RIGIFoam (Pty) Ltd
SUPERIOR RIGID FOAM PRODUCTS

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Date: 01-01-2021

Re: House Sample

Please find attached Rational Design Report demonstrating compliance with SANS 10400XA.

The report indicates that the design in the report attached will bring the building into compliance via the Reference Building Method.

The energy modeling conducted shows that the building will theoretically use less energy and have a lower energy demand than an equivalent building meeting the Prescriptive Requirements as per SANS 10400 XA.

Note: This report is for information only and example of a Rational Design Report

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Introduction

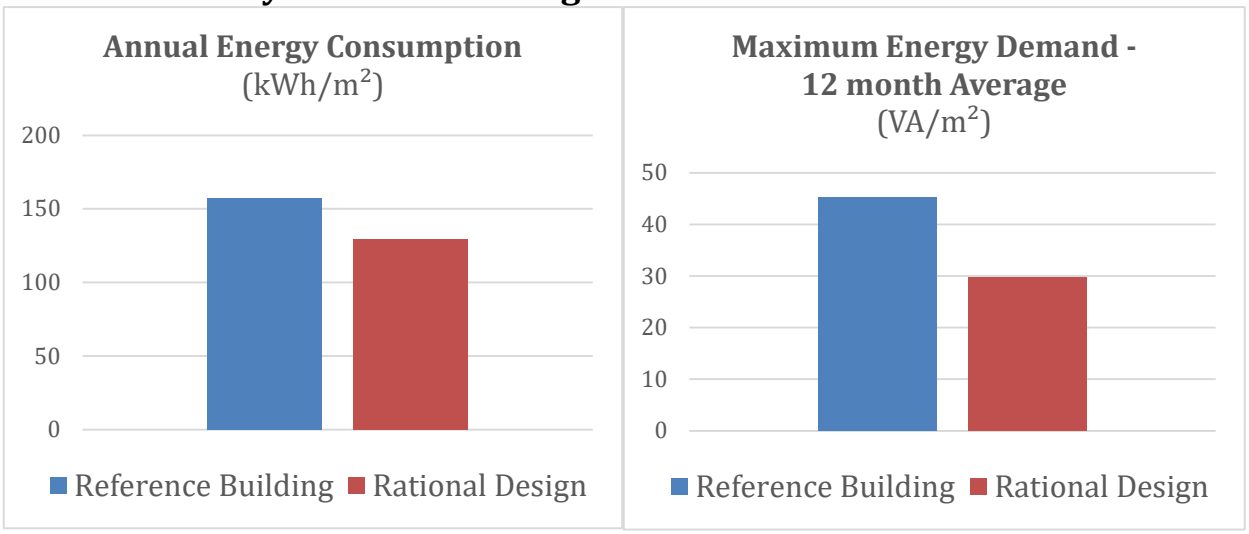
It is required that an Energy Modeling and a Rational Design is performed in order to evidence that the Proposed design has a lower theoretical energy usage and demand that the reference building designed in accordance with the prescriptive route.

In accordance with the National Building Regulation XA3 C) the building deemed to be complied with by means of the Reference Building Route if the above is demonstrated.

Compliance methodology of Rational Design

The compliance route selected is that set out in paragraph 4.2.1. c) of SANS 10400XA which is described in Annexure A.
The energy modeling software description and certification is provided in Annexure A.
Details of the competency requirements of the rational designer are provided in Annexure A.
Disclaimer for the use of this report Annexure A.
Detailed building input and assumptions are stipulated in Annexure B, with a description of the Rational Design essentials necessary to ensure the required energy savings are achieved.
Relevant energy usage, demand outputs and modeling results are provided in Annexure C.

Summary of Rational Design results



Conclusions

House Sample will theoretically preform with a lower annual energy usage and energy demand than a comparable building built and designed in accordance with the prescriptive rules of Regulations XA, and therefor meets the requirements of the National Building Regulations.

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Annexure A

Compliance Route

The paragraph 4.2.1 c) or Reference Building compliance route requires that an energy modelling of the base case design of the house is performed with all Prescriptive provisions as per paragraph 4.2.1 b) applied and using Agrément SA approved software, in order to determine the base-line energy usage and demand.

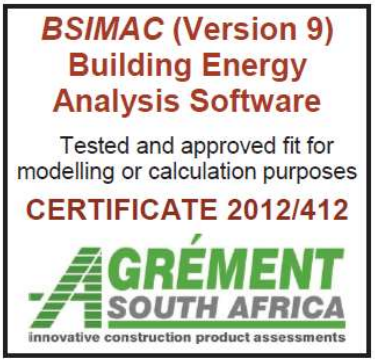
The design is then adjusted to bring about improvements in the energy efficiency, and is remodeled until a lower energy usage is demonstrated. The assumptions of paragraph 4.3 and all the modelling stipulations of SANS10400XA Table 4, 5, and 6 are applied.

Bsimac software

This Rational Design has been developed by making use of the Bsimac Ver9 Software package.

The Bsimac software has been evaluated and approved by Agrément SA (a division of the CSIR) in accordance with the protocols developed for Energy Modelling software in terms of SANS104000XA.

The climate files used in this modelling are the Test Reference Year (TRY) files supplied with the software.



Disclaimer

RigiFoam (Pty) Ltd has provided this Rational Assessment Calculation in terms of SANS10400XA, which calculation incorporates the specific use of RigiFoam's LAMBDABOARD product in the manner, application, and thickness described. It is recorded that the use of any other product, or deviation in any way whatsoever from the details described in this calculation, shall render the calculation entirely inaccurate and as such RigiFoam does not warrant the correctness in such circumstance, nor shall RigiFoam bear any responsibility or liability in respect thereof.

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Annexure B

General Specifications

House Sample consisting of a 2 Bedroom Double Storey residential dwelling. Garage excluded from simulations

Modeling methodology

As per the requirements set out in SANS 10400-XA, two simulations were conducted for the building.

The first simulation is of a 'Reference Building' based on the same design, but with prescribed specifications for windows, fabric and insulation, etc. (detailed below) as per SANS 10400-XA. This simulation shows the 'reference' energy consumption and demand which this building might consume.

The second simulation is of the actual design, with actual specifications of windows, fabric and insulation used. This simulation shows the actual predicted energy consumption and demand for the building.
The results show that the Rational Design has a theoretical annual energy consumption and demand equal than or less the Reference Building Complying with clause 4.2.1 b) of SANS 10400-XA, thus proving compliance with the SANS-10400-XA standard.

Simulation Inputs

	Reference Building	Rational Design Building
Climatic Zone	• Climate Zone 4 Temperate coastal • Weather Data approved by Agrément SA	
Perimeter / Floors	**As per SANS 10400-XA & SANS 204** • Uninsulated floor slab - no underfloor heating • Vertical Edge Perimeter insulation required for floor area's less than 500m^{2}with min R-Value of 1.	**As per Actual designs/suggestions** • Uninsulated floor slab - no underfloor heating • 25mm Lambdaboard Vertical Edge Perimeter insulation, installed as per manufacture's specifications
External Walls	**As per SANS 10400-XA** • Masonry Walls with min R-Value 0.35	**As per Actual designs/suggestions** • All external cavity as per Design Architect's Council Drawings
Roof Assemblies	**As per SANS 10400-XA** • Roof assemblies to achieve a minimum R-value of 3.7 for Climate Zone 4.	**As per Actual designs/suggestions** • Concrete roof tiles 50mm Lambdaboard installed as ceiling application installed as per manufacturer's specifications
Fenestration	**As per SANS 10400-XA** • Fenestration area maximum 15% of Net Floor Area With minimum energy performance requirements Single Clear Glazing as per SAN204.	**As per Actual designs/suggestions** • Double Glazing as per Architect's' window and door schedule.

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Shading	• Solar exposure factors used, assuming no shading for reference building	• Shading measures provided as per architect's design
Heating and Cooling	**As per SANS 10400-XA and SANS 204** Building modelled theoretically as if cooled with an air-conditioning system of efficiency in terms of SANS 204 Table 14 to determine an energy budget.	
Design Population	**2 persons per bedroom as per SANS 10400-XA**	
Metabolic Rates	**75 W sensible heat gain per person as per SANS 10400-XA**	
Lighting	**5 W / m^2 as per SANS 10400-XA and SANS 204**	
Hot Water Service	**As per SANS 10400-XA and SANS 204** • 50% volume supplied by gas/heat pump/solar thermal estimated at 115l/capita/day over the total occupancy.	**As per Actual designs** • Gas Geyser Specified as per Design Architect's Council Drawings.

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Annexure C

Energy Modeling Results

The Bsimac computer runs are set out below:

Reference Building

Energy consumption for all Plants for the whole Year (or period computed)

Category	Energy consumption for the period indicated	
	Per sq metre, kWh/m²	Total, kWh
Cooling, Dehumidifying	47.5	5 870
Heating	9.3	1 146
Humidifying	0.0	0
Sub-Total	56.8	7 015
Fans and pumps	5.0	617
TOTAL	61.7	7 632
Lights: electrical input	50.9	6 289
Hot water	44.9	5 548
Vertical transport	0.0	0
GRAND TOTAL	157.5	19 470

** Based on the 'Nett Floor Area' of 123.6 m².

Month	Electrical demand for the period indicated	
	Per sq metre**, VA/m²	Total, kVA
January	49.2	6.1
February	50.3	6.2
March	49.2	6.1
April	49.3	6.1
May	36.9	4.6
June	43.1	5.3
July	42.3	5.2
August	38.2	4.7
September	46.2	5.7
October	44.6	5.5
November	45.6	5.6
December	47.4	5.9
Average for the year	45.2	5.6

** Based on the 'Nett Floor Area' of 123.6 m².

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Rational Design Building

Energy consumption for all Plants for the whole Year (or period computed)

Category	Energy consumption for the period indicated	
	Per sq metre, kWh/m²	Total, kWh
Cooling, Dehumidifying	64.8	8 016
Heating	0.5	63
Humidifying	0.0	0
Sub-Total	65.4	8 079
Fans and pumps	7.0	862
TOTAL	72.3	8 942
Lights: electrical input	50.9	6 289
Hot water	6.1	751
Vertical transport	0.0	0
GRAND TOTAL	129.3	15 982

** Based on the 'Nett Floor Area' of 123.6 m².

Month	Electrical demand for the period indicated	
	Per sq metre**, VA/m²	Total, kVA
January	35.2	4.3
February	35.9	4.4
March	36.4	4.5
April	36.5	4.5
May	22.9	2.8
June	17.2	2.1
July	17.4	2.1
August	23.6	2.9
September	30.8	3.8
October	32.5	4.0
November	33.8	4.2
December	34.0	4.2
Average for the year	29.7	3.7

** Based on the 'Nett Floor Area' of 123.6 m².