Safe fibre cement and no asbestos

by Lieven Alderweireldt, Chair, ISO/TC 77, and John Cottier, technical manager, R&D, James Hardie Fibre Cement Building Products

With the awareness of the health issues related to asbestos increasing in the 1960s and 1970s, the asbestos cement industry's research and development focused on finding alternative reinforcing fibres to asbestos for use in fibre cement products.

The first asbestos free replacement flat sheet and roofing products, incorporating cellulose fibres, began appearing commercially in the early 1980s.

The development of these products and their adoption in a number of countries provided a new challenge for ISO/TC 77, which began to develop a range of new performance based standards to accommodate this major development in the industry. The new fibre reinforced products had different physical characteristics to the asbestos-cement product, requiring new acceptance tests and type tests. Additionally, the building industry's need for higher quality assurance controls required that statistically-based quality assurance measures be introduced into the new standards.

Initially, a dual approach was taken where the existing asbestos cement standards were maintained in parallel with the fibre cement alternatives. This was done to give industry sufficient time to develop the necessary technology to convert asbestos cement production to fibre cement. From 2003 to 2005, all remaining asbestos cement standards were removed.

Over the past 25 years, ISO/TC 77 has overseen the development of fibre cement standards as alternatives to asbestos cement standards for all of the major

product lines of asbestos cement products. The last of these standards is fibre cement drain pipe, which will be circulated as an FDIS (Final Draft International Standard) in early 2006.

By providing this range of fibre cement standards, we hope to encourage countries still manufacturing asbestos cement products to convert to the safer fibre cement alternatives.

Increased globalization of fibre cement products

Fibre cement is now an established global product, and is manufactured throughout the world. This is reflected in the participating membership of TC 77.

The technical committee currently has two active working groups:

- WG 7, *Building fibre reinforced cement products,* and,
- WG 29, *Fibre reinforced cement pipes, joints and fittings for sewerage and drainage.*

Revision of all fibre cement building product standards has begun. The intent is to harmonize those standards of ISO, the European Committee for Standardization, and the American Society for Testing Materials, and thus provide a set of truly international standards. The flat sheet standard will be the first standard to be revised.

With the rapidly increasing worldwide use of fibre cement building products, new product applications are being developed which require standardization. A new standard for interior substrate sheets has been drafted, and an enquiry launched to add the item to the programme of work.

Controlling resources and risk

The construction sector is a relatively new target group for sustainable development. We can no longer borrow from future generations and shift environmental problems to other areas. This is why recent architectural designs have incorporated new sustainable features into building systems like energy conservation. They sometimes make use of building materials in different ways, asking for different performances to be demonstrated.

A concept of sustainable construction is generally based on two principles: control of resources and control of risk. Both intervene at three different dimensions of sustainability: environmental, economic and health and comfort performance. It is not yet clear how an integrated approach towards the assessment of overall performance can be established, but only simultaneous consideration of the three dimensions throughout all phases within the building cycle can lead to success.

Within this framework, a number of standards exist, such as ISO 21930, *Sustainability in building construction – Environmental declaration of building products,* and new ones are being developed, for instance, within the ISO 15686 series on service life planning for building and constructed assets. These standards sometimes refer to additional information required at the product level with respect to the environment and service life. Although this information may exist in different sources, technical committees are now being requested to do so through their product standards. This subject has only been recently introduced within ISO/TC 77. The inclusion of product declarations, with respect to environment and to durability and service life, are now seen as new challenges for the future generation of fibre cement product standards. The fibre cement industry, driven by other market mechanisms rather than by the concept of sustainability, has already made considerable efforts to develop environmentally-friendly and durable products. The challenge is not always reflected in today's product standards and certainly, the information available to manufacturers is not of the same type and format that is sometimes requested.

Product declarations and the environment

Legislation is becoming more stringent and customers are becoming more demanding. The fibre cement industry recognized these trends years ago and many of the producers have installed best practices in order to turn sustainability into an everyday part of their business. They have translated the principles of sustainability into more tangible objectives, such as: reducing the use of primary raw materials and replacement by secondary or renewable ones; reducing and recycling of waste; saving energy; cutting pollution and implementing ISO 14001 for environmental management.

About the authors

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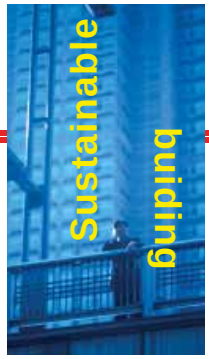

To enable architects, builders, and customers to make informed environmental comparisons between construction products, it is necessary that environmental performance be measured in a robust, transparent and coherent manner. This is not an easy task, especially when comparison beyond the boundaries of product groups becomes necessary. And there is another important requirement. The information available on individual products should also allow users and designers to determine the environmental impact of a construction element and aid their assessment of the building's sustainability. Industry is looking to capitalize on its environmental investments, but can only do so when there is a larger base of acceptance of the measurement systems.

Currently different national practices exist, and the developments within ISO and CEN (mandate M350 on environmental product declarations and the associated work programme) in this respect are important. Within ISO/TC 77, we are monitoring several developments in these areas which are or could be relevant to fibre cement. Examples are leaching of substances when in contact with water, inert classification of building waste, LCA (life cycle assessment) studies.

What information for product durability declarations?

Current ISO standards for fibre cement roofing and cladding products are state-of-the-art with respect to durability requirements. The evaluation of products to maintain their fundamental characteristics when exposed to accelerated climatic conditions is an essential part.

Service life assessment, as prescribed in ISO 15686, however, is not directly addressed by the current generation of standards. A request has been made to incorporate explicit statements in product standards for the minimum estimated service life, and/or the reference service life, combined with the in-use and/or reference use conditions. A guidance document on how to deal with this is going to be developed as a new work item. It is expected that within Europe the new guidance paper on durability prepared by the CEN task force on durability will also consider these principles.

However, estimating the life span of a product, within a product standard, is not always easy or even possible. For example, the manufacturer has a direct influence on the product quality only at the factory gate, and the product's characteristics, as they are specified in a standard, do not always make it possible to estimate product life-span. This will also depend on other factors, such as fixing, assembly, environmental conditions – both external and internal (which can change with time) – climate conditions, and maintenance, just to name a few. These factors are subject to variation according to market or local conditions and cannot simply be summarized into one or a few representative cases. For example, the durability of one building product will be affected by its interaction with other products in an assembly of products.

The question that remains to be answered is what kind of information ought to be given for product durability declarations. Industries as well as other stakeholders should be involved in the development of such tools in order to guarantee realistic and economically-viable solutions. These solutions must also be consistent across the full range of building products and tackled by all the relevant product technical committees concerned.

Up till now, ISO/TC 77 product standards have relied on experimental verification as a predominant condition to demonstrate performance. As product standards are in the public domain and often enter mandatory and regulatory areas, industries feel themselves being exposed to additional liabilities which they cannot fully control. ISO/TC 77 has not yet embarked on a discussion of this issue, but one thing is becoming evident. The framework for giving product declarations with respect to environment and durability should allow as much freedom as possible so it can be used by manufacturers as an opportunity, rather than as a threat.

A little history

The basic manufacturing processes for the production of asbestos-cement flat sheet products was developed in Russia in 1896, and three years later, an improvement on this process was made in Austria by Ludwick Hatschek. The infant industry developed rapidly and by 1903, asbestos-cement sheets and slates were being exported from Europe around the world. Other products were produced from these processes by hand moulding the uncured sheets into their final form. In 1916, Italian-born Adolf Mazza further developed the Hatschek process for the production of asbestos-cement pipe, which bears his name.

ISO technical committee ISO/TC 77 for products in fibre-reinforced cement was established during the 1960s, with the responsibility of developing standards for asbestos cement building products, such as corrugated roofing, slates, wall cladding and pipes.

As the manufacturers had common manufacturing processes and similar product ranges, the first national asbestos-cement standards were largely prescriptive in their content and were aligned with the dimensional systems used by the country (i.e. metric or imperial).

ISO /TC 77 completed their first pipe standards for both asbestos-cement pressure pipes and sewerage/drainage pipes in 1971 and went on to develop in subsequent years documents relating to sampling and inspection, guide to selection of pipes subject to external loads, pipe laying guidelines and field pressure testing.

By the late 1970s, TC 77 had also developed ISO standards for all of the major product lines of asbestos cement building products.