

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP

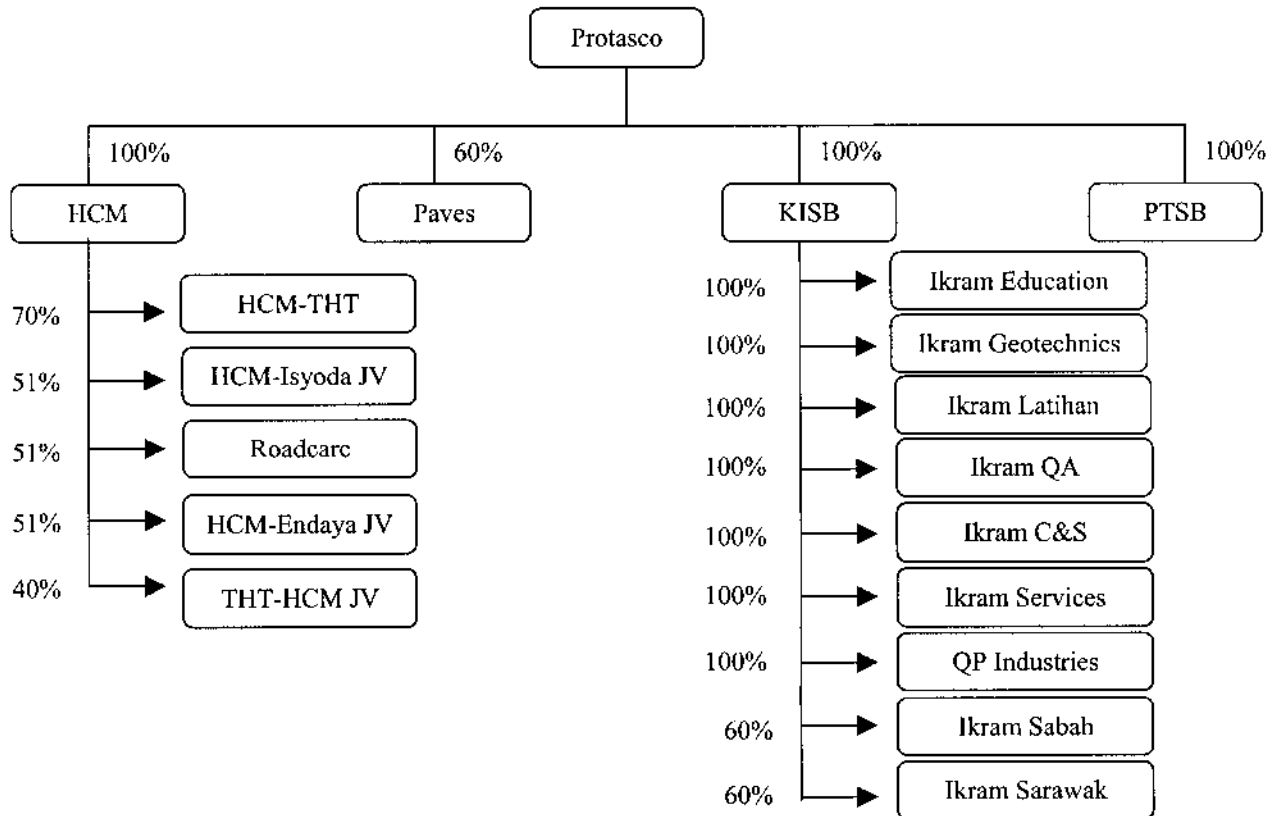
6.1 Introduction

The history of the Protasco Group can be traced back to the early 1990s when its founders, Dato' Hasnur Rabiain bin Ismail and Dato' Chong Ket Pen started in the road construction business by the setting up of HCM in 1991. In the start-up years, HCM was involved in sub-contracting works for clients like PROPEL and JKR. In 1994, the Group achieved a significant milestone when it was awarded a major road construction contract from PROPEL for RM7.5 million for the pavement construction of the East-West Link Expressway (Package 5) in Kuala Lumpur.

Over the past 10 years, the Group has gradually built up an impressive track record in road construction and rehabilitation and has recently expanded its scope of services to include road maintenance works. Today, the Group prides itself as an integrated specialist in road construction, rehabilitation and maintenance works.

6.2 Group Structure

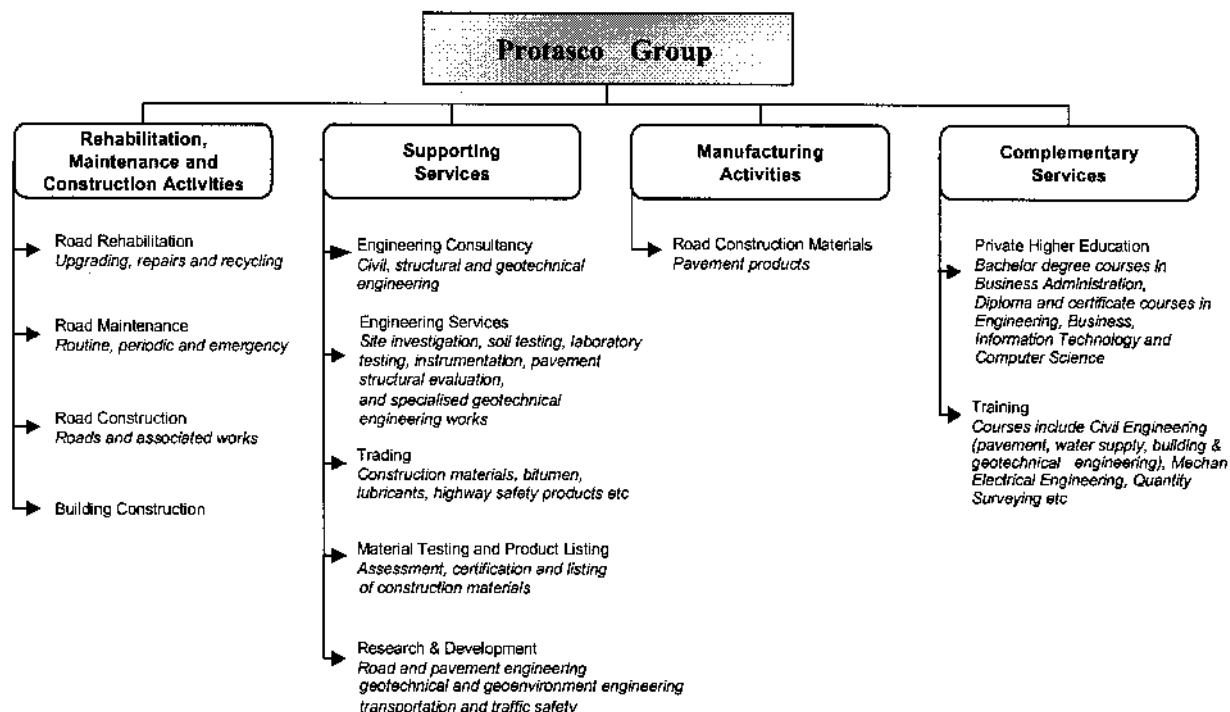
The corporate group structure of the Protasco Group is set out below:



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6.3 Principal Activities

The principal activities of the Protasco Group are broken down as follows:



The breakdown of the Group's turnover by business activities for the year ended 31 December 2002 is as follows:

Business Activities	Revenue Contribution for the Financial Year Ended 31 December 2002
Road construction, rehabilitation and maintenance	74.8%
Engineering services	9.3%
Trading	13.9%
Training	1.0%
Education	0.8%
Others	0.2%
Total	100.0%

The Group's core business activities in the financial year ended 31 December 2002 were in road construction, rehabilitation and maintenance works, which contributed approximately 74.8% of the Group's proforma turnover of RM715.6 million.

Over the past 10 years, the Group had completed a total of 39 projects with total contract value of approximately RM483 million. As at 31 May 2003, the Group has on hand 8 on-going road projects and one building construction project with a total contract value of approximately RM1.36 billion at various stages of construction.

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The Group's road construction and rehabilitation activities are primarily undertaken by HCM. HCM is registered with the CIDB. The company is able to tender for projects of unlimited value as it has a G7 ranking in civil engineering construction, specialising in road and pavement construction and general civil engineering works as well as in building construction specialising in general buildings and maintenance.

HCM is also registered as a Bumiputera contractor with PKK and holds a Class A licence, which enables it to tender for projects with contract values above RM10 million.

The Group has a dedicated and experienced team of engineers, project managers and technical personnel who are committed to quality and excellence to ensure the success of its projects.

The Group also has two long-term public sector concessions, as follows:

- (i) A 15-year concession for road maintenance valued at approximately RM103.9 million per annum based on routine maintenance works awarded to Roadcare, a 51% subsidiary of HCM via a privatisation agreement dated 22 December 2000. The concession excludes periodic maintenance and emergency works which are billed according to actual work carried out. The concession will expire in February 2016; and
- (ii) A 15-year concession to provide the Government with a range of services including geotechnical consultancy, forensic engineering, structural and material testing, site investigation and soil testing, pavement evaluation, training, research and development which is valued at RM348.3 million over the concession period was awarded to KISB via a privatisation agreement dated 5 November 1996 and a second supplemental agreement to the privatisation agreement dated 4 September 2002. The concession will end in 2011 or when the consumption of services by the Government reaches a cumulative total value of RM348.3 million.

Further details on the salient terms of the 2 concession agreements are set out in Section 17.10 of this Prospectus.

6.4 Principal Products and Range of Services

6.4.1 Road Construction

The Group's road construction activities are undertaken by HCM Group.

The Group adopts the "Construction Management Approach" in all its road projects, focusing on planning and management. To ensure maximum cost-effectiveness, the Group sub-contracts out portions of its projects such as relocation of utility services, earthworks, drainage, construction of small bridges, roadside furniture and street lightings. Depending on the projects, the Group may outsource the entire portion or only the labour of these portions, which has low added value.

The outsourcing of labour, which is mainly low-skilled, enables the Group to focus on its core competencies in pavement works.

6.4.2 Road Rehabilitation

Road rehabilitation is a principal activity undertaken by the Group through the HCM Group. Works carried out under road rehabilitation projects include upgrading, pavement repairs, pavement recycling and overlay.

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The Group has established a niche in road rehabilitation works, achieved through constant research and development and keeping abreast with the latest technology in pavement design and construction and in particular, pavement recycling technology.

The Group has vast experience in various techniques of pavement rehabilitation, which includes both conventional techniques as well as advanced asphalt technology in pavement recycling.

(a) Conventional Pavement Techniques

Some of the conventional techniques utilised by the Group are:

(i) Pavement Overlay or Resurfacing

This method is generally used for general pavement strengthening where a layer of new asphalt is laid on top of the old pavement.

(ii) Mill and Pave (Cut and Patch)

This is applicable where severe cracking or surface deterioration has occurred in the pavement. A milling machine is used to remove the affected area before a new layer of asphalt is laid in its place.

(b) Advanced Asphalt Technology

In keeping with its philosophy of staying abreast with changes in pavement technology, the Group has been successful in developing its technical expertise in various advanced asphalt techniques, such as:

(i) Very Thin Overlay

This is a technique where a thin layer of wearing course, approximately 20 mm thick, is laid with a modified bituminous binder. This pavement exhibits high performance in terms of durability and safety. The Group applied this technique on the Bangi-Seremban and Ipoh-Changkat Jering sections of the North-South Expressway.

(ii) Porous Asphalt

This technique basically involves laying porous asphalt with a modified bituminous binder. Due to its porous nature, water drains away from the pavement easily, thereby significantly reducing ponding and splashing. It also exhibits better skid resistance and lower noise levels.

6.4.3 Pavement Recycling

Pavement recycling is the process where the distressed road surface to be repaired is reused. The surface is milled, then mixed with bind additives before it is laid back, either as a base or a wearing layer. There are three main types of recycling, namely:

(i) Cold-in-Place Recycling (CIPR)

This environmentally friendly technique is very effective for treating full-depth cracked asphalt pavements. It is a more cost effective alternative to partial or total reconstruction of the cracked pavement.

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The process involves milling the mixed pavement layers to a maximum depth of 500 mm. The milled pavement is then remixed, with or without new aggregate materials, together with a binding agent before it is laid back. Depending on the condition of the pavement, binding agents such as cement, conventional or modified bitumen emulsion and foam bitumen are used.

(ii) Cold-in-Plant Recycling

This technique is the same as the CIPR except that a mobile mixing plant, which can be easily transported from one site to another, is used. The plant can be quickly set-up without any foundation work.

The mobile plant is capable of producing a variety of pavement materials using new aggregate materials, milling waste or reclaimed asphalt pavement, mixed with either cement, conventional or modified bitumen. The product is called CHIPmix.

(iii) Hot-in-Place Recycling

This technique is suitable for restoring wearing course layers experiencing minor rutting and cracking, where the depth of the cracks are less than 60 mm. It is a more superior alternative to the conventional cut and patch method.

The distressed pavement is loosened with a pre-heater and then remixed with new materials and a rejuvenating agent. The remixing is carried out in an onboard pugmill and the mixture is then laid back.

The remixing technique is also suitable when used with the laying of a new wearing course on top of pavement requiring additional overlay.

6.4.4 Road Maintenance

Advanced road and highways systems are developed along stringent measures to ensure safety, comfort and durability. As such, it is essential that these road infrastructures are properly maintained for the safety of its users. Furthermore, proper maintenance would maximise investments spent and reduce expenditure in the longer term. Road maintenance works can be divided into 3 main categories as follows:

(i) Routine Maintenance

Routine Maintenance involves repairs of potholes, maintenance of road shoulders, roadside furniture, drainage systems, bridges and culverts, grass cutting, landscaping on protocol roads and routine inspection.

(ii) Periodic Maintenance

Periodic Maintenance involves repair, replacement and installation of existing pavement, roadside furniture, drains, culverts and guardrails as well as slope repairs.

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(iii) Emergency Works

Emergency works involve:

- (a) Traffic management, clearing work and provision of temporary diversion in the event of slope failures;
- (b) Traffic management and provision of temporary crossing in the event of bridge or culvert failures; and
- (c) Traffic management in the event of floods or fallen trees.

6.4.5 Engineering Services and Consultancy

Over the past 10 years, to better support its road construction and rehabilitation activities, the Protasco Group, through Paves and the KISB Group, has developed its expertise in engineering services and consultancy. It currently provides the following:

- (a) pavement and structural evaluation;
- (b) quality control and assurance services;
- (c) geotechnical engineering services; and
- (d) geotechnical and structural forensic services.

The Protasco Group is continuously keeping abreast with local and global developments in pavement design and construction to enhance the quality of its evaluation and testing services and where suitable, customising its services to suit local road conditions.

(a) Pavement and Structural Evaluation Services

The Group has the capability of providing a complete range of pavement evaluation services to recommend the type of rehabilitation measures needed to repair, reinforce and stabilise distressed roads.

Some of the types of pavement evaluation tests carried out include:

- (i) **Ikram Road Scanner:** The scanner, which has laser sensors and video cameras, identifies the parameters of rut depth, texture depth, roughness, cracking, ravelling, longitudinal profile, crossfall, gradient and horizontal curvature.
- (ii) **Falling Weight Deflectometer Test:** Pavement conditions are assessed with the device and data is analysed using the Group's in-house software program, PENDOS, to determine the strength parameters of the road, such as the resilient modulus of each pavement layer, its residual life and overlay thickness.
- (iii) **Manual Surface Condition Survey:** The survey provides a means of quantifying the failures in the pavement (e.g. cracks, rutting or bleeding) shoulder and drainage.
- (iv) **Coring/Dynamic Cone Penetrometer Test:** The test determines the thickness of pavement layers, structural properties of materials and subgrade strength.

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- (v) **Ground Penetration Radar Survey:** This test determines the pavement thickness, presence of voids beneath concrete pavements and underground services (such as cable, pipe and culvert).
- (vi) **Texture Depth Measurement:** A mini texture meter, using laser technique, is used in place of a Sand Patch for the macrotexture of the pavement surface.
- (vii) **Skid Resistance Measurement:** A surface friction tester or a simple pendulum tester is used to determine the skidding resistance of road surfaces.
- (viii) **Axle Load (Weight-in-Motion)/Traffic Census Survey:** A 24-hour survey is conducted on both sides of the carriageway together with traffic census and an Origin-Destination survey. The survey is used to determine traffic volume, vehicle classification, damaging effects of heavy vehicles, origin and destination data.
- (ix) **Structural Evaluation Services:** The Group also provides evaluation services for structures such as bridges and flyovers to detect any possible weaknesses or defects such as cracks, spalling or corrosion, which may threaten the stability of the structure.

Preventive or corrective measures are then recommended to stabilise or restore the pavement condition to avoid serious damages from occurring.

Its range of structure evaluation services include:

- (a) Condition survey and structural assessment;
- (b) Destructive and non-destructive tests;
- (c) Bridge Management System; and
- (d) Ongoing monitoring work.

(b) Quality Control and Assurance Services

The Group believes that highly accurate information is critical in determining the factors which contribute towards a distressed or damaged road.

The Group has a well-equipped laboratory with the capability of carrying out a comprehensive range of laboratory tests on pavement materials to determine material quality control and compliance with project specifications.

Some of the tests include:

- (i) Asphalt recovery;
- (ii) Binder content;
- (iii) Aggregate grading;
- (iv) Bitumen viscosity/penetration and softening point tests;

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- (v) Marshall mix design; and
- (vi) Quality control and assurance testing.

(c) Geotechnical Engineering Services

Through KISB and its subsidiary companies, the Group provides a comprehensive range of geotechnical engineering services in the following areas:

- (i) Site investigation;
- (ii) Soil testing;
- (iii) Laboratory testing;
- (iv) Instrumentation and monitoring; and
- (v) Specialised geotechnical engineering works.

Site investigation involves the assessment of ground conditions of proposed civil engineering structures or developments. Recommendations are subsequently made on the feasibility and design of the structures.

The Group has a team of experienced and qualified engineers and technicians to undertake in-situ testing on foundations, roads, slopes, earthworks, new development areas, etc. The Group also has extensive experience in site investigation in tough and hilly jungle terrain, as well as over water for bridges, jetties and other marine structures.

Most investigations involve the excavation of trial pits or the sinking of deep boreholes using drilling rigs. Tests are carried out on extracted soil samples to assess the profile of the site, such as variability of soil conditions, in-situ density and permeability.

Soil testing undertaken by the Group comprise either field observations of soil profiles as well as physical and chemical analyses of soil samples in the Group's laboratory where they are described and classified.

The Group also provides instrumentation and monitoring services for geotechnical installations, water tables, ground movements and soil settlements.

Specialised geotechnical works provided by the Group include slope repairs, ground anchor, micropiling, guniting, soil nailing, horizontal drains, geotextile/geogrid reinforced walls, vertical drains and stone columns.

Through Ikram Geotechnics, the Group has a G4 ranking in Civil Engineering Construction and Building Construction with CIDB which enables it to tender for projects not exceeding RM3 million. It is also registered with PKK as a Class C contractor under the Building Works and Other Specialist Civil Engineering Works category which entitles it to tender for projects of between RM2,000,001 and RM5,000,000.

(d) Geotechnical and Structural Forensic Services

Geotechnical forensic services are performed for specific purposes, such as soil explorations and geotechnical analysis.

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Investigations and studies are undertaken in natural as well as 'man-made' disasters, including slope failure, settlement, slope stability, stability of retaining structure, river bank failure and road embankments.

Independent geotechnical reports done contain information on the causes of failure and its analysis. Remedial measures and conceptual design are also recommended.

Structural forensic services relate to the investigation of failed or distressed completed structures, aimed at assessing the real condition and adequacy of existing structures.

Typical investigation work is undertaken in 4 phases as follows:

- (i) Preliminary and detailed structural inspection;
- (ii) In-situ and laboratory material testing;
- (iii) Engineering assessment and conceptual and detailed remedial designs; and
- (iv) Contract administration and site supervision.

6.4.6 Other Business Activities**(i) Trading**

The Protasco Group, through PTSB, is presently involved in the trading of the following products:

- (a) Construction materials such as cement, pipes, steel bars, British reinforced concrete, beams, concrete products, geotextiles, vertical drain and other construction materials;
- (b) Petroleum based products such as bitumen, diesel and lubricants;
- (c) Highway safety products such as road signs, street lightings, road markings, guardrails, traffic management items; and
- (d) Other products such as scientific equipment, plant and machinery, machine parts and office equipment.

The Group sources and purchases most of its products directly from the suppliers and manufacturers.

Not less than 75% of the Group's raw material requirements, such as quarry products, steel products, bitumen, concrete products, geotextiles and diesel are purchased through PTSB. The Group also supplies to its sub-contractors and third parties.

As such, with a central procurement arm, the Group is able to purchase more cost effectively, especially in cases where bulk purchases are made. It is also in a better position to control material quality. Furthermore, its bulk purchases also accord the Group special privilege status in terms of prompt delivery and uninterrupted supply of materials.

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(ii) Material Certification and Product Listing Services

The Group, through Ikram QA, also undertakes the certification and listing of construction materials. The certification is conducted in accordance with ISO Guide 65.

Ikram QA was responsible for the publication of the approved Senarai Bahan/Barangan Binaan Tempatan No. 10 for the Treasury, Ministry of Finance and the assessment and certification of the local construction materials on the list. The Ministry of Finance has issued directives (Treasury Circular Letters No 11/2000 and 7/2002) to various government agencies, with the instruction that locally produced construction materials, as certified and listed by Ikram QA, are to be used on all government projects.

The Material Laboratory of Ikram C&S is an accredited Material Testing Laboratory. It was awarded the Certificate of Accreditation for ISO Guide 25 Quality Assurance by the Department of Standards, Malaysia in September 2000.

(iii) Manufacture of Pavement Products

In August 1998, the Group started manufacturing pavement products, on an experimental basis, developed in its in-house research and development laboratories.

In contrast with hot bitumen usually used for road construction, these products are all cold-mix products. In addition, the high performance, durability and convenience afforded by these products, make them highly suitable for pavement recycling works.

At present, the Group's product range are as follows:

- (a) IKRAMix; and
- (b) QS3E Emulsion.

(iv) Research and Development

The Group, through its R&D Centre and subsidiary company, Ikram C&S provides R&D services in several categories, such as applied research, contract research, academic research and innovative research.

The Group works closely with various government agencies and private companies to develop R&D programmes and to help facilitate the commercialisation of its research findings into competitive products.

At present, special emphasis is given to research, development and implementation of activities related to:

- (a) Road and pavement engineering;
- (b) Geotechnical and geoenvironmental engineering;
- (c) Transportation and traffic safety; and
- (d) Information technology in engineering.

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(v) Private Higher Education and Training Services

The Group is also engaged in the provision of private higher education and training services.

Through Ikram College of Technology ("iCT"), the Group is currently offering certificate, diploma and bachelor degree. Courses offered are in the field of:

- (a) Engineering;
- (b) Information Technology; and
- (c) Business.

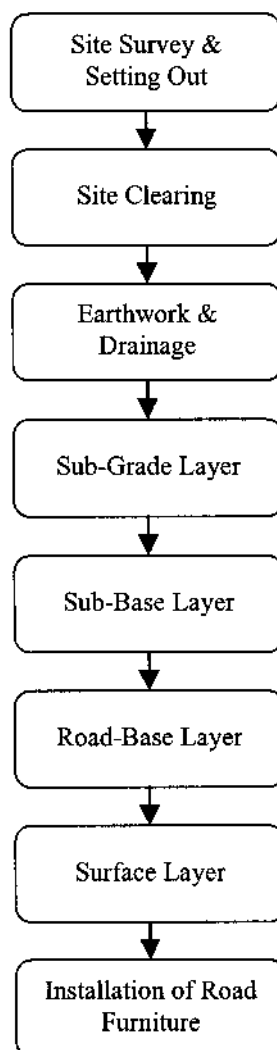
The enrolment of iCT, which is located in Taman Ilmu Ikram, Kajang, totalled 1,130 students in May 2003. The college is ISO 9001:2000 certified.

The Group also provides training courses related to Engineering, Technology (Skill), Management and Information Technology through Ikram Training and Infrastructure Development Institute ("ITiDi"). ITiDi is also ISO 9001:2000 certified.

On 12 January 2003, an invitation from the Minister of Education was received to upgrade iCT by setting up a university college to be known as Kuala Lumpur Infrastructure College University ("KLICU"). The registration of KLICU is in progress.

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6.5 Process Flows For Principal Products and Services**6.5.1 Road Construction**

In carrying out its work as a road construction contractor, the Group uses methods which ensure that the project specifications are complied with and successfully met.

Prior to the actual road pavement construction, some preliminary works are required. A surveyor would locate and set up the horizontal and vertical alignments and levels on the existing ground for the road to be built.

This is then followed by site clearing to clear the overburden of bushes, jungle and boulders, as well as any obstacles such as existing structures.

Road construction basically involves the laying of four layers, namely the sub-grade, sub-base, road-base and surface layers as further explained below.

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Sub-Grade Layer

- Works on the sub-grade layer involves ground levelling where excess levels of existing ground are cut or excavated and insufficient ground is filled and levelled with soil, with the use of backpushers and motorgraders. Soil used for filling is obtained from either nearby areas or from borrowed pits. Once the soil has been levelled to the desired level, the ground is then compacted according to specifications, using vibratory rollers. Density and Compaction Tests are carried out to determine the density and compactness of the ground respectively. California Bearing Ratio (“CBR”) Test is also undertaken to confirm the suitability of the soil as determined in the design.

Sub-Base Layer

- The next layer, the sub-base layer, is the lowest layer of pavement, consisting of sand and aggregates. This layer prevents water from penetrating the sub-grade layer. The Sieve Analysis is used to grade the raw materials first. Like the previous layer, backpushers and motorgraders are used to level and lay the materials at the desired level. The layer is then compacted with the use of vibratory rollers and compaction and CBR tests are carried out.

Road-Base Layer

- This is the pavement’s middle layer, which transfers the load uniformly to the ground. The Sieve Analysis is done on the crusher run, which is the main raw material used in this layer. Similarly, backpushers and motorgraders are used to level and lay the crusher run, followed by compacting of the layer with vibratory rollers. Compaction and CBR tests are again performed for this layer.

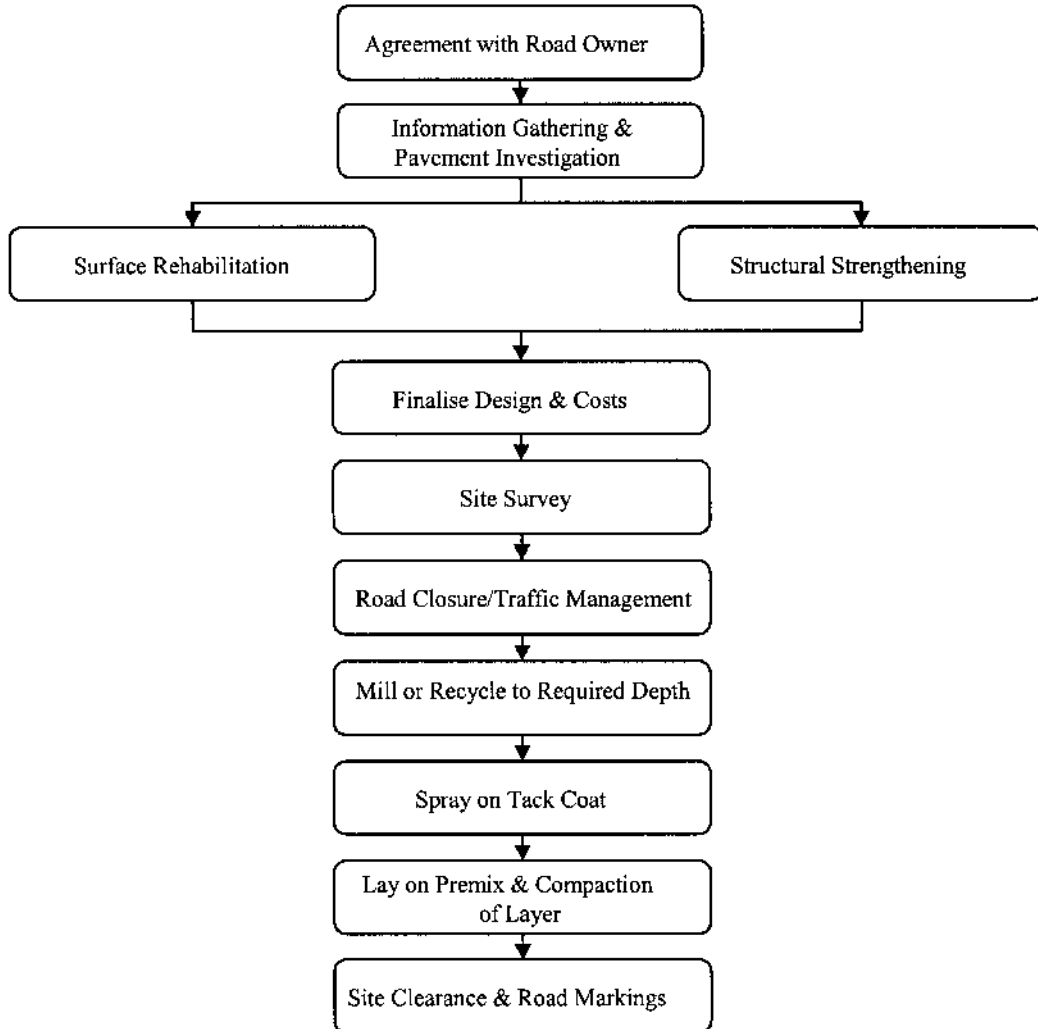
Surface Layer

- The surface layer is the final layer, comprising of premix which provides skid resistance and load transfer to the ground. Firstly, tests are carried out on samples of the premix. Marshall Density Test is carried out to ensure suitability whilst Binder Content Test is carried out to check that the bitumen used in the premix is according to standard specifications. Backpushers, motorgraders and pavers are then used to level and lay the premix dumped on top of the road-base layer. Next, vibratory and tyre rollers are used to compact the premix. Subsequently, Coring Test is performed to check the thickness of the layers of pavement.

Road construction is completed with the installation of road markings, lightings, plants and roadside furniture such as guardrails and information signs.

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6.5.2 Road Rehabilitation



Design life, functional and geometrical standards of the roads and practical construction consideration are some of the factors that are taken into account by the contractor prior to reaching an agreement with road owner. Once the agreement is made, the contractor is then involved in information gathering and pavement investigation at the assigned site. A costing analysis is prepared on rehabilitation options based on the information gathered and pavement investigation.

The two feasible options for rehabilitation works are surface rehabilitation and structural strengthening. Surface rehabilitation involves overlay, mill and replace or recycling works whilst structural strengthening involves total reconstruction, deep recycling or construction of an additional layer.

Once a decision is made on the type of work to be carried out, the pavement design and construction costs are finalised. The rehabilitation work can then begin based on the project schedule.

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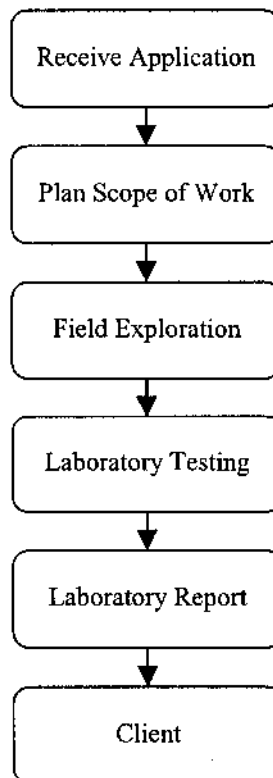
Some preliminary works are first carried out by a surveyor to locate and set up road alignments. To avoid damage to or interference with existing utility services, detection work may be required to be carried out to locate, demarcate and protect such services. This is followed by road closure of the affected area to ensure rehabilitation works can be carried out.

For the mill and pave process, a milling machine is first used to remove the affected area to the required depth before a new layer of asphalt is laid in its place. For the recycling process, the existing pavement is recycled with the addition of cement, foamed bitumen or bitumen emulsion, using a special purpose built recycling machine. Next, the milled or recycled surface is sprayed with a layer of tack coat before pavers are used to lay and level premix onto the coated layer. The layer is then compacted using tandem and tyre rollers.

Rehabilitation work is completed with site clearing and installation of road markings.

6.5.3 Engineering Services

Site Investigation and Soil Testing



When an application for site investigation and/or soil testing is received from a client, a site visit is made to assess the site. The scope of work is then proposed. An estimate costing for and scheduling of the work to be carried out is prepared and submitted to the client. Once the fee is agreed upon, the work can commence. The field exploration work is either done by its in-house team or outsourced to contractors on the approved panel of site investigators.

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Some of the field exploration techniques involving boring and ground penetration include:

(a) Deep Boring

There are two types of deep boring, namely boring in soil and rock coring.

- Boring in soil is the process whereby boreholes are advanced using rotary wash boring in which a cutting tool is rotated by a drilling rig while water or drilling mud is pumped down the drill rods to wash soil cuttings to ground level. Boring in soil is continued either until a specified resistance is reached according to the Standard Penetration Test (SPT) or until a specified depth. As the borehole is advanced, samples of soil or ground water are taken at specified depths. Besides SPTs, Vane Shear Tests are carried out to estimate shear strength and bearing capacity.
- Core barrels are used in the process of rock coring to drill through the rock and to retrieve rock cores of 54 millimetre in diameter. The Rock Core Recovery Ratio (CR), Rock Quality Designation (RQD) and Fracture Index (FI) are indicators used to assess the ratio of good quality cores over the drilling length.

(b) Deep Sounding and Piezocone

A deep sounding cone is advanced into the ground at the rate of 10 to 20 millimetre per second while the measured parameters are recorded at every 25 centimetres. The piezocone is advanced into the ground at a rate of 20 millimetre per second while the measured parameters are recorded at every 20 millimetres.

Both tests are terminated either at the limit of the equipment or at a specified depth, after which the cone is pulled out of the ground and a final baseline is recorded.

(c) JKR/Macintosh Probe

The probe is carried out by using a hammer to drive in a rod. The hammer is dropped through a vertical height of 280 millimetre along a guided rod. The total number of blows required for a penetration of 300 millimetres is recorded and terminated when resistance exceeding 400 blows/ 300mm or 15m in depth is encountered.

(d) Hand Bores

An auger is used to drill holes for soil sampling. The auger stem is designed such that a thin-walled tube sampler can be fitted at the end to collect an undisturbed sample. The minimum diameter of the holes are 100 millimetres. Disturbed samples recovered from the auger are collected at 1.50 metres interval or when there is a change in the material encountered.

(e) Penetration Field Vane Shear Test

The Field Vane Shear Test is carried out at various depths to determine the shear strength of the soil using a Geonor Vane.

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(f) Plate Loading Test

This method covers the estimation of the bearing capacity of soil in place by means of field loading tests. The test is only a part of the necessary procedure for soil investigation of foundation design. It gives information on the soil only to a depth of about two diameters of the bearing plate, and takes into account only part of the effect of time.

(g) In-Situ California Bearing Ratio Test

This method covers a procedure for making repetitive static plate load tests on subgrade soils and flexible pavement components, in either the compacted condition or the natural state, and is to provide data for use in the evaluation and design of rigid and flexible-type airport and highway pavements.

Other tests are also carried out in the field exploration process, including the permeability test, field density test and trial pit. The permeability test is further categorised into the constant head test, variable head test and single or double pneumatic packer tests. The field density test involves the sand replacement method (small or large pouring cylinder methods), water replacement method and core cutter method. For trial pit, shallow test pits are dug out, using a hydraulic backhoe excavator. Shallow test pits permit the in-situ condition of the ground to be examined and logged in detail, both laterally and vertically. The pits also provide access for taking disturbed sample, bulk sample and undisturbed block samples. Disturbed samples are taken in order to determine soil sample's moisture content. Bulk and block samples are then sent for laboratory testing.

There are many different types of samples which can be collected through ground excavation and penetration. The type of samples collected are largely determined by sampling requirements. Some of the samples include:

Disturbed samples in bulk

The disturbed samples are collected in bulk quantity with the use of excavation equipment. Immediately after being taken from an excavation, the sample should be placed in a non-corrodible and durable container of at least 0.5kg capacity, which the sample should fill with a minimum of air space. Large disturbed samples that are required for certain laboratory tests may be packed in robust containers or plastic sacks.

Water Samples

Ground water samples are taken from the boreholes only when all mud or water added to assist boring has been removed. The samples are sealed in screw-top plastic bottles with approximately one litre of water.

Block Undisturbed Samples

Block samples are cut by hand from material exposed in excavations and are normally taken in rock and cohesive soil. The procedures are often used for obtaining specially orientated samples, and, in such cases, both the location and orientation are recorded before the sample is separated from the ground. The samples are coated with a succession of layers of microcrystalline wax, and may be reinforced with layers of porous fabric. The samples are then packed in a suitable material and placed in a strong plate.

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The samples collected through excavation undergo various laboratory testing based on the specified laboratory schedule. Some of the laboratory tests include:

- (i) classification test;
- (ii) soil compaction test;
- (iii) detailed compaction studies;
- (iv) soil strength test;
- (v) soil chemical test; and
- (vi) shear box test.

All the raw data obtained from samples tested and reviewed are entered into the computer to generate the laboratory results, tables and graphs, which will then be compiled into the laboratory report.

The laboratory report is verified before it is sent to the client.

6.6 Projects of Protasco Group

6.6.1 Completed Projects of the Protasco Group

A list of the major projects completed by the Protasco Group since its incorporation are summarised as follows as at 31 May 2003:

	Client	Project Description & Location	Contract Duration	Amount (RM)
1.	Bumi Hiway (M) Sdn Bhd	Cement base stabilization, Kuala Lipis, Pahang	Oct 93 – Dec 93	1,005,000
2.	PROPEL	Pavement construction, East-West Link Expressway, (Package 5), Kuala Lumpur	May 94 – Feb 95	7,499,628
3.	Projek Usahasama Transit Ringan Automatic Sdn Bhd ("PUTRA")	Longhouse comprising 60 units (Phase 1B), Setapak, Kuala Lumpur	Jan 95 – Apr 95	2,070,601
4.	PROPEL-PATI Joint Venture	Third lane widening, Bangi – Nilai, NSE, Selangor	Mar 95 – Sep 95	11,177,462
5.	PROPEL	Pavement works, North-South Central Link and KLIA Expressway (Packages 1A, 1B, 2A +2 B and 3A), Selangor	Mar 95 – Apr 97	79,083,458
6.	PROPEL	Pavement regulation and repairs, Sections N3 and N4, NSE, Kedah	Apr 95 – Dec 95	5,116,800

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

	Client	Project Description & Location	Contract Duration	Amount (RM)
7.	Isyoda (M) Sdn Bhd	Earthworks, drainage, structure and pavement works, Middle Ring Road II (Package 10), Kuala Lumpur	Jun 95 – Oct 97	22,851,267
8.	PPES Progap Sdn Bhd	Pavement recycling and overlay, Jalan Matang, Kuching	Jul 95 – Dec 95	3,645,900
9.	PROPEL	Pavement rehabilitation, Senawang – Ayer Keroh and Ipoh-Changkat Jering Expressway, NSE	Jul 95 – Dec 95	938,095
10.	PROPEL	Protection for fibre optic and TNB cable, Sungai Buloh, Selangor	Sep 95 – Nov 95	498,950
11.	Dewan Bandaraya Kuala Lumpur	Installation of pipe culverts, Jalan Choo Cheng Kay to Jalan Brickfield, Kuala Lumpur	Oct 95 - Aug 96	4,408,280
12.	Linkedua (M) Sdn Bhd	Pavement works, Malaysia-Singapore Second Crossing Project, Johor	Jul 96 – Dec 97	39,013,448
13.	JKR Malaysia	Road construction (design & build), Kuala Perlis – Changlun, Kedah	Aug 97– Aug 00	167,263,230
14.	Trac JV	Construction and completion of civil works at Putrajaya Upper North Wetland at Ch 20780 to Ch 22180	Oct 97 – Dec 99	3,017,215
15.	PLUS	Pavement upgrading at 8 rest & service areas along the NSE	Nov 97 - Feb 98	1,679,189
16.	PLUS	Pavement upgrading at 26 laybys along the NSE (Package 3B)	Jan 98 – Jul 98	387,440
17.	PROPEL	Maintenance of NSE (Central Region), Selangor	Feb 98 – Dec 99	1,946,765
18.	Kamunting Construction Sdn Bhd	Construction and completion of Southern Inner Ring Road (Phase 1A – Package R8A), Putrajaya, Selangor	Jun 98– Sep 98	3,085,216
19.	PROPEL	Pavement rehabilitation and associated works along Simpang Ampat – Pagoh Expressway (Package F), Melaka	Jul 98 – Nov 98	2,258,307
20.	PLUS	Pavement upgrading works (porous asphalt) on accident prone areas along NSE (Phase 4, Packages 4A & C), Johor & Kedah	Aug 98 - Oct 98	1,255,682
21.	Peremba Construction Sdn Bhd	Drainage and pavement works, Putrajaya Bridge (BR10), Selangor	Sep 98 – Jan 99	880,655

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

	Client	Project Description & Location	Contract Duration	Amount (RM)
22.	PROPEL	Pavement rehabilitation works along Ipoh – Changkat Jering Expressway (Package G2B), Perak	Nov 98 – Dec 98	698,000
23.	UE Construction Sdn Bhd	Construction of elevated viaduct, NSE Central Link & KLIA Expressway (Package 3D-2), Selangor	Feb 99 – Nov 99	41,615,349
24.	PROPEL	Pavement rehabilitation and associated works at Kempas – Skudai Expressway (Phase 1A), Johor	Mar 99 – Sep 99	5,469,402
25.	Hasrat Usaha Sdn Bhd	Pavement works, NSE Central Link & KLIA Expressway, Section 3D, Putrajaya Interchange and Link Road, Selangor	May 99 – Dec 99	4,937,281
26.	KISB	Building construction of 2 blocks of 9 storey- hostel, Taman Ilmu Ikram, Kajang, Selangor	Aug 99 – Nov 00	16,069,442
27.	Putra Perdana Construction Sdn Bhd	Pavement, road kerbs and road furniture, Road MH01 part of Precinct 16, Putrajaya, Selangor	Oct 99 – Jan 00	1,632,679
28.	YTL Civil Engineering Sdn Bhd	Earthworks and associated works Express Rail Link, Kuala Lumpur – KLIA project, Sector 3.3 Part 3, Selangor	Dec 99 – Jun 00	6,457,920
29.	JKR Malaysia	Road projects at Telok Kemang, Port Dickson, Negeri Sembilan	May 00 – Aug 00	7,000,000
30.	PROPEL	Pavement rehabilitation works, KM275.0 to KM339.3, both sides, Section CI, Perak	Mar 00 – Sep 00	3,973,936
31.	PROPEL	Pavement rehabilitation works, Senai-Johor Bahru KM0.00 – KM27.55 BB Section S5, Johor	Aug 00 – Jan 01	2,774,545
32.	JKR Malaysia	Rehabilitation and upgrading works, at Lunas, Kedah.	Dec 00 – Mar 01	9,854,156
33.	Menuju Asas Sdn Bhd	Road upgrading at Mcribok, Kedah	May 01 – May 02	4,074,000
34.	MKJ Construction	Pavement works at Gua Musang, Kelantan	Jun 01 – Nov 01	5,432,615
35.	HESB Corporation Sdn Bhd	Pavement works at Dungun, Terengganu	Oct 01 – Nov 01	2,191,408
36.	Ciptera Engineering Sdn Bhd	Pavement works at Bukit Sagu, Pahang	Nov 01 – Jun 02	2,773,471
37.	HESB Corporation Sdn Bhd	Pavement works at Kemaman, Terengganu	Mar 02 – Jun 02	1,451,101

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

	Client	Project Description & Location	Contract Duration	Amount (RM)
38.	MKJ Construction	Pavement works at Gua Musang, Kelantan	Mar 02 – Jun 02	1,443,479
39.	Expressway Lingkaran Tengah Sdn Bhd	North South Expressway Central Link and KLIA Expressway Proposed pavement rehabilitation and associated works along Expressway Lingkaran Tengah Package 1 km 22.00 to km 30.00 southbound and Package 2 km 18.00 to km 26.00 northbound	Nov 02 – May 03	5,748,800
Total :				482,680,172

6.6.2 On-Going Major Projects of the Protasco Group

A list of the on-going major projects of the Protasco Group as at 31 May 2003 are summarised below. In addition to the 9 on-going major projects set out below valued at approximately RM1.36 billion, the HCM Group, through Roadcare has a 15-year on-going road maintenance concession. The concession, which commenced in February 2001 and expires in February 2016, has an estimated contract value of approximately RM103.9 million annually for routine maintenance. Periodic maintenance and emergency works, which are included under the concession are based on actual works carried out.

	Client	Project Description & Location	Contract Duration	Amount (RM)
1.	JKR Malaysia	Rehabilitation and upgrading Federal Route 5 – Kapar – Sabak Bernam & Klang – Banting, Selangor (Phase A)	Dec 99– Aug 03	300,199,360
2.	HCM-THT JV ⁽¹⁾ *	Design, construct, rehabilitate and upgrade of Muar - Melaka - Alor Gajah- Simpang Ampat road	Apr 01– Apr 05	320,450,445
3.	JKR Malaysia	Rehabilitation and upgrading Federal Route 5 – Kapar – Sabak Bernam & Klang – Banting, Selangor (Phase B)	Jun 01 – Jun 04	396,366,140
4.	Muhibbah Engineering (M) Berhad	Pavement works at Special Service Group Camp, Phase 1 Mersing, Johor	Aug 01 – Oct 03	11,213,093
5.	HCM-Endaya ⁽²⁾ *	Road design, build and upgrade Kuching - Serian, Sarawak	Sep 01– Sep 04	90,085,806
6.	HCM-Konsortium Indera JV ⁽³⁾ *	Upgrading roads from Utan Aji, Perlis – Changlun, Kedah	Sep 01– Sep 03	180,883,643
7.	Pembinaan Bumiasia Sdn Bhd / Profil Makmur Sdn Bhd	Construction and project management for Jasin Hospital, Melaka	Oct 01 – Oct 03	50,000,000

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

	Client	Project Description & Location	Contract Duration	Amount (RM)
8.	Kostima Construction Sdn Bhd	Pavement works for “Cadangan Membaikpulih Lebuhraya Persekutuan (Federal Highway) di Laluan 2, Seksyen 26.00 – 33.90, Daerah Petaling, Selangor Darul Ehsan (In relation to the Maintenance of Federal Roads in Peninsular Malaysia)” – Package 1 & 2	Mar 03 – Nov 03	6,508,656
9.	TH Technologies Sdn Bhd	“Cadangan Pusat Latihan Gabungan Pasukan Tempur (PLGPT) Tentera Darat, Fasa II Di Gemas, Negeri Sembilan. Tender for Premix Carpark, Road Signages, Entrance Signages & Padang Kawad for Sector A1 (M.K Garison, Rumah Sakit & Balai Bomba)”	May 03 – Nov 03	3,023,779
			Total :	1,358,730,922

Notes:

- * Ultimate client is JKR.
- (1) Unincorporated joint venture company with TH-Technologies Sdn Bhd where HCM has 60% interest.
- (2) Unincorporated joint venture company with Endaya Construction Sdn Bhd where HCM has 51% interest.
- (3) Unincorporated joint venture company with Konsortium Indera Sdn Bhd where HCM has 80% interest.

6.7 Areas and Role of Research and Development

Research & Development (“R&D”) is one of the principal activities of the Protasco Group. Over the past 10 years, the Group has been actively engaged in Applied Research, which is usually practical in nature with specific application in view.

The Group R&D is headed by Dr. Mahadzer Mahmud, Director of R&D Centre of KISB, and assisted by not less than 18 staff.

R&D activities have provided the Group with business advantages for business sustainability, growth and profitability. At the same time, the Group plays a key role in supporting the Government’s policies of encouraging greater investment in R&D activities.

The Group undertakes R&D in:

- (a) Creation of new products;
- (b) Improvement of existing processes; and
- (c) Soil mechanics.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

R&D plays a critical role in creating competitive advantages for the Protasco Group in the following manner:

- (i) sustainable business growth through development and marketing of new and better quality products;
- (ii) reduce impact of competitive pressure through new products and developing niche markets; and
- (iii) sustainable business growth through continuous improvement of its existing processes.

6.7.1 Creation of new products

The Protasco Group is continuously involved in the R&D of new products, particularly in relation to road pavement and construction materials.

Some of the products which the Group has developed to-date from its research findings for commercial use are:

- (i) IKRAMix;
- (ii) QS3E; and
- (iii) QS2R.

IKRAMix – a high performance cold bituminous mix developed principally for patching potholes. This product is environmentally friendly and results in greater cost savings due to its higher durability and user friendly application.

QS3E – a quick strength slow setting emulsion developed for road maintenance. The cold emulsion sets in 4 hours and gains strength immediately. Although slightly more expensive than conventional mixes, it is more environmentally and user friendly as it requires fewer machines and equipment, has the ability to bind with most types of rocks and has proven to be longer lasting.

QS2R – a quick strength rapid setting emulsion also developed for road maintenance but has a faster setting rate of less than an hour. It has similar advantages as the QS3E emulsion.

To commercialise IKRAMix, the Group set up a pilot plant and is currently undertaking small-scale production of between 2 to 7 metric tons daily.

The Group conducted field testing on another pavement product, the QS3E cold mix emulsion in August 1999 on part of the Kuala Perlis-Changlun Highway. Subsequently in 2000, the Group successfully used the emulsion in upgrading a total of 46 kampung roads in Jasin, Melaka Tengah and Alor Gajah for the Ministry of Rural Projects.

To-date, the Group has not done any testing of QS2R on a project site. Continuing research and development is being carried out on the emulsion for the purpose of slurry seal and surface dressing of road pavements.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

6.7.2 Improvement of Existing Processes

The Group is continuously focused on process flow development to enhance its current processes.

An efficient process flow is critical for the following reasons:

- (a) increases productivity, resulting in greater cost effectiveness;
- (b) increases effectiveness and efficiency to ensure high quality standards; and
- (c) removes redundant or unnecessary processes to shorten work cycle.

The Group undertakes R&D through the following means:

- (i) selection of process flow best practices locally and internationally;
- (ii) research in new technologies and machineries that help hasten processes; and
- (iii) constantly research and study existing work flow processes and developing new or modifying existing processes and procedures to optimise work flow.

6.7.3 Soil Mechanics

The Group continuously conducts research on the characteristics and performance of numerous types of soils throughout Malaysia.

The studies carried out are used to support the other business activities of the Group in road construction, rehabilitation and maintenance, landslide investigation, slope stabilisation, erosion control, soft soil engineering and residual soil analyses.

Over the last 10 years, an extensive database on the sub soil and rock of Peninsular Malaysia has built up. The Group is currently developing an information system to cover all states in Peninsular Malaysia, called LogIK.

The Group started developing LogIK in June 1999. The system for Selangor has been completed and the development of the system for Wilayah Persekutuan has started in May 2003.

Phase 1 which comprises the states of Selangor, Penang, Wilayah Persekutuan, Perak and Kedah is scheduled for completion by January 2006. Phase 2 which will comprise the remaining states in Peninsular Malaysia, is due for completion at the end of 2008.

Thereafter, LogIK will be available for marketing to operators in the industry, including road construction contractors, property developers and soil investigators.

6.7.4 Facilities and Skilled Knowledge

The Protasco Group's R&D capabilities and facilities are based on the following:

- in-house facilities and expertise; and
- joint-development with other organisations.

6. **BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP**
(Continued)

In-house facilities and expertise include the following:

- (a) Two well-equipped research laboratories to undertake its R&D work;
- (b) A team of well qualified technical personnel with extensive experience in the various areas of R&D; and
- (c) Extensive knowledge and information database as well as technical expertise from more than 10 years in the business, especially in pavement studies and geotechnical engineering.

For new products, the Group has the capabilities to facilitate the development and commercialisation of its research findings for mass production.

6.7.5 Research & Development Programmes of the Protasco Group

The focus of the Group's R&D is mainly related to the following:

(a) Road and Pavement Engineering

R&D is continuously undertaken to evaluate the performance of road pavement and various road construction materials such as asphalt, modified emulsions and binding agents. Studies also include field monitoring, pavement design and modelling, raw material formulation, dynamic mechanical analysis, quality control and certification testing.

(b) Geotechnical and Geoenvironmental Engineering

The Group has been developing its expertise in this area of research and has successfully provided solutions to geotechnical and geoenvironmental issues. Its comprehensive research capabilities encompasses landslide investigation, slope stabilisation, erosion control, soft soil engineering, residual soil, landfill engineering, contaminant transport, application of geographic information system and global positioning system, geosynthetics and software development.

(c) Transportation and Traffic Safety

This area of research focuses on the application of advanced technology in information systems, communications and sensors to improve the effectiveness and efficiency in the Malaysian transportation infrastructure. Special emphasis is given to traffic and safety engineering problems in both the urban and rural areas.

(d) Information Technology in Engineering

The research will focus in the enhancement of the information technology application for infrastructure solutions, to improve the efficiency of planning, decision making and co-ordination of activities.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

Some of the major internal R&D projects successfully undertaken by the Protasco Group in the past are listed below:

Project	Duration
High Performance cold mix asphalt	Apr 98 – Apr 99
Quick strength and very slow setting emulsion	Jul 98 – Mar 99
Improvement of QS3E and development of QS2R	Jun 99 – Jan 00
Development of Cold Micro Asphalt Concrete (MAC Surfacing) for CHIPMAC pavement	Oct 01 – May 02

At present, some of the current R&D projects undertaken by the Group include:

Project	Duration
1. Full scale trial on pavement recycling	Aug 99 - Aug 04
2. LogIK the soil and rock information system	Jun 99 – Dec 08
3. Pavement Materials	
i. Full scale trials of CHIPMAC Pavement ^A	Jan 02 – Dec 04
ii. Development of G-Mix design method for road construction in Malaysia ^{A & B}	Oct 01 – Dec 05
iii. Study of the aging of bituminous surfacing ^{A & C}	Oct 01 – Dec 03
4. Pavement Performance - Establishment of structural layer coefficient for recycled materials ^{A & D}	Dec 01 – Dec 03
5. Geotechnical and Geoenvironmental Engineering	
i. The application of scrap tyres for retaining structures ^A	Jan 02 – Dec 05
ii. Performance evaluation of a flexible panel reinforced earth system ^{A & E}	Oct 01 – Dec 05
iii. Slope risk management system for Fraser Hill	Jan 03 – Jun 04
6. Information Technology in Engineering - Enhancement of the Total Infrastructure Management System	Jan 02 – Dec 05
7. Guidelines and specifications on Cold-In-Place recycling of roads in Malaysia ^F	May 03 – Oct 03

Notes:

Joint R&D projects in collaboration with the following parties:

- (A) JKR
- (B) ARRB Transport Research of Australia
- (C) Transport Research Laboratory, UK
- (D) University of Birmingham
- (E) Maju Consult Sdn Bhd
- (F) CSIR-Transportek of South Africa

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

Some of the projects are internal and some are undertaken in collaboration with other organizations. They include the following:

- (a) JKR, Malaysia;
- (b) ARRB Transport Research of Australia;
- (c) Transport Research Laboratory, UK;
- (d) University of Birmingham, UK;
- (e) Maju Consult Sdn Bhd; and
- (f) CSIR-Transportek of South Africa.

A brief description of some of the R&D projects are as follows:

Full scale trial of CHIPMAC Pavement

The objective of the trial is to monitor the performance of MAC surfacing which can be used as a finished layer (wearing course) in the Chip-Mac System and to develop an appropriate construction technique for MAC Surfacing. The trial will consist pre-construction measurement, mix design, during construction and post construction measurement. Performance evaluation will be based on laboratory and field evaluation.

Development of G-Mix design method for road construction in Malaysia

This research is to develop an asphalt mix design procedure, which is performance based and to produce mixes with improved service properties for different road conditions, from light to medium to heavily trafficked roads.

Study of the aging of bituminous surfacing

The aging of bituminous surfacing, due to factors such as volatilisation, oxidation and hardening of the asphalt cement mixture, is of increasing concern in the maintenance of flexible pavement. It will result in an increase in the brittleness of the surface and subsequent pavement cracking and reduction in pavement durability. The objective of the research is to determine the reasons for service life changes in bitumen properties of bituminous surfacing in Malaysia.

Establishment of structural layer coefficient for recycled materials

The concept of recycling road pavements as an alternative rehabilitation measure is relatively new yet becoming more popular and acceptable in Malaysia now. As there are no guides or published reports on the performance of pavement rehabilitated using cold recycling techniques in Malaysia, the structural coefficients used in the design calculation for various recycled materials were rough estimations, based on experience. This study will monitor the performance of pavement layers recycled with addition of cement, bitumen emulsion and/or foamed bitumen, comparing the strength of each layer against conventional asphalt layers.

The application of scrap tyres for retaining structures

In Malaysia, a large quantity of scarp rubber tyres is produced each year. Present recycling techniques only consume a small portion of scrap tyres. With this in mind, the project is aimed at exploring various ways to optimise the usage of unwanted tyres in retaining structures.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

Performance evaluation of a flexible panel reinforced earth system

The project will be aimed at evaluating the performance of flexible reinforced earth system as an option to slope remedial work, the development of innovative slope repair and its workability.

Slope Risk Management System

The objective of developing slope risk management system is to provide a digital risk and hazard map for the management of slopes in landslide prone areas. The risk map can be easily retrieved from the database and utilised for the management of the development of hilly terrain in Fraser Hill.

Enhancement of the Total Infrastructure Management System

The objective of this project is to produce an enhanced road network management system which will improve the efficiency of decision making, expand the scope, provide feedback on the consequences of decisions and facilitate the coordination of activities. The project will thus focus on enhancing the core total infrastructure management system IT application and infrastructure solution. The solution will be aimed at enhancing the system to provide and ensure a timely and accurate information transfer.

Guidelines and specifications on Cold-In-Place recycling of roads in Malaysia

The main objective of the project is to develop draft guidelines and specifications for Cold-In-Place recycling with cement, bitumen emulsion and/or framed bitumen that will suit local materials, construction practices, climate conditions and availability of equipment.

6.8 Method of Distribution

The Group utilises direct channels of distribution through its internal sales and marketing team. As a service-based industry, direct channels of distribution are more effective than the indirect method of distribution.

Currently, the Protasco Group has a total of 16 persons in its sales and marketing team, who are responsible for its customer service. The team is mainly responsible for the marketing of PTSB and iCT.

In addition, most of the managers in the Protasco Group also undertake marketing of the Group's services.

6.9 Major Suppliers and Customers

6.9.1 Supply of Raw Materials

The Protasco Group sources all its main raw material requirements either directly from local manufacturers or suppliers. The bulk of the Group's raw materials purchases are for its road construction and pavement rehabilitation activities. They are as follows:

- (a) Quarry products, e.g. aggregates, crusher-run;
- (b) Bitumen;

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

- (c) Plastic products, e.g. high density polyethylene and unplasticized polyvinyl chloride products;
- (d) Geotextiles;
- (e) Concrete products, e.g. cement, casting, ready-mix concrete;
- (f) Steel products, e.g. bars, plates, beams, pipes; and
- (g) Diesel.

All the Group's raw material requirements are sourced locally.

To-date, the Group has not encountered any problems in sourcing raw materials, which are available in abundant supply locally.

6.9.2 Customer Base And Dependencies

The proforma turnover of the Protasco Group for the financial year ended 31 December 2002 was approximately RM715.6 million.

The Protasco Group enjoys close business relationships with its customers and places great emphasis on developing and maintaining customer goodwill and rapport.

The top 20 customers of the Protasco Group for the financial year ended 31 December 2002, are as set out in the table below:

Customers	Main Services Provided/ Products Purchased	Sales for the year ended 31 December 2002 RM	% of Protasco Group Turnover	Length of Relationship (No. of years)
1. JKR Malaysia	Road construction, rehabilitation & maintenance	374,454,614	52.3	6
2. HCM-Konsortium Indera JV ¹	Road construction & rehabilitation	80,010,427	11.2	2
3. HCM-THT JV ²	Road construction & rehabilitation	39,052,645	5.5	2
4. Pembinaan Bumiasia Sdn Bhd	Construction of building	11,275,752	1.6	1
5. P.A.T Bina Sdn Bhd	Construction materials, lubricant/oil and quarry products	10,484,022	1.5	8
6. That Seng Construction Sdn Bhd	Construction materials	10,062,333	1.4	2
7. Tukang Paip Siva	Construction materials	7,606,943	1.1	2
8. HESB Corporation Sdn Bhd	Pavement works and construction materials	7,289,068	1.0	5

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

	Customers	Main Services Provided/ Products Purchased	Sales for the year ended 31 December 2002 RM	% of Protasco Group Turnover	Length of Relationship (No. of years)
9.	HCM-Endaya ³	Road construction & rehabilitation	7,118,411	1.0	2
10.	Ciptera Engineering Sdn Bhd	Pavement works	7,061,307	1.0	1
11.	Kementerian Pendidikan Malaysia	Engineering services	4,997,400	0.7	6
12.	JKR Ibu Pejabat Cawangan Jalan	Engineering services	4,900,840	0.7	6
13.	Bintong Construction Sdn Bhd	Construction materials	4,651,595	0.7	3
14.	Menuju Asas Sdn Bhd	Construction materials	3,870,228	0.5	4
15.	MKJ Construction	Pavement works	3,480,208	0.5	2
16.	ACP-DMT Sdn Bhd	Lubricant/oil	3,285,223	0.5	7
17.	JKR Ibu Pejabat Perancangan & Perkhidmatan Koperat	Engineering services	3,267,584	0.5	6
18.	Muhibbah Engineering Sdn Bhd	Pavement works	2,512,864	0.4	2
19.	Jurubina AKC Sdn Bhd	Construction materials	2,446,808	0.3	2
20.	Timorfon Sdn Bhd	Construction materials and road furniture	2,425,393	0.3	3
	Total		590,253,665	82.7	

Notes:

- * The proforma turnover of the Protasco Group for the financial year ended 31 December 2002 totalled RM715.6 million.
1. HCM-Konsortium Indera JV is an unincorporated joint venture in which HCM has 80% interest.
 2. HCM-THT JV is an unincorporated joint venture in which HCM has 60% interest.
 3. HCM-Endaya is an unincorporated joint venture in which HCM has 51% interest.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

The top 20 customers of the Protasco Group accounts for nearly 82.7% of its total turnover. Sales to all the various divisions of JKR Malaysia in the financial year ended 31 December 2002 amounted to approximately RM390 million. This represents around 54.5% of the Group's total sales for the year.

Approximately 50% of the above customers have been with the Protasco Group for 3 or more years.

6.10 Risk Management Plan

Due to the various risks which Protasco Group is exposed to in its day-to-day operations and also to complement its insurance programme, Protasco has developed various risk management plans which include the following:

(i) Risks associated with customer concentration with JKR as its major customer

To mitigate this, Protasco Group is actively exploring opportunities to export its activities overseas to widen its customer base by focusing on projects financed by governments and major international organisations such as the World Bank and the Asian Development Bank.

The Group also intends to expand into business activities not related to the public sector via education by upgrading Ikram College of Technology (iCT) with the setting up of a university college to be known as Kuala Lumpur Infrastructure College University (KLICU), expected in the second half of year 2003.

(ii) Risks associated with road construction industry

The Group seeks to limit the risk through having contractual terms for project undertaken, continual upgrading of its facilities and services and prudent management policies. Presently, the Group adopts a policy of being selective when tendering for private sector project due to potential credit risk and unstable payment patterns frequently associated with private sector projects. With such prudent emphasis adopted by the management, a big portion of the projects currently being undertaken by the Protasco Group are Government related contracts such as road construction and maintenance where credit risk is minimal.

(iii) Risks associated with security and system disruption

As the Group's business operation partially rely on IT, the Group has developed a risk management plan to mitigate the risk associated with security and systems disruption. The plan comprises security on application and associated databases with restricted physical access only to authorised personnel and unauthorised end-users are prevented from logging in. To overcome systems disruption, the Group has put in place a technological backup and redundancy system. Further, the Group continuously tap on the latest technology to enhance the security and minimise systems disruption.

(iv) Risks associated with fire outbreak, disruption of electricity and water supply

The Group faces certain operational risks which include but are not limited to fire outbreak, disruption of electricity and water supply, which will affect the Group's business operations.

The Group has taken precautionary steps to minimise the occurrence of such risks through the installation of fire resistance doors, fire hydrants, fire extinguishers, smoke detector systems and disperse the storage of raw materials at various premises.

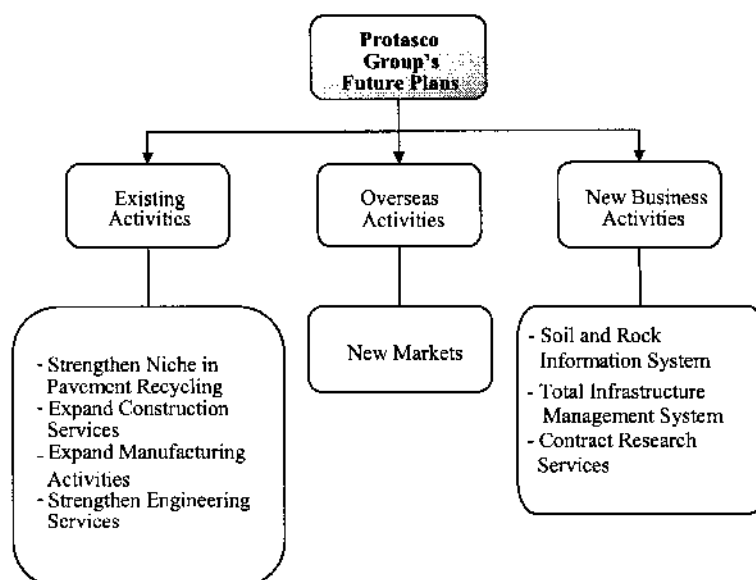
6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

Notwithstanding the aforesaid, the Group has purchased adequate insurance coverage on consequential loss and damages resulting from fire at its permits, plant and equipment and stocks. As at 31 May 2003, the net book value of fixed assets, including land, of RM149.722 million and the value of stocks of RM0.672 million have insurance coverage amounting to RM127.8 million and RM0.697 million respectively.

6.11 Prospects of the Protasco Group

6.11.1 Overview of Future Plans

The Protasco Group's future plans are focussed in three key areas as depicted in the diagram below:



(i) Existing Activities

(a) Strengthen Niche in Pavement Recycling

Although the Protasco Group will continue to participate actively in tendering for more road construction projects, it aims to increase its focus on road rehabilitation and maintenance to expand its present niche in pavement recycling. This would distinguish the Group from other conventional road contractors and strengthen its competitive advantages.

Early in the 90s, the Group recognised the substantial benefits which pavement recycling could offer to the road construction, rehabilitation and maintenance industry. The management had observed trends in several states in the USA, in Europe, Africa and Australia, where emphasis in pavement recycling was growing in importance and becoming an accepted method for road strengthening and upgrading.

6. **BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP**
(Continued)

Some of the factors supporting growing preference for pavement recycling compared with conventional road construction include:

- Significantly shorter duration of time in carrying out repair works, thereby reducing inconvenience and costs to road users. The shorter construction time also affords cost savings to the client;
- The full reuse of existing pavement materials is environmentally friendly as it reduces the need for dumping unwanted pavement materials, reduces usage of new quarry and other pavement materials and reduces material haulage over the existing road network thereby reducing pavement damage. At the same time, the recycling of existing materials reduces pavement material costs; and
- Performance of roads constructed using recycling techniques have proven to be on par with those constructed using conventional methods.

With a slower growth rate for new road construction compared with a growing need for rehabilitation and maintenance of the existing road network, estimated at around 73,018 kilometres in 2001, the Group believes that the demand for rehabilitation and maintenance works will increase significantly.

As such, since 1993, the Group has invested aggressively in terms of technology acquisitions, training of key personnel and investment in the latest equipment and machinery for its road projects, particularly for pavement recycling.

The Group continuously keeps abreast with developments in pavement technology abroad. At the same time, the Group, supported by its in-house state-of-the-art R&D and laboratory testing facilities, continues its in-house R&D on new product in pavement technology. In this connection, Ikram C&S is in the process of setting up a mix design and quality control laboratory for cold recycling projects to tap potential business opportunities in the region.

By strengthening its niche in pavement recycling, the Protasco Group is confident that it will be able to secure more road rehabilitation and maintenance projects in the future. At present, its environmentally friendly techniques result in cost savings of at least 20% for its clients compared with conventional pavement methods.

(b) Expand Construction Services

The Group believes in constantly developing its core competencies to maintain its competitive edge in the industry. In line with this philosophy, the Group intends to maintain its close relationships with its customers, subcontractors and suppliers by providing responsive and effective solutions, maintaining good project progress and quality compliance records and providing prompt support and advice.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

With its years of experience in the road infrastructure business, the Group has developed extensive knowledge in practical construction methodology as well as technical expertise in engineering and research capabilities in road pavement.

The Group's management team, through years of experience as a main contractor, is able to co-ordinate the services of various parties involved in a project effectively to ensure timely completion of the projects.

Building on such experience, the Group aims to better serve its customers by providing 'Design and Build' services where it will be responsible for projects from inception to completion.

At present, of the Group's 9 on-going major projects, 5 are Design and Build projects, as follows:

	Client	Project Description & Location	Contract Duration	Amount (RM)
1.	JKR Malaysia	Rehabilitation and upgrading Federal Route 5 – Kapar – Sabak Bernam & Klang – Banting, Selangor (Phase A)	Dec 99– Aug 03	300,199,360
2.	HCM-THT JV	Design, construct, rehabilitate and upgrade of Muar – Melaka – Alor Gajah – Simpang Ampat road	Apr 01–Apr 05	320,450,445
3.	JKR Malaysia	Rehabilitation and upgrading Federal Route 5 – Kapar – Sabak Bernam & Klang – Banting, Selangor (Phase B)	Jun 01 – Jun 04	396,366,140
4.	HCM-Konsortium Indera JV	Upgrading roads from Utan Aji, Perlis – Changlun, Kedah	Sep 01–Sep 03	180,883,643
5.	HCM-Endaya	Road design, build and upgrade Kuching - Serian, Sarawak	Sep 01–Sep 04	90,085,806
			Total:	1,287,985,394

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

The Protasco Group is currently bidding for the following projects:

	Client	Project Description & Location	Estimate Cost of Contract (RM)	Remarks
1.	JKR Malaysia	Design and build 26 kms of road from Chiku Aring (Package 5)	120,000,000	Project bid by THT-HCM JV. Negotiations finalized. Awaiting Letter of Award from Government. Commencing 2 nd half of 2003.
2.	UE Construction Sdn Bhd	Proposed Pavement Structural Overlay and Associated Works along Bangi to Seremban Expressway (Section A [km 289.5 to km 284 and km 283 to km 281.5 Southbound] and Section B [km 284 to km 283 Southbound]) Section C5 Package B1	9,600,000	Tender submitted. Evaluation stage. Commencing 2 nd half of 2003 if successful.
3.	UE Construction Sdn Bhd	North-South Expressway Pavement Structural Overlay at km 110.5 to km 114 Sb, Package S3, Pagoh-Yong Pong Expressway	2,600,000	Tender submitted. Evaluation Stage. Commencing 2 nd half of 2003 if successful.
4.	Lembaga Kemajuan Kelantan Selatan	Cadangan Menaikkan Taraf Jalan Untuk Laluan Kedua Persiaran Raya (Jalan 1-1 Gua Musang Kelantan (Fasa 1))	12,900,000	Tender submitted. Evaluation Stage. Commencing 2 nd half of 2003 if successful.
5.	Expressway Lingkaran Tengah Sdn Bhd	North-South Expressway Central Link and KLIA Expressway Proposed pavement rehabilitation and associated works along Expressway Lingkaran Tengah Package A km 33.00 to km 48.00 bothbound	7,400,000	Tender submitted. Evaluation Stage. Commencing 2 nd half of 2003 if successful.
6.	TH Technologies Sdn Bhd	Cadangan Pusat Latihan Gabungan Pasukan Tempur (PLGPT) Tentera Darat, Fasa 2, Gemas, Negeri Sembilan Untuk Tetuan THUB Sdn Bhd dan Kementerian Pertahanan Malaysia – Premix, road marking, road signages, turfing, ancillaries works for Sector D (Package No. PS/1(D))	2,800,000	Tender submitted. Evaluation Stage. Commencing 2 nd half of 2003 if successful.

(c) Expand Manufacturing Activities

The Group aims to expand its manufacturing capabilities to produce construction materials.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

At present, the Group is involved in production of IKRAMix at its pilot experimental plant whilst the manufacture of its cold mix emulsion product, QS3E, is subcontracted to other manufacturers.

Volume produced for these products are still fairly low at present. However, the Group intends to place more emphasis on its marketing strategies both locally and overseas, to increase its sales of IKRAMix and to commercialise its cold mix products.

Whilst the Group's in-house research activities continue in the development of new and innovative products, it will also be assessing the potential viability of expanding its product range to include the manufacture of other construction products and machines, such as cement railway sleepers and concrete piles, rubberised emulsion, pot-hole patching machines and modified bitumen machines.

(d) Strengthen Engineering Services

In view of the weaker performance of the building construction and infrastructure industry in recent years, especially since the 1997/98 economic crisis, the Group believes that it is crucial to maintain its competitive advantages by continuously strengthening its core competencies.

One of the areas the Group aims to strengthen is its engineering services. It intends to further enhance its services through improvement and upgrade of its technical knowledge, research and development of innovative technology and keeping abreast with the latest developments.

(ii) Overseas Activities

The Protasco Group is actively exploring opportunities to export its services to other countries to widen its earnings base.

The Group intends to focus on opportunities in the following countries:

- (a) India;
- (b) Cambodia; and
- (c) Bangladesh.

With its established track record and extensive experience in road infrastructure locally, especially its expertise in pavement recycling, the Group believes that it is poised to tap growth potentials in such countries where the infrastructure is relatively less developed. The Group also believes that it would have an advantage over local contractors in these countries in terms of civil engineering expertise and financial resources.

The Group also intends to adopt a very cautious approach in its venture overseas by focusing on projects financed by major international organisations such as the World Bank and the Asian Development Bank. Participation of such organisations would provide assurance on the viability of the projects and mitigate the Group's potential exposure to credit risks.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP (Continued)

The Group has tendered for overseas projects through the formation of a consortium of local and foreign reputable construction companies and plans to continue to do so.

Details of the projects are as follows:

Client	Project Description	Estimate Cost of Project (USD)	Remarks
1. Government of the People's Republic of Bangladesh	Maintenance of National Highway N1 Section from Daudkandi to start of Chandina Bypass (28.69) and Section from Chandina Bypass End to start of Comila.	6,000,000	<ul style="list-style-type: none"> - Pre-qualifying stage. - Joint venture with Muhibbah. - To commence in 2nd half of 2003 if successful.
2. Government of the People's Republic of Bangladesh	Maintenance of National Highway N1 Section from Comila Bypass End to start of Feni Bypass (34.62)		
3. Kerala Public Works, India	Kerala State Transport Project Phase II KSTP V – 102km KSTP VI – 88km KSTP VII – 132km	60,760,000	<ul style="list-style-type: none"> - Pre-qualifying stage. - Joint venture with Muhibbah. - To commence in 2nd half of 2003 if successful.
4. National Highways Authority of India, New Delhi	Package 1 – Porbandar-Bhiladi section of NH 8B (km 2 to km 52.50) – 50.50km Package 2 – Bhiladi – Jetpur section of NH 8B (km 52.50 to km 117) – 64.50km Package 3 – Bornanbore-Garamore section of NH 8A (km 182.60 to km 254) – 71.40 km Package 4 – Gagodhar section of NH 8A and NH 15 (km 254 to km 308 and km 281.30 to km 245) – 90.30 km Package 5 – Gagodhar-Radhanpur section of NH 15 (km 254 to km 138.80) – 106.30 km Package 6 – Radhanpur – Deesan section of NH 14 (km 458 to km 372.60) – 85.40km	54,000,000	<ul style="list-style-type: none"> - Pre-qualifying stage - Joint venture with Muhibbah - To commence in 2nd half of 2003 if successful

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

(iii) New Business Activities

(a) Soil and Rock Information System

The Group plans to computerise its extensive database on the characteristics and performance of sub surface soils and rocks of Peninsular Malaysia.

In June 1999, the Group started developing the soil and rock information system, known as LogIK. The system will be developed in phases, from state to state. Phase 1 comprises Wilayah Persekutuan and the states of Selangor, Penang, Perak and Kedah whilst Phase 2 will comprise the remaining states in Peninsular Malaysia.

The Group has completed developing the system for Selangor in December 2002. In May 2003, it has started the development of the system for Wilayah Persekutuan. Phase 1 is scheduled for completion by January 2006 whilst Phase 2 is due for completion in 2008.

By the end of 2008, LogIK will be available for marketing to operators in the industry, including road construction contractors, property developers and soil investigators.

(b) Contract Research Services

The Group plans to expand its services to include the provision of contract research services to the Government and private companies.

Some of the areas of its research activities include:

- (i) The use of rubber in road construction, rehabilitation and maintenance;
- (ii) Road rehabilitation techniques;
- (iii) Road performance; and
- (iv) Construction materials.

In May 2002, KISB entered into a three-year Memorandum of Understanding ("MOU") with the Malaysian Rubber Board ("MRB") and JKR to collaborate in the development of a mechanism for technical and scientific cooperation in the general field of the use of rubber in road construction and infrastructure projects.

Some of the objectives of the MOU include:

- (i) To carry out joint R&D projects which would enhance and increase the use of rubber in road construction and other infrastructure projects;
- (ii) To build up and continuously update database on the usage of rubber in road construction; and

6. **BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP**
(Continued)

- (iii) To establish the listing of locally produced rubber products for use in public infrastructure projects.

In May 2002, KISB also entered into a Memorandum of Agreement (“MOA”) with MRB to provide professional services in designing mobile rubber-bitumen blending equipment (“RBBE”) for Malaysian agencies and organisations involved in road construction.

KISB will also assist the MRB in proposing and carrying out trials for testing of the RBBE on public highways jointly with road construction operators.

(c) **Total Infrastructure Management System**

Total Infrastructure Management System (“TIMS”) is a web-based road and highway IT enterprise management system solution.

It provides a systematic method of scheduled maintenance program and data collection on road features and surrounding areas for managers and decision makers to optimise maintenance cost and strategies.

TIMS consist of various integrated modules that utilize web and network infrastructure to automate the collection, storage and dissemination of information. The modules are the executive sub-system, routine and periodic maintenance system, pavement management system, slope management system and incident management system.

- The executive sub-system, the main governing module, is a web based geographical information system digital map that incorporates all the other modules.
- The routine and periodic maintenance system is designed to monitor and to report on the condition of road furniture, elements on the road and road pavement defects.
- The pavement management system is a data analysis tool to assist decision makers in finding cost effective solutions for maintaining pavements in a serviceable condition.
- The slope management system provides various information about the slope and the on-going development at affected areas for maintenance and rehabilitation purposes.
- The incident management system is a management tool to establish a comprehensive and coordinated responses to any road incident, thereby ensuring safe and rapid clearance at the scene.

Research and development of TIMS started in January 2002 and is expected to be completed and fully operational before the end of 2005.

6. BUSINESS OVERVIEW AND FUTURE PROSPECTS OF THE PROTASCO GROUP
(Continued)

The Group plans to market TIMS to the Federal Government, State Governments and operators in the private sector which are involved in road maintenance activities.

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