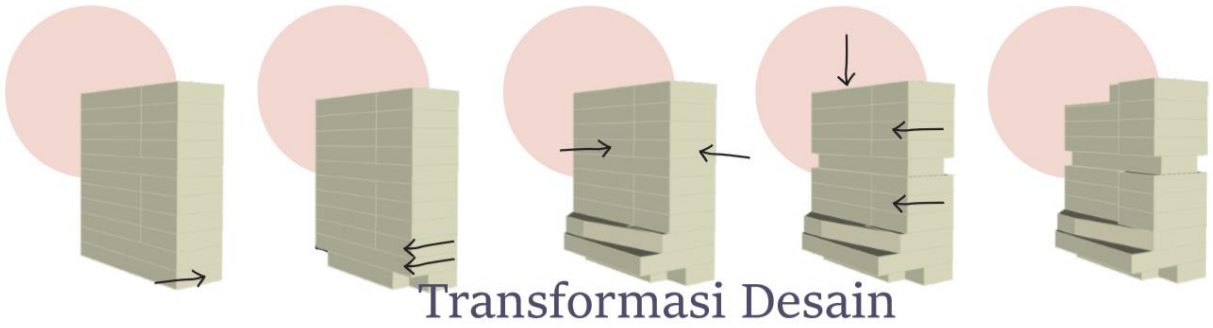
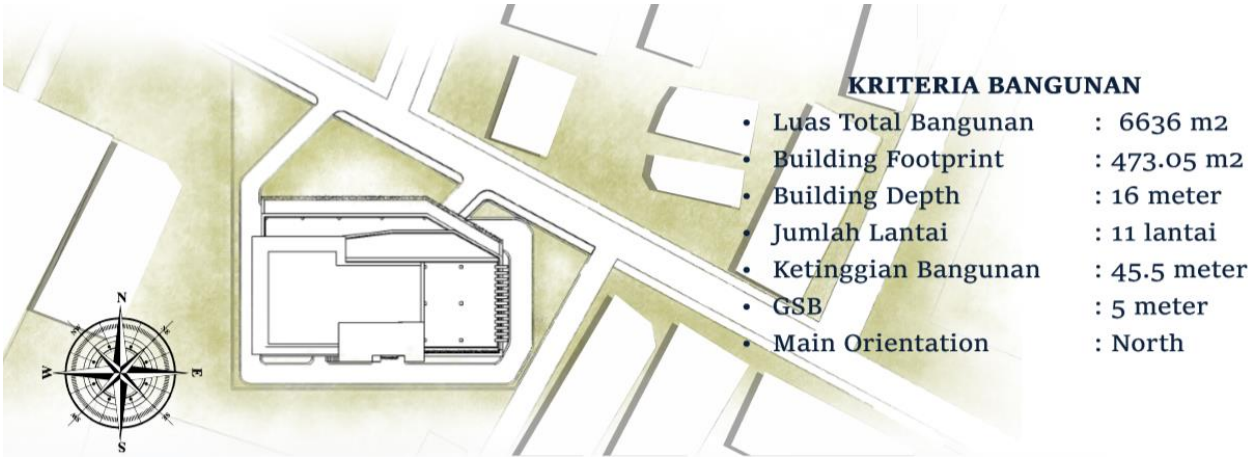
BAB IV
PENDEKATAN DESAIN DENGAN PERHITUNGAN EDGE

4.1. Data Bangunan



Gambar 4.1 tranformasi Desain



Gambar 4.2 Siteplan

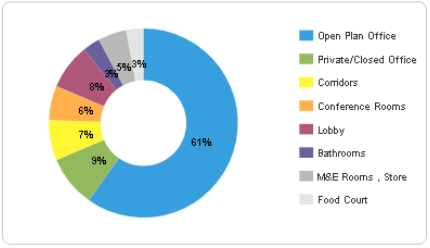
Gross Internal Area Excluding Car Pa...	6,750	m²
Floors Above Grade	11	no.
Floors Below Grade	2	no.
Floor-to-Floor Height	4	m

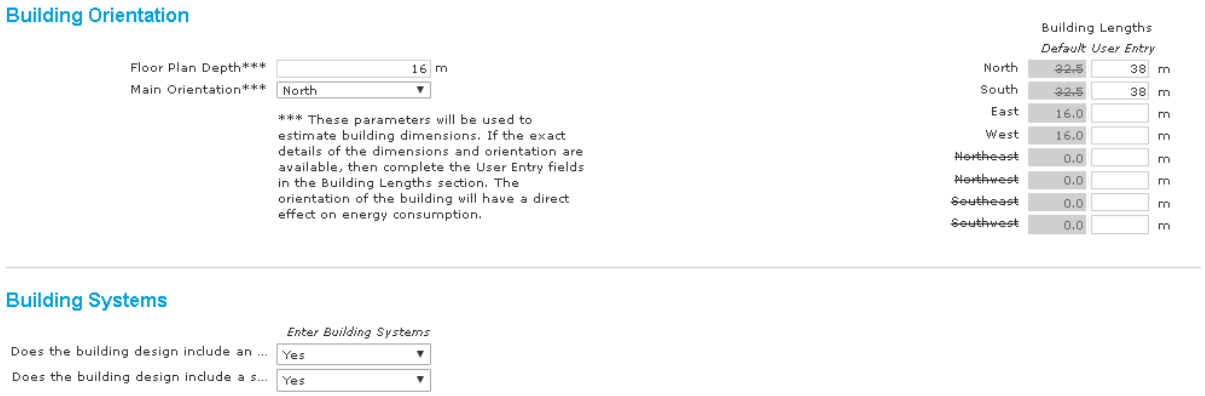
Food Court ☑
Cellular Office ☐

	Default	User Entry	
Open Plan Office	4,096		m²
Private/Closed Office	620		m²
Corridors	451		m²
Conference Rooms	384		m²
Lobby	519		m²
Bathrooms	181		m²
M&E Rooms, Store **	316		m²
Food Court	181		m²
Gross Internal Area	6,750		m²

**The M&E Rooms, Store field is equal to the remaining space required to total the gross internal area excluding car parking.

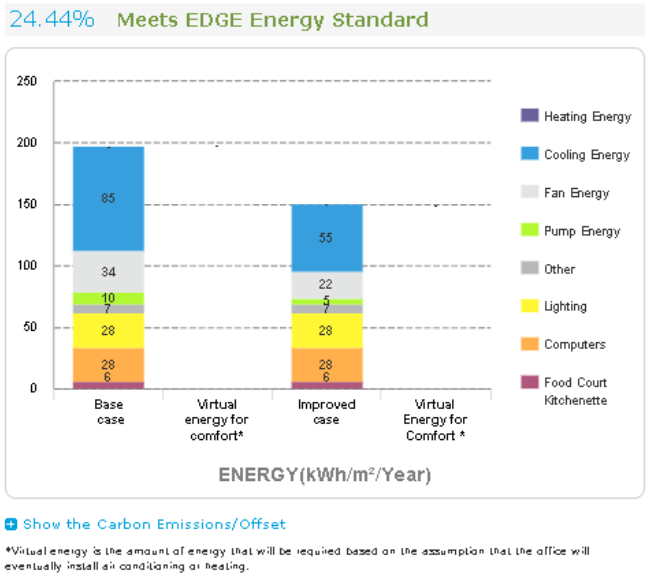
	Default	User Entry	
Occupancy Density	10		m²/Person
Operational Hours	10		Hours/Day
Working Days	5		Days/Week
Holidays	12		Days/Year





Gambar 4.3 Data Bangunan berdasarkan EDGE

4.2. Saving energy



Grafik energi menunjukkan rincian penggunaan akhir yang mengonsumsi energi. Dengan satuan adalah kWh / m2 / tahun. Ini termasuk energi dari semua bahan bakar - termasuk listrik, gas alam, dan diesel - dikonversi ke kilowatt-jam. Setiap di bagian grafik batang menampilkan informasi lebih lanjut tentang setiap bagian.

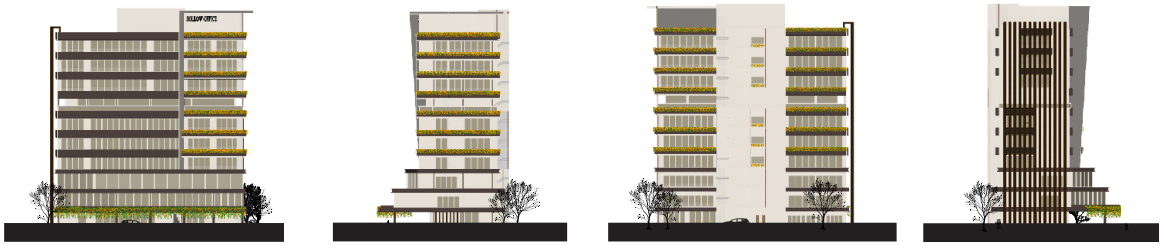
- **Reduce Window Wall to ratio (WWR)**

OFE01* ☑ Reduced Window to Wall Ratio - WWR of 26.63%

North	43.72	%	South	23.09	%
East	10.10	%	West	13.47	%
~~Northeast~~		%	~~Northwest~~		%
~~Southeast~~		%	~~Southwest~~		%

Upload Document(s) | Calculator

Orientation	Wall Area (m²) Example: 120	Glazing Area (m²) Example: 60	Ratio in %
North	1641.76	717.79	43.72
South	1628.27	375.97	23.09
East	694.43	70.17	10.10
West	823.72	110.97	13.47
~~Northeast~~	~~0.00~~	~~0.00~~	
~~Northwest~~	~~0.00~~	~~0.00~~	
~~Southeast~~	~~0.00~~	~~0.00~~	
~~Southwest~~	~~0.00~~	~~0.00~~	
Total	4,788.18	1,274.90	
		WWR	26.63%



Wall Area: 1641.76 m2
Glass Area : 717.79m2

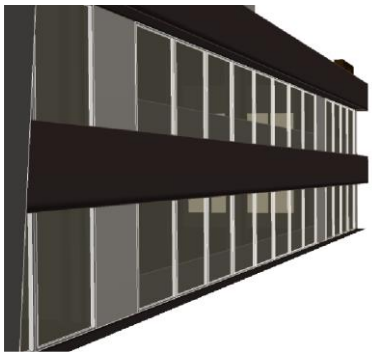
Wall Area: 823.72 m2
Glass Area : 110.97 m2

Wall Area: 1628.27 m2
Glass Area : 375.97 m2

Wall Area: 694.4 m2
Glass Area : 70.1 m2

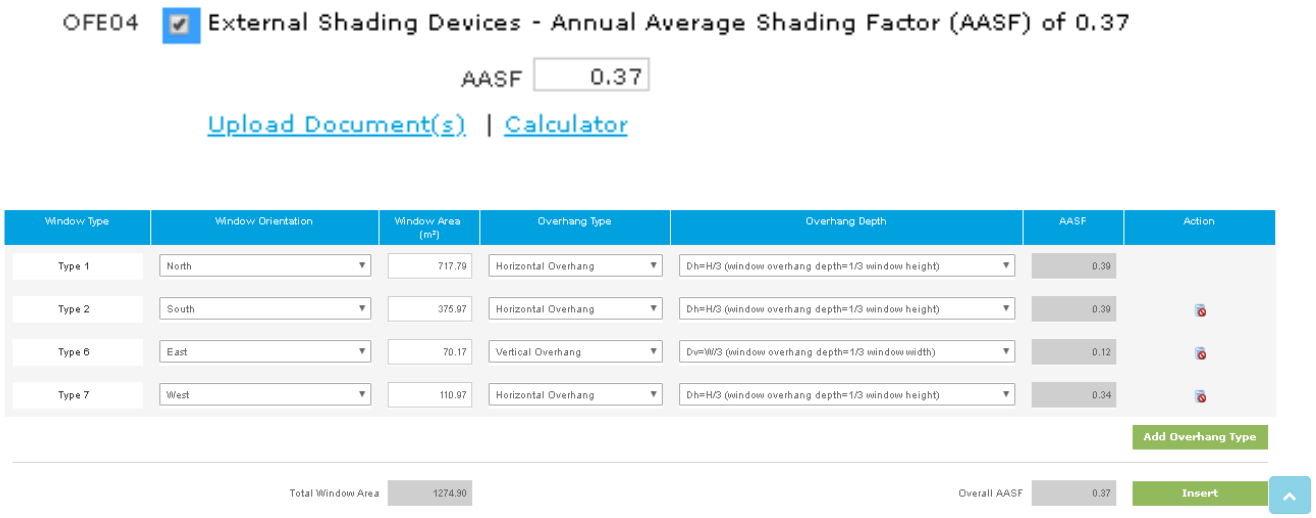
Gambar 4.4 Perbandingan Rasio Jendela dan Dinding

- **External Shading Devices – Annual Averange Shading Factor (AASF)**



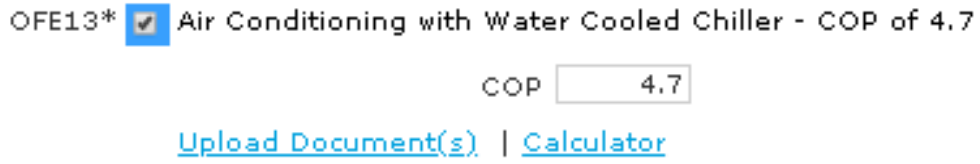
Gambar 4.5 Overhang

Shading device merupakan sarana untuk pemberian pembayangan pada lubang cahaya untuk mengurangi masuknya sinar matahari kedalam ruangan tanpa mengurangi masuknya cahaya alami ke dalam ruangan.



- **Air Conditioning with Water Cooled Chiller**

Penghawaan yang digunakan pada bangunan ini adalah menggunakan Cooling Water dengan memanfaatkan air dari grey water dan rain water harvesting

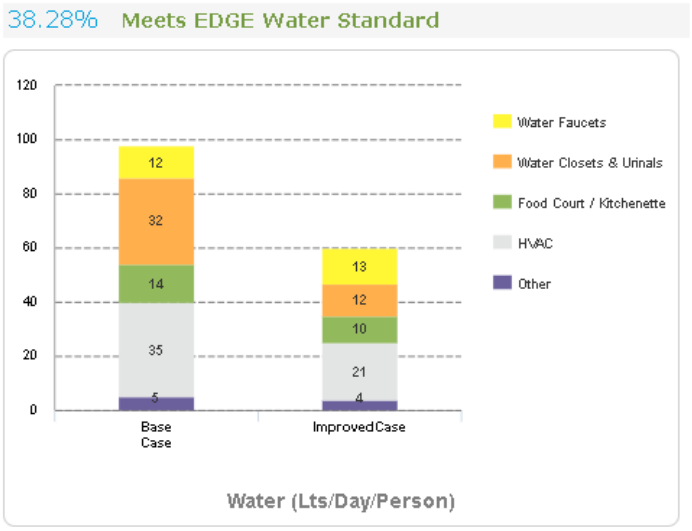


- **Lighting Controls for Corridors and Staircase**

Sensor lighting digunakan pada area sepanjang corridors dan tangga darurat karena penggunaan pada daerah ini yang tidak begitu intens dengan kegiatan manusia sehingga supaya mampu lebih menghemat energy yang dikeluarkan.

OFE26 ☑ Lighting Controls for Corridors and Staircases
Upload Document(s)

4.3. Saving Water



Disclaimer: EDGE is designed as comparative software and is not a design tool. Therefore predicted results for energy, water and materials may vary from actuals.

OFW01* ☑ Low-Flow Faucets in All Bathrooms - 7 L/min

7 L/min

Upload Document(s) | Calculator

OFW02* ☑ Dual Flush for Water Closets in All Bathrooms - 3.3 L/first flush and 6 L/second flush

☐ Single Flush/Flush Valve

3.3 1st - L/flush 6 2nd - L/flush

Upload Document(s)

OFW03* ☑ Water-Efficient Urinals in All Other Bathrooms - 3.3 L/flush

3.3 L/flush

Upload Document(s)

OFW04* ☑ Water-Efficient Faucets for Kitchen Sinks - 5 L/min

5 L/min

Upload Document(s) | Calculator

OFW05 ☑ Condensate Water Recovery

Upload Document(s)

OFW06 ☑ Rainwater Harvesting System - 100% of Roof Area Used for Collection

% of Roof Area Used 100

Upload Document(s)

OFW07 ☑ Grey Water Treatment and Recycling System

Upload Document(s)

OFW08 ☐ Black Water Treatment and Recycling System

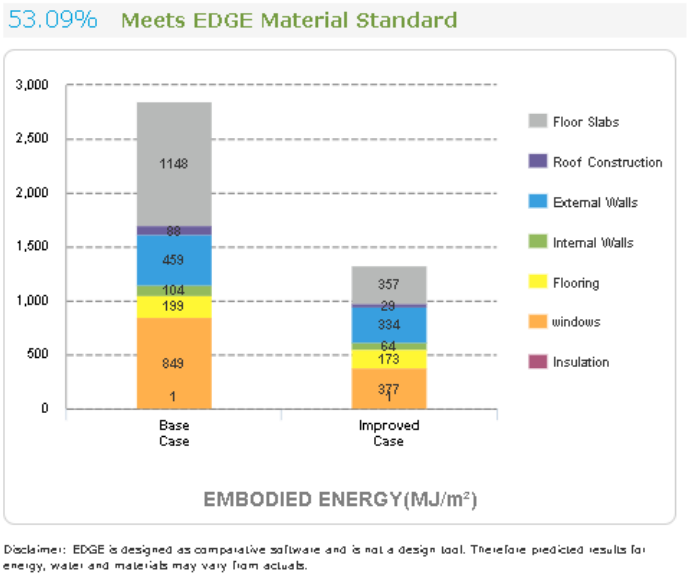
**Indicates a measure that must be ticked and a value entered, whether or not it contributes positively to savings.*

Keran Wastafel	**L/menit**	**L/menit**	**(%)**	**(L/hari)**
Toto TX115LP 5lpm	8	5	100%	
Produk K	8			
<Deskripsi produk/tipe produk>	8			
<Deskripsi produk/tipe produk>	8			
Total air untuk Keran wastafel	783	489.375	**100%**	**293.625**
% Jumlah Keran Tembok			27%	
% Jumlah Keran Wastafel			73.0000%	
TOTAL AIR DARI KERAN (L/hari)	**783**	**542.2275**	**100%**	**240.7725**

Keran Tembok (diluar keran wudhu)	**L/menit**	**L/menit**	**(%)**	**(L/hari)**
T30AR13V7N	8	7	100%	
Produk G	8			
Produk H	8			
<Deskripsi produk/tipe produk>	8			
Asumsi air keran tembok (L/hari)	783	685.125	**100%**	**97.875**

4.1 Tabel Water Calculator

4.4. Saving Material



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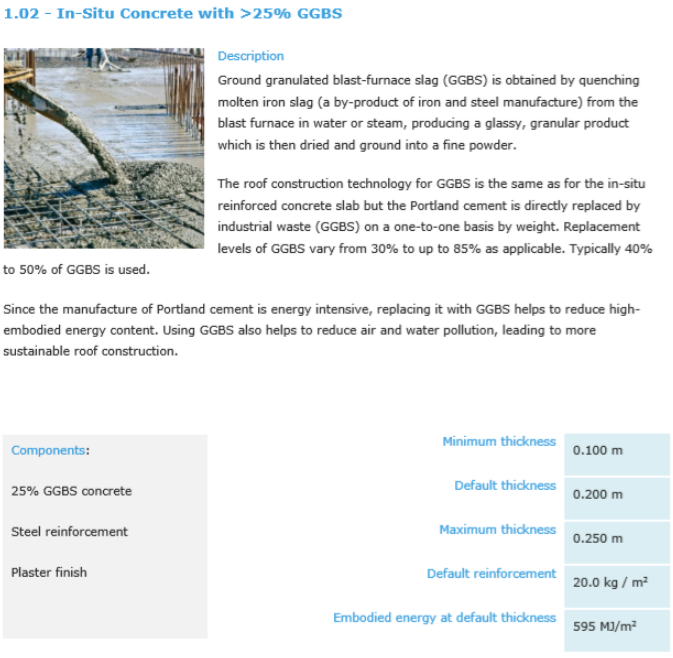
Daftar spesifikasi yang relevan untuk setiap elemen bangunan (atap, dinding eksternal, dinding internal, pelapis lantai, dll.) Muncul di bagian Bahan. Untuk setiap elemen bangunan, spesifikasi harus dipilih dari daftar drop-down yang paling mirip dengan spesifikasi yang digunakan dalam desain. Jika ada beberapa spesifikasi untuk setiap elemen bangunan, spesifikasi utama harus dipilih. Ketebalan harus diindikasikan untuk pelat lantai, konstruksi atap, dinding eksternal, dan dinding internal.

Gambar 4.6 Material pada Bangunan

- Floor Slabs

Material : In-Situ Concrete with >25% GGBS
Thickness : 120mm
Proportion : -



1.02 - In-Situ Concrete with >25% GGBS

Description

Ground granulated blast-furnace slag (GGBS) is obtained by quenching molten iron slag (a by-product of iron and steel manufacture) from the blast furnace in water or steam, producing a glassy, granular product which is then dried and ground into a fine powder.

The roof construction technology for GGBS is the same as for the in-situ reinforced concrete slab but the Portland cement is directly replaced by industrial waste (GGBS) on a one-to-one basis by weight. Replacement levels of GGBS vary from 30% to up to 85% as applicable. Typically 40% to 50% of GGBS is used.

Since the manufacture of Portland cement is energy intensive, replacing it with GGBS helps to reduce high-embodied energy content. Using GGBS also helps to reduce air and water pollution, leading to more sustainable roof construction.

Components:
25% GGBS concrete
Steel reinforcement
Plaster finish

Minimum thickness	0.100 m
Default thickness	0.200 m
Maximum thickness	0.250 m
Default reinforcement	20.0 kg / m²
Embodied energy at default thickness	595 MJ/m²

Gambar 4.7 Jenis Material

- Roof Construction
  Material : In-Situ Concrete with >25% GGBS
  Thickness : 120mm
  Proportion : 100%

2.02 - In-Situ Concrete with >25% GGBS

Description

Ground granulated blast-furnace slag (GGBS) is obtained by quenching molten iron slag (a by-product of iron and steel making) from the blast furnace in water or steam, producing a glassy, granular product which is then dried and ground into a fine powder. EDGE estimates the embodied energy based on a 200mm thickness.

The roof construction technology for GGBS is the same as for the in-situ reinforced concrete slab but the Portland cement is directly replaced by industrial waste (GGBFS) on a one-to-one basis by weight. Replacement levels of GGBS vary from 30% to up to 85% as applicable. In most instances typically 40% to 50% of GGBS is used.

Since the manufacture of Portland cement is energy intensive, replacing it with GGBS helps to reduce high-embodied energy content. Using GGBS also helps to reduce air and water pollution, leading to a more sustainable roof construction practice.

Components:	
25% GGBS mixed concrete	
Steel reinforcement	
Plaster finish	

Minimum thickness	0.100 m
Default thickness	0.200 m
Maximum thickness	0.250 m
Default reinforcement	20.0 kg / m³
Embodied energy at default thickness	619 MJ/m²

Gambar 4.8 Jenis Material

- External Walls
  Material 1 : ferrocement wall panel
  Thickness : 150mm
  Proportion : 75%

3.15 - Ferrocement Wall Panel

Description

Ferrocement is a very simple construction of 2 to 5 layers of chicken wire over a frame made from reinforcing bar, with ordinary portland cement (OPC) filled into the gaps and in a layer over the chicken wire reinforcing. The use of chicken wire makes ferrocement a very flexible building material that is strongest when curved.

Components:

Ordinary portland cement concrete

Steel mesh and reinforcement

Minimum thickness	0.100 m
Default thickness	0.200 m
Maximum thickness	0.200 m
Default reinforcement	20.0 kg / m²
Embodied energy at default thickness	627 MJ/m²

Gambar 4.9 Jenis Material

Material 2 : Curtain walling
Thickness : 2mm
Proportion : 25%

3.40 - Curtain walling (opaque element)

Description

A curtain wall is a vertical building enclosure which supports no load other than its own weight and the environmental forces which act upon it. Curtain walls are not intended to assist in maintaining the structural integrity of a building. Dead loads and live loads are thus not intended to be transferred via the curtain wall to the foundations.

Curtain walling systems come in two basic types: (1) 'Proprietary' curtain walling, which uses a manufacturer's standardised components, and (2) 'Bespoke' or 'Custom' systems, which are purpose-designed for each particular project. Aluminium framing is used for the vast majority of curtain walling applications, primarily for its excellent strength-to-weight ratio and its ability to be extruded into complex shapes.

Components:		
Alumunium cladding panels	Minimum thickness	0.100 m
Air gap	Default thickness	0.100 m
Insulation (calculated separately)	Maximum thickness	0.200 m
Interior wall board	Default reinforcement	0 kg / m³
Interior plaster finish	Embodied energy at default thickness	1,204 MJ/m³
Aluminium extrusion profile (window frame)		

Gambar 4.10 Jenis Material

- Internal Walls
  Material 1 : ferrocement wall panel
  Thickness : 150mm
  Proportion : 60%

4.13 - Ferrocement Wall Panel

Description

Ferrocement is a very simple construction of 2 to 5 layers of chicken wire over a frame made from reinforcing bar, with ordinary portland cement (OPC) forced into the gaps and in a layer over the chicken wire reinforcing. The use of chicken wire makes ferrocement a very flexible building material that is strongest when curved.

Components:

Ordinary portland cement concrete

Steel mesh and reinforcement

Minimum thickness	0.100 m
Default thickness	0.100 m
Maximum thickness	0.200 m
Default reinforcement	5.1 kg / m²
Embodied energy at default thickness	369 MJ/m²

Gambar 4.11 Jenis Material

Material 2 : Plasterboard on metal
Thickness : -
Proportion : 40%

4.25 – Plasterboards on metal studs

Description

Plasterboard is a form of wallboard manufactured using a core of gypsum plaster bonded to layers of paper or fiberboard. The plasterboard may be mounted on studwork made from galvanised steel sheet profiles.

Components:
Exterior plaster finish
Exterior wall plasterboard
Steel channels
Insulation (accounted for elsewhere)
Interior wall board
Interior plaster finish

Minimum thickness	0.100 m
Default thickness	0.100 m
Maximum thickness	0.200 m
Default reinforcement	0 kg / m²
Embodied energy at default thickness	324 MJ/m²

Gambar 4.12 Jenis Material

- Flooring
  Material 1 : Ceramic tile
  Thickness : -
  Proportion : 80%

Description

Ceramic tiles are hard wearing, which minimizes the maintenance required. However, the grout between the tiles does require maintenance. Ceramic tiles have high embodied energy because of the large amounts of energy required for firing to harden them during the manufacturing process.

Components:

Ceramic tiles

Cement mortar

Cement floor screed

Minimum thickness	0.005 m
Default thickness	0.010 m
Maximum thickness	0.015 m
Default reinforcement	0 kg / m²
Embodied energy at default thickness	199 MJ/m²

Gambar 4.13 Jenis Material

Material 2 : Finished concrete floor
Thickness : -
Proportion : 20%

5.04 - Finished Concrete Floor

Description

More commonly referred to as "screed," cement plaster is often used as a preparation layer for soft or flexible floor finishes or tiles. Cement plaster can also be used as a finish layer, but it chips more easily than other hard flooring options.

Components:

Cement floor screed

Minimum thickness	0.015 m
Default thickness	0.035 m
Maximum thickness	0.050 m
Default reinforcement	0 kg / m²
Embodied energy at default thickness	70 MJ/m²

Gambar 4.14 Jenis Material

- Window Frames
  Material : Aluminium
  Thickness : -
  Proportion : 100%

6.01 – Aluminium

Description

The advantage of using metal window frames is that they are strong, light, and require less maintenance than other materials used for window frames. However as metal conducts heat very well, the thermal performance of metal windows is not as good as other materials. To reduce heat flow (indicated by the U-value), metal frames can use strategies such as a thermal break between the inside and outside of the frame.

The two metals typically used for window frames are aluminium or steel. Aluminium is lighter weight and does not rust like a ferrous metal such as steel, but the embodied energy is much higher. Steel windows are heavier and require some maintenance to protect from rust (unless stainless steel is used).

Components:	Embodied energy at default thickness	1,636 MJ/m²
Extruded aluminium window frame		

Gambar 4.15 Jenis Material