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# AGM 2016

Fancourt Golf Resort, George  
28-29 April 2016



STYLISH





# TECHNICAL REPORT

## LIFE CYCLE ASSESSMENT (LCA) OF CLAY BRICK WALLING IN SOUTH AFRICA

CHRIS DICKINSON



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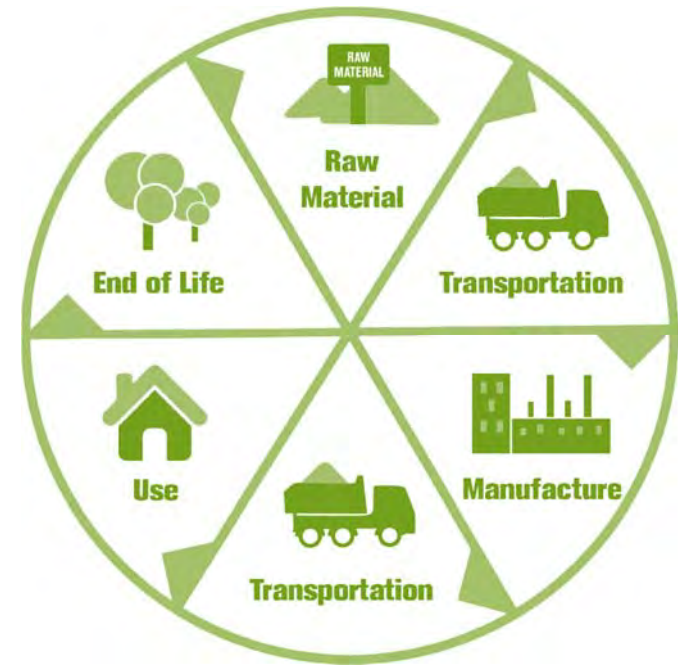


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# What is a “Life Cycle Assessment”

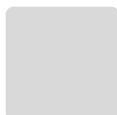
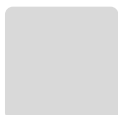
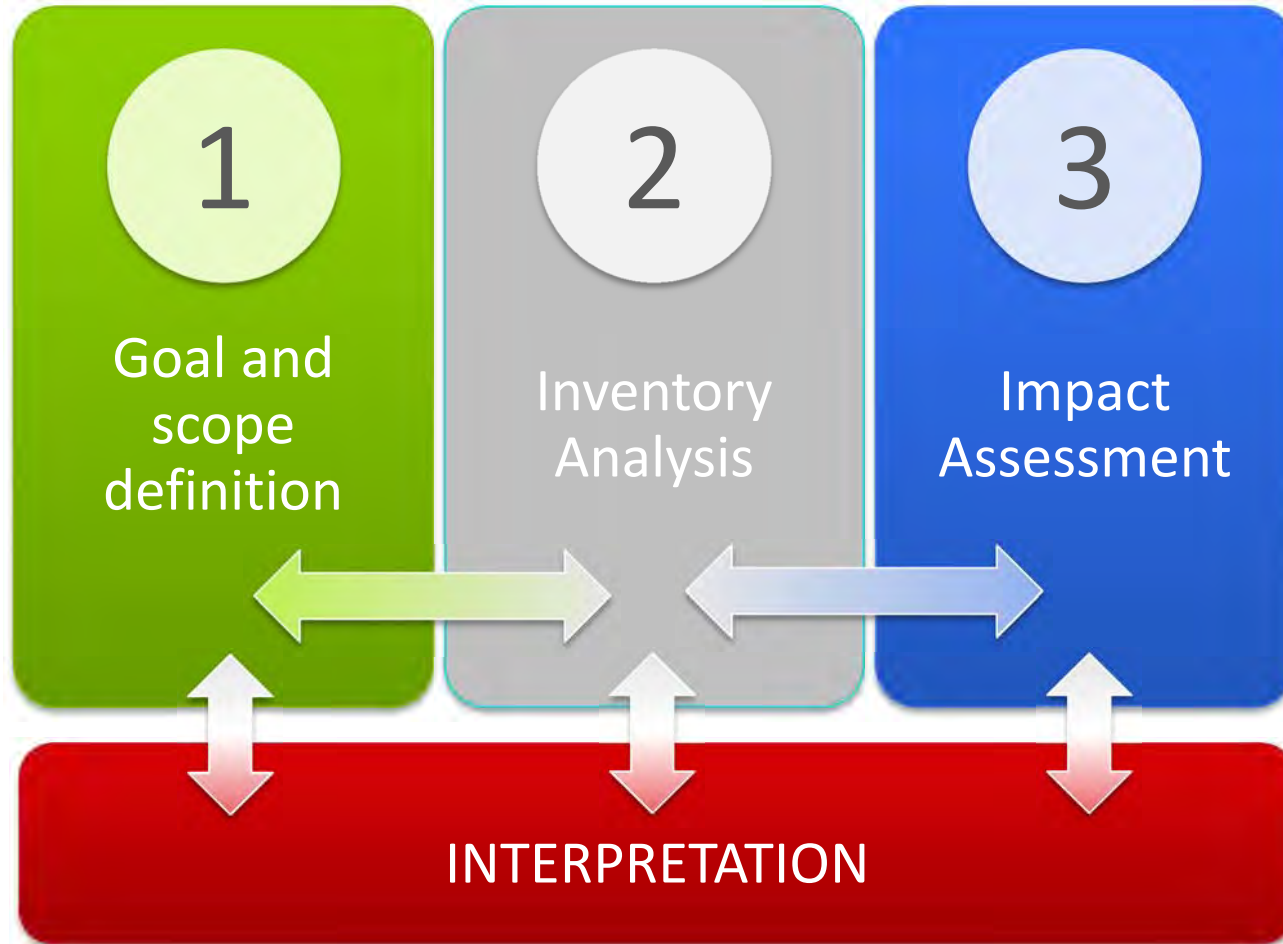
A tool for the systematic evaluation of environment impacts associated with **ALL** the stages of a product’s life, from “**cradle-to-grave**”



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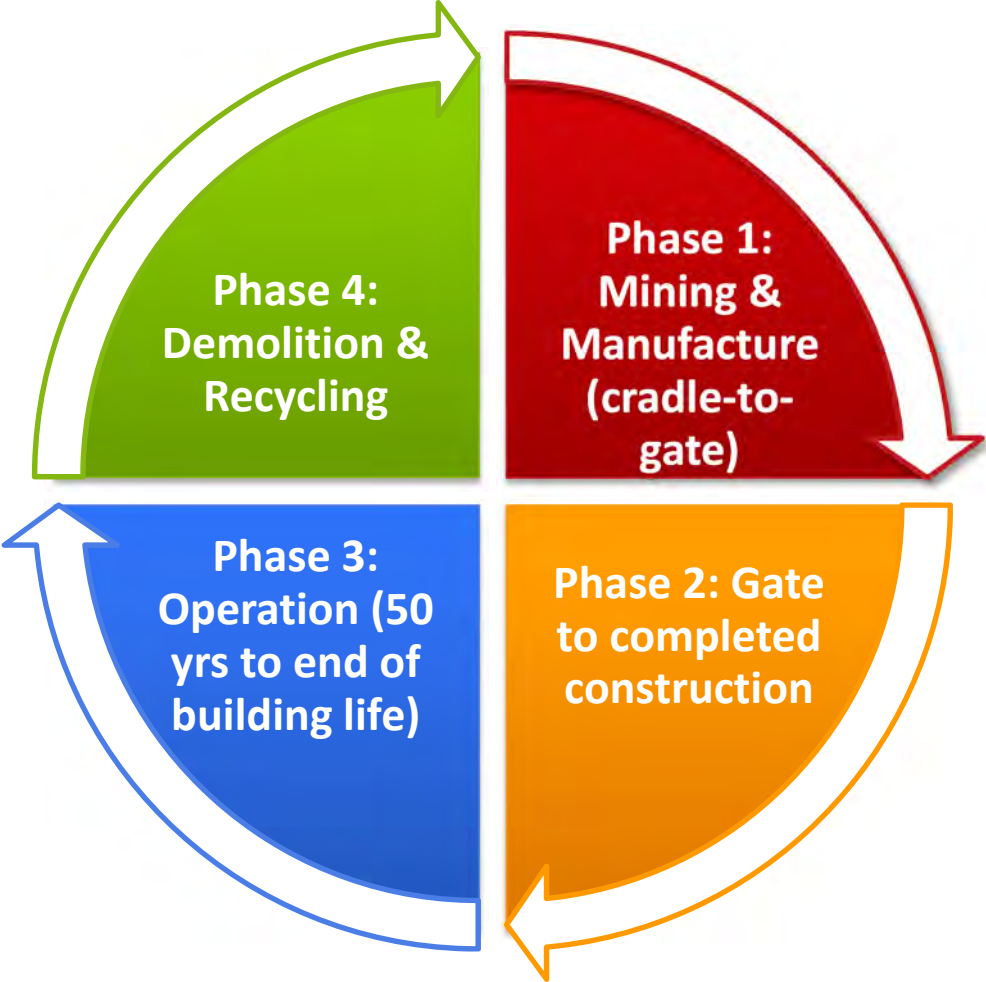
# Life Cycle Assessment Methodology



# Life Cycle Assessment Methodology

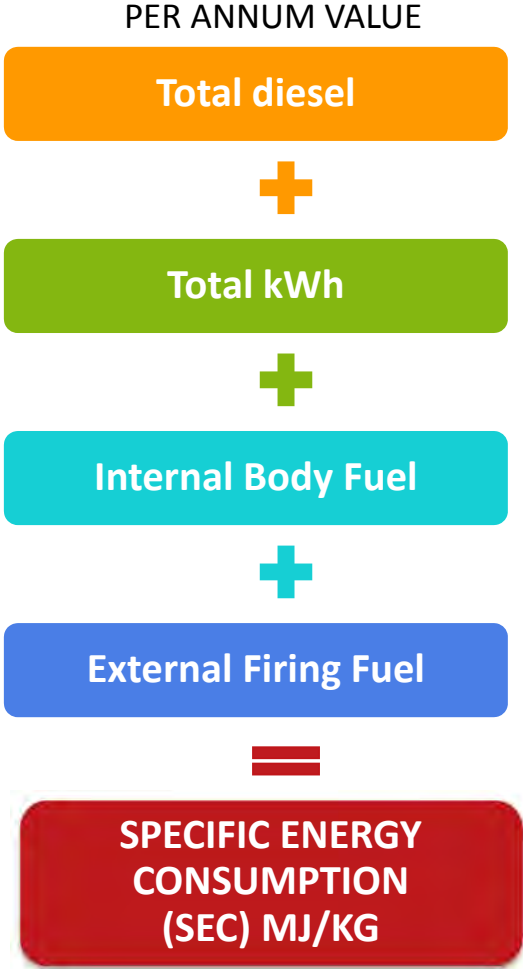
## ENERGY & MATERIALS

- 1. Questionnaires completed by  $\pm$  80 CBA members.
- 2. Emissions, calorific value of fuels, transport energy and operational energy from literature, thermal performance modelling and internationally accepted databases.

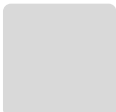
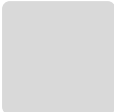
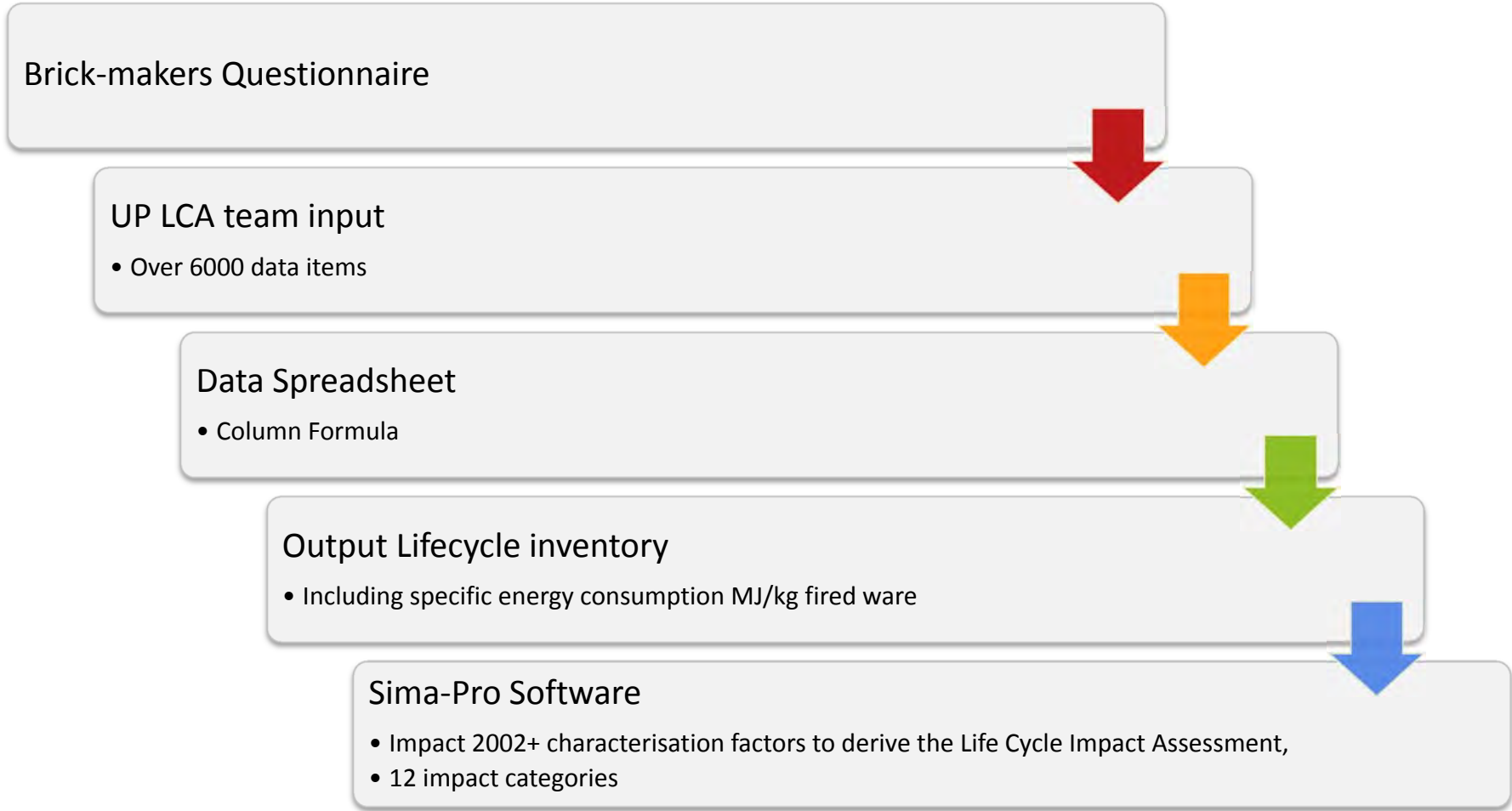


# Phase 1: “Cradle to Gate”

- Mining of clay to stockpile
- Stockpile to plant
- Crushing and Mixing
- Extrusion
- Drying
- Firing
- Storage in Yard



# Phase 1: Process Flow



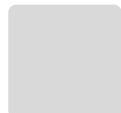
# Phase 1: Process Flow

## Impact Categories

- Carcinogens
- Non-carcinogens
- Respiratory inorganics (2)
- Ionizing radiation
- Ozone layer depletion
- Aquatic / Terrestrial eco-toxicity
- Terrestrial acidification/nitrification
- Land occupation
- Global warming
- Non-renewable energy

## Overview

- Human health
- Ecosystem quality
- Climate change
- Resources





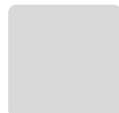
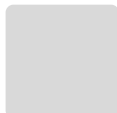
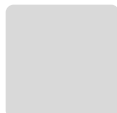
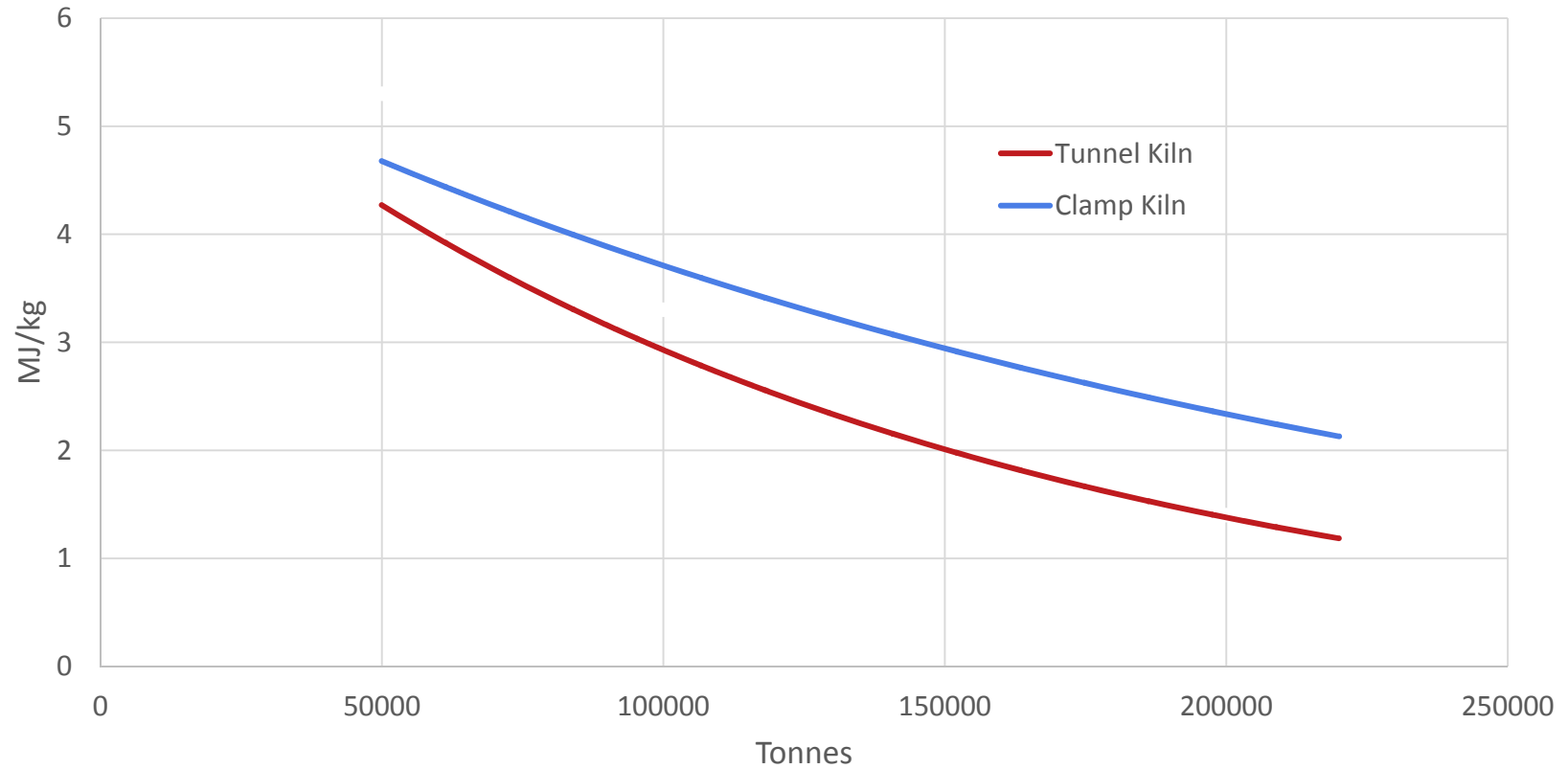
# Energy consumption comparisons

Kiln Type	UP LCA 2013	SA UCT 1995	UK Carbon Trust 2012	Australia 2010	Canada 1998
Clamp	3.48	3.97	-	Mix tunnel and others	-
Tunnel	2.74	2.93	2.54	Mix tunnel and others	4.58
Industry Ave.	3.23	3.42	2.54	3.39	4.58



# Specific Energy Consumption

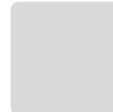
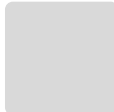
Annual Tons (MJ/kg) Fired Ware by Kiln Type



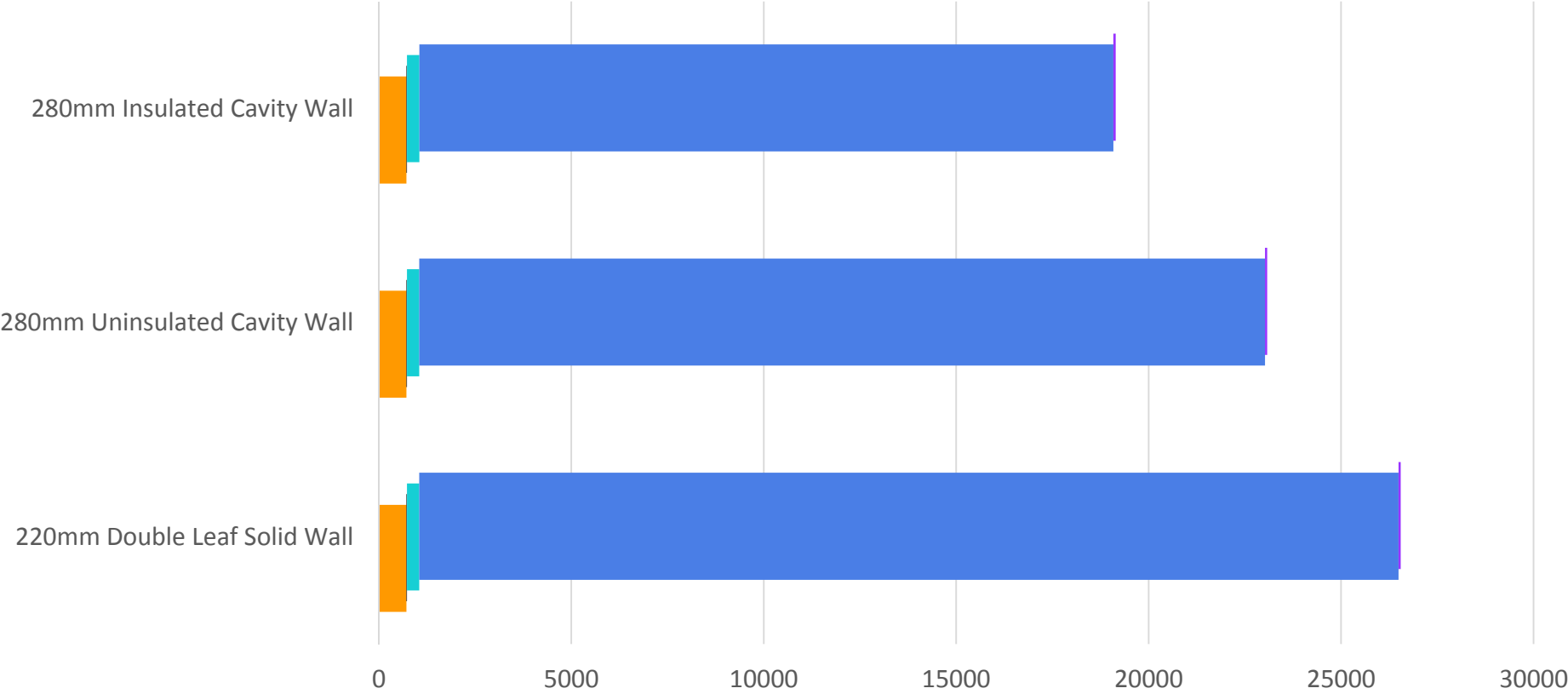
# Non Renewable Energy Consumption

*MJ for 1m<sup>2</sup> (286kg fired brick) of 3 types of walling plastered and painted both sides.  
Lifespan: for 50 years. Climate Zone: 1.*

PHASE	220MM DOUBLE LEAF SOLID WALL	280MM UNINSULATED CAVITY WALL	280MM INSULATED CAVITY WALL
Cradle to gate	715	715	715
Gate to site	15	15	15
Materials: mortar, plaster, paint, wall ties	318	320	323
Operational Phase: 50 years	25 443	21 972	18 031
Demolition & Recycling	59	59	59
<b>Total</b>	<b>26 550</b>	<b>23 081</b>	<b>19 143</b>



# Non Renewable Energy Consumption



■ Cradle to gate   
 ■ Gate to site   
 ■ Materials   
 ■ Operational Phase   
 ■ Demolition & Recycling

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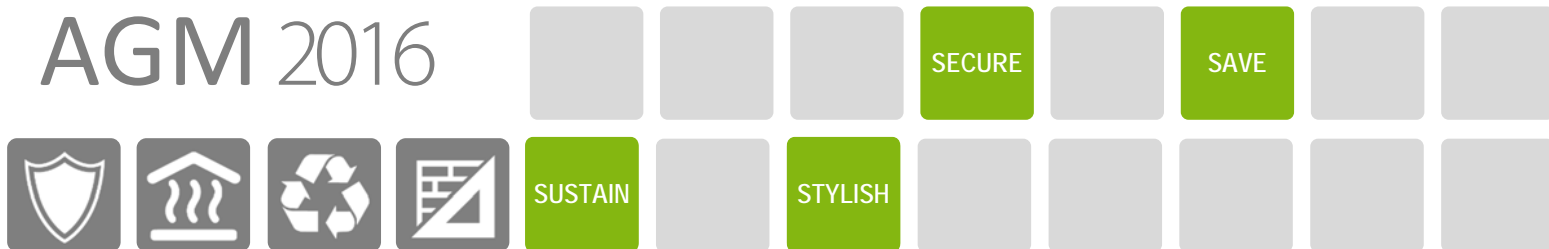


# Eurocode 6

Design of masonry structures



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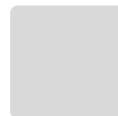
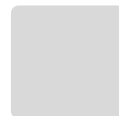
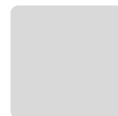
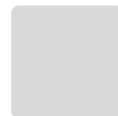
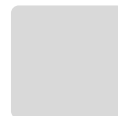
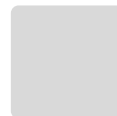
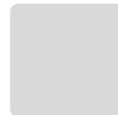
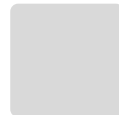
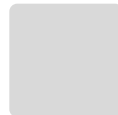
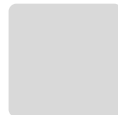
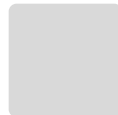
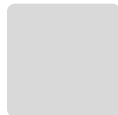
# Current SA Structural Design Standards

SANS 10249: Masonry Walling: 1993

SANS 10145: Concrete Masonry Construction: 1978



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# Eurocode 6: Published 2006 & updated

BS EN 1996-1  
Rules for Reinforced and unreinforced masonry

BS EN 1996-2  
Selection of materials and execution of masonry

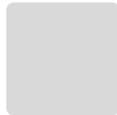
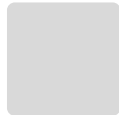
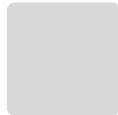
BS EN 1996-3  
Simplified calculation methods for unreinforced masonry



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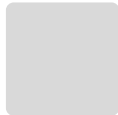
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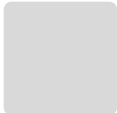
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# Status

**SABS/TC098/SCO5**: recommended adoption of Eurocode 6

SABS Ballot approved proposal for “new work item proposals”  
iro Eurocode 6 + country annexures

**SABS/TC081/SCO7/WG01**: currently preparing draft country  
annexure to *EN771-Part 1: Clay Masonry units* to replace  
SANS227 specification for burnt clay masonry units.



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