

Energy Usage in Buildings

SANS 10400-XA – Design Report

V. 4.0



Insert logo here

Report Date: _____

Competent Person:
Prof. Registration No:

Practice Name:

Client's Name:

Project Description:

Site Address:

Cadastral Description:

This report is to be read in conjunction with the applicable drawings, specifications and other relevant documentation.

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Climatic Zone & Data

Site Location :	--- Select Location ---		
Latitude:	<i>South</i>	Longitude:	<i>East</i>
Energy zone :			
Heating	Cooling	Humidity	

Building Design - Occupancy Classification

Occupancy Classification: _____

Occupancy Description: _____

Building Design – Category

Building Category: _____

Building Design – Occupancy Times

Design occupancy times:	_____	<i>Hrs / Day</i>	<i>Days / Week</i>
	_____	<i>Hrs / Week</i>	<i>Hrs / Year</i>

Building Design – Population

Design Population
Reg. A20 – Table 2: _____

Design Population: _____

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Building Design – Floor Area

Proposal – Floor Area:

Nett		Gross	
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
	<i>m</i> ²		<i>m</i> ²
Total Nett Floor Area:	<i>m</i> ²		<i>m</i> ²

Building Design – Maximum Permissible Annual Energy Consumption / Demand

Energy Consumption / <i>m</i> ² :	<i>kWh/m</i> ²
Energy Consumption – Permissible:	<i>kWh</i>
Energy Demand / <i>m</i> ² :	<i>W/m</i> ²
Energy Demand – Permissible:	<i>W</i>

Building Orientation – Primary Façade

Orientation Sector:	
Orientation Bearing:	<i>Deg.</i>

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Building Envelope – Fenestration

Fenestration Data

Storey Level		Fenestration Area (m ²)	% / Nett FA
Basement Storey:			
Ground Storey:			
First Storey:			
Second Storey:			
Third Storey:			
Fourth Storey:			
Fifth Storey:			
Sixth Storey:			
Seventh Storey:			
Eighth Storey:			
Ninth Storey:			
Tenth Storey:			

Fenestration Performance Values / Orientation Sector

West, North West, North, North East, East Sectors

Storey	Area Weighted U-value	Area Weighted SHGC	
		Un-shaded	Shaded
Basement Storey			
Ground Storey			
First Storey			
Second Storey			
Third Storey			
Fourth Storey			
Fifth Storey			
Sixth Storey			
Seventh Storey			
Eighth Storey			
Ninth Storey			
Tenth Storey			

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Fenestration Performance Values / Orientation Sector

South East, South, South West Sectors

Storey	Area Weighted U-value	Area Weighted SHGC
Basement Storey		
Ground Storey		
First Storey		
Second Storey		
Third Storey		
Fourth Storey		
Fifth Storey		
Sixth Storey		
Seventh Storey		
Eighth Storey		
Ninth Storey		
Tenth Storey		

Fenestration Performance Achieved

"Shaded" refers to openings shaded according to 5.2.1 of SANS 10400-XA while "Un-shaded" refers to openings that do not satisfy the requirements.

Storey	Area Weighted U-value	Area Weighted SHGC		
		West, Northern & East Sectors		Southern Sectors
		Shaded	Un-shaded	
Basement Storey				
Ground Storey				
First Storey				
Second Storey				
Third Storey				
Fourth Storey				
Fifth Storey				
Sixth Storey				
Seventh Storey				
Eighth Storey				
Ninth Storey				
Tenth Storey				

Fenestration Summary

Roof Light Summary

Maximum Permitted Air Leakage

Maximum permissible air leakage for glazing elements :

Openable glazing : *L/sm²*

Non-openable glazing : *L/sm²*

Glazed double action swing and revolving doors : *L/sm²*

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Building Envelope – Floors

Underfloor Insulation – Slab On-ground

Underfloor heating system installed ?

Underfloor Insulation - Min. R-value Required: *m²K/W*

Underfloor Insulation:

Material	Thickness (mm)	R-value (<i>m²K/W</i>)

Floor Insulation – Exposed Suspended

Suspended floor forms part of external building envelope ?

Additional Insulation – Min. R-value Required: *m²K/W*

Additional Insulation:

Material	Thickness (mm)	R-value (<i>m²K/W</i>)

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Building Envelope – Adjoining Unconditioned Space(s)

Unconditioned Space 1

Separating Element :

Separating Element Size :

R-Value Achieved : m^2K/W

Improved R-value – Separating Element + Unconditioned Space :

Summer – Jan:Mar m^2K/W

Autumn – Apr:Jun m^2K/W

Winter - Jul:Sep m^2K/W

Spring – Oct:Dec m^2K/W

Unconditioned Space 2

Separating Element :

Separating Element Size :

R-Value Achieved : m^2K/W

Improved R-value – Separating Element + Unconditioned Space :

Summer – Jan:Mar m^2K/W

Autumn – Apr:Jun m^2K/W

Winter - Jul:Sep m^2K/W

Spring – Oct:Dec m^2K/W

Unconditioned Space 3

Separating Element :

Separating Element Size :

R-Value Achieved : m^2K/W

Improved R-value – Separating Element + Unconditioned Space :

Summer – Jan:Mar m^2K/W

Autumn – Apr:Jun m^2K/W

Winter - Jul:Sep m^2K/W

Spring – Oct:Dec m^2K/W

Unconditioned Space 4

Separating Element :

Separating Element Size :

R-Value Achieved : m^2K/W

Improved R-value – Separating Element + Unconditioned Space :

Summer – Jan:Mar m^2K/W

Autumn – Apr:Jun m^2K/W

Winter - Jul:Sep m^2K/W

Spring – Oct:Dec m^2K/W

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Services – Hot Water

Hot Water System – Assumptions

Hot water demand :

Hot water storage volume :

Hot Water System – Required

Hot Water Storage – Non-solar Heating :

L

Hot Water Storage – Solar Heating :

L

Daily Hot Water Demand :

L

Annual Hot Water Demand :

kL – Based on design occupancy

50 % of Annual Hot Water Demand :

kL

Hot Water System Adopted

Hot Water System – Resistance Heating

Resistance Heating – Unit 1

Design Units/Population

Tank Storage Volume :

L

% Volume to be Heated :

%

Rated Power Input :

kW

Energy Consumption – Daily :

kWh

Resistance Heating – Unit 2

Design Units/Population

Tank Storage Volume :

L

% Volume to be Heated :

%

Rated Power Input :

kW

Energy Consumption – Daily :

kWh

Resistance Heating – Unit 3

Design Units/Population

Tank Storage Volume :

L

% Volume to be Heated :

%

Rated Power Input :

kW

Energy Consumption – Daily :

kWh

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Hot Water System – Heat Pump

Heat Pump – Unit 1

Design Units/Population

Tank Storage Volume :	<i>L</i>
% Volume to be Heated :	<i>%</i>
Heat Pump Capacity :	<i>kW</i>
Rated Power Input :	<i>kW</i>
COP :	
Energy Consumption – Daily :	<i>kWh</i>

Heat Pump – Unit 2

Design Units/Population

Tank Storage Volume :	<i>L</i>
% Volume to be Heated :	<i>%</i>
Heat Pump Capacity :	<i>kW</i>
Rated Power Input :	<i>kW</i>
COP :	
Energy Consumption – Daily :	<i>kWh</i>

Heat Pump – Unit 3

Design Units/Population

Tank Storage Volume :	<i>L</i>
% Volume to be Heated :	<i>%</i>
Heat Pump Capacity :	<i>kW</i>
Rated Power Input :	<i>kW</i>
COP :	
Energy Consumption – Daily :	<i>kWh</i>

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Hot Water System – Solar Heating

Solar Hot Water (SHW) System – Unit 1

Design Units/Population

% Volume to be Heated : %

Absorber Type :

Storage Tank Type :

Supplementary Energy Source :

Min. Absorber Area : m^2

Solar Tank Capacity : L

Supplementary Storage Tank Capacity : L

Absorber Orientation :

Absorber Tilt Angle : *Degrees from horizontal*

Solar Hot Water (SHW) System – Unit 2

Design Units/Population

% Volume to be Heated : %

Absorber Type :

Storage Tank Type :

Supplementary Energy Source :

Min. Absorber Area : m^2

Solar Tank Capacity : L

Supplementary Storage Tank Capacity : L

Absorber Orientation :

Absorber Tilt Angle : *Degrees from horizontal*

Solar Hot Water (SHW) System – Unit 3

Design Units/Population

% Volume to be Heated : %

Absorber Type :

Storage Tank Type :

Supplementary Energy Source :

Min. Absorber Area : m^2

Solar Tank Capacity : L

Supplementary Storage Tank Capacity : L

Absorber Orientation :

Absorber Tilt Angle : *Degrees from horizontal*

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Hot Water System – Instantaneous – LP Gas

Instantaneous Water Heater – Unit 1

Net Heater Power : *kW*
 Flow Rate : *L/min*

Instantaneous Water Heater – Unit 2

Net Heater Power : *kW*
 Flow Rate : *L/min*

Instantaneous Water Heater – Unit 3

Net Heater Power : *kW*
 Flow Rate : *L/min*

Instantaneous Water Heater – Unit 4

Net Heater Power : *kW*
 Flow Rate : *L/min*

Hot Water System Adopted – Energy Consumption

Heating System	Unit 1	Unit 2	Unit 3	Unit 4	
					<i>kWh/d</i>
					<i>% Volume</i>
					<i>kWh/d</i>
					<i>% Volume</i>
					<i>% Volume</i>

Hot Water System Adopted – Energy Consumption

Daily Energy Consumption : *kWh/d*
 Annual Energy Consumption : *kWh/a*

Hot Water System – Pipework Insulation

Hot Water Service Pipe – Ø ID : *mm*

Min. R-value for Pipe Insulation :

Piping to be Insulated :

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Power Density – Lighting – SANS 10400 XA

Power Density (Lighting & Fans)

NOTE : Lighting Density ONLY required to satisfy SANS 10400-XA

Storey	Lighting	Ceiling Fan	Lighting + Fans	
	Power Density		Power Density	
Basement				
Ground				
First				
Second				
Third				
Fourth				
Fifth				
Sixth				
Seventh				
Eighth				
Ninth				
Tenth				
External				
Daily Total				W
Annual Total				kW

Lighting Power Density – Permitted :	W
Lighting Power Density – Design Load:	W
Lighting Power Density – Achieved:	W/m ²
Lighting Power Density – Remaining :	

Building Sealing

Envelope Sealing

Roof Space Sealing

Non-Thatch Roof Type

Thatch Roof Type

Door / Other Opening

Solid-fuel Burning Appliance

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Space Conditioning

Ventilation Method

Building Ventilation Method :

HVAC System

Equipment Type:

Capacity Range: *kW*

Minimum COP_C :

Minimum COP_H :

Note:

Typical thermal properties of common building and insulating materials (design values) sourced from ASHRAE 2009 – Fundamentals, CIBSE Guide A, Environmental Design & BRE Publication, BEPAC Research Report, BRE/169/12/1, The Harmonisation of Thermal Properties of Building Materials, 1990

Thermal resistance of building elements is calculated in accordance with SANS 6946.

Interpolation of shading factors is utilised in shading element calculations.

Hot water system calculations and volume data is sourced from SANS 10252-1 and various on-line resources.

Hot water energy consumption is calculated for a hot water requirement of 60 °C with cold water temperature based on the average ambient air temperature for the climatic zone.

Mean available solar irradiance values is based on satellite-derived meteorology and solar energy parameters sourced from NASA – NASA Prediction of Worldwide Energy Resources (<https://power.larc.nasa.gov/>). Source values (kWh/m²/day) converted to kJ/m²/day.

Declaration

I, the undersigned, hereby certify that all the information contained in this report is to the best of my knowledge and belief, true and correct.

Signature: _____

Competent Person:

Professional Registration No: