CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

RJSeal™ Application
He-Ning Expressway,
AnHui Province,
Peoples Republic of China

August 2005

TS^2 Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

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APPENDICES

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A	RJSeal™ Descriptive Literature
B	Desco D200 Sprayer – Technical Data
C	Testing Results from AnHui Express Highway Company

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Application of RJSeal^{T}
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1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement in August 2005 with the AnHui Express Highway Company, which is responsible for the maintenance of the He-Ning Expressway in proximity to the city of Hefei. This arrangement calls for the analysis of the performance of RJSeal^{TM}, a sealer/rejuvenator for asphalt pavement on the He-Ning Expressway; near the city of Hefei, the Capital City of AnHui Province.

AnHui Province is situated in eastern China, bordering Shandong, JiangSu, Zhejiang, JiangXi, Hubei and Henan Provinces. The capital city of AnHui Province is Hefei with a population of approximately 600 thousand (as of 2000). The population is composed of primarily of Han People, with some minority groups.

AnHui Province has a climate that is typical of a temperate zone. The weather is characterized by a wet season which occurs in June thru September and a dry season for the balance of the year. The temperature varies moderately between day and night. July and August are the hottest months of summer and the temperature varies between 25 Celsius and 37 Celsius. The coldest month is January in the winter where the weather ranges from +5 Celsius to -12 Celsius. See figure 1.0 for a map showing the location of AnHui Province.

The predominant feature of the topography is the extensive farmland, which covers 43% of the province and extensive wetlands, that border the many freshwater lakes and the Yangtze and Huai River. The asphalt concrete in the area is manufactured from locally sourced aggregate materials, which are comprised of crushed and screened sandstone and diorites hauled in from quarries elsewhere in AnHui Province, as well as washed gravels from the various rivers. The bitumen binder is probably sourced from refineries located outside China.

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BaoTouHuShi Expressway
General Location Map
Figure 1.0

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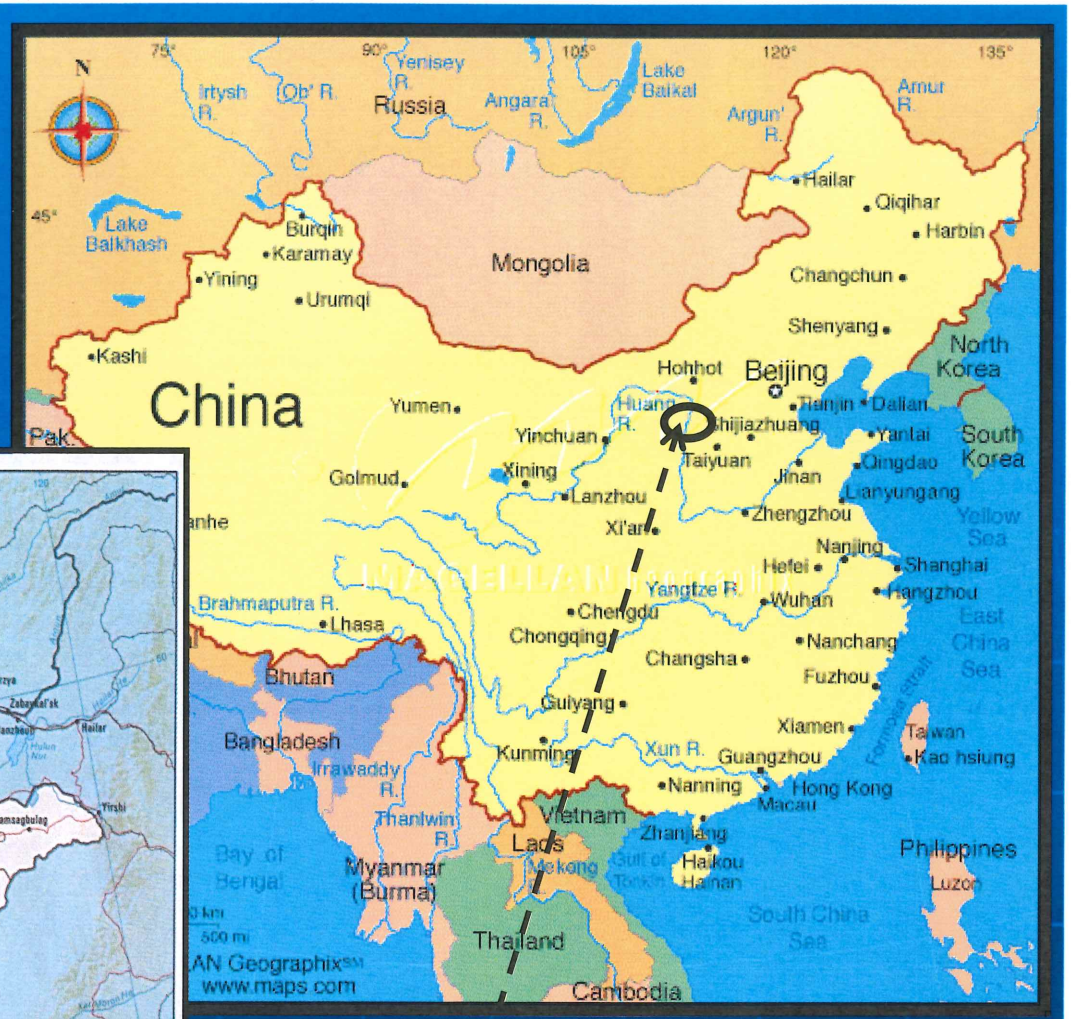
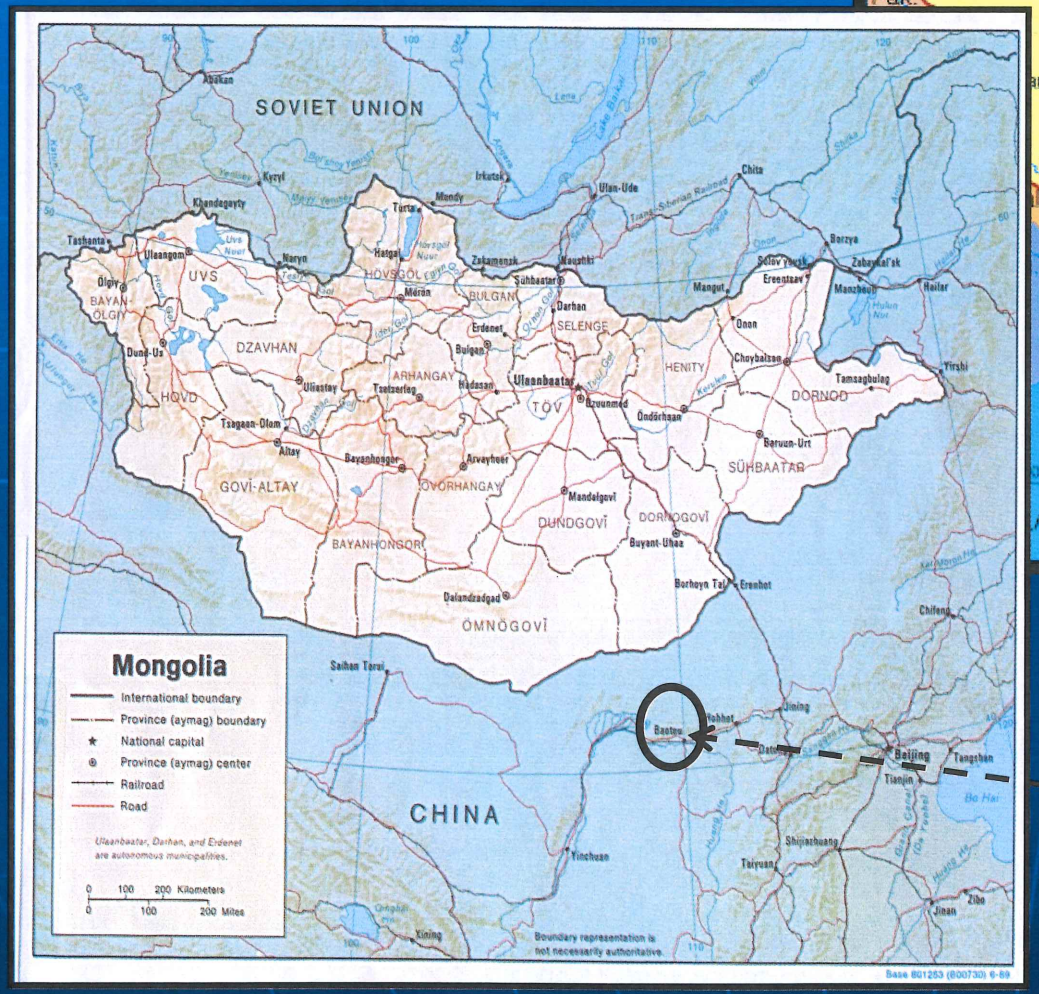




Job Site

2.0 CO-OPERATIVE PROGRAM

The intent of the arrangement with AnHui Express Highway Company, which is responsible for the He-Ning highway, is to demonstrate RJSeal™ at a location selected by the Maintenance Division. The Application will subsequently allow analysis of the performance of RJSeal™ on a variety of asphalt surfaces. An application was undertaken on the outside, westbound (driving or slow) lane of the He-Ning Expressway, 5 km's east of the city of Hefei. The work was undertaken on August 16, 2005. The portion of the highway that was treated is composed of asphalt pavement, nominally 16 centimetres thick, which overlays a silty sand.

The age of the asphalt pavement is circa 2002. Keen interest was expressed in having the life of the asphalt pavement extended on this Expressway. The asphalt pavement has a number of linear cracks. Smaller cracks also exist and the road maintenance department wished to prevent water percolating through these cracks in the asphalt pavement, thus softening the sub-grade. An emulsified bitumen has been applied on the inside (overtaking) lane and immediately before the RJSeal™ Test Strip in the slow (driving or slow lane). Experience with the emulsified bitumen has not been satisfactory according to the Anhui Express Highway Company. Several test sections in the immediate proximity to the test sectin with Micro-Texturing in both wheel-paths of the driving and overtaking lane. Some minor rutting has occurred in the slow lane.

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 and recently in China 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 which outlines the experience with RJSeal™ at various locations in North America and South America as well as China. 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 other locations in the U.S.A. Since 2000, RJSeal™ has been demonstrated successfully at over forty five (45) locations in China and forty (40) commercial-scale applications have taken place at various locations, including Shanghai, DaQing, Kunming and QinHuangDao.

4.0 TEST PROGRAM

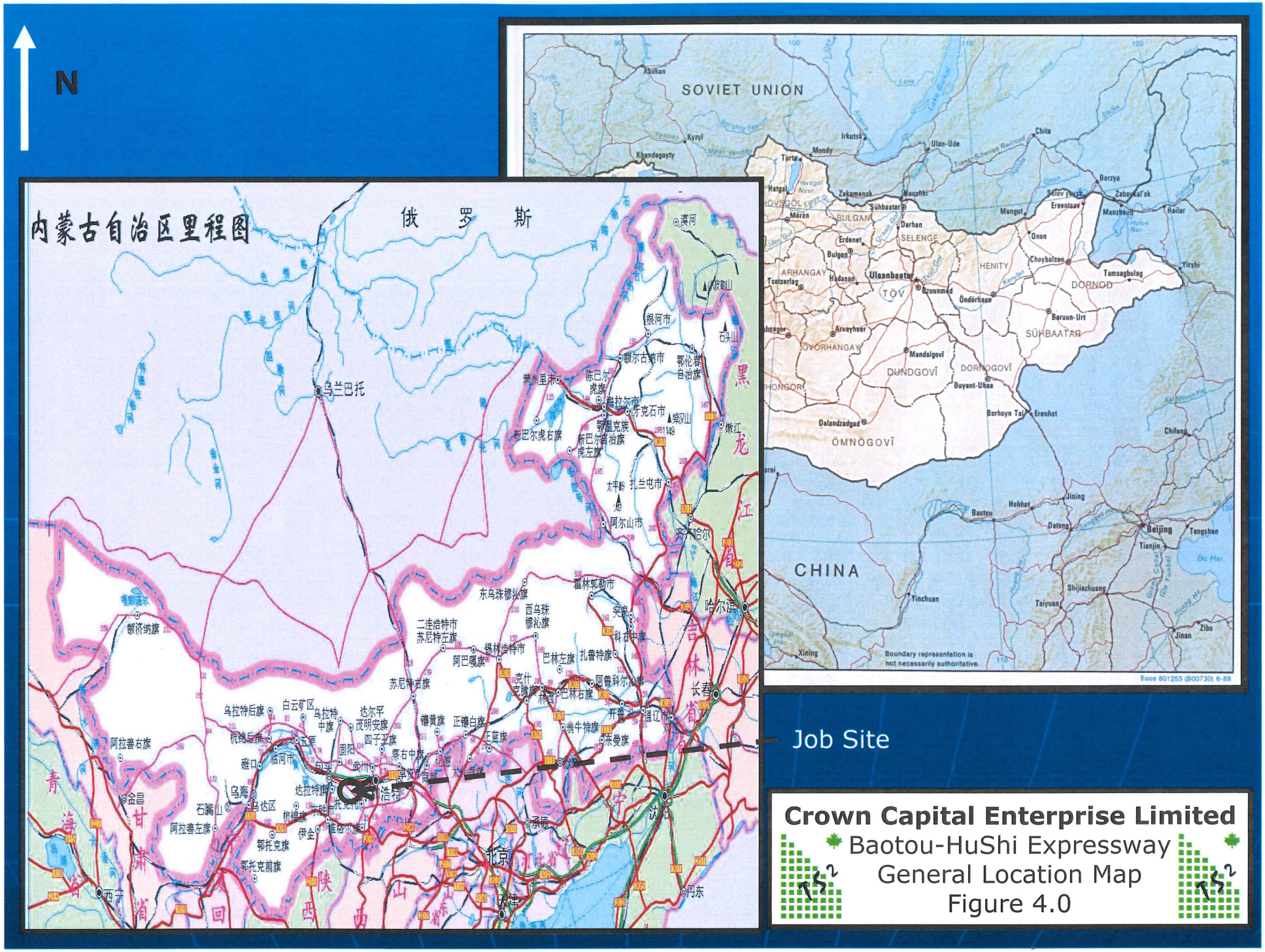
Since AnHui Province is located in a temperate climate (Latitude: 30 to 35 North) at a low altitude (20 to 200 metres), it's a demanding setting for asphalt, given the climate (extremes of 45 Celsius in summer and minus 15 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

AnHui Province has a significant concentration of highways, with some 10,000 kms of National and Provincial Highway. The AnHui Express Highway Company is responsible for the maintenance of the He-Ning Expressway.

In view of this extensive network of roads and the relatively short life of the asphalt surface, The Expressway Maintenance Department is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, they agreed to try RJSeal™ on He-Ning Expressway, immediately east of the city of Hohhot. See Figure 4.0, showing the location of this Expressway with respect to Hefei

On August 16, 2005 a test strip on the westbound driving (outside) lane of the He-Ning Expressway, (a four lane, divided highway) was treated with RJSeal™. The location selected for an application of RJSeal™ was between the Km marker 28+200 and the Km marker 27+200, at the following geographic location:

Table 4.1	**Geographic Location of Test Strip on He-Ning Expressway**		
Test Strip	**System i.e. Geographic or Universal Transverse Mercator (UTM)**	**Northing**	**Easting**
East End (Km 28+200)	Geographic (deg, min)	31^0 49.172'	117^0 23.816'
	UTM Grid (50R) (metres)	3,520,514	537,566
West End (Km 27+200)	Geographic (deg, min)	31^0 48.887'	117^0 23.291'
	UTM Grid (50R) (metres)	3,519,985	536,739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内蒙古自治区里程图
俄 罗 斯
SOVIET UNION
CHINA
Job Site
Crown Capital Enterprise Limited
Baotou-HuShi Expressway
General Location Map
Figure 4.0

Particulars of the test strips are shown in the table that follows:

Table 4.2				Particulars of the Test Strip on He-Ning Expressway							
Work Period	Work Time (hrs)	Strip Length (m)	Total Area (m^2)	Total Area yd^2 approx	RJSeal™ Applied			Application Rate			
					US gals	Litres	Kgs	US Gal /yd^2	litres /m^2	m^2 /Litre	m^2 /Kg
08:00-08:45	0.75	0	set-up								
08.45-09:00	0.25	100.0	367	439	17	66	70	**0.040**	**0.18**	**5.56**	**5.24**
09:00-09:15	0.25	0.0	inspection and okay of test strip								
09.15 - 10:20.	1.08	900.0	3,303	3,948	157	594	630	**0.040**	**0.18**	**5.56**	**5.24**
10:20-10:40	0.33	0.0	photos by customer of application								
10:40-11:20	0.67	0.0	slag spreading and clean-up								
	3.33	1,000.0	3,670	4,387	175	660	700	**0.040**	**0.18**	**5.56**	**5.24**

Subsequent inspection of the test strips, showed that the application rate of 5.24 m^2/kg was adequate for the asphalt pavement at this location. Copper slag was spread by hand to ensure the roadway would dry in time and improve skid resistance of the surface.

The 1,000 metre long application section on the He-Ning Expressway is comprised entirely of asphalt pavement. The RJSeal™ application was nominally between the Km marker 28+200 and Km marker 27+200 in the driving or outside lane. See figure 4.0 for the location of the test strip with respect to the city of Hefei. The test strip location is graphically shown in figure 4.1, which follows.

Figure 4.1 Test Strip on He-Ning Expressway

There is a slight camber to the road, which causes water to run off toward the shoulder, rather than puddle on the road. No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The asphalt pavement surface was not appreciably worn with some minor rutting due to traffic wear. There was some minor aging and oxidation of the bitumen, which extended to a depth of several millimetres. There were lateral cracks,. The entire portion of the treated asphalt pavement section overlies a compacted silty-clay, sub-grade

RJSeal^{TM} was applied, using a Desco D200 Sprayer. See Appendix B for technical information on this unit. This unit can uniformly apply the RJSealTM in the application.

Ambient temperatures at the time of the application during the morning of August 16 were in the 35 to 37 degree Celsius range, with humidity in the 65% range. Photos showing the test application of RJSeal^{TM} follow in figures 4.2, 4.3 and 4.4. on the following pages.

A site visit in the late afternoon of August 16, 2005 was made to check to entire test section and evaluate the penetration of the RJSealTM. A difference was readily perceived between the RJSeal^{TM} treated sections and the adjoining untreated lanes. A screwdriver was used to dig several small holes in the asphalt pavement, to determine the penetration of the RJSeal^{TM}. At these locations the rejuvenated surface was evident, by the black resilient surface layer, which was now approximately 5 milliimetre thick. Below that depth, the grey, oxidized layer of asphalt was evident. This is pictorially shown in Figure 4.4 that follows.

4.2	Typical Application Procedure

4.3	Finished Surface

4.1 RJSeal™ Testing

To date the comparison of the asphalt treated with RJSeal™ has been compared on a subjective basis over a very short period on He-Ning Expressway. Testing equipment brought to the site for determination of the following aspects was undertaken by the AnHui Express Highway Companey.

- Skid Resistance
- Water Penetration
- Macrotexture (Depth of Texture)

At a later date, further tests will be undertaken in the future

4.2 Skid Resistance

A "British Pendulum" manufactured in China by the Jiangsu Asphalt Pavement Equipment Testing Company (see figure 4.5) was used to measure the asphalt pavements skid resistance, as concern has been expressed about hydroplaning on the RJSeal™ treated surface, versus the untreated surface. The procedure is documented in the ASTM Standard E303-93. The British Pendulum gives a reading for comparison between the untreated and treated surface. No meaningful correlation has been made with other testing procedures for determination of skid resistance, such as the dynamic skid tester or similar devices.

4.3 Water Penetration

Water Penetration Tests (China Testing Standard T 0730-2000) were undertaken at five locations on the He-Ning Expressway on both the original untreated segment. Further tests will be conducted in the near future. See Figure 4.6 that follows for a pictorial presentation of the Water Penetration Meter. When results are received from the AnHui Express Highway Company, they will be incorporated in the appendix.

4.4 Macrotexture (Depth of Texture)

The sand patch test (ASTM Standard E965-96 OR China Standard T 0961-95) will be used to ascertain the Pavement Macrotexture (Depth of Structure). Tests were undertaken at several locations on the untreated section in close proximity to the Water Penetration Meter tests.

See Figure 4.7 which follows, showing the sand patch testing procedure.

4.5 Ductility/Viscosity/Penetration Testing

This aspect of the testing is beyond the capabilities Crown Capital Enterprise Limited personnel and external assistance has been sought from outside experts in the field of Asphalt Testing. To this end, the AnHui Express Highway Company has retained an independent testing company to conduct tests on the treated section. This will be reported separately.

5.0 Test Completion Schedule

The technicians from the testing laboratory, retained by the AnHui Express Highway Company will be dispatched to undertake further testing on the trial section in the near future. The projected completion of this testing is scheduled as shown in the following chart.

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Appendix A

RJSeal™ Descriptive Literature

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Appendix B

Desco D200 Sprayer

Technical Data

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Appendix C

Test Results from

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