CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™
Chen-Guan Expressway, ChengDu,
Sichuan Province,
Peoples Republic of China

November 2001

TS^2 Consulting Inc.
Lamma, Hong Kong

TS² CONSULTING INC.

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

Hong Kong (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

China (Liaison Office)
Room 2607, Feng Yuan Bldg,
RenMing Zhong Lu,
Kunming, Yunnan,
Peoples Republic of China,
Phone: (86-871)-537-7086
Mobile:(86)-1362-949-8994
Email: speed_cny@yahoo.co.uk

中国云南昆明市人民中路丰园大厦2607室

November 16th. 2001

Crown Capital Enterprise Limited
B5, Centre Point Building
181 – 185 Gloucestor Road,
Wanchai, Hong Kong.

Attn: Charence Chiang
General Manager

Dear Charence

Re: Demonstration of RejuvaSeal™ on Cheng-Guang Expressway, Sichuan.

This is the final report on the demonstration of RejuvaSeal™ on the Cheng-Guang Expressway, Sichuan Province, which connects ChengDu to DuJiangYan. On November 6th, 2001, a demonstration strip, some 502 metres in length and covering the inside lane on the southbound side of this six-lane, toll highway was undertaken. The asphalt pavement on this highway was approximately 18 months old and shows signs of advanced deterioration, with ravelling and potholes in some locales. Fosroc Nitoflor Aggregate was applied to several segments of the demonstration strip on an experimental basis

Yours Sincerely

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

LICENSED PROFESSIONAL ENGINEER
A. G. SPEED
PROVINCE OF ONTARIO

Crown Capital Enterprise Limited.
RejuvaSeal Demo
Cheng-Guan Expressway

Demo Date	6-Nov-01
Prepared by	A.G. Speed
Updated by	A.G. Speed
Updated	13-Nov-01

Assumptions

Panels 1-5 L	23.0	Metres
Panel Width	3.5	Metres
Panel Area	80.5	Sq Metres
Panels 6-23	21.5	Metres
Panel Width	3.5	Metres
Panel Area	75.3	Sq Metres

Conversion Factors

US Gallon:	3.78	Litres
Sq Metre=	10.76	Sq Feet
Sq Metre=	1.20	Sq Yds

Crew Consist	No
Labourers	8
Truck Dr	1
Supervisor	1
Total	10

Work Schedule am/pm	Work Time (hrs)	No. of Panels	Test Length (m)	Total Area m^2	Total Area yd^2	RejuvaSeal Applied US gals	RejuvaSeal Applied litres	Application Rate USGal /yd^2	Application Rate Litres /m^2	Application Rate m^2 /Litre	10 Man Crew m^2 /man hr	10 Man Crew yd^2 /man hr
10:15-11:25	1.17	5	115	403	481	25	95	0.052	0.23	4.26	34.5	41.2
11:25-11:45	0.33	4	86	301	360	20	76	0.056	0.25	3.98	90.3	107.9
13:45-15:30	1.75	14	301	1,054	1,259	70	265	0.056	0.25	3.98	60.2	72.0
Totals	3.25	23	502	1,757	2,100	115	435	0.055	0.25	4.04	54.1	64.6

Test Patches
Cheng-Guan Expressway
Km 0+/-

Test Patch Date
5-Oct-01

Test Patch Number	Patch Width (m)	Patch Length (m)	Total Area m^2	Total Area ft^2 approx	RejuvaSeal Applied US gals	RejuvaSeal Applied litres	Application Rate USGal /ft^2	Application Rate USGal /yd^2	Application Rate Litres /m^2	Application Rate m^2 /Litre
One	1.00	1.11	1.11	12	0.07	0.25	0.006	0.050	0.22	4.46
Two	1.00	1.38	1.38	15	0.07	0.25	0.004	0.040	0.18	5.50

FlowMeter Reading:	Time (sec)	Location	Taken on Nov 6
Treated	4	on Test Patch 4.5m^2/litre	
Un-treated	3	between Test Patches	

Treated	Time (sec)	Location	Taken on Nov 8
1	6	Panel No. 1	
2	3	Panel No. 1	

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RejuvaSeal
Cheng-Guan Expressway, ChengDu, Sichuan Province,
Peoples Republic of China

November 2001

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	14
4.2	Water Dissipation	14
4.3	Fuel Resistance Testing	16
4.4	Elasticity/Ductility Testing	16
5.0	Project Completion Schedule	17
6.0	Statement of qualifications	19

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	Application of Nitoflor Hardtop Aggregate to RejuvaSeal™	12
4.4	Finished Surface	13
4.5	Humble Equipment Co. Outflow Meter	15
5.0	Project Completion Schedule	18

TABLES

No.	Description	Page
4.1	Geographic Location of Test Patch	5
4.2	Details on Test Patch on Cheng-Guang Expressway, ChengDu	5
4.3	Geographic Location of Demo Site	9
4.4	Details on RejuvaSeal™ Demonstration Section on Cheng-Guan Expressway, ChengDU	10
4.5	Outflow Meter readings at Demo Site	14

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RejuvaSeal
Cheng-Guan Expressway, ChengDu, Sichuan Province, Peoples Republic of China

September 2001

APPENDICES

No.	Description
A	Rejuvaseal™ – Technical Seminar, ChengDu, China, 28 September, 2001
B	Rejuvaseal Descriptive Literature
C	Nitoflor Hardtop Aggregate Specification sheet

TS² Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RejuvaSeal™
Cheng Guan Expressway, ChengDu, Sichuan Province
Peoples Republic of China

November 2001

1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement with the City of ChengDu, in Sichuan Province, China in September 2001. This arrangement calls for the analysis of the performance of RejuvaSeal™, a sealer/rejuvenator for asphalt pavement on highways within the jurisdiction of the city.

The City of ChengDu is located in central Sichuan Province, which is bordered by Shanxi, Hubei, Guizhou and Sichuan Provinces. ChengDu has a lengthy history and extensive archival records exist via the numerous museums and historical exhibits in the immediate area, which document the growth of the City. The City of ChengDu is the capital city of Sichuan province and is a major service center for the area and in recent years has seen a major growth in population, along with significant construction due to a major government drive to introduce High Technology Industries to this province, considered one of the "Western provinces". The present population of ChengDu is estimated at approximately 10 million. See figure 1.0 for a map showing the location of ChengDu in Sichuan Province. The majority of the area lies at 600 to 700 metres in elevation, although mountains to the north and east hold some peaks that exceed 4,000 metres. The regions' latitude (30 degrees north), mean that there are four seasons, with temperatures ranging from 40 Celsius in the long, hot summer to minus 5 Celsius in the short winter. The rainy season is primarily May thru August, but can extend into September. Although this year, the rains extended to late October.

In the immediate ChengDu area, a sequence of sedimentary rocks predominates and due to the significant rock cuts along the highways, numerous rock outcrop exposures are available. Drainage channels such as the Fu and Sha River, also afford opportunities to see the bedrock. The asphalt in the area is manufactured from local materials, which is comprised of crushed and screened sandstone, as well as washed gravels from the various rivers. The bitumen binder for the asphalt is sourced from various locations. Since ChengDu is only 320 kms from ChongQing on the Yangtze River, which is navigable by ocean vessels, the possibility of bitumen being sourced from offshore is a distinct possibility so refineries in Singapore and the like should not be forgotten.

TB2 Consulting Inc.
Wanchai, Hong Kong

SCALE:	NTS
PROJECT NO.	B023

REJUVASEAL DEMO

CROWN CAPITAL ENTERPRISE LIMITED

GENERAL LOCATION MAP

DRAWING NO.	REV.
FIGURE 1.0	A

Figure 1.0 General Location Plan

2.0 CO-OPERATIVE PROGRAM

The intent of the arrangement with the City of ChengDu is to demonstrate RejuvaSeal™ at different locations selected by the Sichuan Communications Department, which will subsequently allow analysis of the performance of Rejuvaseal™ on a variety of asphalt surfaces. A demonstration was undertaken on the Cheng Guan Expressway that links ChengDu with the city of DuJiangYan on November 6, 2001. The portion of the expressway that was treated, was constructed in 1999. No details are known about the subgrade, but inspection of the shoulders show a sandy-silty material. Knowing construction techniques in highways in China in general, minimal gravel would be used for an immediate coarse base, beneath the asphalt pavement. In the proximity of the demonstration site, the highway runs on fill at an elevation, about 1.5 metres above the surrounding terrain. The surface of the asphalt is quite porous and concern has been expressed about rain percolating through the asphalt and softening the sub-grade. Several potholes have appeared in some adjacent sections of the expressway. Inspection of the asphalt at these locations showed that there was little bitumen to act as the binder and this could be attributed to either segregation of the asphalt during transportation to the site, or inadequate mixing during the asphalt production.

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 ChengDu on September 28, 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 Sichuan Province is located in a semi-tropical climate (Latitude: 30 North) at a low altitude (600 to 700 metres), it's a demanding setting for asphalt, given the year round warm climate (extremes of 40 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.

The City of ChengDu is responsible for 25,000 kilometres of highway, (distances as of year-end 2000). The highway network is forecast to expand to 30,000 kilometres by the end of year 2005.

In view of this extensive network of roads and the relatively short life of the asphalt surface, ChengDu is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, ChengDu has agreed to try RejuvaSeal™ on the Cheng Guan Expressway, which connects ChengDu with DuJiangYan. 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 expressway with respect to ChengDu

On November 5, two test patches on the shoulder of the Cheng Guan Expressway at the north tollgate were treated with RejuvaSeal™. The test patches were at the following geographic location:

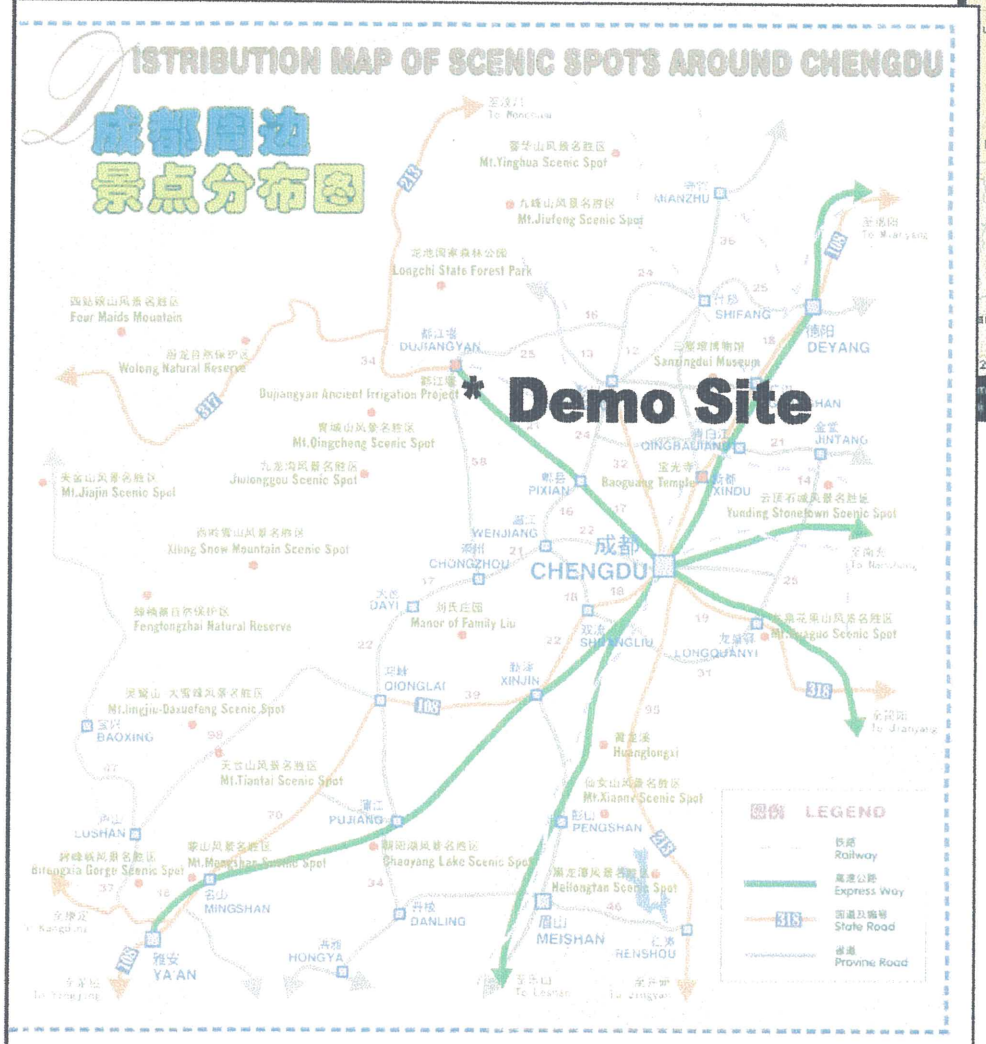
Table 4.1	**Geographic Location of Test Patch Site**	
System	**Northing**	**Easting**
Geographic (deg, min)	30^0 57.659'	103^0 39.963'
Universal Transverse Mercator Grid (48R) (metres)	3426054	0372595

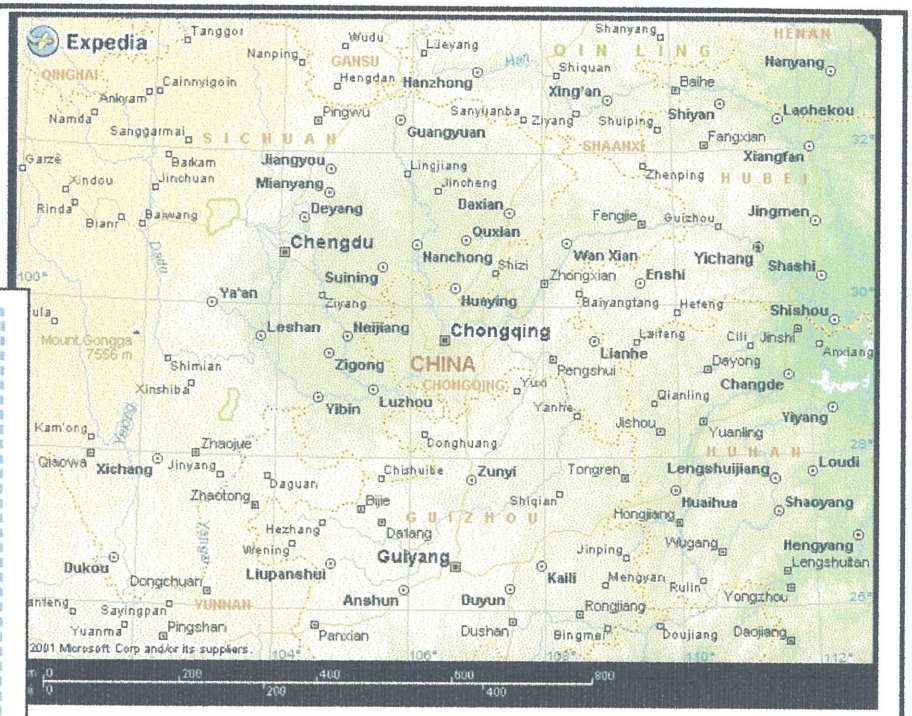
See Figure No 4.1 for a photo showing the test patches as implemented. Particulars of the test patches are as follows:

Table 4.2				**Particulars of the test patch**						
Test Patch Number	**Patch Width (m)**	**Patch Length (m)**	**Total Area m^2**	**Total Area ft^2 approx**	**RejuvaSeal™ Applied**		**Application Rate**			
					US gals	**litres**	**US Gal /ft^2**	**US Gal /yd^2**	**Litres /m^2**	**m^2 /Litre**
One	1.00	1.11	1.11	12	0.07	0.25	0.006	0.050	0.22	4.5
Two	1.00	1.38	1.38	15	0.07	0.25	0.004	0.040	0.18	5.5

Subsequent inspection of the test patches on November 6, showed that the application rate of 4.5 m^2/litre (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 demonstration section on the Cheng Guan Expressway is located at the north end of the Expressway, immediately in front of the tollbooths and some 2 kms south of the town of Du Jiang Yan. 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 of the Expressway is graphically shown in figure 4.1, which follows.





TSZ Consulting Inc. Lumma, Hong Kong	REJUVASEAL DEMO	
	CROWN CAPITAL ENTERPRISE LIMITED	
	DETAILED LOCATION PLAN	
SCALE: NTS	DRAWING NO. FIGURE 4.0	REV. A
PROJECT NO. B023C		

Figure 4.0 Specific Location Plan

Figure 4.1: Test Patches at Demo Site

Figure 4.1 Test Patches at Demonstration Site

the demonstration section, at kilometer post 40 (as measured from ChengDu) some 45 kilometres northwest of ChengDu, on the Cheng Guan Expressway was selected by the Sichuan Communications Department, and is geographically located as follows:

Table 4.3	Location of Demo Site	
System	**Northing**	**Easting**
Geographic (deg, min)	30^0 57.659'	103^0 39.963'
Universal Transverse Mercator Grid (metres)	3426054	0372595

This is at the same location as the test patch. Refer to Figure 4.0 for the location. Work commenced on the demonstration section at 10:15 am on November 6, on a warm, sunny day, where the mid-day temperature reached 16 Celsius. This was the first sunny day, following a lengthy extended rainy period. A strip, 502 metres long, on the high speed (overtaking lane) inside lane on the south bound side of the six lane, divided portion of the Cheng Guan Expressway was treated. The test section is located on a straight, flat section with no gradient for the most part. 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 18 months old (1999 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The highway surface was not appreciably worn and for the most part, bitumen coated the aggregate. There were no lateral or longitudinal cracks and no rutting due to traffic wear. There was some slight aging and oxidation of the bitumen, which extended to a depth of several millimetres. The entire portion of the treated highway section was on a compacted silty-clay, sub-grade

On November 6, an initial five segments (panels) were marked off in 23. metre lengths. The width of the lane is 3.5 metres between the painted lane dividing line and the shoulder (inside lane) marker 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.

An additional 18 segments (panels) were subsequently marked off, with the length shortened to 21.5 metres, as the rough surface required more RejuvaSeal™ to effectively cover the surface. This resulted in the application rate for the RejuvaSeal™ being increased from 4.26 metre^2/litre to 3.98 metre^2/litre. The last panel was completed at 3:30 pm.

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

Table 4.4				Details on RejuvaSeal™ Demonstration Section on Cheng Guan Expressway						
Work Schedule	Work Time (hrs)	No. of Panels	Test Length (m)	Total Area m^2	Total Area yd^2	RejuvaSeal™ Applied		Application Rate		
						US gals	litres	US Gal /yd2	Litres /m2	m2 /Litre
10:15-11.25	1.17	5	115	403	481	25	95	0.052	0.23	4.26
11:25-11:45	0.33	4	86	301	360	20	76	0.056	0.25	3.98
13:45-15:30	1.75	14	301	1,054	1,259	70	265	0.056	0.25	3.98
Totals	3.25	23	502	1,757	2,100	115	435	0.055	0.25	4.04

In view of concern expressed by the Cheng Guan Expressway Co. Ltd, that the RejuvaSeal™ treated road gave the appearance of a slippery surface, Nitoflor Hardtop Aggregate (a topping mix), was applied to the road surface immediately following the application of RejuvaSeal™. The application rate was approximately 0.25 kgs/sq metre (0.5 lbs/sq yard). This was applied to the last (most northerly) section treated Nitoflor is a product sold by Fosroc and at was purchased in Hong Kong. Further information on this Nitoflor product is contained in the Fosroc information sheet for this product in Appendix C. The approximate size consist for Nitoflor Hardtop Aggregate is stated as follows: >98% passing #8 mesh (2.5 mm) and <5% passing #30 mesh (0.5mm).

Ambient temperatures at the time of the application were in the 14 to 16 degree Celsius range, with humidity in the 85% range. The application ceased at 3:30 pm and the lane remained closed until 8:00 pm on November 6, when it was re-opened for traffic. Photos showing the test application of RejuvaSeal™ follow in figures 4.2, 4.3 and 4.4. on the following pages.

The site was visited on November 8 around 12:30 pm and a difference was readily perceived between the RejuvaSeal™ treated section and the adjoining untreated portion. A screwdriver was used to dig two small holes in the asphalt pavement, to a depth of 3 centimetres, some 5 metres north of the start point (south end) of the demonstration section, to determine the penetration of the RejuvaSeal™. This was two days 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. Approximately 95% or the Nitoflor Hardtop Aggregate remained on the surface of the road, although minimal traffic had the opportunity to travel over this section, as it had only been open for 40.5 hours (from 8 pm on November 6 to the time of the visit at 12:30 pm on November 8). Little to no carryover of the RejuvaSeal™ was observed from vehicle tires, so it can be presumed that the surface was dry at the time of the re-opening of the lane on November 6 at 8 pm.

Figure 4.2: Typical Application Procedure for RejuvaSeal TM

4.2	Typical Application Procedure

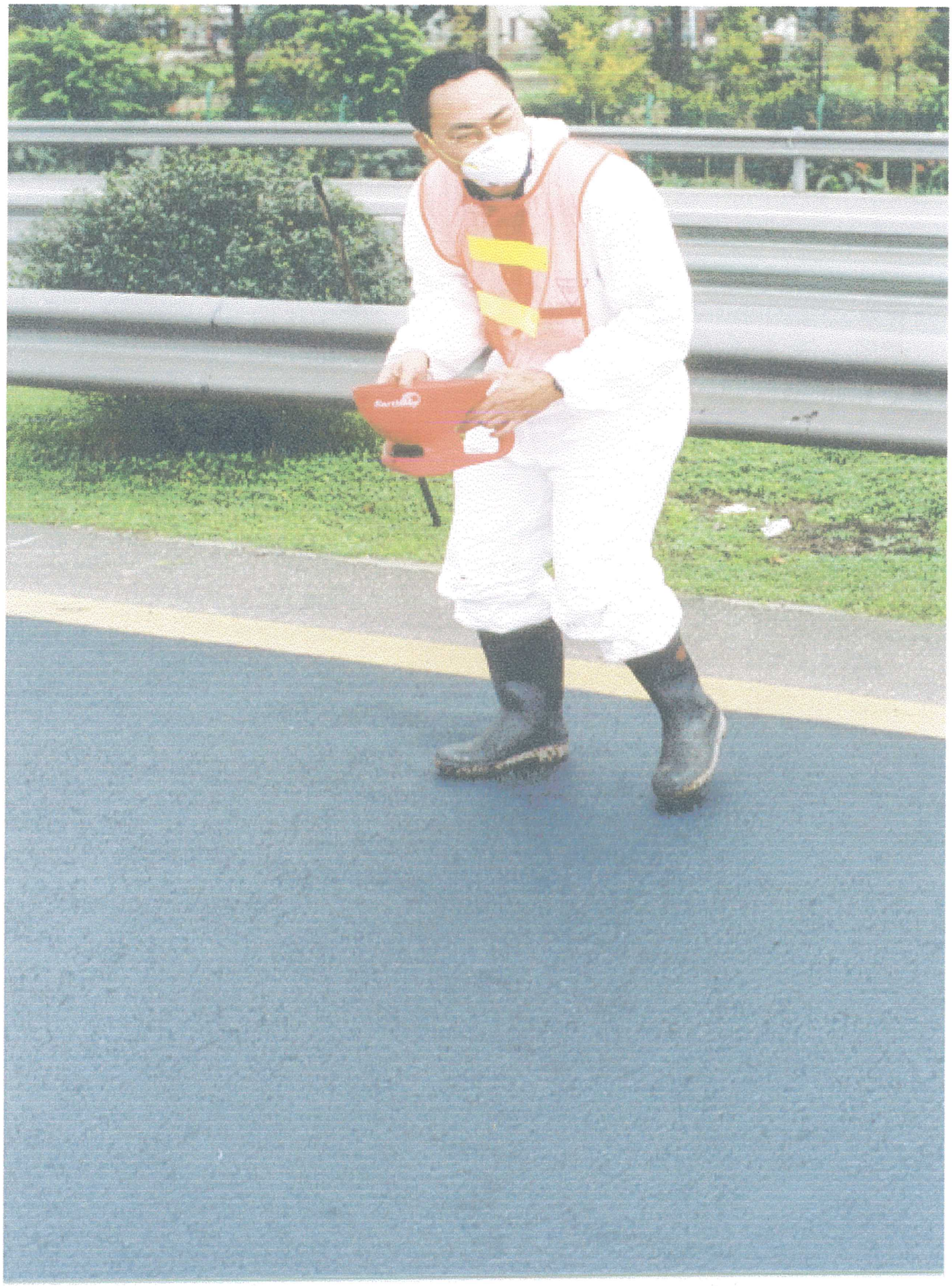


Figure 4.3: Applying Coat of Nitoflor Aggregate to RejuvaSeal ™

4.3	Application of Fosroc Nitoflor hardtop Aggregate to RejuvaSeal™ .

Figure 4.4: Finished RejuvaSeal ™ Surface

Figure 4.4 Finished Surface

4.1 RejuvaSeal™ Testing

To date the comparison of the asphalt treated with Rejuvaseal™ has been compared on a subjective basis over a very short period at the test site on the Cheng Guan Expressway. Testing equipment brought to the site for comparison on a more disciplined, objective basis 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).

Testing equipment will be brought to the site for comparison on a more disciplined, objective basis in the future, and to this end, the following tests will be undertaken.

- Fuel Resistance Comparison
- Elasticity/Ductility Testing

. 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.

Initially readings were taken with this aforesaid Outflow Meter at two locations on the portion of the highway selected for the test, in proximity to the test patches. These initial readings were taken at 10 am on November 6,. Further readings were taken on the treated road surface, when the site was revisited on November 8 at 12.30 pm. The results are shown in the table that follows:

Table 4.5		**Outflow Meter Readings**		
Test	Location relative to inside shoulder line	Location relative to start of demo sect'n	Before RejuvaSeal™ (secs)	After RejuvaSeal™ (secs)
One	atop test patch	10 m north	n/a	6
Two	between test patches	8 m north	3	n/a
Three	0.8 m west	11 m north	n/a	3
Four	1.8 m west	11 m north	n/a	3

- **All these readings are quite acceptable from a skid resistance viewpoint.**

Figure 4.5: Humble Equipment “Outflow Meter”.

figure 4.5 Humble Equipment Company, "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.

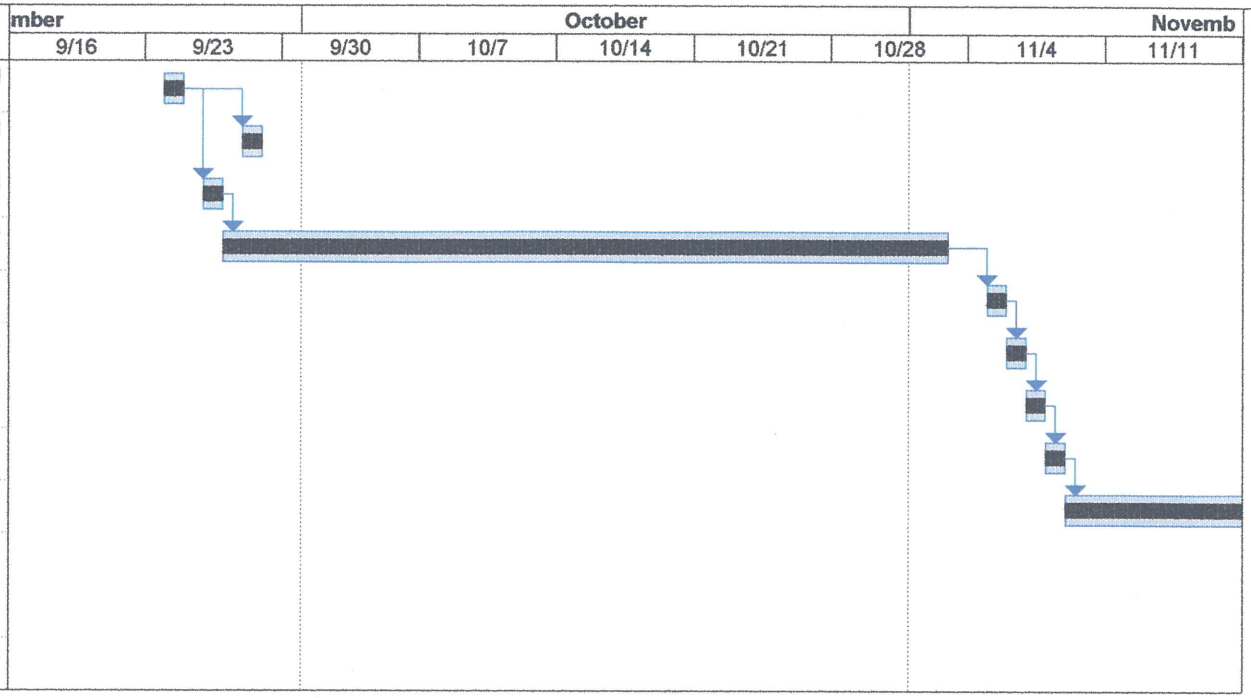
4.4 Elasticity/Ductility Testing

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. To this end, Dr John Emery in Toronto, Canada has been contacted for advise on independent 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.

ID	Task Name	Duration
1	Travel to ChengDu	1d
2	Seminar - ChengDu	1d
3	Testing of Asphalt Surface on ChengYu Hwy	1d
4	Rain Delays	27d
5	Test Patches on Cheng Guan Expressway	1d
6	Demonstration Section on Cheng Guan Expressway	1d
7	Demonstration Section on ChengYu Expressway	1d
8	Inspection of Demonstration Sections	1d
9	Prepare draft report on RejuvaSeal Demo and Testi	15d
10	Prepare and Submit final report	2d
11	Hiatus	60d
12	Visit to site to record status of demo	1d



Project: ChengDusched
Date: Mar 8

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

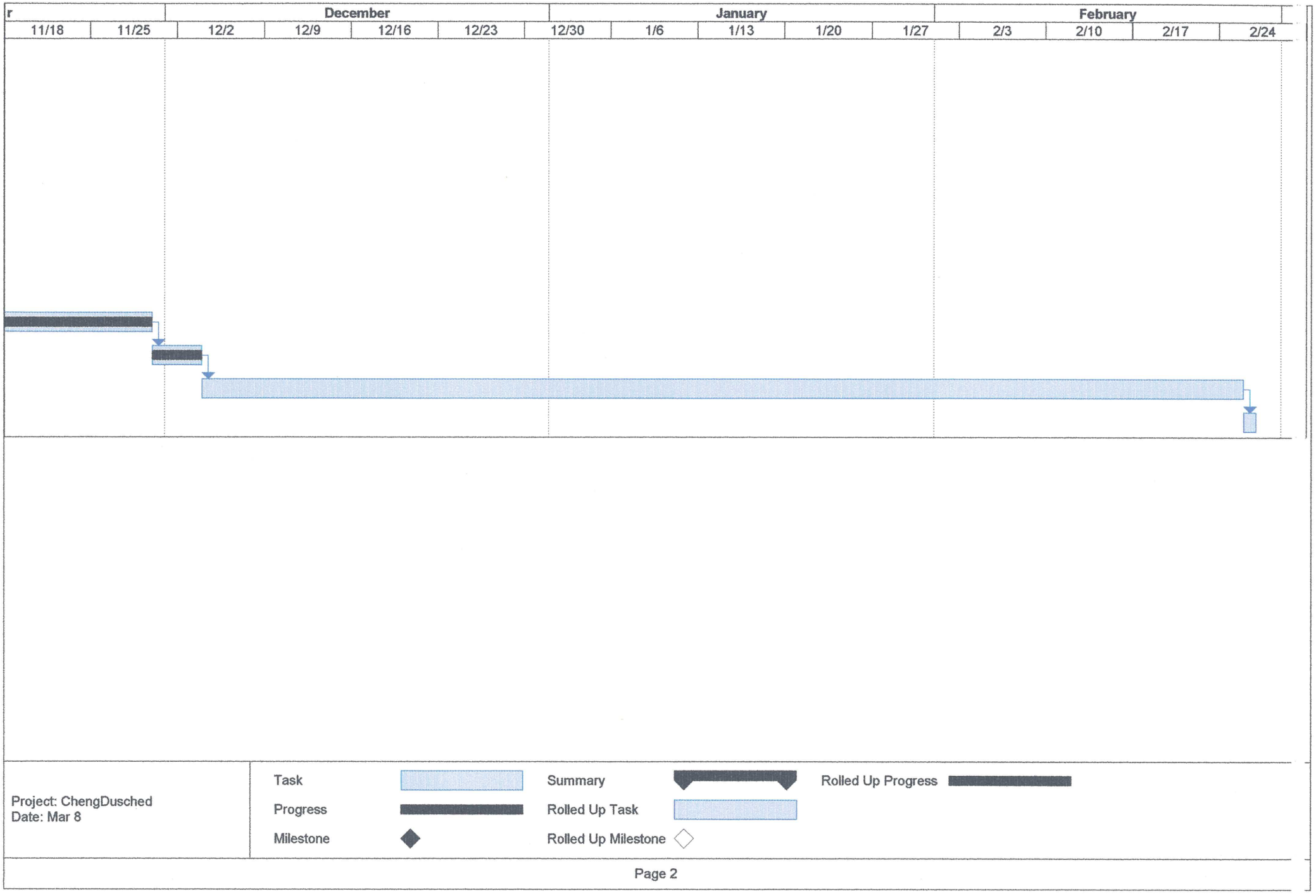

r
December
January
February
11/18
11/25
12/2
12/9
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
2/24
Project: ChengDusched
Date: Mar 8
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

Figure 5.0 Project Completion Schedule

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 25-29 and November 4-8, 2001 to ChengDu, Sichuan Province, China to view the test section, described in this report

Dated at Hong Kong, this 16 TH day of November, 2001

LICENSED PROFESSIONAL ENGINEER A. G. SPEED PROVINCE OF ONTARIO

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

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™ Cheng-Guan Expressway, ChengDu, Sichuan Province, Peoples Republic of China

November 2001

APPENDICES

No.	Description
A	Rejuvaseal™ – Technical Seminar, ChengDu, Sichuan Province, China, 28 September, 2001
B	Rejuvaseal™ Descriptive Literature
C	Nitoflor Hardtop Aggregate Specification sheet

TS² Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™
Cheng-Guan Expressway, ChengDu, Sichuan Province, Peoples Republic of China

November 2001

Appendix A

Rejuvaseal™ – Technical Seminar, ChengDu, Sichuan Province, Peoples Republic of China, September 28, 2001

TS² Consulting Inc.
Lamma, Hong Kong

中怡

中怡企业发展有限公司
Crown Capital Enterprise Limited

沥再生 – 技术交流会
RejuvaSeal ™ - Technical Seminar

中国四川省城都市

Chengdu, Sichuan Province, China

二零零一年九月二十八日

28 September 2001

Registration and Reception

Introduction

Welcoming Speech

RejuvaSeal ™ – An Introduction

Road Demonstration Projects

Question and Answer Session

Lunch

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™
Cheng-Guan Expressway, ChengDu, Sichuan Province, Peoples Republic of China

November 2001

Appendix B

Rejuvaseal™ Descriptive Literature

TS² Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED
中 怡 企 業 發 展 有 限 公 司

RejuvaSeal™ 沥再生

Asphalt Pavement Rejuvenator
沥青路面再生密封剂

B5, CENTRE POINT, 181 – 185 GLOUCESTER ROAD, WANCHAI, HONG KONG
香港灣仔告士打道 181 - 185 號中怡大廈 B5 室
TEL.電話: + 852 - 2142 3500 FAX 傳真: + 852 - 2390 5465
E-mail 電郵: crowncap@crowncapital.com.hk

May 2001

沥再生 RejuvaSeal™

	页
Ⅰ. 概述	1
Ⅱ. 产品资料	
A. 新一代的沥青路面再生密封剂	2
B. 产品规范	3-5
C. 部份施用现场名单	6-7
Ⅲ. 技术数据事项	
A. 独立实验室之测试结果	8
B. 芯样测试步骤	9-10
Ⅳ. 应用须知	
A. 安全事项	11
B. 施工前测试之要求	12
Ⅴ. 质量保证	
Ⅵ. 美国联邦航空局之第 44 号工程法令	

附件 I. 一些使用沥再生的现场照片

附件 II. 沥再生 RejuvaSeal™ - 沥青再生密封剂时代来临 - 摘自 (2001 年国际机场科技)

附件 III. 加拿大国防部的执行测试概论 - 1999 年 9 月 24 日至 10 月 10 日之沥青路面之处理

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™
Cheng-Guan Expressway, ChengDu, Sichuan Province, Peoples Republic of China

November 2001

Appendix C

Nitoflor Hardtop Aggregate

Specification Sheet

TS^2 Consulting Inc.
Lamma, Hong Kong

Nitoflor Hardtop Aggregate

FOSROC

The right chemistry for construction

Monolithic surface hardening compound

Uses

Nitoflor Hardtop Aggregate provides a highly abrasion resistant surface to concrete floors by the dry shake method which ensures the hard wearing surface bonds monolithically to the base concrete. It is ideally suited for all industrial areas subject to heavy traffic, e.g. loading bays, trucking lanes, car parks, workshops, machine shops, ramps and spillways.

Advantages

- Provides hard, abrasion resistant floors
- Provides high impact resistance
- Forms a monolithic bond with base concrete
- Good non-slip properties
- Easy and economical to apply

Description

Nitoflor Hardtop Aggregate is a quality controlled hardwearing aggregate selected for its physical properties of abrasion and wear resistance as well as shape and grading.

Nitoflor Hardtop Aggregate dry mixed with Portland Cement cures monolithically to provide a dense floor surface.

Technical support

Fosroc offers comprehensive technical support, including help at the design stage, application advice and on the site problem solving. Specifiers and contractors are encouraged to contact our trained staff for answers to their questions.

Properties

Nitoflor Hardtop Aggregate has been tested to ASTM.D4060 - Taber Abrader and BS 6431 - Part 20 (Wet Abrasive Method), alongside concrete mortar control panels. The test results show that Nitoflor Hardtop Aggregate improves the abrasion resistance of plain concrete by over 200%.

Compressive Strength (BS.6319.Pt.1.) At water contents equivalent to those obtained in practical applications, the typical 28 day strength of Nitoflor Hardtop Aggregate cubes exceeds 60 Mpa.

Mohs Hardness	>6
Specific Gravity	3.1
Corrosive Elements	None
Sieve Analysis # 8 (2.5mm)	>98% passing
#30 (0.5mm)	< 5% passing

Specification clauses

All base slab concrete areas so designated shall be applied with monolithic hard wearing, abrasion resistant floor hardener tested to BS 6431-Part 20 (Wet Abrasive Method), such as Nitoflor Hardtop Aggregate manufactured by Fosroc Ltd.

Application instructions

Base Concrete

The base concrete should have a minimum cement content of 300kg/m³. The concrete mix should be designed to minimise segregation and bleeding. Free water:cement ratios of less than 0.55 are required. The concrete should have a slump of between 75 and 100mm.

The base concrete should be laid and compacted in accordance with good concrete practice. Accurate finished profile and minimum laitence build up should be ensured. Particular attention should be paid to bay edges and corners to ensure full compaction.

Vacuum dewatering is not recommended when w/c ratios of less than 0.55 have been used.

Mixing

The following proportions should be dry-mixed together:

100kg Nitoflor Hardtop Aggregate
50kg Cement

Care should be taken to ensure that the two components are thoroughly mixed together. Mechanical mixing is preferred.

Application

It is recommended that the floor be marked off into bays of known area. Sufficient material should then be laid out to meet the required spread rates.

Application of Hardtop Aggregate can begin when the base concrete has stiffened to the point when light foot traffic leaves an imprint of about 3mm. Any bleed water should have evaporated now.

Hardtop Aggregate mix is applied in two application stages.

(a) The first application is made using 1/2 to 2/3 of the material required for the eventual end use. Hardtop Aggregate mix is evenly broadcast onto the concrete surface. When the material becomes uniformly dark by the absorption of moisture from the concrete this first application can be floated. Wooden floats, or, on large areas a power float may be used. It is important, however, that the surface is not over-worked.

(b) Immediately after floating, the remaining Hardtop Aggregate mix is thrown evenly over the surface. Again moisture is absorbed and the surface can be floated in the same way as before.

Final finishing of the floor using the blades of a power float can be carried out when the floor has stiffened sufficiently so that damage will not be caused.

Limitations

1. **Timing of Application**
   Timing of the application of the Hardtop Aggregate mix is important. Too early and excess water will be absorbed and the resultant floor surface will be of lower strength and subject to dusting. Also the dense aggregate of Hardtop Aggregate mix could sink and be lost from the surface. Too late and insufficient moisture will be available to completely hydrate the Hardtop Aggregate mix. Crazing and pitting of the surface are likely to result.

2. **Bay Edges**
   Where bay edges are likely to suffer particularly heavy impact or wear these can be given additional protection. Immediately after the base concrete is levelled, sprinkle Hardtop Aggregate mix on a strip 100-150mm wide along the bay edges. Steel trowel into the surface.

   Areas where saw-cut transverse control joints are located can also be pretreated in this manner.

3. **Curing**
   Tests have shown that proper curing of concrete floors treated with products such as Hardtop Aggregate mix is essential to ensure the physical properties of the floor.

   The most efficient method of curing is to use Fosroc Concure curing membranes which conform to ASTM and DOT specifications. However, in indoor applications where curing conditions are less arduous and breakdown of the membrane slower, alternative approved methods of curing such as polythene sheeting are acceptable.

4. **Surface Treatments**
   Because of the high density, low porosity surface finish of floors treated with Hardtop Aggregate mix, subsequent surface finishes are not recommended.

Estimating

Pack sizes

Nitoflor Hardtop Aggregate	50 kg bags

Coverage

Dry-mixed Nitoflor Hardtop Aggregate is applied at different rates per m² to provide floor surfaces suitable for different types of industrial use.

Application rate (Mixed)	Intended traffic use
2.5 kg/m²	Light vehicular
3.5 kg/m²	Heavy vehicular & storage
5.0 kg/m²	Aisleways & industrial
7.5 kg/m²	Severe impact & abrasion

Storage

There is no minimum shelf life for Hardtop Aggregate. Bags should be stored in dry conditions.

Precautions

Health & safety

Portland cement is alkaline when in contact with water. Avoid prolonged contact with the skin. Any eye contamination should be washed immediately with plenty of clean water and medical advice sought.

For additional information please consult your local Fosroc office for a copy of the products health and safety datasheet.

Hardtop Aggregate is non-flammable.

Additional information

Fosroc offers a comprehensive range of products for all types of specialist floor applications. This range provides solutions to satisfy the most critical conditions to ensure the safe working environment required from industrial and heavily trafficked floors.

FOSROC