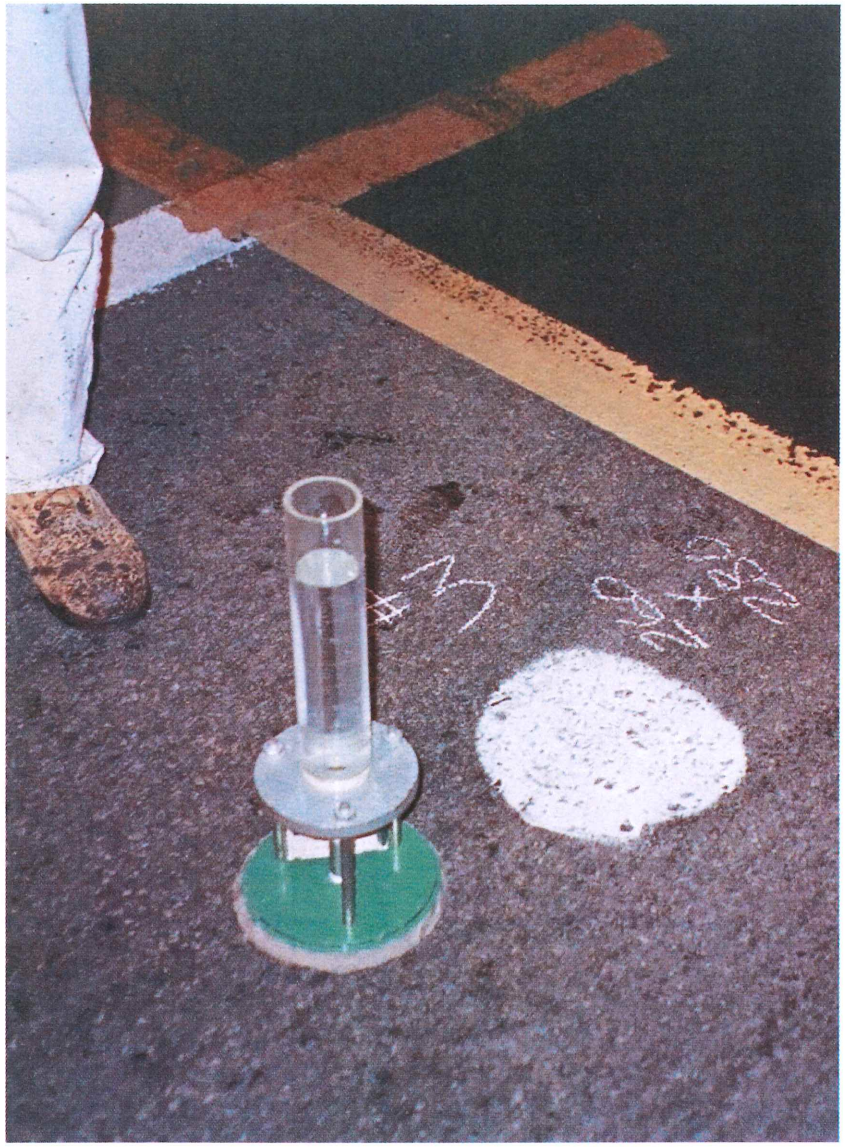


Figure 4.5
Humble Equipment Co. Outflow Meter
Water Penetration Meter & Sand Patch Test

4.3 Macrotexture Depth

The sand patch test (ASTM Standard E965-96 OR China Standard T 0961-95) will be used to ascertain the Pavement Macrotexture Depth. Comparison was undertaken at several locations on both the untreated and RJSeal™ treated sections in close proximity to the Water Penetration Meter tests.

Table 4.4			**Sand Patch Readings (Macrotexture Depth)**		
Test No.	Test Date	Location relative to the shoulder line	Location relative to start of demo section	Untreated (mm)	RJSeal™ Treated segment (mm)
1	Sept 27	4.6 m north	0.3 m west	0.37	n/a
2	Sept 27	6.9 m north	0.3 m east	n/a	0.34
3	Sept 27	4.6 m north	0.3 m west	0.44	n/a
4	Sept 27	6.9 m north	0.3 m east	n/a	0.31

The readings taken before the application of RJSeal™ indicate that the Shennan Avenue road surface at this location is sufficiently rough, to minimize problems with skidding, especially when raining and hydroplaning.

4.4 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 macrotexture, as concern has been expressed about hydroplaning on the RJSeal™ treated surface, versus the untreated surface. The procedure is documented in the 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 pavement surface, if hydroplaning is to be minimized. The following readings were obtained on Shennan Avenue at the west end of the demonstration section:

Table 4.5			**Outflow Meter Readings**		
Test No.	Test Date	Location relative to the shoulder line	Location relative to start of demo section	Adjoining Untreated Segment (seconds)	RJSeal™ Treated Segment (seconds)
1	Sept 27	4.6 m north	0.3 m west	18	n/a
2	Sept 27	6.9 m north	0.3 m east	n/a	**10**

These readings suggest that hydroplaning is not a significant problem on Shennan Avenue, especially after the application of copper slag.

Figure 4.5 Humble Equipment Company, "Outflow Meter"

5.0 Test Completion Schedule

The team of technicians from the Hong Kong office will be dispatched to undertake further testing on the RJSeal™ application section in the near future. The projected completion of this testing is scheduled as shown in the following chart.

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RJSeal
Shennanxinzhou LiJao Interchange,
Shenzhen, GuangDong Province,
Peoples Republic of China

September 2004

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FIGURES

TABLES

6.0 Qualifications

STATEMENT OF QUALIFICATIONS

I, Anthony G. Speed of Hong Kong in the Special Administrative Region of China, DO HEREBY CERTIFY.

I. THAT I am a Consulting Engineer, with offices at 2/F, 81 Po Wah Yuen, Lamma Island, Hong Kong

II. THAT I am a 1968 graduate of the University of Saskatchewan, Canada with a Bachelor of Science Degree in Mining Engineering.

III. THAT I am currently registered and in good standing as a Professional Engineer with the Association of Professional Engineers of Ontario, and New Brunswick, Canada

IV. THAT my 30 years of continuous experience in mining, major civil engineering works (earth moving, highway and mining construction) has exposed me to a broad knowledge of mining and heavy civil engineering construction and allowed considerable familiarization with road construction and asphalt pavement.

V. THAT this report is based on my visit on September 25 thru 28, 2004 to Shenzhen, Guangdong Province, China to view the application of RJSeal™, described in this report and facts as reported to me by Ekman Tang, of Crown Capital Enterprise Limited who supervised the actual RJSeal™ application on September 25 thru 28. 2004

Dated at Hong Kong, this _____day of October 2004

_____

Anthony G. Speed, P.Eng. (Ontario and New Brunswick, Canada)