CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of RJSeal™
National Highway G314, NingJin,
ShanDong Province,
Peoples Republic of China

July 2003

TS² Consulting Inc.
Lamma, Hong Kong

TS² CONSULTING INC. <

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August 19, 2003

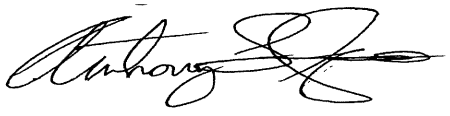
Crown Capital Enterprise Limited
B5, Centre Point Building
181 – 185 Gloucestor Road,
Wanchai, Hong Kong.
Attn: Charence Chiang
General Manager

Dear Charence

Re: Demonstration of RJSeal™ on National Highway G314, NingJin, ShanDong.

This is the final report on the demonstration of RJSeal™ on National Highway G314, immediately south of the town of NingJin, ShanDong Province. This demonstration was undertaken on July 30 and encompassed a 500 metre long section on both lanes of this two lane highway. The principal interest of the Traffic Administration Bureau of QingDao, ShanDong Province was restoration of the asphalt pavement's ductility and elasticity as well as improvement of the resistance to water penetration.

Yours Sincerely



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

Crown Capital Enterprise Limited.
RJS Demo
NingJin - National Hwy 314

Demo Date	30-Jul-03
Prepared by	A.G. Speed
Updated by	A.G. Speed
Revised	23-Aug-03

Assumptions

Eastbound Lane	4.50 Metres
Westbound Lane	4.50 Metres
Total Width	9.00 Metres

Conversion Factors

US Gallon=	3.78	Litres
Sq Metre=	10.76	Sq Feet
Sq Metre=	1.20	Sq Yds
SG	1.04	

Crew

Desco Op	1
Desco helper	1
Truck Driver	2
Labourers	4
Supervisor	2
	10

Work Schedule am/pm	Work Time (hrs)	Test Length (m)	Total Area m^2	Total Area ft^2 **approx**	Total Area yd^2 **approx**	RejuvaSeal Applied			Application Rate					10 Man Crew	
						US gals	litres	kgs	USGal /ft^2	USGal /yd^2	Litres /m^2	m^2 /Litre	m^2 /kg	**m^2 /man hr**	**yd^2 /man hr**
9:00–10.15	1.25	300	1,800	19,363	2,151	76	288	300	**0.004**	**0.035**	**0.16**	**6.24**	**6.00**	144.0	172.1
10:15-10:45	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 - 11:00	0.25	300	900	9,682	1,076	38	144	150	**0.004**	**0.035**	**0.16**	**6.24**	**6.00**	360.0	430.3
Totals	2.00		2,700	29,045	3,227	114	433	450	**0.004**	**0.035**	**0.16**	**6.24**	**6.00**	135.0	161.4

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Peoples Republic of China

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B	RJSeal Descriptive Literature
C	Desco D200 Sprayer – Technical Data

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1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement with the Traffic Administration Bureau of QingDao, ShanDong Province, China in July 2003. This arrangement calls for the analysis of the performance of RJSeal™, a sealer/rejuvenator for asphalt pavement on highways within ShanDong Province.

ShanDong Province straddles the Yellow River (HuangHe) at it's confluence with the Bohai Sea. 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. NingJin, is approximately 100 kilometres north of Jinan, the capital city of ShanDong and lies north of the Yellow River. NingJin is just immediately south of the border with Hebei Province The population of NingJin is estimated at approximately 20,000. See figure 1.0 for a map showing the location of ShanDong. The majority of the area lies at 10 to 20 metres in elevation, on the extensive plain that borders the Gulf of Bohai and the East China Sea. The regions' latitude (36 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. Their is no rainy season per-se, just thunderstorms and these occur primarily in June thru August, but can extend into September.

In the immediate NingJin 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 located elsewhere 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 bitumen production. ShanDong Province borders the East China Sea, the possibility of bitumen being sourced from offshore is a distinct possibility so refineries in Singapore and the like should not be forgotten.

Figure 1.0 General Location Plan

2.0 CO-OPERATIVE PROGRAM

The intent of the arrangement with the Traffic Administration Bureau of QingDao is to demonstrate RJSeal™ at different locations selected by the Bureau. The demonstration will subsequently allow analysis of the performance of RJSeal™ on a variety of asphalt surfaces. A demonstration was undertaken on National Highway G314, immediately south of the Town of NingJin on July 30, 2003. The portion of the highway that was treated was composed of asphalt pavement of 1997 vintage. 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. The surface of the asphalt is quite smooth and concern had been expressed about hydroplaning during heavy rains and also water percolating through cracks in the asphalt pavement and softening the sub-grade. Furthermore, this asphalt pavement is approaching it's mid-life and keen interest was expressed in having the life extended.

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, 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 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 twenty six (26) locations in China and five (5) commercial-scale applications have taken place at various locations, including Shanghai and Kunming.

4.0 TEST PROGRAM

Since ShanDong Province is located in a semi-tropical climate (Latitude: 34 to 37 North) at a low altitude (10 to 20 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 Highways. NingJin County is responsible for administering a portion of the National Highway G314 which stretches 84 kilometres from Zhaizhe thru NingJin to LinYee. The manager of the Highway is NingJin County.

In view of this extensive network of roads and the relatively short life of the asphalt surface, the QingDao Traffic Administration Bureau is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, NingJin County has agreed to try RJSeal^{TM} on the National Highway G314, nearby the Town of NingJin. See Figure 4.0, showing the location of this highway with respect to NingJin and ShanDong

On July 30, an inspection was made of the asphalt pavement on this highway and it was decided to try an application of RJSeal^{TM} with the Desco D200 Sprayer at a rate of 6.0 square metres/kilogram. A trial strip on the southbound lane (adjacent to the shoulder) of National Highway G314 was undertaken with RJSeal^{TM}. The test strip was at the following geographic location:

Table 4.1	**Geographic Location of Test Patch Site**	
System	**Northing**	**Easting**
Geographic (deg, min)	37^0 39.044'	116^0 53.384'
Universal Transverse Mercator Grid (50S) (metres)	4167085	0490274

See Figure No 4.1 for a photo showing the test strip as implemented. Inspection of this test strip showed that the application rate of 6.0 m^2/kg was appropriate for the asphalt pavement at this location. Accordingly the balance of the demonstration section was treated at the same rate.

The north end of the 300 metre long demonstration section on National Highway G314 is located immediately south of the Town of NingJin. This strip is entirely asphalt pavement. See figure 4.0, which follows, for a map showing the general locale.

Figure 4.0 Specific Location Plan

Figure 4.1 Test Strip on southbound lane.

The demonstration section, on National Highway G314 was selected by the QingDao Traffic Administration Bureau Department in conjunction with the NingJin County road maintenance department and is geographically located as follows:

Table 4.2		**Location of Demo Site**	
Location	**System**	**Northing**	**Easting**
North End of Test Strip	Geographic (deg, min)	37^0 39.044'	116^0 53.384'
	Universal Transverse Mercator Grid (metres) 50S	4167085	0490274
South End of Test Strip	Geographic (deg, min)	37^0 39.057'	116^0 53.163'
	Universal Transverse Mercator Grid (metres) 50S	4167109	0489947

Refer to Figure 4.0 for the location. Work commenced on the demonstration section at 9:00 am on July 30, on a hot, sunny day, where the mid-day temperature reached 34 Celsius. A strip, 500 metres long, on this two-lane highway was treated. The test section is located on a straight section. 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 5 years old (1997 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The asphalt pavement surface was appreciably worn with minor rutting due to traffic wear. There was aging and oxidation of the bitumen, which extended to a depth of several millimetres. There were longitudinal cracks and some lateral cracks. The entire portion of the treated highway section was on a compacted silty-clay, sub-grade

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

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

Table 4.3			**Details on RJSeal™ Demonstration Section on National Highway G314**							
Work Schedule	Work Time (hrs)	Test Length (m)	Total Area m^2	Total Area yd^2	RJSeal™ Applied			Application Rate		
					US gals	litres	kgs	US Gal /yd2	m2 /Litre	m2 /kg
9:00-10:15	1.25	300	1800	2151	76	288	300	0.035	6.24	6.00
10:15-10:45	0.50	0	0	0	0	0	0	0	0	0
10:45-11:00	0.25	300	900	1076	38	144	150	0.035	6.24	6.00
Totals	2.00	300	2,700	3,227	114	433	450	0.035	6.24	6.00

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 on the northbound lanes ceased at 7:00 pm and the crew then used rollers to apply additional RJSeal to the 1.75 metre strip beside the shoulder as the dirty soaked up a significant amount of RJSeal. The highway remained closed to traffic until 10 pm, on July 31 when it was re-opened for traffic. Photos showing the test application of follow in figures 4.2, 4.3 and 4.4. on the following pages.

The site was visited on July 31 around 10:00 am and a difference was readily perceived between the RJSeal™ 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 20 metres north of the extreme south end of the demonstration section, to determine the penetration of the RJSeal™. This was one day 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 1 millimetre thick. Below that depth, the grey, oxidized layer of asphalt was evident.

Figure 4.2 Typical Application Procedure.

Figure 4.3 Finished Surface.

TS2

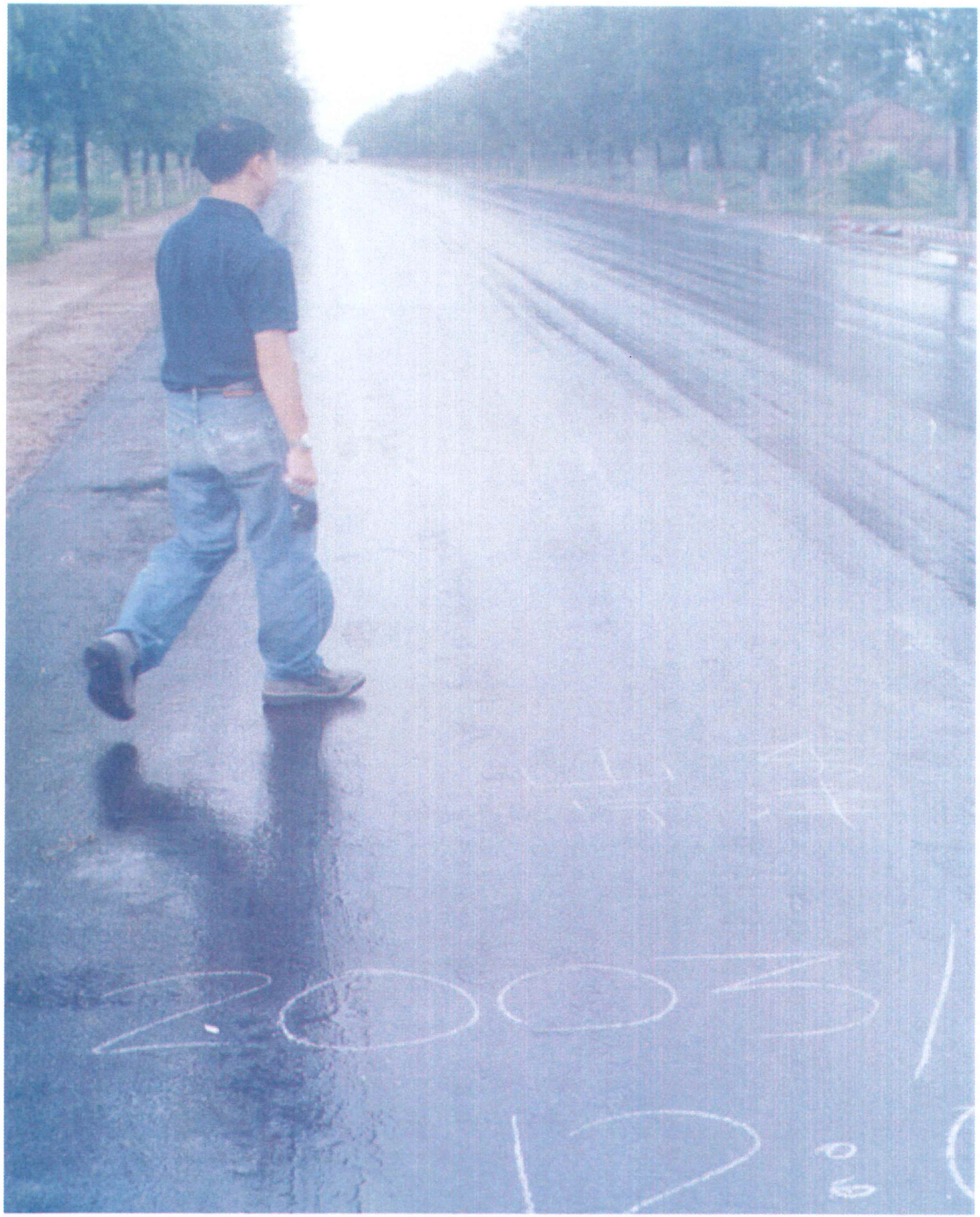


Figure 4.4 Site visit - following application

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 at the test site on National Highway G314. 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 RJSeal™ 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.

A reading was taken with this aforesaid Outflow Meter at one location on July 31 on the demonstration portion treated with Desco D200 Sprayer. Further readings were not implemented as a heavy downpour of rain precluded further work. This sole reading was taken at 10:00 am on July 31. The result is shown in the table that follows:

Table 4.4		**Outflow Meter Readings**		
Test Date	Location relative to shoulder of highway	Location relative to south end of test section	Before RJSeal™ (secs)	After RJSeal™ (secs)
July 31	2.5 metres west	20 m north	n/a	4

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

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 RJSeal™ 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 RJSeal™ personnel and as such, external assistance has been sought from outside experts in the field of Asphalt Testing. To this end, independent consultants have been contacted for advise on 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.

Figure 4.5
Humble Equipment Co. Outflow Meter

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

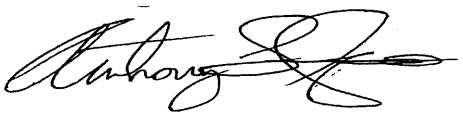
II. THAT I am a 1968 graduate of the University of Saskatchewan, Canada with a Bachelor of Science Degree in Mining Engineering.

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 July 30-31, 2003 to LiaoChen in ShanDong Province, China to view the test section, described in this report

Dated at Hong Kong, this _____day of August, 2003



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

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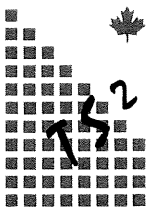

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Appendix A

RJSeal^{tm} – Technical Seminar,
Beijing,
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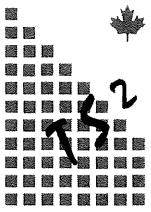
August 2001



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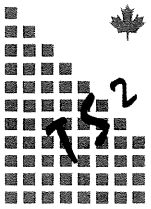
Appendix B

RJSeal™ Descriptive Literature



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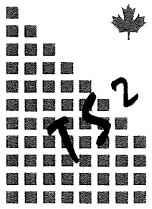
Appendix C

Desco D200 Sprayer

Technical Data



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