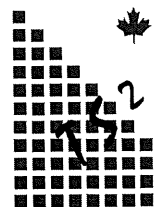


**CROWN CAPITAL ENTERPRISE
LIMITED**

WANCHAI, HONG KONG

**Demonstration of Rejuvaseal™
Wei-Lai Expressway, WeiFang, ShanDong,
Peoples Republic of China**

June 2002



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

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RejuvaSeal Wei-Lai Expressway, WeiFang, ShanDong, Peoples Republic of China

June 2002

TABLE OF CONTENTS

Section	Description	Page
1.0	Introduction	1
2.0	Co-operative Program	3
3.0	RejuvaSeal™	4
3.1	Prior Experience	4
4.0	Test Program	5
4.1	RejuvaSeal™ Testing	13
4.2	Water Dissipation	15
4.3	Fuel Resistance Testing	17
4.4	Elasticity/Ductility Testing	17
5.0	Project Completion Schedule	18

FIGURES

No.	Description	Page
1.0	General Location Map	2
4.0	Specific Location Map	7
4.1	Test Patches At Demonstration Site	8
4.2	Typical Application Procedure	11
4.3	Finished Surface	12
4.4	British Pendulum, Sand Patch Test and Water Infusion Test	14
4.5	Humble Equipment Co. Outflow Meter	16
5.0	Project Completion Schedule	19

TABLES

No.	Description	Page
4.1	Geographic Location of Test Patch	5
4.2	Details of Test Patch on Wei-Lai Expressway, WeiFang	5
4.3	Geographic Location of Demo Site	9
4.4	Details of RejuvaSeal™ Demonstration Section on Wei-Lai Expressway, WeiFang, ShanDong	10
4.5	Outflow Meter readings at Demo Site	15

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APPENDICES

No.	Description
A	Rejuvaseal™ – Technical Seminar, Ping-Gu (Beijing) China, August 2001
B	Rejuvaseal Descriptive Literature
C	Kunming Copper Slag – Technical Data



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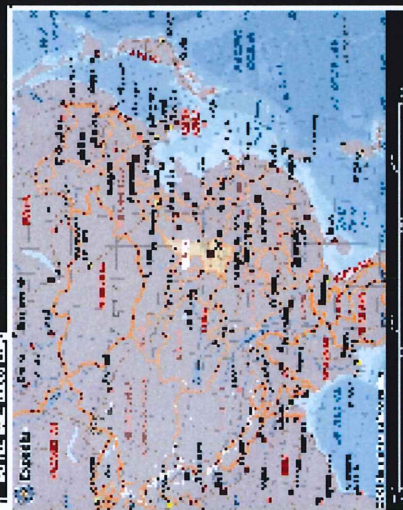
1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement with the Highway Administration Department of ShanDong Province, China in June 2002. This arrangement calls for the analysis of the performance of RejuvaSeal™, a sealer/rejuvenator for asphalt pavement on highways within ShanDong Province.

ShanDong Province straddles the Yellow River (HuangHe) at it's confluence with the Sea of Bohai. ShanDong is bordered by Henan, Hebei and JiangSu Provinces. ShanDong has seen a major growth in the highway system, due to a government drive to build national highways linking ShanDong with major cities in the adjoining provinces. WeiFang, lies approximately 70 kilometres east of Jinan, the capital city of ShanDong and also south of the Sea of Bohai. The present population of WeiFang is estimated at approximately 1 million. See figure 1.0 for a map showing the location of WeiFang and ShanDong. The majority of the area lies at 10 to 20 metres in elevation, on the extensive plain that borders the Sea of Bohai and the East China Sea. The regions' latitude (37 degrees north), mean that there are four seasons, with temperatures ranging from 45 Celsius in the long, hot summer to minus 5 Celsius in the short winter. There is no rainy season per-se, just thunderstorms and these occur primarily in June thru August, but can extend into September.

In the immediate WeiFang area, a significant unconsolidated sedimentary sequence predominates and this is due to the site adjoining the delta of the Yellow River. There are no outcrop exposures available. Drainage channels feeding into the Yellow River also afford no opportunities to see the bedrock. The asphalt in the area is manufactured from imported materials, which is comprised of crushed and screened sandstone and diorites hauled in from quarries near WeiHai in ShanDong Province, as well as washed gravels from the various rivers. The bitumen binder for the asphalt is sourced from various locations. Since ShanDong Province has it's own indigenous oil fields and petroleum refining capacity, there is some domestic asphalt production. Shandong Province also borders the East China Sea, so the possibility of bitumen being sourced from offshore is a distinct possibility so refineries in Singapore and the like should not be forgotten.

INSTITUTE OF AERONAUTICS, 100 HAZARD RECORDS



MOTIVATIONAL INDEX	
1	2
STANDARD PROVIDE	
GENERAL LOCATION MAP	
1	2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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2.0 CO-OPERATIVE PROGRAM

The intent of the arrangement with ShanDong Province is to demonstrate RejuvaSeal™ at different locations selected by the Highways Administration Bureau. The demonstration will subsequently allow analysis of the performance of Rejuvaseal™ on a variety of asphalt surfaces. A demonstration was undertaken on a bridge deck on the Wei-Lai Expressway, some 35 kilometres north-east of the City of WeiFang on June 18, 2002. The bridge deck that was treated was composed of asphalt pavement of 1998 vintage.. The surface of the asphalt is not smooth and concern has been expressed about water percolating through the asphalt pavement and causing corrosion and exacerbating maintenance problems with the concrete superstructure of the bridges on this expressway. Furthermore, there are concerns that asphalt pavement which has a low bitumen content, will suffer an abbreviated life and interest was expressed in having the life extended.

3.0 REJUVASEAL™

RejuvaSeal™ is a proprietary product that is supplied by Crown Capital Enterprise Limited of Wanchai, Hong Kong. Rejuvaseal™ 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. Rejuvaseal™ 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 provided to participants at a seminar held in Ping-Gu (Beijing Municipality) in August 2001. This outlines the experience with Rejuvaseal™ at various locations in North America and South America. Further information is available from Crown Capital Enterprise Limited. Rejuvaseal™ 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.

4.0 TEST PROGRAM

Since ShanDong Province is located in a semi-tropical climate (Latitude: 37 North) at a low altitude (10 to 50 metres), it's a demanding setting for asphalt, given the year round warm climate (extremes of 45 Celsius in summer and minus 5 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

ShanDong has the greatest concentration of highways in China, with some 26,000 kms of National and Provincial highway. The ShanDong Infrastructure Company is responsible for administering a portion of the Wei-Lai Expressway which stretches 140 kilometres from WeiFang to LaiYun. The owner of the Highway is the ShanDong Provincial Expressway.

In view of this extensive network of roads and the relatively short life of the asphalt surface, ShanDong is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, the ShanDong Infrastructure Company Limited has agreed to try RejuvaSeal™ on the Wei-Lai Expressway, nearby the city of WeiFang. The arrangement led to a committee being struck to suggest appropriate locations for the testing of RejuvaSeal™. See Figure 4.0, showing the location of this highway with respect to WeiFang and ShanDong

On June 15, two test patches on the inside lane of the southbound segment of of the Wei-Lai Expressway were treated with RejuvaSeal™. The test patches were atop the brige that is located at the following geographic location:

Table 4.1	Geographic Location of Test Patch Site	
System	Northing	Easting
Geographic (deg, min)	36 ⁰ 44.965'	119 ⁰ 29.028'
Universal Transverse Mercator Grid (50S) (metres)	4069966	0721742

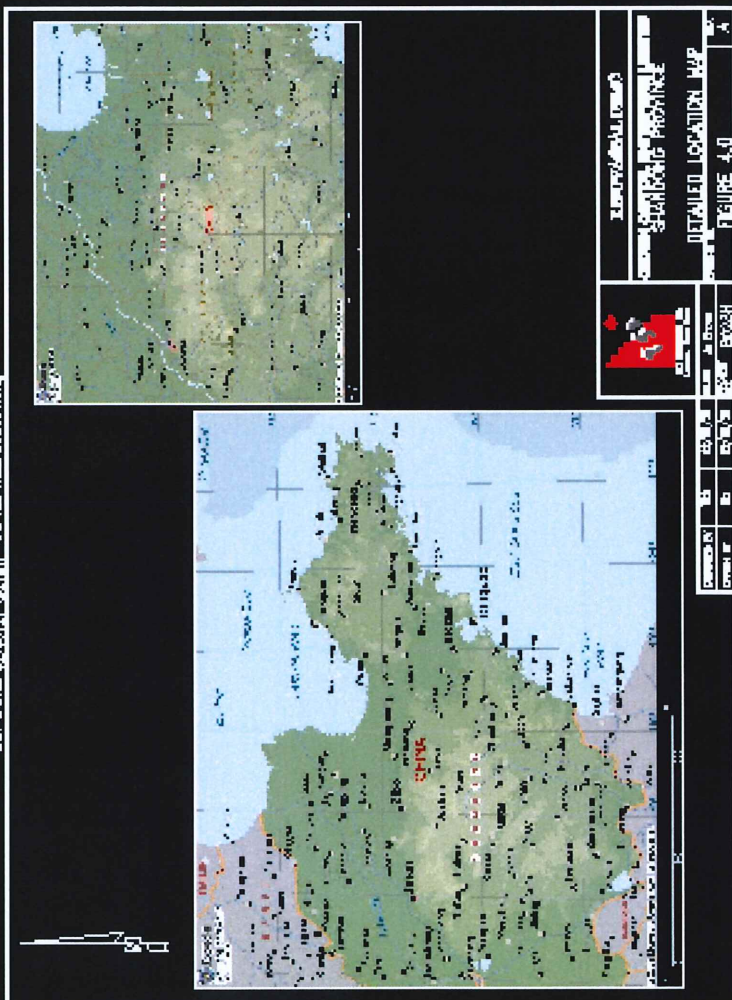
See Figure No 4.1 for a photo showing the test patches as implemented. Particulars of the test patches are as follows:

Table 4.2				Particulars of the test patch						
Test Patch Number	Patch Width (m)	Patch Length (m)	Total Area m²	Total Area ft² approx	RejuvaSeal™ Applied		Application Rate			
					litres	Kgs	US Gal /yd ²	Litres /m ²	m ² /Litre	m ² /Kg
One	0.68	0.80	0.55	6	0.25	0.28	0.101	0.46	2.20	2.00
Two	0.41	1.00	0.41	4	0.25	0.28	0.134	0.61	1.65	1.50

Subsequent inspection of the test patches on June 18, showed that the application rate of 2.0 m²/Kg (test patch one) was appropriate for the asphalt

pavement at this location and could be used as a guide for other locations with similar physical characteristics.

The 122.5 metre long demonstration section on the Wei-Lai Expressway is located approximately 35 kilometres north east of the City of WeiFang, on a bridge that crosses a canal. The bridge deck is comprised of concrete girders with a concrete deck, which is entirely covered with asphalt pavement. Concern has been expressed about water percolating thru the asphalt pavement and causing damage to the underlying concrete bridge deck, thru corrosion of the rebar. See figure 4.0, which follows, for a location of the general locale. The location of the test patch with respect to the demonstration portion is graphically shown in figure 4.1, which follows.



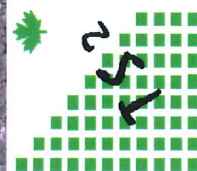


Figure 4.1
Test Patches at Demonstration Site.

the demonstration section, on the bridge deck on the Wei-Lai Expressway was selected by the ShanDong Highway Administration Department, and is geographically located as follows:

Table 4.3		Location of Demo Site	
Location	System	Northing	Easting
East End of Test Strip	Geographic (deg, min)	36 ⁰ 44.959'	119 ⁰ 29.070'
	Universal Transverse Mercator Grid (metres) 50S	4069957	0721805
West End of Test Strip	Geographic (deg, min)	36 ⁰ 44.957'	119 ⁰ 28.984'
	Universal Transverse Mercator Grid (metres) 50S	4069950	0721679

This is overlying the location of the test patches. Refer to Figure 4.0 for the location. Work commenced on the demonstration section at 8:35 am on June 18, on a hot, sunny day, where the mid-day temperature reached 34 Celsius. This was the first sunny day, following a lengthy extended rainy period. A demonstration strip, 122.5 metres long, on the bridge deck, on the inside southbound lane on this four-lane divided highway was treated. The test section is located on a straight section, with a downhill gradient of approximately 5%. There is a slight camber to the bridge deck, which causes water to run off toward the curb lane, rather than puddle on the bridge. The asphalt surface on the section treated, was reputedly 3 years old (1998 vintage). 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. There was some minor aging and oxidation of the bitumen, which extended to a depth of several millimetres. There were no longitudinal cracks and no lateral cracks.

On June 18, segments (panels) were marked off in 7 metre increments, the full width of the inside lane. The width of the lane is 4.55 metres between the bridge guardrail and the dividing line. A five U.S. gallon (17.9 litres) pail of RejuvaSeal™ was assigned to each panel. The RejuvaSeal™ was applied to each of the panels, using paint rollers and paint roller pans, to ensure uniformity in the application. The last panel was completed at 10:05 am.

Details of the application are summarized in the table that follows:

Table 4.4				Details on RejuvaSeal™ Demonstration Section on Wei-Lai Expressway						
Work Schedule	Work Time	No. of Panels	Test Length	Total Area m ²	Total Area yd ²	RejuvaSeal™ Applied		Application Rate		
	(hrs)		(m)			US gals	litres	US Gal /yd ²	m ² /Litre	m ² /Kg
8:25-10:00	1.42	17	119.0	541	647	85	321	0.131	1.69	1.53
10:00-10:05	0.08	1	3.1	14	17	5	19	0.293	0.76	0.69
Totals	1.50	18	122.1	556	664	90	340	0.135	1.63	1.9

Ambient temperatures at the time of the application were in the 31 to 34 degree Celsius range, with humidity in the 85% range. The application ceased at 10:50 pm and the pneumatic roller worked until 12:50 pm. The lane remained closed until 7 pm on June 18, when it was re-opened for traffic. Photos showing the test application of RejuvaSeal™ follow in figures 4.2 and 4.3. on the following pages.

The site was visited on June 19 around 9:20 pm and a difference was readily perceived between the RejuvaSeal™ treated section and the adjoining untreated lanes. A screwdriver was used to dig two small holes in the asphalt pavement, to a depth of 3 centimetres, some 45 metres west of the extreme east end of the demonstration section, to determine the penetration of the RejuvaSeal™. This was one day after the application of RejuvaSeal™ and at these two locations the newly rejuvenated surface was evident, by the black resilient surface layer, which was now approximately 1 millimetre thick. Below that depth, the grey, oxidized layer of asphalt was evident. The copper slag remained embedded in surface of the road, and most had cemented to the RejuvaSeal™. No carryover of the RejuvaSeal™ was observed from vehicle tires at the east end of the demonstration strip, so it can be presumed that the surface was dry when the site was vacated at 7 pm on June 18.

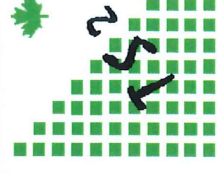


Figure 4.2 Typical Application Procedure.

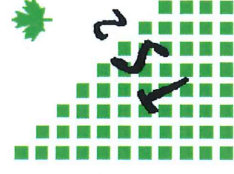


Figure 4.3 Finished Surface.

4.1 RejuvaSeal™ Testing

To date the comparison of the asphalt treated with Rejuvaseal™ has been compared on a very short period at the test site on Wei-Lai Expressway. Testing equipment brought to the site by Crown Capital Enterprise Limited solely consisted of an Outflow meter manufactured by Humble Equipment Co. of Reston, Louisiana, U.S.A. This was to establish the Water Dissipation (Hydroplaning Comparison).

The Shandong Highway Research Department brought additional testing equipment to the site on June 19, for comparison on a more disciplined, objective basis and to this end, the following tests were undertaken.

- Sand Patch Test
- British Pendulum Test
- Water Infusion Test.

These will be reported separately in a report compiled by the Shandong Highway Research Department. See Figure 4.4 that follows, showing the testing equipment utilized by the Shandong Highway Research Department.



Figure 4.4 British pendulum Test (top)
 Sand Patch Test (lower left)
 Water Infusion Test (lower right)



4.2 Water Dissipation

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 capability to dissipate water, as concern has been expressed about hydroplaning on the RejuvaSeal™ treated surface, versus the untreated surface. 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.

Readings were taken with this aforesaid Outflow Meter at three locations on the portion of the bridge selected for the test. These readings were taken at 9:30 am on June 17. The results are shown in the table that follows:

Table 4.5		Outflow Meter Readings		
Test Date	Location relative to bridge barrier rail	Location relative to east end of test section	Before RejuvaSeal™ (secs)	After RejuvaSea™ (secs)
June 17	2.5 metres north	30 m west	7	n/a
June 17	1.8 metres north	30 m west	6	n/a
June 17	0.5 metres north	30 m west	12	n/a

- **Readings in the 3 to 10 second range are quite acceptable from a skid resistance viewpoint.**

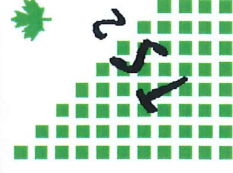


Figure 4.5
Humble Equipment Co. Outflow Meter

4.3 Fuel Resistance Comparison

Fuel Resistance Comparison will be undertaken on several sections of the untreated and RejuvaSeal™ treated sections in close proximity to the Outflow meter tests in the near future. This comparison will consist of pouring about a cupful of diesel fuel onto the road surface and then later checking the penetration of the fuel. If the fuel readily penetrated the asphalt pavement surface, then resistance to this form of chemical attack was presumed to be lower than if the fuel pooled on the surface of the asphalt pavement and slowly evaporated.

4.4 Elasticity/Ductility Testing

This aspect of the testing is beyond the capabilities of the field equipment available to both Crown Capital Enterprise Limited and RejuvaSeal™ personnel and as such, external assistance has been sought from outside experts in the field of Asphalt Testing. .

5.0 Test Completion Schedule

The team of technicians from the Hong Kong office 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.