Agrément Certificate 2015/485

The master copy of this document appears on the website: http://www.agrement.co.za

Validity

Users of any Agrément certificate should check its status: all currently valid certificates are listed on the website. In addition, check whether the certificate is Active or Inactive.

The certificate holder is in possession of a confirmation certificate attesting to his status.

Code of Practice *Foundations and superstructures for single storey residential buildngs of masonry construction, Joint Structural Division of SAICE and ISructE*

Quick guide

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Subject:

Geoplast Modulo Foundation System

Certificate holder:

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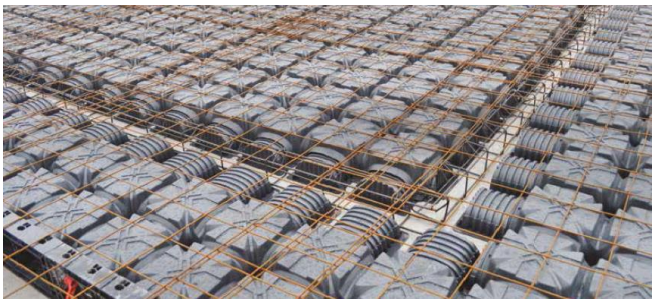

Use

The certificate covers the use of Geoplast Modulo Foundation System in all areas of South Africa as:

- set out in Table 3 of the South African Institute of Engineering and Environmental Geologists (SAIEG) publication titled *Guidelines for Urban Engineering and Geological Investigations.*
- in all site class designations, foundations are designed in accordance with the requirements of **SANS 10161**.

This certificate and Agrément South Africa's assessment apply only to Geoplast Modulo Foundation Systems that are designed as described and illustrated in this certificate and where the terms and conditions of certification are complied with.

General description

The Geoplast Modulo Foundation System is reinforced concrete floor slab with permanent formwork (modulo). The slab has edge and centre beams under load bearing walls to support loads and increase its stiffness as per project and site requirements.

The permanent formwork creates a system of pillars and arches which supports the ground floor slab. The system is designed such that the slab is supported by small columns formed at the formwork legs from the ground which creates voids beneath the slab. The design, including the thickness of concrete topping, beams and reinforcement sizes are always the responsibility of an approved competent person.

The foundations are ventilated by creating openings of between 80 to 120 mm Ø using PVC or metallic pipes.

The permanent formwork are made from recycled polypropylene (PP) and available in dimensions of 500 x 500 mm, 580 x 580 mm and 710 x 710 mm. The heights range from 300 mm to 700 mm.

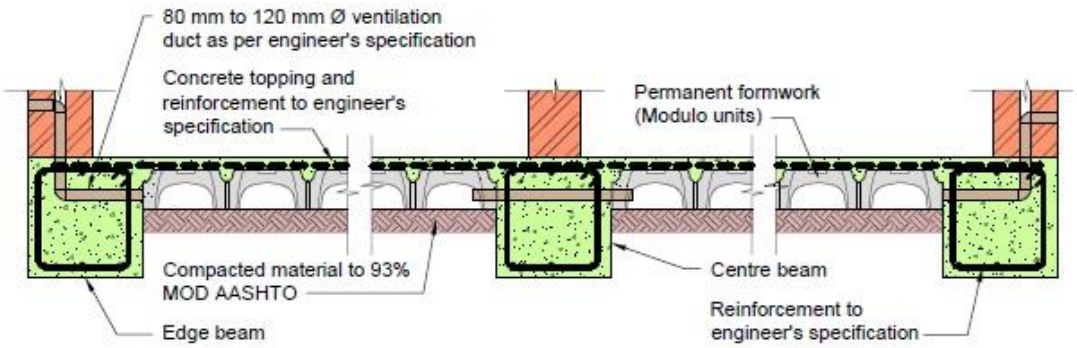

Figure 1: Typical section through foundation

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PREAMBLE

This certificate is issued by Agrément South Africa in terms of the powers granted to it by the Minister of Public Works. This certificate:

- has been granted after a technical appraisal of the performance of Geoplast Modulo Foundation System for the uses covered by the certificate,
- is independent of any patent rights that may or may not subsist in the subject of the certificate, and
- does not relieve the certificate holder from the obligation to obtain the prior approval of the building authority concerned for the use of the subject.

Agrément South Africa considers that the quality and performance of Geoplast Modulo Foundation System will be satisfactory provided that the requirements stipulated in this certificate are adhered to. However, Agrément South Africa does not on behalf of itself, or the State, or any of its employees or agents guarantee such quality or performance.

Responsibility for compliance with the requirements of this certificate and the quality of the completed foundations resides with the certificate holder.

No action for damages, or any other claim whatsoever, lies against Agrément South Africa, its members, the State or any of its employees should the said components and materials fail to comply with the standard set out in this certificate.

Building authorities or users who are in any doubt about any detail or variation, should contact Agrément South Africa.

The validity of this certificate is reviewed every three years. The certificate shall remain valid as long as Agrément South Africa is satisfied that:

- the certificate holder complies with the general and specific conditions of certification and the technical requirements stipulated in the certificate
- the performance-in-use of the subject is acceptable and
- any changes in building legislation, regulations, relevant standards or Agrément performance criteria have not invalidated the technical assessment which formed the basis of certification.

Agrément South Africa reserves the right to withdraw the certificate at any time, should reasonable cause exist.

Notices affecting the validity of this certificate will be published in the *Government Gazette*.

PART 1: CONDITIONS OF CERTIFICATION

Licensee - any person or company appointed by the certificate holder and registered with Agrément South Africa to construct Geoplast Modulo Foundation System in accordance with this certificate and authorised by Geoplast South Africa (Pty) Ltd to claim compliance with the certificate. It is the certificate holder's responsibility to ensure that the licensee carries out the works in compliance with this certificate and in accordance with the approved quality system.

Geoplast Modulo Foundation System described in this certificate must be:

- designed, manufactured and erected by the certificate holder or a licensee
- constructed in accordance with the technical description (see Part 3) and the certificate holder's detailed specifications and quality management manual and
- comply with the Conditions of Certification.

Any person required to check on details of construction must refer to the documentation listed above, which is available from the certificate holder.

Geoplast Modulo Foundation System is a combination of innovative and conventional construction. A change to any one aspect could result in one or more of the other aspects no longer complying with Agrément South Africa's performance criteria. For these reasons, no change may be made to Geoplast Foundation System as described and illustrated in this certificate unless such change is approved in writing by Agrément South Africa before it is implemented.

SANS 17050-1, *Conformity assessment-Supplier`s declaration of conformity Part 1: General requirements*

SANS 17050-2, *Conformity assessment-Supplier`s declaration of conformity Part 2: Supporting documentation*

Geoplast South Africa (Pty) Ltd is be responsible for the accuracy of the information contained within the Material Data Sheets, Technical Data Sheets and Material Performance Specifications, and all other information pertaining to the supply and application of Geoplast Foundation System**.** Geoplast South Africa (Pty) Ltd shall submit a COA (Certificate of Analysis) and COC (Certificate of Compliance) in terms of the requirements stipulated in **SANS 17050-1** Suppliers declaration of conformity when requested by Agrément South Africa in accordance with the documentation requirements of **SANS 17050-2**. Should Geoplast South Africa (Pty) Ltd change or substitute any ingredient in the formulation of the product in question, then a notification shall be addressed to Agrément South Africa immediately.

General conditions

Geoplast Modulo Foundation System

Tested and approved fit for purpose when constructed as specified in

CERTIFICATE 2015/485

AGRÉMENT SOUTH AFRICA
innovative construction product assessments

Marking

Where possible and appropriate, marketing brochures and packaging must be suitably marked with Agrément South Africa's identification logo together with the number as illustrated in this certificate.

Reappraisal

- must be requested by the certificate holder prior to implementing changes to the product
- will be required by Agrément South Africa if there are changes to the National Building Regulations or to Agrément criteria.

This certificate may be withdrawn if the certificate holder or a registered licensee fails to comply with these requirements.

Validity

The continued validity of this certificate is subject to a satisfactory review by Agrément South Africa every three years.

Quality monitoring

The certificate holder is required to participate in Agrément South Africa's post-certification quality management scheme, which requires:

- that the certificate holder shall continue to implement and manage the quality management system approved by Agrément South Africa in the assessment of Geoplast Foundation System
- the co-operation of the certificate holder in facilitating post-certification quality monitoring by Agrément South Africa or its authorised agents.

Requirements of *Supplement to certificates* that must be met

The *Supplement to certificates: good building practice* (revised 2001) applies to those conventional aspects of Geoplast Foundation System that have not been specifically assessed (see Part 2: *Scope of assessment* on next page). Cognisance should be taken of the recommendations contained in the *Supplement to certificates* to ensure that an acceptable standard of construction is consistently maintained.

On behalf of the Board of Agrément South Africa

Signed

Chairperson

September 2015

PART 2: ASSESSMENT

Scope of assessment

The conventional aspects of the construction are subject to the rules of good building practice (typically as described and illustrated in Agrément South Africa's *Supplement to certificates* and in the *Home building manual Parts 1, 2 & 3* issued by the National Home Builders Registration Council), and must comply with the National Building Regulations.

This assessment applies to those innovative aspects of Geoplast Modulo Foundation System described in Part 3 of the certificate. It also applies to those conventional aspects of the foundation system which, in the opinion of Agrément South Africa, are influenced by the innovative aspects. The innovative aspects referred to is:

- the use of permanent shuttering in foundation floor slab
- the use of permanent shuttering (modulo) to suspended and ventilate floor slab, and house services below

Assessment

In the opinion of Agrément South Africa, the system as described in the certificate is suitable for use on sites as classified in Table 3 of the South African Institute of Engineering and Environmental Geologists (SAIEG) publication titled *Guidelines for Urban Engineering and Geological Investigations.*

For details see Agrément South Africa's *Assessment criteria: building and walling systems*.

The performance in use of buildings erected with Geoplast Modulo Foundation System will be such that they will satisfy:

- the relevant requirements for safety and health prescribed by Agrément South Africa
- where stated in Table 1, the requirements of the National Building Regulations
- Agrément South Africa's performance criteria and requirements for durability and quality management.

Agrément South Africa's detailed comments on the assessment are set out in Tables 1 and 2 below. Each aspect of performance was assessed by experts in that field.

Government Notice R. 711, *National Building Regulations and Building Standard Act*, 1977 (Government Gazette No 34586 dated 9 September 2011)

Compliance with National Building Regulations

The innovative aspects of Geoplast Modulo Foundation System relate to the National Building Regulations as set out in Table 1. Any regulation not specifically referred to is considered to be outside the scope of this certificate and must be applied by the local authority in the normal manner.

Table 1: Performance

Aspects of performance	Opinion of Agrément South Africa	National Building Regulations satisfied
Fitness-for-purpose of materials used	The materials described in Part 3 meet the requirements of the regulations.	A13(1)(a) *Materials*
Structural performance	Satisfactory, provided the requirements of this certificate are complied with.	Regulations H1(1) and (2), *Foundations*, are deemed to be satisfied as follows: H1(1) on non-problematic soils H1(2) in all buildings where foundations are designed by an approved competent person and deemed-to-satisfy rule HH1 (a) Agrément South Africa strongly recommends that for foundations on sites classified as C2, S2 or H3 intended for single storey construction that the recommendations of the Code of Practice *Foundations and superstructures for single storey residential buildings of masonry construction,* Joint Structural Division of SAICE and IStructE, be followed.
Resistance to Rising damp	Satisfactory. Geoplast Foundation System meets Agrément South Africa's criteria for resistance to rainwater penetration and rising damp throughout South Africa.	J1(4) *Floors*

Table 2: Habitability

Aspects of performance	Opinion of Agrément South Africa	Explanatory note
Thermal performance	Satisfactory.	The Geoplast Modulo Foundation System will offer better thermal performance than floor slabs-cast-on-the-ground and buildings making use of this foundation system will require less energy to heat and cool than similar buildings erected off conventional foundations. Total R-Values for floors constructed by modulos are available from the certificate holder, if necessary.
Durability	The durability of Geoplast Modulo Foundation System will be satisfactory	Agrément South Africa's opinion is based on the knowledge of the materials used and on inspection of the buildings constructed using the Geoplast Modulo Foundation System.

Table 3: Quality management system

Aspects of performance	Opinion of Agrément South Africa	Explanatory note
Quality management system	The certificate holder's quality management system complies with Agrément South Africa's requirements. Properly applied it will ensure that quality in design and erection of foundations and the manufacture of Modulos will be consistently maintained.	Agrément South Africa's requirements are based on SANS/ISO 9001:2008 **SANS/ISO 9001:2008** *Quality management systems – Requirements'*

PART 3: TECHNICAL DESCRIPTION

General description

The Geoplast Modulo Foundation System is reinforced concrete floor slab with permanent formwork (modulo). The slab has edge and centre beams under load bearing walls to support loads and increase its stiffness as per project and site requirements.

The permanent formwork creates a system of pillars and arches which supports the ground floor slab. The system is designed such that the slab is supported by small columns formed at the formwork legs from the ground which creates voids beneath the slab. The design, including the thickness of concrete topping, beams and reinforcement sizes are always the responsibility of an approved competent person.

The foundations are ventilated by creating openings of between 80 to 120 mm Ø using PVC or metallic pipes.

The permanent formwork are made from recycled polypropylene (PP) and available in dimensions of 500 x 500 mm, 580 x 580 mm and 710 x 710 mm. The heights range from 300 mm to 700 mm.

Description of Modulo formwork components

Modulo: plastic formwork used to create the ventilated space of the underside of the foundation slab and support the foundation slab above (See figure 2).

Figure 2: Modulo

Figure 3: Multimodulo

Multimodulo: Modulos that have been moulded together in groups to form a larger area with the units (See figure 3).

Geoblock: a ribbed half circle block used as a stopend for closing the ends of the installed Modulos completely or as an adaptable extension up to the maximum length of 250 or 320 mm in functions of Modulo units of dimension 500 x 500 mm or 710 x 710 mm and available for Modulo forms H13 to H70 only (See figure 4).

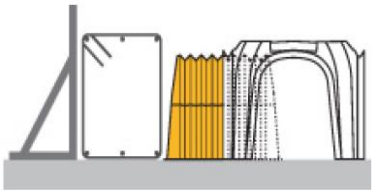


Figure 4: Geoblock

Figure 5: Stopend

Stopend: a half circular plastic lid used to close off the ends of the Modulos to prevent concrete from creeping into the ventilated space. Available for Modulo forms H13 to H40 only (See figure 5)

Fermagetto: a flat rectangular plastic running the length and height of the Modulo arch opening used to close off the opening from concrete creeping into the ventilated space.

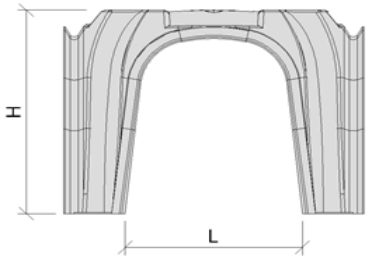
Available Modulo sizes:

	Modulo H3	Modulo H6	Modulo H9	Modulo H13	Modulo H15	Modulo H17
Dimension	500 x 500	500 x 500	580 x 580	500 x 500	500 x 500	500 x 500
H	30 mm	60 mm	90 mm	130 mm	150 mm	170
L	55	54	205	280	264	300

	Modulo H20	Modulo H25	Modulo H27	Modulo H30	Modulo H35	Modulo H40
Dimension	500 x 500	500 x 500	500 x 500	580 x 580	500 x 500	500 x 500
H	200	250	270	300	350	400
L	280	300	340	317	350	360

	Modulo H45	Modulo H50	Modulo H55	Modulo H60	Modulo H65	Modulo H70
Dimension	710 x 710	710 x 710	710 x 710	710 x 710	710 x 710	710 x 710
H	450	500	550	600	650	700
L	480	480	500	509	530	530

The type and size of Modulos to be used for any particular project are to be specified by an approved competent person.



LEGEND
Note: All measurements in mm
Dimension: Area
H: Height
L: span between modulo legs

Manufacturing

The manufacturing of the modulos is through an injection moulding process. Steel Moulds for the different size Modulos are used to create the formwork.

Polypropylene granules are stored in silos. A vacuum system transports the granules from the silos to the injection machine. The granules are loaded into the press by a worm screw where they will be heated to a liquid state. The steel mould made of two half forms of the modulos creates a closed mould where the liquid plastic is injected via high pressure nozzles. The moulds are opened after a specified period were the Modulo is allowed to cool down before being stripped out and sent for packing. Modulos are stacked on top of wooden pallets to height of 2400 mm and wrapped with a plastic cling.

Transportation and site handling

Modulos are stacked on top of each other and wrapped with a plastic cling. They are transported in containers to site and may be stored openly or in roofed structures on top of wooden pallet platforms.

Technical requirements

Design requirements

Foundation and surface bed designs are the responsibility of an approved competent person who classifies the site in accordance with the site class designation set out in Table 3 of the South African Institute of Engineering and Environmental Geologists (SAIEG) publication titled *Guidelines for Urban Engineering and Geological Investigations.*

SANS 10161: *The design of foundations for buildings*

SANS 10160(Part 1 - 8): *Bases of structural design and actions for building and industrial structures*

SANS 10100(Part 1 and 2): *The structural use of concrete*

In all ground conditions, foundations are designed in accordance with the requirements of **SANS 10161** and constructed accordingly.

The application of **SANS 10160 (Parts 1 to 8)**: *Bases of structural design and actions for building and industrial structures* in conjunction with **SANS 10100 (Part 1 and 2)**: *The structural use of concrete* are applied as required by an approved competent person.

All open spaces separated by foundation beams must be connected with the same opening size ventilation ducts as the exterior parameter openings to allow continuation of air flow.

Erection process

The erection of the Modulos takes the form and order listed below:

- levelling and compaction of the ground

- setting out the site and marking the trenches for external and internal ground beams
- installation of the shutters on perimeter of foundation
- excavation of trenches
- fixing of steel to ground beams
- installation of Modulo and connecting ventilation pipes on compacted and well levelled platform
- placement of welded mesh to size complying with **SANS 1024** on top of Modulo
- inspection by an approved competent person
- pouring and placing of concrete.

(Figures 6 (a), 6 (b) and 6 (c) illustrates typical installed Modulos)

SANS 1024: *Welded steel fabric for reinforcement of concrete*

The Modulo formwork must be installed in horizontal lines starting from the right to the left, and continuing with the rows in that manner. The modulos connect via a male and female interlocking groove and the end sections parallel to the ground beams are closed off with a *Geoblock, Stopend lid or Fermagetto* specially designed to seal off concrete encroachment from the ventilated space underneath. Alternatively the ends may be closed off using solid plastic end stop, plastic corrugated Maizey or sheets of plastic (DPC) taped to the formwork.

The foundations are ventilated by creating openings of between 80 to 120 mm Ø using PVC or metallic pipes along the perimeter beams of the foundation every 3 500 to 4 000 mm. The ventilation openings must be placed at a higher level of the side of the building receiving more warmth and lower on the opposite cooler side to create a natural ventilation effect. The external ventilation pipes are fitted with an anti-intrusion net.

The welded mesh is supported by spacers at appropriate intervals. The pouring of concrete is directed first onto the top of the Modulo and then into the pillars and the pouring height should not exceed 500 mm above the Modulo units. Concrete is re-vibrated until it sets. Drainage for possible flooding along the external walls where the ventilation pipes are exposed must be provided.

Figure 6 (a)

Figure 6 (b)

Figure 6 (c)

Typical installed modules (Modulos)