USE OF FITNESS FOR PURPOSE CRITERIA FOR TRANSPORT INFRASTRUCTURE PRODUCTS

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ABSTRACT

There is a proliferation of various types of non-standard transport infrastructure products where existing standards and specifications do not cater for the specific type of products. Typically, these include various proprietary products to stabilise materials, surface roads and provide specific road furniture. Traditionally, the lack of specifications for these products caused the client and user to rely on manufacturer supplied information on the expected benefits of the product. This is not a healthy situation, as different products are then compared without similar parameters to base decisions on selection for specific applications on. The concept of Agrément has been developed in the traditional built environment field to cater for these non-standard types of products. The objective of Agrément is to develop guidelines for the evaluation and subsequent certification of non-standard products to assess their fitness-for-purpose. In this regard, the guidelines for a specific family of products would indicate the required tests and evaluation procedures to enable a decision to be made regarding the fitness-for-purpose of the specific product. Upon certification of the product, the potential client would then have a better understanding of the specific benefits and limitations of the specific product, and thus an objective decision can be made regarding the use of a specific product.

Over the past 5 years Agrément SA has embarked on a programme to add specific road infrastructure related products to its portfolio of certificates. In this regard, evaluation procedures have been developed for bridge deck joints, non-traditional road additives and thin bituminous surfacing systems. A number of these products have since been evaluated and certified for use. This Agrément system and certification process contributes to the social and economic growth in Africa through provision of a system by which fitness-for-purpose of specific products used in the road infrastructure field can be ensured.

This paper provides background to the Agrément concept, discusses the current evaluation systems being available through Agrément for road infrastructure and reflects on the effect of this fitness-for-purpose system on the growth of sustainable road infrastructure in Africa.

INTRODUCTION

In South Africa there are a number of organisations that develop and publish standards and specifications related to the road infrastructure industry. These include the South African Bureau of Standard (SABS), Standards South Africa (STANSA), Agrément South Africa (Agrément SA) and the Department of Transport (DOT) through various committees. Most of these specifications and standards are accepted on a national level, and they are implemented throughout the country.

The SABS defines their mandate as including the development, publication and dissemination of national standards for products and services, administering compulsory specifications to protect the health and safety of the consumer or provide environmental protection where market forces have failed and to give effect to provision for quality promotion as contained in the Standards Act, 1993 (www.sabs.co.za; 8 March 2006). The SABS generally deals with standards and codes of practice that relate to conventional products and cooperates with international organisations for standardisation.

STANSA provides standards to enhance the competitiveness of South Africa. These standards form the basis for consumer protection, health, safety and environmental issues. The core function is the development of national standards and the maximization of benefits of the internationalisation of standards. There are more than 450 technical committees and subcommittees administered by STANSA that work together to develop these standards (http://www.stansa.co.za, 8 March 2006).

The DOT has traditionally managed a number of committees (through its Committee of Transport Officials (COTO)) that were active in the development and provision of various roads standards and specifications. These documents typically focused on specifications that were of a generic nature for use in general road construction, such as the design and construction of specific layers in a road. This function has over the years diminished, but is currently being reactivated.

In this whole process there are a number of products that do not form part of the standard road infrastructure products that are addressed through the various specifications available. Most of these products are non-standard or newly developed products such as bridge deck joints, novel stabilisation and surfacing products. In the late 1990s the realisation came that the manufacturing and application of these non-standard products could ideally be certified through the same process used in the building industry in South Africa for many years, and this is how the involvement of Agrément SA in the certification of non-standard road infrastructure products started. In Europe, a similar trend has started a few years ago with the introduction of Agrément guidelines at the British Board of Agrément (BBA) for the evaluation of cold mixes, thin asphalt surfacings etc.

Consequently, SABS, STANSA and DOT focus their efforts mostly on standard products and processes that have attained general acceptance in their use and application, Agrément SA focuses on a very specific market where no current standard specifications exist and where products are typically unique. The certification of these road infrastructure products as being fit-for-purpose has over the last 5 years become a focus area of Agrément South Africa, who

traditionally focused their efforts on building products. This development was initiated through the availability of various commercial products for which national standards did not exist, but where the wide range of quality and applicability necessitated a form of certification to ensure that only products that were deemed fit-for-purpose could be applied.

AGRÉMENT CONCEPT

The general concept of Agrément started when a process was required for the certification of non-standard innovative products. Internationally, there are various Agrément organisations with a World Federation of Technical Assessment Organisations (WFTAO) (www.wftao.com) and European Union of Agrément (EUA) (www.ueatc.com) with similar roles and functions that are in correspondence with each other regarding processes, procedures and acceptance of certificates.

Agrément SA sees their mission as serving the national interest by being the internationally acknowledged, independent South African centre serving the building and engineering communities by providing assurance to specifiers and users via technical approvals for the fitness for purpose of non-standardised and/or unconventional products (www.csir.co.za, 7 March 2006).

Agrément SA was established in 1969 as an independent organisation by the Minister of Public Works. The primary business of Agrément SA is the certification of non-standardised construction products, through technical assessments that verify whether the products and systems are fit for purpose. Through this process, it provides assurance to specifiers, regulators, financial institutions and users that the certified products adhere to certain minimum standards.

Agrément SA evaluates the fitness-for-purpose of non-standardised construction products and systems against performance-based criteria. Performance criteria and test methods are established in consultation with relevant experts. Agrément criteria may apply to any type of construction process or construction product. All certificate holders are required to have a quality management system, the implementation of which is monitored annually. If the subject of an evaluation is assessed to be fit-for-purpose, the Board of Agrément SA grants it an Agrément Certificate. The subject of a certificate is reappraised if the certificate holder makes any changes to the subject, or if there are any changes to Agrément SA criteria that affect the subject. An ongoing process of auditing is also conducted by Agrément SA on all certified products. Only the certificate holder or his licensees who are registered with Agrément SA may claim compliance with a certificate. The quality management of licensees is also monitored by Agrément SA.

Products request certification from Agrément SA because there are as yet no national standards for the product. Agrément South Africa bases its assessments of such non-standard products on the fitness-for-purpose concept, whereby the required performance-in-use of a product is specified in qualitative and quantitative performance terms. The fitness-for-purpose evaluation typically consists of the following steps:

- establishment of appropriate performance criteria;
- development or identification of suitable test methods or methods;
- measurement of the actual performance of the product, and
- judgement of acceptability with relation to the assessed performance of the product against the performance criteria.

It is vital to distinguish between a product specification and a product certificate. A specification is defined as ‘a detailed description of the construction, workmanship, materials etc of work done or to be done…’, and it may include engineering properties or performance criteria in some instances. A certificate is defined as ‘a formal document attesting a fact, … fulfilment of requirements … etc’. The main difference between a specification and a certificate is thus that a specification describes a process to be followed or an expected outcome (sometimes with guidelines as to required performance), while a certificate indicates the manner in which the product fulfils the requirements.

In the case of Agrément certification the outcome is thus a standard certificate that indicates to the potential user that the specific product conforms to specific requirements. The certificate may and should include reference to a specification for design, detailing, installation and maintenance of the product and manufacturer’s appliance methodology and tolerances. This is, however, not included in detail in the certificate or certification process.

It is also important to distinguish between a guarantee and a certificate for a specific product. A guarantee is defined as ‘.. an assurance of the quality of or the length of use to be expected from a product offered for sale, accompanied by a promise to replace it or to pay the customer back…’. An Agrément certificate is by definition not a guarantee for the product. A guarantee is normally issued when little or no knowledge of the expected performance of the product is available and the risk is carried by the provider of the product to ensure that the product will be functional for a specified period or expected duration.

When a certificate is available indicating the level of performance to be expected from the product for a certain period, a guarantee may become unnecessary, as the certificate already indicates the performance expected from the product. However, if the client still requires a guarantee it is his prerogative. If, however, a user specifies performance criteria beyond the scope of the certificate for the certified product, these may and should be covered by a guarantee, as the original certificate will no longer be applicable.

PROCESS FOR DEVELOPMENT OF CRITERIA

The typical Agrément evaluation process consists of the following steps:

- Identification of the need for a guideline for certification of a particular product;
- Development of a guideline for evaluation for certification by a technical committee;
- Acceptance of the guideline by Agrément and industry;
- Applications for evaluation by industry;
- Evaluation of applications by technical committee appointed by Agrément;
- Additional testing / evaluation of product where applicable;
- Recommendation regarding certification by technical committee, and
- Certification of the product by Agrément.

Final approval of the certificate is done through the Board of Agrément SA. During the evaluation process, Agrément SA makes use of independent technical specialists in the area of the specific application. Once the certificate has been approved, it remains valid subject to there being no changes to the product and an annual site and/or factory inspection. Any changes to the product must be approved by Agrément SA prior to implementation to ensure that such changes do not affect the fitness-for-purpose of the product negatively.

REQUIREMENTS FOR A PRODUCT FOR CERTIFICATION

Any product that requires certification in a specific category needs to comply with certain requirements, even before application for certification starts. The various guidelines for the products that can be certified all provide detailed requirements of the specific parameters of the product that requires evaluation. However, there are some general principles that should be adhered to for all products.

The product should have been evaluated extensively before the certification process starts. The certification process is not a shortcut for product evaluation, and any applicant should have completed a rigorous internal evaluation of their products before the application for certification is initiated. A track record of the specific product can provide support to the claims made by the applicant regarding the potential performance of their product. Such a track record should be supported by evidence that the same product (not a previous formulation) has been used, that the application was performed in accordance with standard specifications for the product and that there was a valid control section without the product to which the performance can be compared.

Essentially a complete set of literature on the specifications of the product, the manufacturing process, design procedures for application of the product, installation or application procedures and any required maintenance procedures should form part of the application.

A requirement for certification by Agrément South Africa is that each certificate holder has a simple, approved quality management system in place. This system must be based on the recommendations of the ISO 9000 series. The system is required to ensure that good quality materials and satisfactory standards of design, manufacture and, where appropriate, erection are consistently maintained within defined parameters.

CURRENT AGRÉMENT SA EVALUATION SYSTEMS FOR TRANSPORT INFRASTRUCTURE PRODUCTS

Agrément SA has traditionally been focusing on building products in South Africa. These cover novel building systems as well as components for buildings (i.e. roof systems, pipe systems etc). The drive into road infrastructure products only started in 2000. Currently there are Agrément SA guidelines for the certification of three road infrastructure products in South Africa. These are bridge deck joints, non-traditional additives for roads and thin bituminous surfacing systems. The guideline for bridge deck joints has been in existence for 6 years (Steyn et al, 2000) and there are currently 8 bridge deck joint systems certified for use through Agrément SA. The guideline for non-traditional additives has been in existence for 2 years (Jones and Ventura, 2004) and the guideline for thin bituminous surfacing systems for 1 year (Steyn et al, 2005). No certificates have yet been issued for the last two categories, although some applicants have initiated the certification applications.

Bridge deck joints

The South African National Roads Agency Ltd (SANRAL) originally requested the development of a process by which bridge deck joints (both new and existing types) could be evaluated before installation to obtain indications on their suitability for the specific project. Agrément SA facilitated the development of an appropriate guideline, and subsequently facilitated the certification process for the 8 products that applied for certification.

The fitness-for-purpose criteria developed for the evaluation of bridge deck joints was based in part on the Austrian bridge design specifications, with appropriate reference to South African experience and specifications. The criteria developed were mainly based on information regarding the various joint components, typical failure modes and mechanisms and critical issues identified. Since the introduction of the certification system it has been adopted by most of the governing bodies for roads and bridges in South Africa.

Due to the nature of bridge deck joints, the fact that most of the available joints are based on international designs and that the physical testing of these large joints has been done elsewhere, the focus in the guidelines and evaluation of applications has been on calculation of stresses and strains in the system, as well as historical performance of in-service joints. No additional testing of joint systems was thus performed during these evaluations, as this has already been done through the parent companies in Europe. The information from these evaluations formed a vital part of the applications.

Non-traditional road additives

The certification procedure for non-traditional road additives focuses on additives being used as dust palliatives, compaction aids and stabilisers. The starting point for evaluation of these products is the proof that the addition of the specific product will enhance the performance of the natural material similar or better than a traditional road additive such as cement or lime. The specific tests focus on the evaluation of prepared samples of a standard road construction material with the particular product added, without any product added, and with a traditional product added.

Thin bituminous surfacing systems

The thin bituminous surfacing system guideline was based on the British Board of Agrément (BBA) guideline for the evaluation of similar systems. This route was followed as the BBA had an existing guideline, and this approach allows easier comparison between systems that were certified internationally with those requesting certification in South Africa. Due allowance was made for changes in the required properties of the systems due to a different environment and different traffic loads.

POTENTIAL EFFECT OF FITNESS FOR PURPOSE SYSTEM ON GROWTH OF SUSTAINABLE ROAD INFRASTRUCTURE IN AFRICA

One of the major requirements for the adoption of novel and innovative (non-standard) transport infrastructure technologies in Africa is that the technology should be appropriate for the environmental conditions of the region. This include both the natural environment (i.e. temperature, rainfall, etc) and the user environment (i.e. technical knowledge, experience, etc). Often, products that are suitable for developed countries (based on their physical and user environment) are imported for direct use, with either negative results on the ultimate performance of the product, or non-cost-effective solutions through the use of inappropriately specified products. It is thus important that Africa be in a position where appropriate innovative solutions can be identified for its transport infrastructure development. In this process, it is also important not to allow any products to enter the market, as a certain level of quality / standard is required to ensure a safe transport environment for the users. In an environment where the required experience may not exist to select novel products on their technical merits, a system is required to ensure that the unwary are not sold non-standard products that are claimed to solve all existing problems.

In this regard the use of an Agrément system allows for the identification of applicable non-traditional and fit-for-purpose products to enter the market on an equal footing to existing specified products, leading to the potential improved development through the use of these appropriate technologies. The Agrément system allows for the minimum standards to be set and implemented through objective evaluation of all available products.

An Agrément SA certificate is not compulsory for access to the South African market. However, many importers of transport infrastructure solutions, as well as developers of innovative products will opt for certification due to the credibility gained through certification by an independent body. Such certification also leads to the wider trust in the product and use of the product, as the risk of using such a certified product decreases due to the evaluation process that it underwent. The certificate also allows for the comparison of the innovative product with traditional / existing products, as pertinent engineering properties of the product are described in the certificate. Through this overall process, the user is experiencing an environment where the risk of selecting an inappropriate product based solely on good marketing material is decreased. Ultimately, the benefit to the public is increased through more appropriate spending of limited funding on the best solution, and not necessarily the traditional solution in supplying or maintaining transport infrastructure.

In the broader African context (focusing on the longer running building system certificates from Agrément SA), several certificate holders have through the years reported that possession of an Agrément SA certificate facilitated acceptance of their products in other African countries. This experience is particularly relevant in countries such as Botswana, Lesotho and Namibia, where Agrément SA certificates are readily accepted and sometimes required to obtain building approval (Knoetze et al, 2000).

CONCLUSIONS

The Agrément procedure provides a suitable and appropriate method for the evaluation of fitness-for-purpose of non-standard road construction products. It provides industry with a system whereby they can gain trust in the potential performance of a specific product, with the background knowledge that the specific product is being supported by an approved quality management system, and that the performance of the product has been evaluated against industry standards.

The acceptance of the certificates in industry further leads to the wider use of the system by manufacturers, and thus a higher potential level of professional and audited service from suppliers. In the African context the wider use and acceptance of the system by both the governmental agencies and manufacturers will lead to improved quality of the transport infrastructure (thus more appropriate and cost-effective spending on transport infrastructure projects) and a more transparent procurement process.

RECOMMENDATIONS

It is recommended that government and industry in Africa takes on the approval of non-standard product certification through the Agrément route, and supports it in their general work. This should lead to an improvement in the service life obtained from infrastructure in the region, leading to improved quality and spending on quality products that are fit for purpose.

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