Version 3.1
November 2007

Building Code External Moisture

Clause E2 Compliant

De Boer Debobase Waterproofing System

Equus Industries Limited
National Compliance
45 Hutt Road, Petone
PO Box 38 636
Wellington
Ph: 04 576 0333
Fax: 04 576 0334
www.equus.co.nz

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Company Profile

Equus Industries Limited

COMPANY PROFILE

HISTORY

Equus Industries Limited is a private limited liability Company (#120201) incorporated in Blenheim New Zealand in 1982.

The Company commenced business, immediately after formation, as a manufacturer of specialist coating systems for commercial buildings. This remains the main thrust of the operation to this day, with additional high quality complementary products introduced to extend the range to encompass a full range of coating and waterproofing materials for all types of construction.

The Company has been an exporter of specialist lines from late 1983 to date. The Company has exported regularly to Australia, the South Pacific and South East Asia, and presently has strong links with distributors in Australia and South East Asia.

Since formation, growth has been steady and continuous at an average 15% annual compound rate. The Company now has a multi-million dollar turnover and is respected as a supplier of quality protection materials to the construction industry.

PRODUCT RANGE

Equus Industries markets a wide range of high build waterproof finishes, textured coatings, and protective coatings under the brand names Chevaline, Traxx, Protexx, Thermexx and Equus. Our expertise is particularly in the areas of high build acrylic coatings and membranes, waterborne epoxies and high solids one - and two component urethane coatings. The Company is most probably the leading Australasian manufacturer in the area of liquid-applied acrylic roofing membranes, and single-component moisture-cure urethane coatings. The Company has established very close relationships with its principal raw material suppliers in these fields, and operates in the forefront of technology in these areas.

Our prime object has been to place the Company in the position of being able to supply all finishes and waterproofing materials required to protect buildings from sub-basement to roof levels. Where the technology or manufacturing requirements are outside of our standard capabilities, the Company has secured distribution arrangements for appropriate products from leading manufacturers in their respective fields as noted under `Agencies' later in this profile.

Where appropriate, materials are covered under a Warranty system which is operated in conjunction with the Certified Applicator from the Equus Network who carries out the work on any particular project.

All products are manufactured under strict Quality Assurance standards monitored and controlled by our in-house laboratory. The Company has a TQM philosophy and is at present working within the parameters of an ISO9002 framework.

FACILITIES

The Company's production facility, laboratory and Head Office are located on 1.2 hectares of land in the Riverlands Industrial Estate, Blenheim, New Zealand.

The production equipment is modern and standardised, and the Plant has a capacity of up to 1.2 million litres of product per annum when operated on a single-shift basis. There is considerable room for expansion of the facility to cope with all requirements in the foreseeable future.

Additionally, the Company operates stores in Auckland, Wellington, Christchurch, Tauranga and Melbourne where basic stocks of commonly used products are held for immediate supply. The Company regards itself as a custom-formulator, rather than a manufacturer of conventional products, and stock holdings of standard products are rationalised for maximum stock turnover.

Technical representatives service both Clients and Certified Applicators, working from offices associated with the stores in all areas. Full technical back up to the sales staff is provided from the Head Office/Laboratory facility in Blenheim.

DISTRIBUTION NETWORK

Equus Industries Limited is not directly involved in retail sales. Distribution of Equus products is normally to Certified Applicators who are familiar with and trained in the use of the Equus range of products either in part, as Specialist Applicators for product ranges within the Network, or in total for major Applicators and those working in smaller centres.

A close relationship between Equus Certified Applicators and Equus Industries ensures that there is full co-operation on site between the Manufacturer's Supervisory/Technical Staff, and the Applicator's own staff. Quality Assurance Programmes instituted by the Manufacturer are therefore meaningful, noting that programmes are generally written for individual contracts to take in all aspects of work on that particular contract. This facet of the operation is controlled by the Company Compliance Manager. The Company is now operating within a similar framework in Australia.

DIRECTORATE

The Company was founded, and has been operated since inception, by the current Directors, who are:

Brian J Greenall BE (Chem), MNZIC, FTSC, AMIChemE
Managing Director

Marinus Wagenvoort BSc, MNZIC, ATSC
Technical Director

They have recently been joined by:

Dean Barr – Business Development Director

Rob Roxburgh – New Zealand Sales Director

Nikki Brown – Administration Director

These new Directors have all been associated with the Company for a number of years including time in Senior Management roles and bring youth, skills and vitality to ensure the continued strength of the organisation into the future.

It should be noted that the Directors and senior technical representatives have amongst them over 250 years combined experience in the surface coatings and construction industries.

ASSOCIATED PARTNER COMPANIES

As mentioned previously, Equus Industries Limited has formed a firm association with a number of companies outside New Zealand to ensure that the best possible products to fulfil market requirements, and to meet our objective of ensuring that we have available all protective materials required on a project, which can then be sourced from one supplier, generally through one Approved Applicator.

These companies include:

De Boer N.V – Belgium
Unique quality torch-on roofing and tanking membranes and ancillary products.

Tremco Pty Limited (subsidiary of Tremco Inc of USA) - Australia
Torch-on roofing and tanking membranes, construction sealants and liquid membranes.

Texmastic International Inc - USA
Self-adhesive membranes, protection board and associated materials.

Keimfarben GMBH & CO KG - Germany
Silicate paints and plasters.

Asahi Denka - Japan
Hydrophilic waterstops.

Shobond Construction Company - Japan
Epoxy Injection Systems for concrete repair.

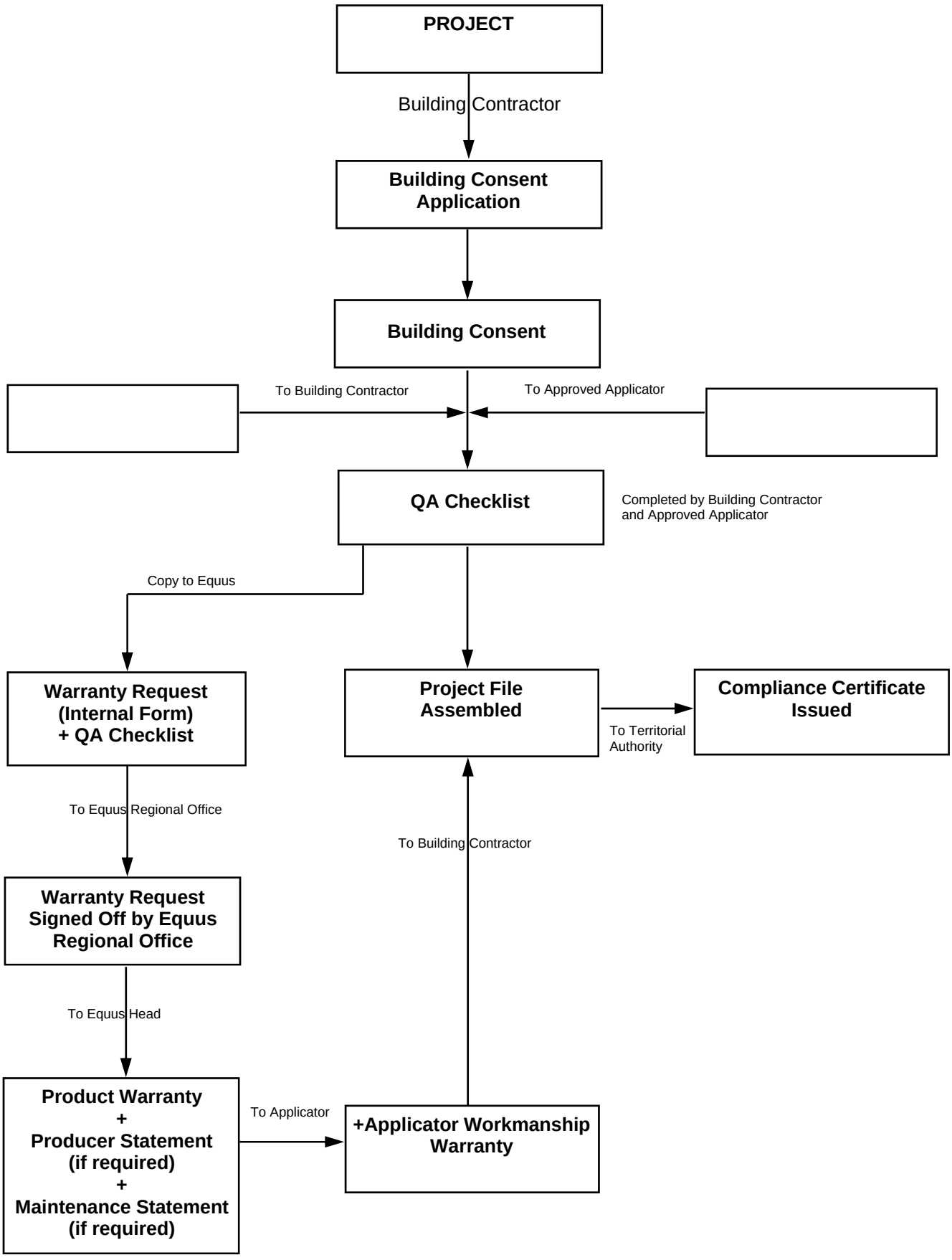
Concept Chemicals Ltd – UK
Cleaning Compounds

In all cases, Equus Industries Limited has the distribution rights for the New Zealand Market.

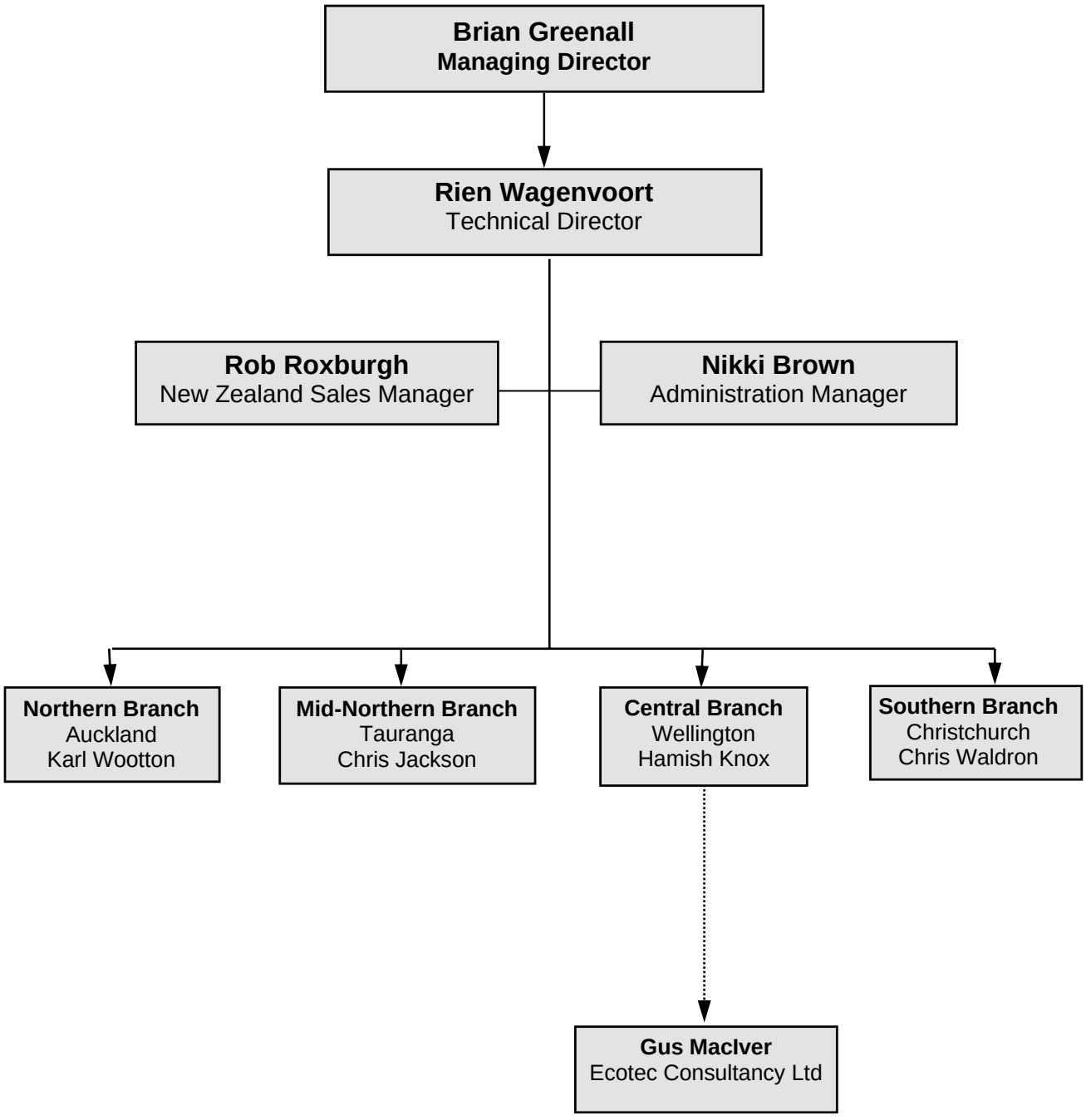
OUR MISSION STATEMENT

Through teamwork, to profitably manufacture and distribute the optimum in waterproofing and protective materials to the construction and allied industries.

Building Consent Process


PROJECT
Building Contractor
Building Consent Application
Building Consent
To Building Contractor
To Approved Applicator
QA Checklist
Completed by Building Contractor and Approved Applicator
Copy to Equus
Warranty Request (Internal Form) + QA Checklist
Project File Assembled
Compliance Certificate Issued
To Territorial Authority
To Equus Regional Office
To Building Contractor
Warranty Request Signed Off by Equus Regional Office
To Equus Head
Product Warranty + Producer Statement (if required) + Maintenance Statement (if required)
To Applicator
+Applicator Workmanship Warranty

Equus Compliance Chain Of Command

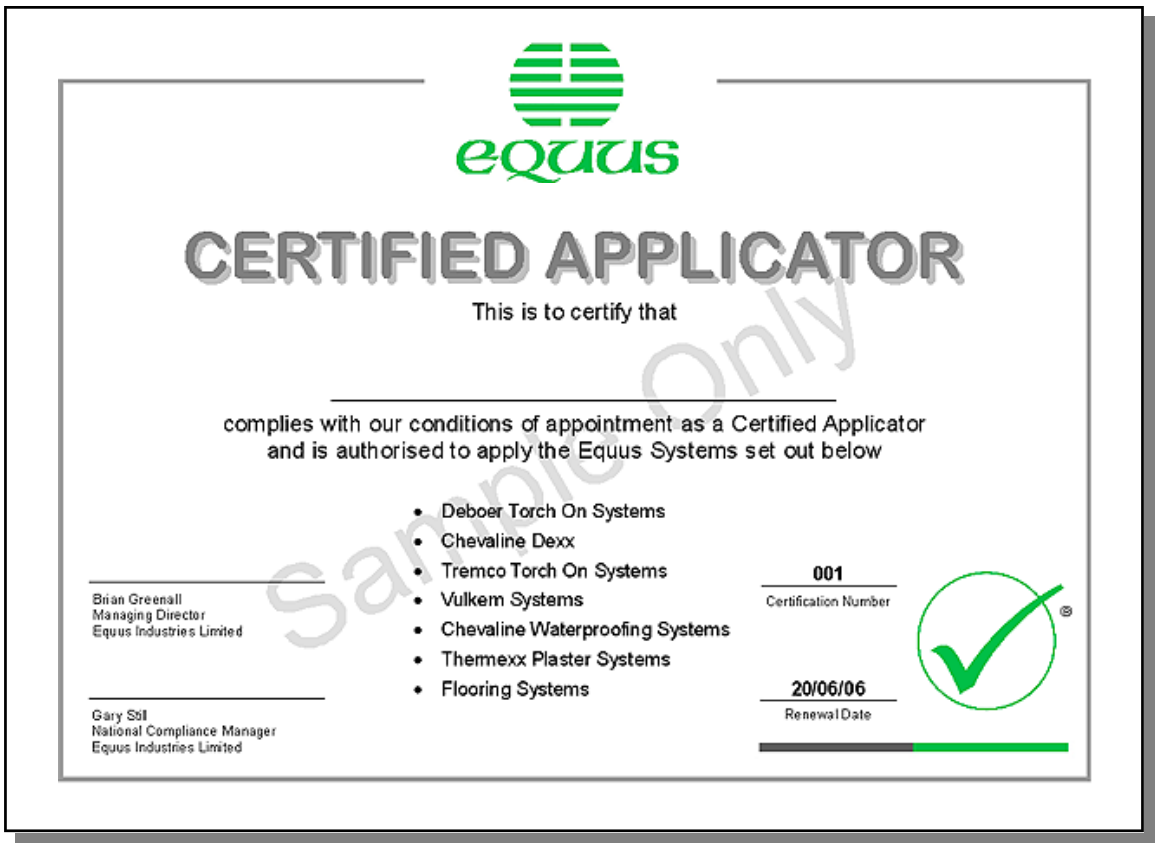


Approved Applicator List

Equus Industries Limited

Tick of Approval

Equus Industries is aware that the current market requires a high level of surety, not only for the performance of products that either have been manufactured locally by Equus over the last 22 years, or imported specifically for local conditions, but also that the Certified Applicator has the experience to perform the tasks covered by Equus technical requirements and also the requirements of all Regularity Authorities. The 'tick' represents our approval and certification of the applicator. The 'tick' is the achievement of experience within the industry being recognised by Equus Industries.



Specification

Standard specification for the application of DEBOBASE 3.5 CS/F SPECIAL single layer substructure waterproofing

Standard Specification number: P5200
March 2007

1.0 PREAMBLE:

This specification is for the application of **De Boer Debobase 3.5 CS/F Special (previously known as 3.5mm Special)** waterproofing membrane to below ground concrete structures and screed protected areas in construction.

De Boer Debobase has been especially designed to resist underground soil settlement.
The system is applicable on moist and dusty areas. After installation the system is not dependent on the weak lean concrete, but forms one part with the RC bottom slab.

The **Debobase 3.5 CS/F Special** membrane can be loose-laid on the lean concrete and all overlaps are welded by torch. The membrane is torched fully bonded at all vertical parts and corners. The membrane will lay outside the actual structure.

2.0 SURFACE PREPARATION:

2.1 General - Responsibility:

Unless expressly agreed otherwise at time of contract pricing, all work in this section shall be the responsibility of the main contractor, whether carried out by his own staff, other sub-trades or the specialist's finishes sub-contractor.

3.0 MEMBRANE APPLICATION:

3.1 Tanking – Torched Applications

Concrete structures must be specifically engineered to meet the requirements of the New Zealand Building Code.

When applying to existing substrates and structures, they must be thoroughly inspected to ensure that they will not affect the performance of the membrane when applied.

Curing times vary dependent on location, mixes and climate conditions. After the slab has been poured allow sufficient drying time, generally between 14 – 28 days. To verify concrete has sufficiently dried, a measurement can be taken using a hygrometer. A maximum relative humidity of 75% is required, measured at the time of membrane application. This process is essential when **Debobase** is torch applied.

It is recommended that curing compounds are not used. When they are, ensure that all traces of the compound are gone or removed.

The concrete shall be finished to NZS3114:1987 U3, with a light trowel texture.
The concrete shall have all ridges and protrusions stoned flush.

The outside wall receives a solvent based **De Boer Duo Bitumen Primer.** The primer can be applied by brush or roller to a dried and prepared surface at a spreading rate of 5 m2/ litre. Allow to dry for 4-24 hours depending upon prevailing weather conditions.

Debobase sand-finished membrane is torched at the connection between lean concrete and external wall. The lean concrete is cleaned by brush or air compressor. Then the **Debobase 3.5 CS/F Special** horizontal and external applications start. The membrane is torched fully bonded against the wall.

Pile edges are finished by means of a non-shrink mortar. The vertical areas and corners of beams, piles and pilar-caps, receive a solvent based **DUO primer**. All corners (internal and external) are reinforced with a complementary strip of **Debovix 3T/F K180** sand finished membrane

Fully heat weld all sheet joints by gas torch. Ensure all joins are well sealed with a minimum lap of 100mm.

Tanking - Loose-laid Applications

Debobase 3.5 CS/F Special can be installed inside tiltslabs or other types of pre-cast formwork prior to the concrete being poured. The waterproofing membrane becomes a part of the reinforced concrete slab and does not depend on the weak lean concrete.

Loose lay **Debobase 3.5 CS/F Special** to fit inside the formwork with the granular surface facing upwards. Fully heat weld all sheet joints by gas torch. Ensure all joins are well sealed with a minimum lap of 100mm. This in indicated by the presence of a thin bead of melted bitumen at all sheet joins after torching.

This process can be done off site if appropriate and the membrane delivered immediately prior to steelwork and concrete placement to prevent damage to the membrane during the construction process. The tiltslabs or pre-cast concrete must be left to cure for a minimum 4-day period before lifting takes place. This will enable the chemical bond of the surface of the membrane to the concrete to take place and also allow the correct curing of the concrete to occur. This is critical to the success of the waterproofing system.

Damp Proof Membranes (DPM) - Loose-laid Applications

In applications where **Debobase 3.5 CS/F Special** is installed as a loose laid damp proof membrane under concrete floor slab, curing times are not applicable.

When laying **Debobase 3.5 CS/F Special** as a Damp proof membrane under a concrete slab, the maximum non specific design of hardfill shall be up to 600mm in depth. Granular fill, sand blinding and compaction shall comply with the requirements of NZS 3604-99.

Granular fill in excess of 600mm will require a Geotechnical Engineer to investigate the underlying soil substrate layers for specific design requirements.

When placing reinforcing steel all care must be exercised to avoid unnecessary puncture or damage. While the membrane is tough and resistant, care is necessary.

3.4 Sheet Joints:

Decide the most suitable direction to follow then unroll and align the first roll, cut to length as required, re-roll both ends to the middle then torch evenly overall as this is unrolled. Ensure even heat application. Repeat in sequence with all rolls, maintaining laps of 100mm. This lap automatically closes during the torching process. Offset end laps in adjacent runs.

3.5 Repairs to damaged areas:

Should the **De Boer Debobase 3.5 CS/F Special** be damaged or perforated so that its waterproofing qualities are affected, repairs can be made by heat welding a piece of **De Boer Debovix 3 T/F K180** of suitable size to cover the damaged area with a minimum overlap of 100mm on all sides on the exterior surface.

Note: The main contractor shall immediately notify the waterproofing contractor if any such damage occurs.

Backfilling:

Drainage is required to prevent excessive hydrostatic pressure against the membrane. Provide a drain coil with a minimum diameter of 100mm (incorporating a filter material) to the base of the foundation. The outlet is required to discharge to an approved outlet. Installation shall be in accordance with E2/AS1 External Moisture of the New Zealand Building Code with provision for cleaning.

The membrane must be protected from being damaged by abrasive materials, expansive soils and during back filling. This can be achieved by installing a barrier such as fibre cement boarding or polystyrene.

Free draining granular backfill is required behind the tanked wall and around the drain coil. An impervious top coating is required above the free draining granular backfill to manage the surface water away from the building with a minimum fall of 1:30.

Equus Industries Limited must be consulted regarding the design and suitability of membrane barriers.

4.0 MAINTENANCE AND WARRANTY:

4.1 Maintenance

Equus Industries Limited recommends as normal maintenance, a certified installer inspect annually to ensure weather tightness and durability of the following areas;

The top edge of the membrane sheet, sheet protection at that top edge, the subsoil drainage is not blocked and is free draining to an approved outlet.

Check all associated building elements that can impact on the durability of the membrane.

4.2 Warranty:

The **De Boer Debobase 3.5 CS/F Special** waterproofing membrane as detailed in this specification, the product may be warranted to be waterproof for a period of up to twenty (20) years.

Such a warranty is issued on condition that:

1. All work is carried out by a **Certified Equus Contractor.**

2. **De Boer Debobase 3.5 CS/F Special must be installed in accordance with the manufacturer's technical literature and the Application Manual current at the time of design, use, installation and maintenance.**

3. The Warranty is issued in conjunction with an appropriate Maintenance Statement.

   The period of warranty is determined by the situation of the installation. The warranty period shall be determined for any contract in consultation with the Manufacturer or his representative.

   The warranty is provided to the client by the Equus Certified Applicator carrying out the work and is backed by the Manufacturer as to the fitness for the purpose of the materials supplied for the contract.

-ooo0ooo-

Datasheets

Debobase 3.5 CS/F Special

Basic Uses:

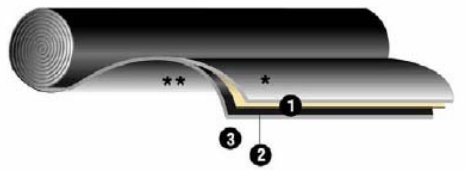
For waterproofing of underground structures and screed protected areas in construction. Especially designed to resist underground soil settlement in basement, tunnels, underpasses and retaining wall construction.

System:

Pre-formed torch-on membrane manufactured in the De Boer ISO 9001 controlled factory in Belgium. The system is applicable on moist and dusty areas. After installation the system is not dependent on the weak lean concrete tidy slab, or compacted fill, but remains integral with the main concrete slab.

Composition:

DeboBase 3.5 CS/F Special is a flexible waterproof membrane consisting of a special mixture of elastomer modified oxidised bitumen, and reinforced with a layer of non-woven polyester of min. 180 g/m². The upper surface is finished with 1 to 2 mm treated aggregate. The under surface is finished with a polyethylene foil of 12 micron thickness. This membrane can be applied by torch, or loose-laid with torch-welded joints.



* Upper finishing: talcum sand
1. Upper coating in SBS modified bitumen
2. Reinforcement consisting of non-woven polyester min. 180 g/m²
3. Under coating in SBS modified bitumen

** Under finishing: polyethylene foil

Packaging:

1m x 10m roll.

Number of rolls on 1 pallet: 20 rolls

Advantages:

- Hi-tech quality waterproofing membrane especially designed for underground waterproofing purposes.
- The system adheres 100% to cement screed and concrete.
- **DeboBase 3.5 CS/F Special** system resists underground soil settlement.
- Fast to install.
- The system can be installed on a moist and/or dusty surface.
- Guaranteed thickness of 3.5 mm.
- Maybe installed by torch, loose-laid and mechanically fastened.

Surface Preparation:

- The working area needs to be free of standing or flowing water and mud.
- Lean concrete has to be sound and stable and is extended by 300mm out of the actual structure.
- The surface needs to be free of oil and grease.
- Co-ordination with specialist applicator concerning piles and pile-caps is important.

Finished Product:

		Average Values
Breaking load NBN 46-201	(N/5 cm)	≥900 (Long) ≥700 (Trans.)
Ultimate elongation NBN B 46-201 (%)		40(L.) 28(T.)
Heat test	ºC (ASTM D638-91)	No sagging after 2 hours at 80ºC
Bending test	ºC (UEAtc)	No breaking at 3º
Peel strength	N (ASTM D4545-86)	830
Puncture strength	N (ASTM D4833-88)	720
Thickness	mm (UEAtc)	+/- 3.5 mm
Roll weight	kg (UEAtc)	+/- 45 kg

Method Statement:
DeboBase 3.5 CS/F Special System

The site concrete is cleaned by brush or air compressor. Pile-edges are finished using a non-shrink mortar. The vertical areas and corners of beams, piles and pile-caps, receive a Duo Bitumen Primer. All corners (internal and external) are reinforced with a complementary strip of **DebobVix 3mm** sand finished membrane.

The **DeboBase 3.5 Special** membrane is loose-laid on the site concrete or prepared sand/fill surface and all overlaps are welded by torch. The membrane is torched fully bonded at all vertical parts and corners. The membrane will lay outside the actual structure. The outside wall is primed with Duo Primer.
A strip of **DeboVix 3mm** sand-finished membrane is torched at the connection between site concrete and external wall. Here the horizontal and external application of the **DeboBase 3.5 Special** starts. The membrane is torched fully bonded against the wall.

Health And Safety:

Duo Bitumen Primer is solvent based and must be used with adequate ventilation. Remove all naked flames and sources of ignition. Adequate ventilation is required to minimise exposure to bitumen fumes during the torching process. Material Safety Data Sheet (MSDS) must be read and understood prior to use of product.

Storage:

Store rolls in a dry place always in upright position.

DeboBase 3.5 Special Product Range:

DUO Primer - Solvent based bitumen primer to prepare the concrete surface.
DebobVix 3 mm T/F - Reinforced membrane to provide extra safety strips at corners.
DeboBase 3.5 mm Special - Special granulated sheet membrane to adhere to the main concrete slab.

Approval:

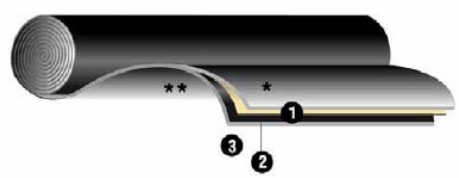
Equus Industries Ltd
PO Box 601
Blenheim
Phone: 03 578 0214 Fax 03 578 0919
Email: admin@equus.co.nz

Edition 1
July 2006

Debovix 3 T/F K180

Technical Description:

Debovix 3 T/F K180 is a flexible waterproofing membrane consisting of a mixture of penetration bitumen, modified with synthetic rubbers of the SBS type (Styrene-Butadiene-Styrene) and reinforced with a layer of non-woven polyester of min. 180 g/m². The upper surface is finished with a mixture of talcum and sand; the under surface with a polyethlene foil. The bitumen mixed with SBS improves the quality and elastic characteristics of the finished product. The addition of SBS increases the heat resistance and improves the flexibility at low temperatures.



* Upper finishing: Talcum and sand
1. Upper coating in SBS modified bitumen
2. Reinforcement consisting of non-woven polyester of minimum 180 g/m²
3. Under coating in SBS modified bitumen

** Under finishing: polyethylene foil

Packaging:

1m x 10m roll.

Number of rolls on 1 pallet: 25

Surface Preparation:

All surfaces need to be cured and dry before the application of the **DUO Primer**. Surfaces need to be smooth and clean, free of oil and grease. All necessary details like skylights, drains and down-pipes need to be addressed before the laying of waterproofing membrane starts. Co-ordination with specialist applicator concerning these details is important.

Warranty

The client will receive a combined warranty on product and installation from the specialist applicator and manufacturer. The product warranty may be insurance backed by AG-FORTIS under policy number 99.075.400

Finished Product:

		Average Values
Breaking load NBN 46-201	(N/5 cm)	≥900 (Long) ≥750 (Trans.)
Ultimate elongation NBN B 46-201 (%)		≥45(L.) 45(T.)
Tear test	(N)	85
Cold flexibility	(ºC)	-23ºC
Softening point	(ºC)	115ºC
Thickness		3 mm
Roll weight		32 kg

Health And Safety:

Duo Bitumen Primer is solvent based and must be used with adequate ventilation. Remove all naked flames and sources of ignition. Adequate ventilation is required to minimise exposure to bitumen fumes during the torching process. Material Safety Data Sheet (MSDS) must be read and understood prior to use of product.

Storage:

Store in a dry place always in upright position.

Approval:

Technical approval: BUTgb ATG 1745

Equus Industries Ltd
PO Box 601
Blenheim
Phone: 03 578 0214 Fax 03 578 0919
Email: admin@equus.co.nz

Edition 1
July 2006

Brochure

de boer
waterproofing solutions

WELCOME TO THE WORLD OF SECURE UNDERGROUND H_2O-PROOFING

debobase

3.5 mm special

A PERFECT SOLUTION FOR STRUCTURAL WATERPROOFING

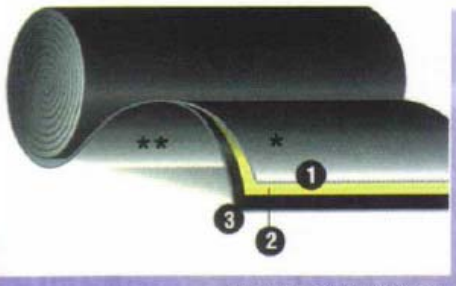
Innovated by

SYSTEM DESCRIPTION

Waterproofing of basement with pilar caps and beams

- The Debobase 3.5 system is designed for fast and efficient **underground waterproofing**.
- This system creates a durable watertight skin that is not affected by future movements of soil or construction.
- The waterproofing membrane is **loose-laid** on top of the lean concrete. Concrete is cast on top of the waterproofing membrane. The waterproofing becomes **a part of the reinforced concrete slab** and does not depend on the weak lean concrete. The system **resists soil settlement** in the future.
- The waterproofing membrane **resists foot traffic** during application.

COMPOSITION



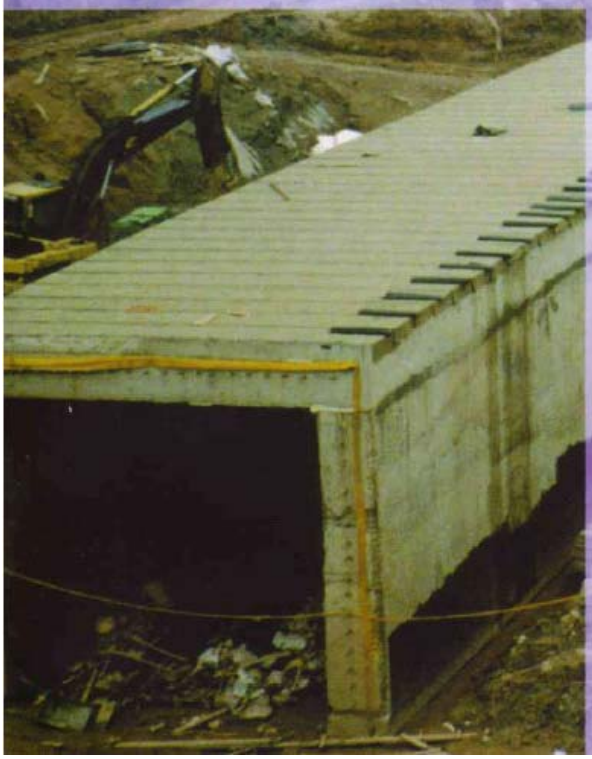
Composition of the membrane

- * **Granule stones**: to protect the membrane and chemically modified to bond to the reinforced concrete.
  1. First layer **elastomeric modified bitumen** for extra adhesion and watertight connection.
  2. 200 g/m² non-woven **polyester reinforcement** for strength and stability.
  3. Second layer of elastomeric bitumen for **extra adhesion** and watertight connections.

  Polyethylene **film
- The membrane has a pre-manufactured overlap of 100 mm at the side.

Polyester Reinforcement

Granulated finishing



USES

- Foundation / basement under slab application
- Foundation wall
- Pile-cap and beam
- Utility supply channel
- Open-cut tunnel
- Swimming pool
- Earth covered structure
- Water ponds

Waterproofing of a pile

ADVANTAGES

PRODUCT

- Does not need water , lime or water pressure to react.
- Ground chemical resistant.
- Durable before and after installation.
- Resists foot traffic immediately after application.
- No complementary self-adhesive tape necessary.
- No primer necessary on horizontal slab.

Waterproofing ceramic factory, Da Nang - Vietnam

DESIGN

- One layer system for damp- & waterproofing.
- Protection screed not necessary.
- Resists soil settlement.
- De Boer provides customized drawings, based on your specific design.
- Independent and external concrete protection.

APPLICATION

- Fast loose-laid installation on lean concrete. (only overlap is sealed)
- Heat welded connection in moist and dusty underground conditions.
- No curing time required.
- Can be left exposed for longer period during installation.
- One layer system.

Waterproofing of utility tunnel, Valencia - Spain

QUALITY

- Single source system.
- Quality inspection of overlaps prior to concrete cast is possible.
- ISO 9001 production.
- Quality inspection by manufacturer on-site.
- Guaranteed thickness of 3.5 mm and weight of 4.5 kg/m².
- References available since 1997.
- Materials deliverd with certificate of origin of the European community (Belgium)

INSTALLATION

- Horizontal application
  - Loose laid on lean concrete
  - Heat welded overlaps for moist and dusty underground conditions.
- Vertical application
  - Torch-on installation at the wall
  - Additional mechanical fastening possible.

Quality assurance procedure is implemented during every project.

Full installation method & details available.

CAD CAM drawings available for your design

TECHNICAL DATA SHEET

Waterproofing Park Hyatt hotel, Hanoi - Vietnam

Waterproofing Park Hyatt hotel, Hanoi - Vietnam

Waterproofing Wisma Mulia Tower, Jakarta - Indonesia

PROPERTY	TYPICAL VALUES DEBOBASE 3.5 mm SPECIAL
Thickness	min. 3.5 mm
(Test: UEATC)	min. 0.138 inch
Roll weigth	45 kg/roll
(Test: UEATC)	99.21 lbs
Weigth/m²	4.5 kg
(Test: UEATC)	9.92 lbs
Dimension	10 m x 1 m
(Test: UEATC)	32.81 ft x 3.28 ft
Low temperature resistance	Unaffected at -5 °C
(Test: UEATC)	Unaffected at + 23 °F
Heat resistance	+90 °C
(Test: UEATC/ASTM D36)	+194 °F
Elongation (average)	45 %
((Test: UEATC on membrane including reinforcement)	
Puncture resistance (average)	720 N
(Test: ASTM D4833-88)	
Lap peel strength (average)	830 N/m
(Test: ASTM D4545-86)	

Full technical data sheet available upon request.

NV De Boer has the authority to change the values at any time upon internal decision conform the ISO9001 guidelines.

REFERENCES

SOME DEBOBASE REFERENCES

Wisma Mulia Tower (Office building)	12,000 m²
Putra Jaya LRT Works 1 (Tunnel)	150,000 m²
Putra Jaya LRT Works 2 (Tunnel)	150,000 m²
New securities commission (Office building)	10,000 m²
Kelana's Entrepreneurs Ex. (Office building)	35,000 m²
Egat, Rayong Province (Power station)	10,000 m²

Full reference list available upon request or see our website on **www.deboer.be**

de boer
waterproofing solutions

Metropoolstraat 33
2900 SCHOTEN
BELGIUM
Tel. +32 3 641 08 01
Fax +32 3 641 08 09
E-mail: info@deboer.be

1/68 Lake Avenue, 188
Sukhumvit Road, Soi 16, Klongtoey
Bangkok 10110, THAILAND
tel. +66 18 28 75 08
fax +66 2 260 08 89
E-mail: o.verdickt@deboer.be

Testing Data

New Zealand Building Code
Complies to E2/AS1
Clause: 10.3.3 — 10.3.4

de boer
waterproofing solutions

E-mail | message

EQUUS INDUSTRIES LTD
Attn.: MR. BRIAN GREENALL
Director
4 Sheffield Street, Riverlands Estate,
Blenheim
NEW ZEALAND

FAX: + 64 3 578 09 19
Mail : brian@equus.co.nz

Our Ref.:OVT/NZ/05/C/0878

Belgium, 29 June 2005

SUBJECT: DEBOBASE 3.5 SPECIAL WATERPROOFING MEMBRANES: VAPOUR FLOW RESISTANCE

Dear Mr. Greenall,

Following your information request concerning the vapour flow resistance of the Debobase 3.5 Special waterproofing membranes, manufactured by our company De Boer NV Belgium, we hereby send you the following statement:

The Debobase 3.5 Special waterproofing membrane is a modified bituminous sheet made of modified bitumen with a non-woven polyester fabric reinforcement and a polyethylene backing.

The Debobase 3.5 Special membrane is designed and developed to:

- Have a vapour flow resistance of no less than 90 MN s/g,
- Have all joints sealed during application by torch-on application,
- Have its own protective granules, incorporated into the pre-manufactured membrane, as extra protection during backfilling.

De Boer NV confirms that Debobase 3.5 Special membranes will have the characteristics mentioned above when correctly installed by our approved applicators.

Yours Sincerely,

Oliver Verdickt
Quality Assurance Engineer
De Boer NV Belgium

Chris DE ROECK
Export Director
De Boer NV Belgium

commitment | worldwide | innovation | since 1922

De Boer nv | Metropoolstraat 33 | BE 2900 Schoten | Belgium | www.deboer.be
Tel. +32 3 641 08 01 | Fax +32 3 641 08 09 | e-mail: sal-exp@deboer.be

SGS

Laboratory Tests

ACSIG
ASIAN CENTER FOR SOIL IMPROVEMENT AND GEOSYNTHETICS
School of Civil Engineering
Asian Institute of Technology
Km. 42 Paholyothin Highway
Klong Luang Pathumthani

PROF. DENNES T. BERGADO, Director
Phone: (66-2) 524-5512
Fax: (66-2) 524-6050
Email: bergado@ait.ac.th

Asian Institute of Technology P.O. Box 4, Klong Luang, Pathumthani 12120 Thailand Tel. (66-2) 516-0110 to 29 Fax. (66-2) 516-2126

LABORATORY TESTS ON GEOMEMBRANES

Specimen: Debobase 3.5 Special

Submitted to:

Mr. Oliver Verdickt
Duo Thailand, 71/197 Moo7
Atthaleeya Ville, Lamlukka Klong 3
Ladsawai, Lamlukka, Pathumthani
Thailand

Submitted by:

Prof. Dennes T. Bergado
ACSIG Director
School of Civil Engineering
Asian Institute of Technology
Km. 42 Phaholyothin Road
Pathumthani Province

April 2000

1 BACKGROUND

The design and performance of geomembranes generally vary depending on its functions and applications. Geomembranes, which are impermeable, are widely used for lining purposes of canals and ponds, for containment purposes of hazardous wastes and leachates, and for other waterproofing purposes. In this report, the properties of the Debobase 3.5 Special geomembrane are presented. The sample was submitted for testing by the Duo Thailand Company. A copy of the pre-testing agreement is included in Appendix.

2 GEOMEMBRANE CHARACTERISTICS

2.1 Tensile Strength

The tensile strength of a geomembrane is that strength of the specimen when it is subjected to a tensile force according to its principal axis, at constant speed, by moving one of the clamps of the tensile machine. The laboratory test was conducted in accordance with ASTM D638 Type IV (Standard Test Method for Tensile Properties of Plastics). In this test, a continually increasing load at a rate of 40 mm/min was applied to the specimen until rupture of the specimen occurred. Values of the breaking load and elongation were obtained through an interfaced computer. Measured tensile strength values of the Debobase 3.5 Special geomembrane are presented in Table 1.

2.2 Tear Resistance

The tear resistance was conducted in accordance with ASTM D1004-90 (Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting). In this test method, resistance to tear is calculated from the maximum load at a rate of 40 mm/min was applied to the specimen until rupture of the specimen occurred. Values of the tearing load and elongation were obtained through an interfaced computer. Measured tear resistance values of the Debobase 3.5 Special geomembrane are presented in Table 2.

2.3 Puncture Resistance

Puncture resistance is defined as the inherent resisting mechanism of the test specimen to failure by a penetrating or puncturing object. The laboratory test was conducted in accordance with ASTM D4833 (Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products). A 100mm x 100mm geomembrane was clamped without tension between circular plates of a ring clamp attachment secured in the tensile testing machine. A force was exerted against the center of the unsupported portion of the test specimen by a solid steel rod attached to the load indicator. Measured puncture resistance of the Debobase 3.5 Special geomembrane are presented in Table 3.

2.4 Seam Strength

The seam strength test was conducted in accordance with ASTM [illegible] 96 (Standard Practice for Determining the Integrity of Factory Seams Used in Joining

Manufactured Flexible Sheet Geomembranes). Five two inch (51mm) wide specimens were prepared with the seam at the center of the test specimen and perpendicular to the centerline. The distance between the clamps was 2 inches (51) plus the width of the seam with the seam centered between the clamps. An increasing load was applied at a rate of 40mm/min and the values of the tensile strength and the corresponding elongation were obtained through an interfaced computer. Measured seam strengths of the Debobase 3.5 Special geomembrane are presented in Table 4.

3 SUMMARY OF TEST RESULTS

The laboratory test results of the properties of the Debobase 3.5 Special geomembrane are summarized in Table 5.

4 DISCLAIMER

The client Duo Thailand is hereby forewarned that this report covers only the test results of the Debobase 3.5 Special Geomembrane that was submitted February 22, 2000 and tested according to the specified test standards and testing atmosphere of 21 ± 2^{0}C temperature and 65 ± 5% humidity. This report, however, does not necessarily represent the condition of other products with the same nomenclature. No changes will be made in this report and in the data without prior permission from the laboratory. This report will be kept in the active file for six months after which it will be disposed.

Very truly yours,

Prof. Dennes T. Bergado
Director
Asian Center for Soil Improvement and Geosynthetics
Geotechnical Engineering Program
School of Civil Engineering
Asian Institute of Technology

REFERENCES:

ASTM DESIGNATION: D638 Type IV. "Standard Test Method for Tensile Properties of Plastics," Annual Book of ASTM Standards.

ASTM DESIGNATION: D1004-90. "Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting," Annual Book of ASTM Standards.

ASTM DESIGNATION: D4833-88. "Standard Test Method for Index Puncture Resistance of Geotextile, Geomembranes, and Related Products." Annual Book of ASTM Standards.

ASTM DESIGNATION: D4545-86. "Standard Practice for Determining the Integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembranes," Annual Book of ASTM Standards.

ASTM DESIGNATION: D4355-92. "Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water," Annual Book of ASTM Standards.

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Phone: (66-2) 524-5512
Fax: (66-2) 524-6050
Email: bergado@ait.ac.th
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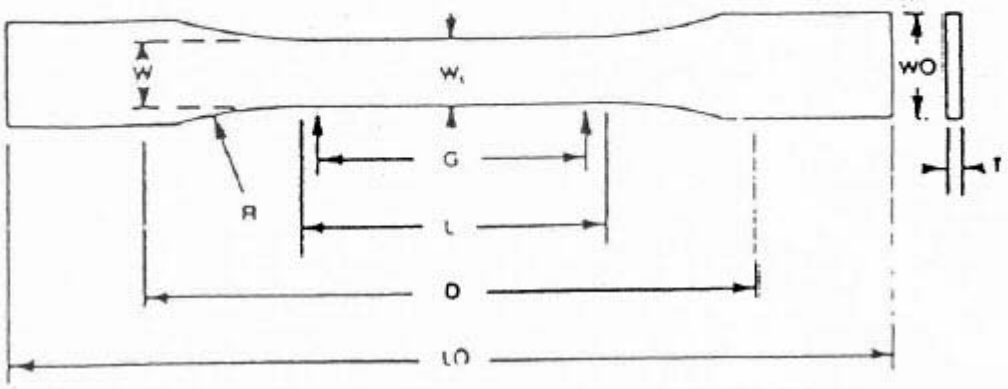
LABORATORY TESTS ON WATERPROOFING MEMBRANES

Product: DEBOBASE 3.5 SPECIAL
Manufacturer: N.V. De Boer - Belgium
Date: April 2000
Submitted to: Mr. Oliver Verdickt - DUO Thailand
Submitted by: Prof. Dennes T. Bergado
ACSIG Director
Asian Center for Soil Improvement and Geosynthetics
School of Civil Engineering
Asian Institute of Technology

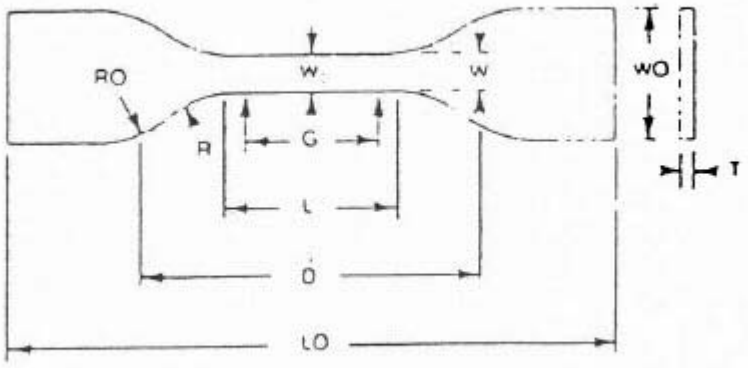
Summary of the Laboratory Test Results of DEBOBASE 3.5 SPECIAL Membrane

Property		Unit	Test Method	Measured Value
Tensile Strength				
Roll Direction	strength	kN/m²	ASTM D638-91 Type IV	3488.00
	elongation	%		40
Cross-roll Direction	strength	kN/m²		2729.76
	elongation	%		28
Trapezoidal Tear Strength		kN	ASTM D1004-90	
roll direction, strength				0.18
cross-roll direction, strength				0.15
Puncture Strength		kN	ASTM D4833-88	0.72
Peel Strength		kN	ASTM D4545-86	0.83

Note: For detail please refers to the test report "Laboratory Tests on Waterproofing Membranes: Specimen: Debobase 3.5 Special" dated April 2000. Likewise, the report will be kept in the active file for six months, after which it will be disposed.



TYPES I II III & V



TYPE IV

TABLES

Table 1 Measured tensile strength values of Debobase 3.5 Special Geomembrane

Tensile Strength		Trial1	Trial2	Trial3	Trial4	Trial5	Mean
roll direction	Strength, psi	494.89	494.81	439.91	604.87	494.89	505.87
	Elongation, %	35	52	41	40	33	40
cross-roll direction	Strength, psi	384.91	439.89	439.89	384.91	329.92	395.90
	Elongation, %	20	32	32	38	19	28

Table 2 Measured tear strength values of Duo 4 Slates/Foil Geomembrane

Tear Strength		Trial1	Trial2	Trial3	Trial4	Trial5	Mean
roll direction	Strength, lb	42.02	37.08	46.97	42.02	37.08	41.03
cross-roll direction	Strength, lb	44.49	32.13	32.13	32.13	32.13	34.60

Table 3 Measured puncture resistance values of Debobase 3.5 Special Geomembrane

Puncture Resistance	Trial1	Trial2	Trial3	Trial4	Trial5	Mean
kN	0.80	0.83	0.79	0.58	0.58	0.72

Table 4 Measured peel strength values of Debobase 3.5 Special Geomembrane

Peel Strength	Trial1	Trial2	Trial3	Trial4	Trial5	Mean
kN	0.87	0.84	0.74	0.87	0.82	0.83

Table 5 Summary of The Laboratory Test Results of Debobase 3.5 Special Geomembrane

Property	Unit	Test Method	Measured Value
Tensile Strength		ASTM D638-91	
Roll Direction		Type IV	
strength	psi		505.87
elongation	%		40
Cross-roll Direction			
strength	psi		395.90
elongation	%		28
Trapezoidal Tear Strength		ASTM D1004-90	
roll direction, strength	lb		41.03
cross-roll direction, strength	lb		34.60
Puncture Strength	kN	ASTM D4833-88	0.72
Peel Strength	kN	ASTM D4545-86	0.83

Independent Physical Testing

Roof Membrane Test

Product	Equus Debobase on basesheet
Date	26 August 2005
Location	Mainzeal Yard, Tawa Wellington
Weather Conditions	Dry, overcast, light winds
Substrate	Existing concrete slab
Test area	1.710Mx1.010Mx0.190M– Weight 0.800T
Crane	Coles 20T rough terrain
Testing Equipment	Calibrated 15T Loadcell
Testing carried out by	Andrew Howie, Mainzeal, 021-625-875
Present to witness test	Jonathan Morgan, Equus, 027-659-2169 Graeme Tennant, 1Group, 0275-452-157

Test Aim

To test surface tension and binding characteristics of the membrane and the insitu concrete slab, also the connection of membrane and the existing slab.

Test will be carried out by trying to pull apart any of the 4 products

- Existing concrete slab
- Membrane Basesheet
- Membrane Debobase
- Insitu Slab

Test 1 Apply tension from the crane at a 20º angle and test to 3.000T and hold for 2 minutes.

Test 2 Apply tension from the crane in a vertical position and test to 3.000T and hold for 2 minutes

Test 3 Apply tension from the crane in a vertical position and test until membrane and/or concrete fail

Preparation for Test

An area of 4m² was steam cleaned to remove any grease and dirt from an existing concrete slab at the Mainzeal Plant Yard in Tawa.
Surfaceworks installed 2m² of the De Boer Debobase along with the systems basesheet membrane.
The membrane system was left untouched for 1 week.
A reinforced concrete slab (1.710x1.10x0.190) was boxed and poured over the membrane and left to cure for 5 days.

Test 1

The crane was placed into a position to give an estimated pulling angle of 20º (17º actual).
The lifting gear was connected to the loadcell and the loadcell zeroed.
Weight was gradually taken by the crane until 3.15T was reached and held for 2 minutes.
No visible movement from the membrane or concrete was witnessed.

Result
At 17º and 3.15T of pull, the slab did not move.

Test 2

The crane was placed with the hook vertically aligned with the concrete slab below.
The loadcell was checked.
Weight was gradually taken by the crane until 3.30T was reached and held for 2 minutes.
No visible movement from the membrane or concrete was witnessed.

Result
At 90º and 3.30T of pull, the slab did not move.

Test 3

A continuation of Test 2
More weight was gradually taken by the crane, it took about 1.5 minutes to increase load from 3.30T to 7.0T
At 7.0T no further weight was taken, after about 30 seconds the insitu slab pulled away from the membrane.
No visible movement was witnessed until the moment the slab let go.

Result
At 90º and 7.00T of pull, came away from the membrane.

After Test Findings

On inspection of all surfaces after testing there was a good connection between the membrane and insitu concrete slab, chip from the Debobase was evident on the underside of the slab.
The top surface of the Debobase was in a good condition with no tears or rips.
The connection between the Debobase and the base sheet was still completely intact.
There was some minor pockets in the centre of the membrane sheeting where the basesheet had come away from the existing slab, 1 about 100mm˘ and 1 about 200mm˘

Conclusion

Whilst this test was not carried out by a recognised testing facility it did show the surface connection between the Debobase and the concrete is excellent

Andrew Howie
1 September 2005


MAINZEAL

Concrete slab pulled to fail,

First Test at 17° angle, held at 3.15T

Quality Assurance

Quality Assurance

De Boer Debobase Special 3.5mm

Single layer Substructure Waterproofing.

Specification No: P5200 **Warranty No:** _____

Project & Address: _____

_____

Certified Applicator: _____

Building Owner: _____

Property Manager: _____

1. Statement of Intent

(a) This checklist is to be completed by both the Equus Applicator and the Equus Technical Consultant, as a step by step record of compliance with both the Equus Specification provided for the contract, and the requirements of the manufacturer for warranty.

(b) A copy of this checklist must be forwarded to the nearest Regional Office of Equus Industries Ltd. A Warranty will not be issued by Equus Industries Ltd. without a copy of this Checklist being filed.

(c) A copy of this checklist should form part of the Contract Documentation filed with the Property Manager on job completion.

2. Areas Treated

The areas to which Membrane is applied are detailed below, with reference to plans (where appropriate).

_____

_____

_____

3. Sign Off

We confirm that all applicable processes listed in Section 4 have been correctly completed and that sign-off on each stage has been made by a person with the authority to do so.

For: _____ _____ (Signature)

(Building Contractor)

Date: / / _____ (Name)

For: _____ _____ (Signature)

(Equus Applicator)

Date: / / _____ (Name)

4. Checklist And Method Statement

No.	Process	Completed On	Building Contractor	Equus Contractor
1.	Loose lay **De Boer Debobase** to fit inside the formwork of the tiltslab panel with granular surface facing upwards.			
2.	Fully heat weld all sheet joints by gas torch and ensure all are well sealed.			
3.	Install Hilti 20-40mm IDP anchors through membrane from reverse-side so shafts are pointing upwards at approx. 400mm centres around perimeter of formwork.			
4.	Install 3-4 fasteners through centre of membrane sheet and seal with a bead of **Polyroof** sealant.			
5.	End Joints: Weld end joints as side joints, and scrape away granular chip prior to welding.			
6.	Damaged areas: Any areas be perforated or damaged repair by heat welding a piece of **De Boer SBS T/F** including a 75mm overlap.			
7.	Tiltslabs: Tiltslab should be allowed to cure for a minimum of 4 days before lifting takes place. This is critical to the success of waterproofing.			
8.	After tiltslabs have been raised, the formwork shall be constructed to enable in-situ pouring of concrete to pillars.			
9.	Place a strip of **De Boer Debobase Special** inside formwork and nail. Install Hilti IDP Anchors as required. Allow to cure min. 3 days.			
10.	All concrete work has been completed, formwork removed and correct curing times have been observed. All cold joints ground smooth.			
11.	All joins to receive a bandage of **De Boer SBS 3T/F** heat welded to the outside of the **De Boer Debobase Special** membrane.			
12.	Ensure all fastener heads are covered and protruding nails are cut off and well sealed, using **Tremco Polyroof**.			
13.	All external/internal corners shall receive the same bandage a required.			
14.	The Polythene floor membrane shall be turned up the external face of the wall approx. 300mm and taped into place with 150mm strip **Texmastic Aquasel AD** self adhesive tanking membrane to **De Boer Debobase Special**.			
15.	Newly installed membrane shall be protected the use of backer board such as **Polyflow**.Care taken to prevent damage to membrane during backfil.			
16.	Any loose areas on the upper edge of membrane can be lightly torched into place or sealed with a bead of **Polyroof** sealant or a strip of **Polyflash** tape.			
17.	System to be inspected on completion			

Warranty

Equus Industries Ltd.
45 Hutt Road
Petone, Lower Hutt
PO Box 38 636
Wellington Mail Centre.
Phone: 04 576 0333
Fax: 04 576 0334
Email: central@equus.co.nz
Web: www.equus.co.nz

20 YEARS OF PROVEN PERFORMANCE

PRODUCER STATEMENT REQUEST FORM

Date: _____

Project: _____

Spec. No: _____

Owner: _____

Site Address: _____

Building Consent No: _____

Issuing Territorial Authority: _____

Building Contractor: _____

I/We _____ have undertaken work at the above address in accordance with Equus Specification No. P_____

I/We confirm that the work was completed in a tradesman like manner using products supplied by Equus Industries ltd.

SPECIFIC AREAS PERTAINING TO PRODUCER STATEMENT:

_____

_____

_____

Please use separate sheet if required (attach to this form).

COMMENTS IN RELATION TO PROJECT WHICH MAY AFFECT OUR PRODUCER STATEMENT:

_____

_____

_____

_____

Please use separate sheet if required (attach to this form).

The undersigned agrees to comply with all conditions of his appointment as an **Approved Equus Applicator.**

Date:_____ Authorised Signatory:_____

Completed project sighted and signed off: _____Equus Representative

Date: _____

Equus Industries Ltd.
45 Hutt Road
Petone, Lower Hutt
PO Box 38 636
Wellington Mail Centre.
Phone: 04 576 0333
Fax: 04 576 0334
Email: central@equus.co.nz
Web: www.equus.co.nz

20 YEARS OF PROVEN PERFORMANCE

WARRANTY REQUEST FORM

Date: _____

Project: _____

Spec. No: _____

Owner: _____

Site Address: _____

Building Consent No: _____

Issuing Territorial Authority: _____

Building Contractor: _____

I/We _____ have undertaken work at the above address in accordance with Equus Specification No. P_____

I/We confirm that the work was completed in a tradesman like manner using products supplied by Equus Industries ltd.

SPECIFIC AREAS PERTAINING TO WARRANTY:

_____

_____

_____

Please use separate sheet if required (attach to this form).

COMMENTS IN RELATION TO PROJECT WHICH MAY AFFECT WARRANTY:

_____

_____

_____

_____

Please use separate sheet if required (attach to this form).

The undersigned agrees to comply with all conditions of his appointment as an **Approved Equus Applicator.**

Date:_____ Authorised Signatory:_____

Completed project sighted and signed off: _____Equus Representative

Date:_____

Project Name
Address
(Building Contractor - ….)
(Building Consent - #### - Territorial Authority)
DE BOER Debobase Special 3.5mm Substructural Waterproofing
(Standard Specification P5200 mod)

Dear Sirs

Further to our discussions regarding a material warranty covering coating materials supplied for the above contact, we would confirm the Terms and Conditions of the Warranty as set out in this letter as follows:

1. **Limitations of Cover:**

   The terms and conditions of Warranty as set out in this letter refer specifically to materials supplied by Equus Industries Limited ('Equus'), acting as Sales Agents for De Boer N.V, (De Boer), Metropoolstraat 33, 2900 Schoten, Belgium, who are the Manufacturers of the materials. The materials supplied to your Company as an Approved Applicator of De Boer Materials.

2. **Warranty Cover:**

   The Warranty covers quality and suitability for use of materials supplied for exterior application and relates to film integrity in the sense that it covers waterproofing integrity of the applied membrane.

3. **Warranty Period:**

   The maximum period for which such materials are covered by a materials warranty is fifteen (15) years from such date as stipulated in any form of warranty entered into by (Approved Applicator Name).

4. **General Terms and Conditions:**

   (a) This warranty is applicable only to materials manufactured by De Boer, supplied by Equus Industries Ltd., and applied by (Approved Applicator Name) on the above contract.

   (b) This warranty is supplied to (Approved Applicator Name) as the purchase of materials. It is not an application or Process Performance Warranty and may not replace or supplant any warranty required of (Approved Applicator Name) for application/ process performance.

   (c) The warranty is valid only for the satisfactory performance of materials which are applied to this contract strictly in accordance with specifications supplied for this contract, information contained in relevant Know How's, and any other specific written instructions supplied by De Boer or Equus Industries Ltd., or amendments thereto.

WORKMANSHIP AND APPLICATION
WARRANTY

Certified Number:_____
Consent Number:_____
Issuing Authority :_____

To _____**(the Client)**

We (Applicator Company Name) an Approved Equus Applicator

having completed our contract on

(Project Name/Location)

with the (Name of Equus System)

Hereby undertake that we will rectify at our own cost, any failure in performance by the above mentioned system or systems resulting from defective workmanship and application or incorrect system nomination by the Applicator, which occurs within the period of ..... years from the date of completion of our contract.

Namely
.....

The systems nominated in this Warranty have been applied as fully representative of the Manufacturer's current specification for each system to permit performance as claimed for that system.

Our liability under this Warranty is subject to the following terms and conditions:-

1. The Warranty shall not be binding on the Applicator until payment in full is received by the Applicator in respect of the above described contract.

2. This Warranty shall be void and of no effect, and the Applicator shall have no liability in respect thereof, if the Applicator is not given notice in writing of any alleged failure or fault or deterioration relating to the processes within seven days of the discovery by the Client if such alleged failure, fault or deterioration.

3. In the event of liability being established pursuant to this Warranty the Applicator shall repair and reinstate the systems as may be required to make good the areas requiring repair PROVIDED that the Applicator shall be entitled to demand and be reimbursed by the Client for all expenses incurred in the investigation of any alleged failure, fault or deterioration, if, on investigation and in accordance with the foregoing terms and conditions, it is found that this Warranty shall not apply, and it shall not be the responsibility under the terms of this Warranty for the Applicator to rectify such alleged failure, fault or deterioration.

4. The Applicator does not warrant that any repair work carried out pursuant to the terms of this Warranty when completed shall exactly match the existing applied systems in respect to colour and/or texture.

5. All other warranties, guarantees or conditions of whatsoever nature, relating to the application of the systems and whether expressed, implied or given to be expressed, implied or given by any agent or employee of the Applicator, or implied or prescribed, or to be implied or to be prescribed by law are hereby excluded.

6. There shall be no liability for the Applicator in respect of this warranty for any damage to the applied processes caused by act of God, exceptional weather conditions, fire, war, riots, civil commotion, vandalism, nuclear explosion and/or fallout, damage caused by objects dropping or falling from aeroplanes or other airborne devices, bursting or other forms of destruction or failure of gas or fluid carrying pipes or other vessels, electrical faults including fusion and short circuits, negligence or wilful damage by the main contractor, owner and/or occupier of the building and/or visitors to the building on which the processes are placed, and any criminal act or illegal act or any consequential damage.

7. There shall be no liability for the Applicator for any deterioration of the applied system resulting from physical damage by point loads or mechanical causes, spillage of any substance onto the surface however caused whether during construction work or thereafter which were not allowed for in the original design and specification contract documents or arising from any natural disturbance of the structure.

8. This Warranty is null and void if any work is carried out on the applied system without prior written consent of the Applicator or if a change in use of the building from that of which it was designed at the time of completion of the Applicator's contract affects the performance of the application.

9. The benefit of this Warranty is not assignable without prior written consent of the Applicator.

Signed .....

For .....
(APPLICATOR COMPANY)

A copy of the Warranty from Equus Industries Limited WW .....

Dated ....., for materials supplied for this contract, is appended herewith.