Renovating a house in **Morangis**

APPENDIX - Detailed report: visual comfort study

VELUX - LIVING PLACES - RENOVATION

CONTENTS

PREAMBLE

The project involves the evaluation of a detached house with a floor area of around 100 m².

This document assesses the project's performance in terms of visual comfort in relation to the **Active House Label in accordance with standard EN 17037.**

- Visual Comfort theme
    - **Autonomy in daylight**
    - **Daylight factor**

1. CONTEXT AND REQUIREMENTS

1.1. REQUIREMENTS FOR THE THEME DAYLIGHT AUTONOMY (DA)

In the Active House label, the amount of daylight in a room is assessed using daylight levels with a target illuminance of 300 lux in homes.

1. **Target illumination :**
   - Minimum level of natural lighting: **300 lux**.

This means that a space is considered to be adequately illuminated when it receives at least 300 lux of natural light.

2. **Performance categories for autonomy :**

Category	Percentage of surface receiving 300 lux for ≥ 50% of the time
1	≥ 70% of the useful surface area of the room.
2	≥ 60% of the useful surface area of the room.
3	≥ 50% of the useful surface area of the room.
4	≥ 40% of the useful surface area of the room.

> A room complies with the standard if at least 50% of its usable surface area receives natural lighting of 300 lux for 50% of the time of year.

1.2. DAYLIGHT FACTOR (DF) REQUIREMENTS

The **Daylight Factor** is the indicator used to assess the amount of natural light available inside a building. The DLF is expressed as a percentage (%) and measures the proportion of natural light reaching an interior point in relation to the available exterior light.

1. **Performance levels in accordance with standard EN 17037**

Standard EN 17037 defines target levels for DLF, establishing minimum, medium and high performance levels. These levels depend on the intended use of the rooms.

Category	Target Daylight Factor (%)	Description
Minimum	Average DLF ≥ 2	Acceptable comfort, sufficient for basic activities.
Medium	Average DLF ≥ 3	Improved visual comfort, good level of natural lighting.
High	Average DLF ≥ 5	Optimum comfort with an abundance of natural light.

2. **Levels by room type**

Room type	Recommended DLF (%)	Minimum requirements in accordance with EN 17037
Living room	≥ 5 %	Minimum: 2%, ideal: 5%.
Rooms	≥ 5 %	Minimum: 2%, ideal: 5%.
Kitchen	≥ 3 %	Minimum: 2%, ideal: 3%.
Bathroom	≥ 2 %	Minimum: 2%.
Traffic areas	≥ 1-2 %	Minimum: 1%.

2. BEFORE WORK

2.1. MODELLING ASSUMPTIONS

Illumination (Lux)	Occupation	Plan height (m)	Reflection		
			Ceiling	Walls	Floor
300	Daytime only (8am-8pm)	0,7	0,8 White	0,7 White	0,2 RDC Grey Beige R1

Surface concerned	Uw(W/m².k)	TLg	Fg	Sun protection
External windows (Double glazing)	2,4	80	70	/

2.2. RESULTS OF THE LIGHT AUTONOMY STUDY

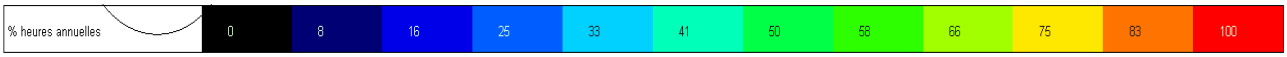
2.2.1. Results for the areas studied

Usage	Zone	Surface area (m²)	Calculated autonomy (Ac)	sDA Area in Range (%)	Compliant surface area (m²)	Category
Residential	Bedroom 1	12	50	95	11	1
Residential	Bedroom 2	13	50	88	11	1
Residential	Bedroom 3	11	50	100	11	1
Residential	Stay	18	50	39	7	Out of category
Residential	Kitchen	12	50	55	6	3
			Total average DA	**84**		

Light autonomy in the house is optimal, thanks to the presence of large bay windows and a high light transmission coefficient of **80%**. This combination allows plenty of natural light to penetrate the rooms, guaranteeing excellent natural lighting and reducing the need for artificial lighting.
However, on the ground floor, the lighting autonomy is worst, due to constraints linked to orientation and possible external masks, limiting the amount of natural light in specific areas.

2.2.2. Cartographic representation

Fig. 1. *Breakdown of percentage of annual daylight hours*



2.3. RESULTS OF THE DLF STUDY

Usage	Zone	Surface area (m²)	Average DLF (%)
Residential	Bedroom 1	12,0	3,9
Residential	Bedroom 2	13,0	4
Residential	Bedroom 3	11,0	4,5
Residential	Stay	18	3,3
Residential	Kitchen	12	2,5
Residential	SDB	5,2	3,3
Residential	Clearance (traffic)	7,6	0

The simulations carried out show that the Daylight Factor (DLF) **generally reaches the threshold recommended** by standard NF EN 17037 and the Active House label, guaranteeing a good supply of natural light. In the **bedrooms**, the results are close to the **ideal level**, with a value close to **5%**, ensuring optimum natural lighting and limiting the use of artificial lighting.

2.3.1. Cartographic representation

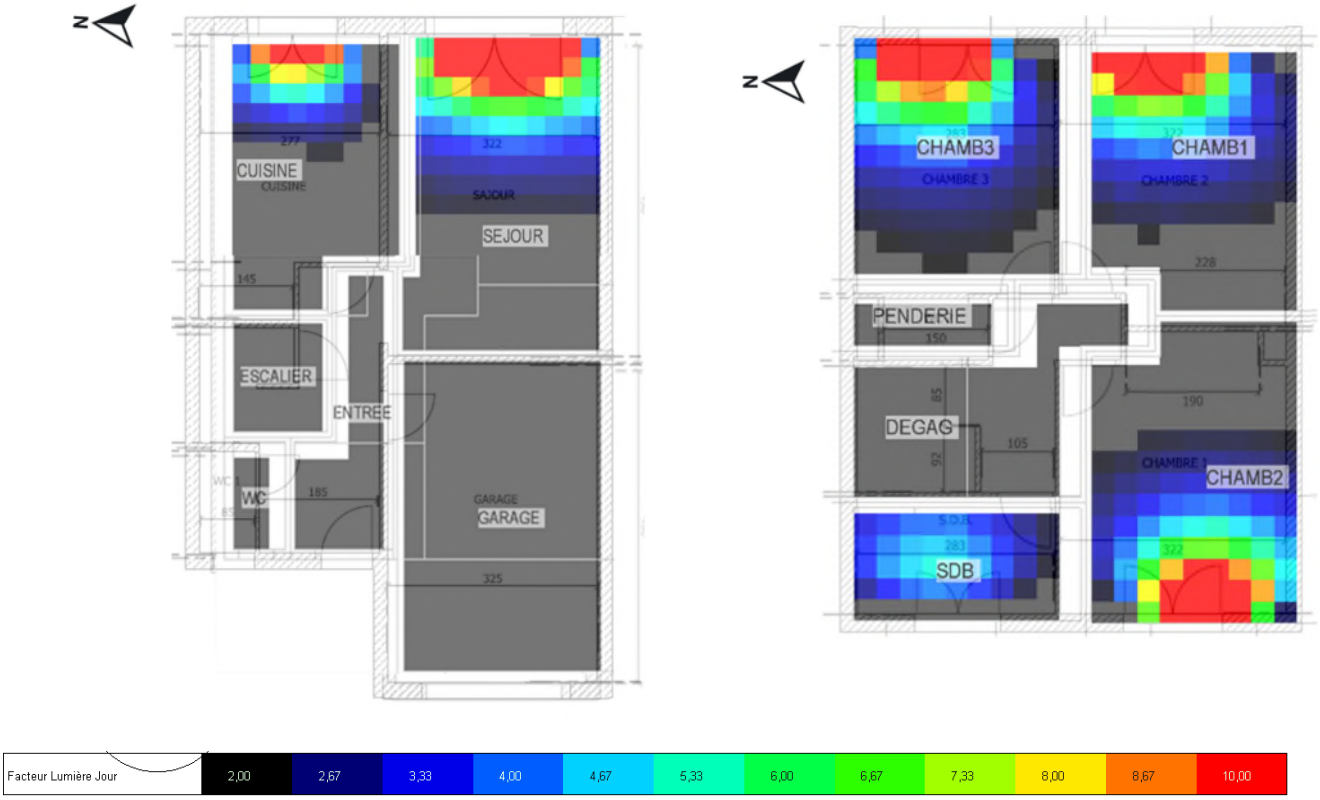


Fig. 2. *Breakdown of the percentage of annual hours of daylight billing*

3. AFTER WORKS

3.1. MODELLING ASSUMPTIONS

Illumination (Lux)	Occupation	Plan height (m)	Reflection		
			Ceiling	Walls	Floor
300	Daytime only (8am-8pm)	0,7	0,8 White	0,7 White	0,2 RDC Grey Beige R1

Surface concerned	Uw(W/m².k)	TLg	Fg
External windows	1,3	70	40
VELUX (Zenith windows)	1,3	63	30

3.2. RESULTS OF THE STUDY OF LIGHTING AUTONOMY AFTER WORK

3.2.1. Results for the areas studied

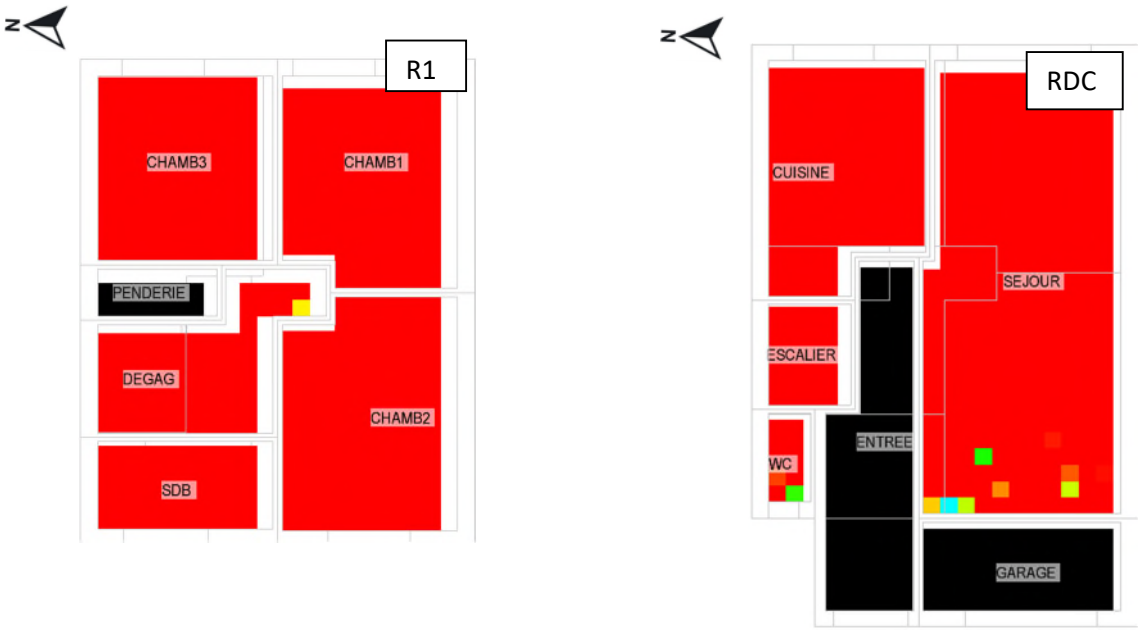
Usage	Zone	Surface area (m²)	Calculated autonomy (Ac)	sDA Area in Range (%)	Compliant surface area (m²)	Category
Residential	Bedroom 1	12,0	50	85	10,2	1
Residential	Bedroom 2	13,0	50	81	10,5	1
Residential	Bedroom 3	11,0	50	99	10,9	1
Residential	Stay	26	50	35	9,1	Out of category
Residential	Kitchen	12	50	45	5,4	4
Residential (Withheld)	**Comble (2 FFKF06 West-2 MK 06 East)**	25	**50**	**76**	**19**	**1**
Variants carried out						
Residential	Comble (4 FFKF08)	25	50	100	36,4	**1**
Residential	Attic (4 FFKF06)	25	50	100	31,6	1
Residential	Comble (2 FFKF06 EST + 1 MK 06 OUEST)	25	50	56	14	3

The assessment of lighting autonomy shows that daylighting performance complies with the criteria set out in standard **EN 17037**. The results obtained show that **category 1** is achieved on the **ground floor and upper floor areas**, with an autonomy of well **over 70%** over the **daytime occupancy period**, guaranteeing an excellent supply of natural light.

This performance makes it possible to limit the use of artificial lighting, thus improving the building's visual comfort and energy efficiency.

On the other hand, the results are less good on **the ground floor**, where the lighting autonomy remains below optimum levels. Despite these variations, the overall level of performance of the house remains **very good**, with a lighting autonomy of **71%**.

3.2.2. Cartographic representation



Attic variations

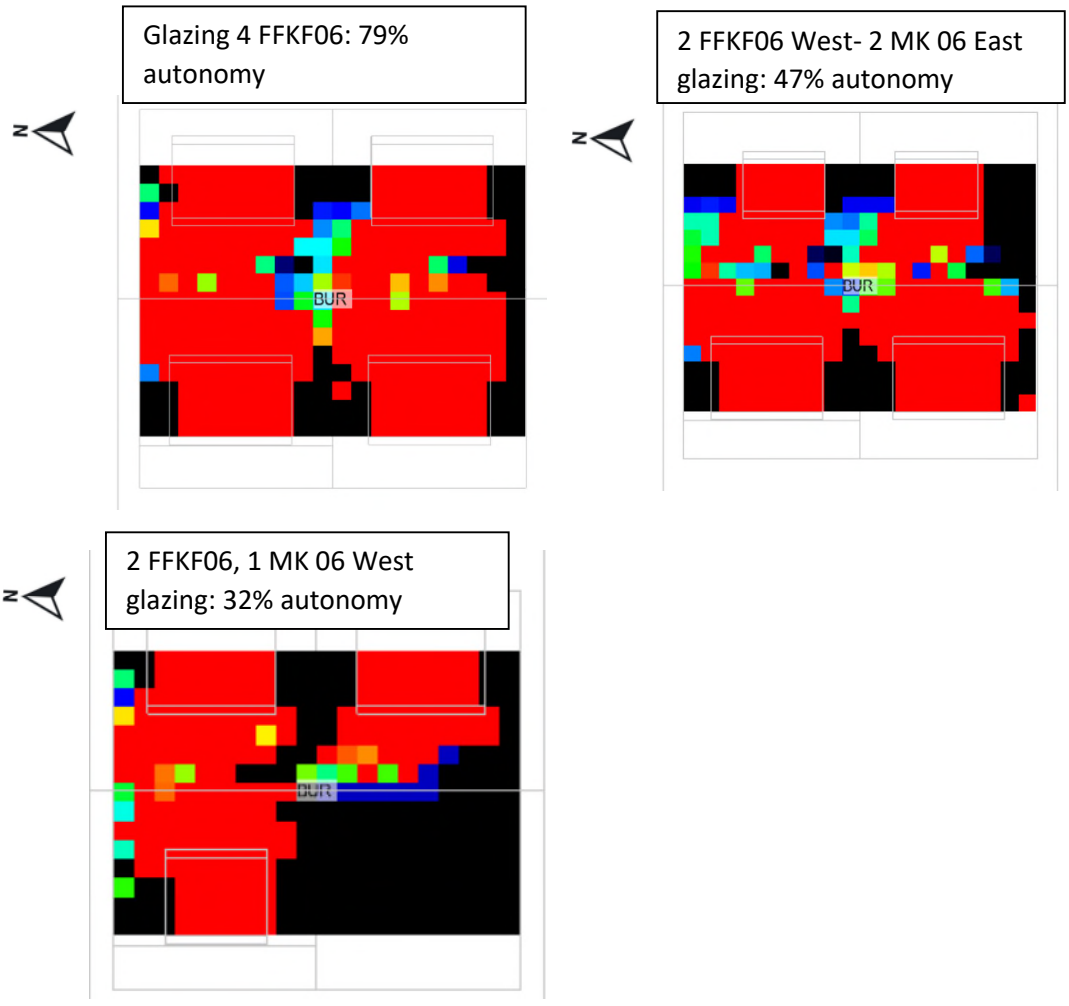


Fig. 3. *Breakdown of percentage of annual daylight hours*

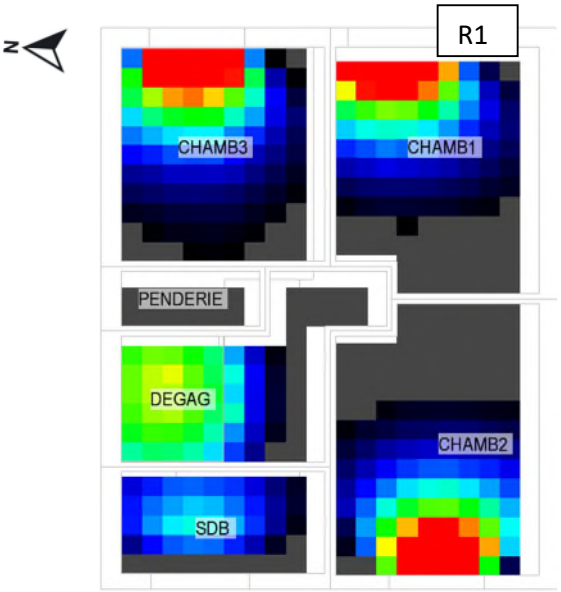
3.3. RESULTS OF THE DLF STUDY

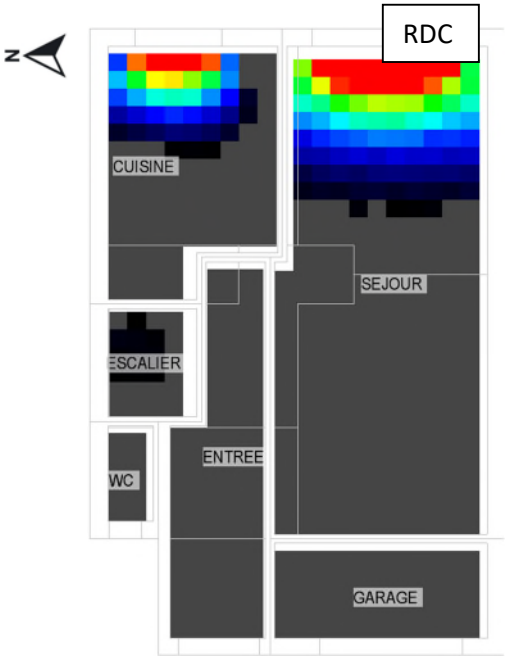
Usage	Zone	Surface area (m²)	Average DLF (%)
Residential	Bedroom 1	12,0	3,9
Residential	Bedroom 2	13,0	4
Residential	Bedroom 3	11,0	4,5
Residential	Stay	26	2,2
Residential	Kitchen	12	2,5
Residential	SDB	5,2	3,3
Residential	Clearance (traffic)	7,6	4,5
Residential	Attic	37	14

The simulations carried out show that the Daylight Factor (DLF) **generally reaches the threshold recommended** by standard NF EN 17037 and the Active House label, guaranteeing a good supply of natural light. In **the bedrooms**, the results are close to the **ideal level**, with a value close to **5%**, ensuring optimum natural lighting and limiting the use of artificial lighting.

It is to be noted that in the attic, the architectural configuration makes it possible to achieve a performant DLF of 14%, guaranteeing an excellent level of natural light.

3.4. CARTOGRAPHIC REPRESENTATION





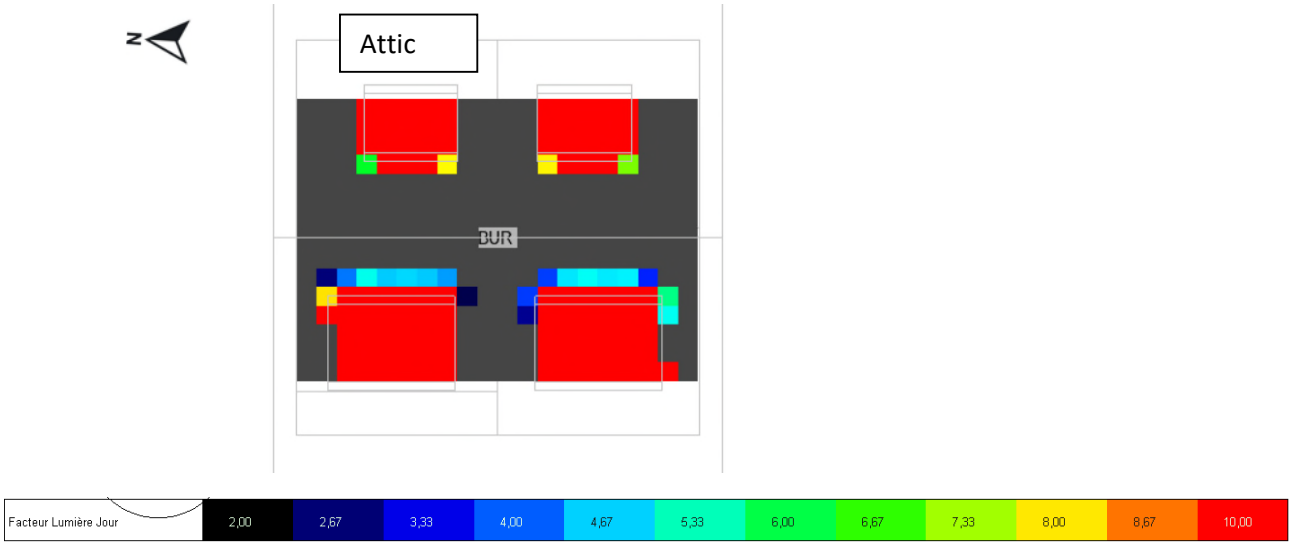


Fig. 4. *Breakdown of the percentage of annual hours of daylight billing*

4. SUMMARY AND COMPARISONS

- **Average light autonomy**: **71%** → good overall performance.
- **High-performance zones (category 1)**: bedrooms and attics with 4 FFKF08 or FFKF06.
- **Recessed areas (category 4)**: living room, kitchen, attic with mixed configuration (FFKF06 + MK06).

Bedrooms and attics are well illuminated naturally, limiting the need for artificial lighting.

The table below shows the difference in score between Active House before and after the work:

Zone	Active House category BEFORE (TLw = 80%)	Active House category AFTER (TLw 63-70%)
Bedroom 1	1	1
Bedroom 2	1	1
Bedroom 3	1	1
Stay	Out of category	Out of category
Kitchen	3	4
Attic	*Non-existent*	1

The deterioration of the ALJ after the works can logically be explained by the main factor:

- **Reduction in light transmission factor (TLw)** :
  - Less natural light transmitted indoors → reduced lighting autonomy
  - There is a clear loss of efficiency between **80%** and **63-70%** TLw glazing.

> The partial deterioration in lighting autonomy is consistent with the reduction in the TLw of the windows after the works.
> The project still has a **good overall** level of **lighting autonomy (71%)**, but there has been some **deterioration in key rooms** (living room, kitchen).
> **All the bedrooms remain in category 1**, which is very positive for the rest areas.