TECHNICAL NOTE #05

Sustainability in masonry walling – an international perspective

Sustainable development is a systems approach directed at managing natural, produced, and social capital for the welfare of not just our own but all future generations.

We review the principles of sustainable development as well as various measurement and monitoring standards in the USA and Europe.

TECHNICAL CONTRIBUTOR

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SUSTAINABILITY IN THE CONTEXT OF CLAY BRICK MASONRY

This Technical Note reviews seminal publications around the principles of Sustainable Development and in particular articles published during the proceedings of SB10 and SB11. The potential for new standards that contribute toward achieving greater sustainability in buildings in the RSA is examined.

SUSTAINABILITY PRINCIPLES

The Brundtland Report issued by the World Commission on Environment & Development of 1983 (named after the Chairman Gro Harlem Brundtland) set out the following fundamental definition of Sustainability:

'Sustainable Development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs.'

Conflict between the various competing goals involves the simultaneous pursuit of economic prosperity, environmental quality and social equity, which today is known as the three dimensions of sustainability, or 'the triple bottom line.

The 'destination' of sustainability is a set of wishful characteristics of a future system. The Agenda 21 item of the World Conference of Nations in Rio de Janeiro of 1992:

- Clearly identified information, integration and participation as key building blocks to help countries achieve broader public participation in decision-making, as a fundamental prerequisite for achieving sustainable development.

- Forms the basis of the Principles to be followed by the process of the annual Conference of the Parties (COP), of which COP17 was held in Durban in 2011. Key international agreements, such as the Kyoto Protocol that binds certain countries to reduce their Greenhouse Gas emissions are the product of this process.

Environmental Sustainability

Environmental sustainability is the process of making sure current processes of interaction with the environment are pursued with the idea of keeping the environment as pristine as naturally possible, based on an ideal-seeking behaviour.

An "unsustainable situation" occurs when natural capital (the sum total of nature's resources) is used up faster than it can be replenished. Sustainability requires that human activity only use nature's resources at a rate at which they can be replenished naturally. Inherently the concept of sustainable development is intertwined with the concept of carrying capacity, as the long-term result of environmental degradation is an inability to sustain human life.

Economic Sustainability

From the above it is clear why Economists view the economy and the environment as a single interlinked system. A unified valuation methodology is in the process of being defined, but no single index or measurement yet provides a simple measure of progress.

Intergenerational equity can be incorporated into this approach, as for the economic valuations of climate change economics. This rules out discrimination against future generations and allows for the possibility of renewable alternatives to petro-chemicals and other non-renewable resources.

Social Sustainability

Efficient policies are compatible with increasing human welfare, eventually reaching a golden-rule steady state. Poverty eradication, synonymously with job creation, has in many under-developed countries been seen as a superior ideal, however the eight Millennium Development Goals of the United Nations Development Programme includes Goal 7: Ensure environmental sustainability.

Measurement of Sustainability

Broadly defined, the sustainable development agenda enjoins current generations to take a systems approach to growth and development, and to manage natural, produced, and social capital for the welfare of their own and future generations.

The measurement and monitoring of this multifaceted agenda is problematic. Different organisations have tried to measure and monitor the proximity to what they consider sustainability by implementing what has been called; sustainability metrics and indices. Even at Project level there is a lack of uniformity of measurement.

USA PERSPECTIVES OF SUSTAINABILITY

In 2007, a report for the U.S. Environmental Protection Agency stated, "While much discussion and effort has gone into sustainability indicators, none of the resulting systems clearly tells us whether our society is sustainable. At best, they can tell us that we are heading in the wrong direction, or that our current activities are not sustainable. More often, they simply draw our attention to the existence of problems, doing little to tell us the origin of those problems and nothing to tell us how to solve them."

Nevertheless, a majority of authors assume that a set of well-defined and harmonised indicators is the only way to make sustainability tangible. Those indicators are expected to be identified and adjusted through empirical observations and trial and error. Commonly used terms, measures and reporting systems are Carbon Footprint (CO_2), Global Warming Potential (GWP), Ozone Depletion Potential (ODP), Material Input per unit of Service (MIPS, Green Building Ratings Systems and the Global Reporting Initiative - all contribute to achieving some comparability.

The most common critiques of such measurements are related to issues like data quality, assumptions, comparability, objective function and the necessary resources. The monetisation of carbon and pollution impacts in terms of an integral, long-term cost-benefit measure and monitoring tool for the sustainability of every project, activity or enterprise would seem to be one solution, which might meet the objective.

The agreement of international or even nationally relevant measures is only attainable if globally relevant assumptions can be agreed upon. Pollution by way of CO_2 emissions is a global problem, but with regional or even local causes. What is needed is a practical guideline towards sustainable development following the principle of conservation rather than restricting the consumption of resources.

INTERNATIONAL STANDARDS OF SUSTAINABILITY

The tenets of sustainable development are established by *ISO 15392: Sustainability in Building Construction – General Principles:*

- Continual improvement
- Equity
- Global thinking and local action
- Holistic approach
- Responsibility
- Involvement of interested parties
- Long-term consideration
- Precaution and risk
- Transparency

ISO 15392: Sustainability in Building Construction General Principles

ISO 15392:2008 identifies and establishes general principles for sustainability in buiding construction. It is based on the concept of sustainable development as it applies to the life cycle of buildings and other construction works, from their inception to the end of life.

ISO 15392:2008 is applicable to buildings and other construction works individually and collectively, as well as to the materials, products, services and processes related to the life cycle of buildings and other construction works.

ISO 15392:2008 does not provide levels (benchmarks) that can serve as the basis for sustainability claims. It is not intended to provide the basis for assessment of organizations or other stakeholders. This standard was last reviewed and confirmed in 2014.

Other Standards serving the measurement of Sustainability are:

ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
ISO 21931-1:2010	Sustainability in building construction -- Framework for methods of assessment of the environmental performance of construction works -- Part 1: Buildings
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
ISO 21929-1:2011	Sustainability in building construction -- Sustainability indicators -- Part 1: Framework for the development of indicators and a core set of indicators for buildings
ISO 23045:2008	Building environment design -- Guidelines to assess energy efficiency of new buildings

Other National Systems

In Japan, the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) is in place, although it is presently voluntary. CASBEE for Cities (for worldwide use) is a tool under development to assess the environmental performance of cities around the world. A pilot version of this tool was released at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change, held in December 2015.

In Europe, **The European Committee for Standardization** is responsible for the development of voluntary horizontal standardised methods for the assessment of the sustainability aspects of new and existing construction works and for standards for the environmental product declaration of construction products.

The standards are generally applicable (horizontal) and relevant for the assessment of integrated performance of buildings over its life cycle.

The standards describe a harmonized methodology for assessment of environmental performance of buildings and life cycle cost performance of buildings as well as the quantifiable performance aspects of health and comfort of buildings.

CEN/TC 350 Published Standards

Reference, Title	Publication date
CEN/TR 15941:2010 (WI=00350006) Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data	2010-05-26
CEN/TR 16970:2016 (WI=00350020) Sustainability of construction works - Guidance for the implementation of EN 15804	2016-07-27
CEN/TR 17005:2016 (WI=00350023) Sustainability of construction works - Additional environmental impact categories and indicators - Background information and possibilities - Evaluation of the possibility of adding environmental impact categories and related indicators and calculation methods for the assessment of the environmental performance of buildings	2016-10-26
EN 15643-1:2010 (WI=00350012) Sustainability of construction works - Sustainability assessment of buildings - Part 1: General framework	2010-09-22
EN 15643-2:2011 (WI=00350010) Sustainability of construction works - Assessment of buildings - Part 2: Framework for the assessment of environmental performance	2011-03-02

EN 15643-3:2012 (WI=00350008) Sustainability of construction works - Assessment of buildings - Part 3: Framework for the assessment of social performance	2012-01-25
EN 15643-4:2012 (WI=00350009) Sustainability of construction works - Assessment of buildings - Part 4: Framework for the assessment of economic performance	2012-01-25
EN 15804:2012+A1:2013 (WI=00350019) Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products	2013-11-20
EN 15942:2011 (WI=00350013) Sustainability of construction works - Environmental product declarations - Communication format business-to-business	2011-10-19
EN 15978:2011 (WI=00350011) Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method	2011-11-09
EN 16309:2014+A1:2014 (WI=00350026) Sustainability of construction works - Assessment of social performance of buildings - Calculation methodology	2014-08-20
EN 16627:2015 (WI=00350017) Sustainability of construction works - Assessment of economic performance of buildings - Calculation methods	2015-06-24

Relevance to the Brick Industry and Masonry Construction

As European building assessments will require data on products, materials, processes and services, as well as specification of scenarios (exposure, use, lifetime, maintenance, repair, replacements and end-of-life), this information will be required to be provided by suppliers in terms of supply contracts and purchase agreements. This is to be provided as an Environmental Performance Declaration (EPD), which will report on Indices, the definition of which will be established in the EN standards.

In the chain of supply of information pertaining to the building, the environmental, social and economic information is to be based on the input and output of resources, energy and emissions. By Industry Agreement this data may be standardised in terms of assumptions around quarry conditions, brick manufacturing methods, firing fuel sources, distances from point of supply, type of masonry construction, etc.

At the building level, each information module in the building's life cycle stages and its sub-stages requires information supplied from products, processes, scenarios and other relevant technical information. Thus, the brick industry will need to provide data which shows the performance of masonry walling, i.e. the bricks in combination with mortar as built into the construction.

The above European requirements are already employed by Green Building Practitioners for the undertaking of Green Building Council assessments. If we can assume that the ISO document development will follow the CEN developments (or the corresponding Japanese developments), then ultimately this type of practice will come to South African building industry.

CONCLUSION

Brick and Masonry construction methods have been shown by Life Cycle Assessment projects in Australia and Europe to be very competitive in comparison with other construction materials and methods. It is highly likely that the same situation will prevail in South Africa.

The competitive advantage of sustainability, as demonstrated by bricks manufactured in South Africa can then be carried to the marketplace.

The Clay Brick Association continues to take the lead on behalf of the construction materials industry in South Africa, by promoting the introduction of Sustainability measures and Standards into buildings.

For further information:
The Clay Brick Association of South Africa
Website: www.claybrick.org