



# **BRNO UNIVERSITY OF TECHNOLOGY**

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

## **FACULTY OF CIVIL ENGINEERING**

FAKULTA STAVEBNÍ

## **INSTITUTE OF BUILDING STRUCTURES**

ÚSTAV POZEMNÍHO STAVITELSTVÍ

# **HOUSE WITH TATTOO STUDIO**

RODINNÝ DOM S TETOVACÍM ŠTÚDIOM

# **DAYLIGHT FACTOR ASSESSMENT**

## **BACHELOR'S THESIS**

BAKALÁRSKA PRÁCA

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AUTOR

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VEDÚCI PRÁCE

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**BRNO 2025**

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# 1. TECHNICAL PARAMETERS

## 1.1. Identification data

|                       |  |
|-----------------------|--|
| Project Title:        | <b>FAMILY HOUSE WITH TATTOO STUDIO</b>       |
| Location:             | c.a. Krokočín [674826], p.n. 730/2 and 728/4 |
| Responsible Designer: | Adela Matušovová                             |
| Contact Address:      | Hontianske Nemce 525                         |
| Date:                 | 05/2025                                      |

## 1.2. Urban and Basic Architectural Design

This part of the municipality is built-up area with family houses and tattoo studio. The building is situated on sloped terrain and is mainly oriented towards the south. Its placement on the site was carefully chosen to minimize excavation work and to allow effective backfilling where necessary. It is located on two land parcels with a total area of 2,094 m<sup>2</sup>, while the family house with the tattoo studio occupies 186 m<sup>2</sup>. The plot is bordered on three sides by residential gardens and on the fourth side by a road. Due to the elongated and narrow shape of the plot, proper spatial arrangement and setback distances were essential in the design process.

The house is detached and includes a partial basement, two above-ground floors, and a garage for two cars. All roof surfaces are flat green roofs. The tattoo studio is a separate unit that shares one wall with the residential part of the house. It has its own entrance and dedicated parking for clients. The tattoo artist—who is also the homeowner—can access the studio directly from the house, ensuring both convenience and privacy for the family. The studio is designed with barrier-free access and complies with applicable standards for premises providing personal care services.

# 2. THE AIM OF THE ASSESSMENT

The main aim of the assessment is to find out, whether the building satisfies the requirements in regulation ČSN EN 17037:2019, ČSN 730580-1, Amendment Z3:2019 and ČSN 730580-2, Change Z1:2019.

# 3. BACKGROUND DOCUMENTS

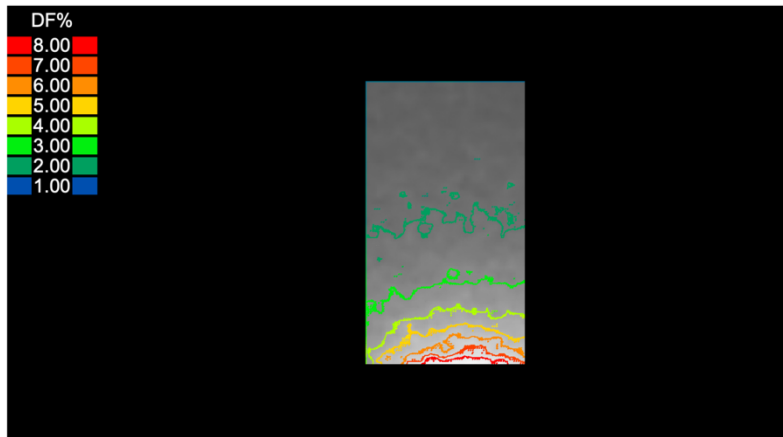
- Plan drawings
- Data from manufacturers
- Standards, norms, regulations

# 4. USED REGULATIONS AND NORMS

- Normative requirements are based on the wording of ČSN EN 17037: 2019 – Daylighting of buildings,
- ČSN 734301:2004 – Residential buildings, as amended Z4:2019, ČSN 73 0580 -1: 2007- Daylighting of buildings
- Part 1: Basic requirements, as amended Z3:2019 and ČSN 73 0580 -2:2007- Daylighting of buildings
- Part 2: Daylighting of residential buildings, as amended by Z1:2019.

## 5. Assessment of daylight factor

### LIVING ROOM



#### EN17037

|                                    |          |            |                |
|------------------------------------|----------|------------|----------------|
| $F_{plane, \%} \geq 50\%$ (median) | $D_T$    | 4.42 DF[%] | Pass (659 lux) |
| $F_{plane, \%} \geq 95\%$          | $D_{TM}$ | 3.15 DF[%] | Pass (469 lux) |

#### Active House

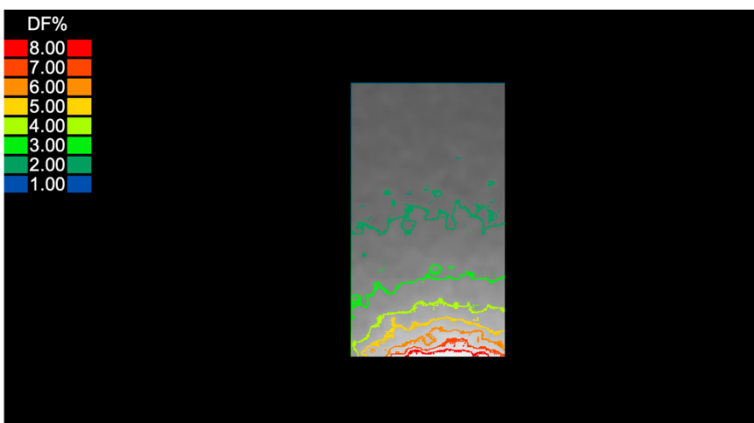
|                           |    |            |                |
|---------------------------|----|------------|----------------|
| $F_{plane, \%} \geq 40\%$ | C4 | 4.94 DF[%] | Pass (736 lux) |
| $F_{plane, \%} \geq 50\%$ | C3 | 4.42 DF[%] | Pass (659 lux) |
| $F_{plane, \%} \geq 60\%$ | C2 | 4.01 DF[%] | Pass (598 lux) |
| $F_{plane, \%} \geq 70\%$ | C1 | 3.68 DF[%] | Pass (548 lux) |

#### Default

|              |                       |             |
|--------------|-----------------------|-------------|
| Average      | $D_{average}$         | 5.57 DF[%]  |
| Median       | $D_{median}$          | 4.42 DF[%]  |
| Minimum      | $D_{min}$             | 2.69 DF[%]  |
| Maximum      | $D_{max}$             | 19.82 DF[%] |
| Uniformity 1 | $D_{min}/D_{average}$ | 0.4821      |
| Uniformity 2 | $D_{min}/D_{max}$     | 0.1356      |

**SATISFIES**

### MAIN BEDROOM



#### EN17037

|                                    |          |            |                |
|------------------------------------|----------|------------|----------------|
| $F_{plane, \%} \geq 50\%$ (median) | $D_T$    | 3.14 DF[%] | Pass (468 lux) |
| $F_{plane, \%} \geq 95\%$          | $D_{TM}$ | 2.22 DF[%] | Pass (331 lux) |

#### Active House

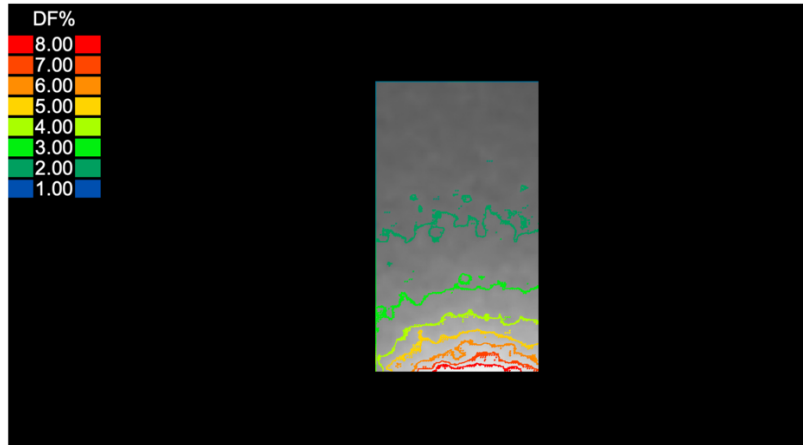
|                           |    |            |                |
|---------------------------|----|------------|----------------|
| $F_{plane, \%} \geq 40\%$ | C4 | 3.67 DF[%] | Pass (547 lux) |
| $F_{plane, \%} \geq 50\%$ | C3 | 3.14 DF[%] | Pass (468 lux) |
| $F_{plane, \%} \geq 60\%$ | C2 | 2.82 DF[%] | Pass (421 lux) |
| $F_{plane, \%} \geq 70\%$ | C1 | 2.58 DF[%] | Pass (385 lux) |

#### Default

|              |                       |             |
|--------------|-----------------------|-------------|
| Average      | $D_{average}$         | 4.12 DF[%]  |
| Median       | $D_{median}$          | 3.14 DF[%]  |
| Minimum      | $D_{min}$             | 2.04 DF[%]  |
| Maximum      | $D_{max}$             | 15.25 DF[%] |
| Uniformity 1 | $D_{min}/D_{average}$ | 0.4948      |
| Uniformity 2 | $D_{min}/D_{max}$     | 0.1337      |

**SATISFIES**

## OFFICE



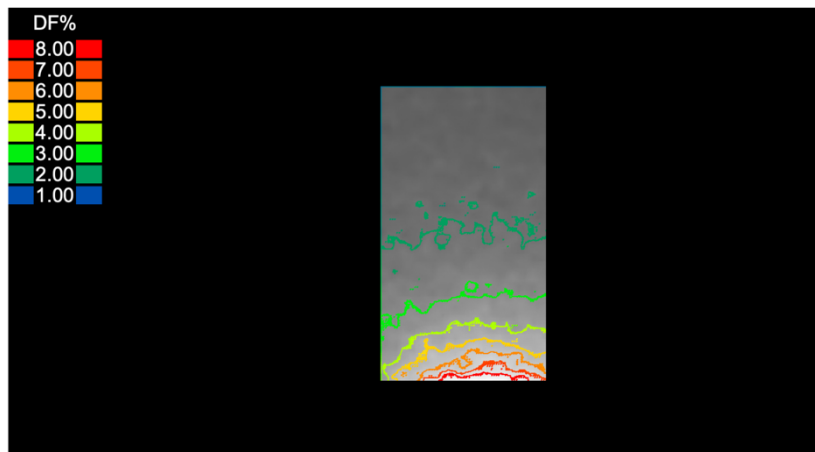
|                                    |          |            |                |
|------------------------------------|----------|------------|----------------|
| <b>EN17037</b>                     |          |            |                |
| $F_{plane, \%} \geq 50\%$ (median) | $D_T$    | 2.00 DF[%] | Pass (298 lux) |
| $F_{plane, \%} \geq 95\%$          | $D_{TM}$ | 1.45 DF[%] | Pass (216 lux) |

|                           |    |            |                |
|---------------------------|----|------------|----------------|
| <b>Active House</b>       |    |            |                |
| $F_{plane, \%} \geq 40\%$ | C4 | 2.30 DF[%] | Pass (343 lux) |
| $F_{plane, \%} \geq 50\%$ | C3 | 2.00 DF[%] | Pass (298 lux) |
| $F_{plane, \%} \geq 60\%$ | C2 | 1.83 DF[%] | Fail (273 lux) |
| $F_{plane, \%} \geq 70\%$ | C1 | 1.69 DF[%] | Fail (252 lux) |

|                |                       |             |  |
|----------------|-----------------------|-------------|--|
| <b>Default</b> |                       |             |  |
| Average        | $D_{average}$         | 2.67 DF[%]  |  |
| Median         | $D_{median}$          | 2.00 DF[%]  |  |
| Minimum        | $D_{min}$             | 1.24 DF[%]  |  |
| Maximum        | $D_{max}$             | 10.08 DF[%] |  |
| Uniformity 1   | $D_{min}/D_{average}$ | 0.4656      |  |
| Uniformity 2   | $D_{min}/D_{max}$     | 0.1232      |  |

**SATISFIES**

## TATTOO STUDIO



|                                    |          |            |                |
|------------------------------------|----------|------------|----------------|
| <b>EN17037</b>                     |          |            |                |
| $F_{plane, \%} \geq 50\%$ (median) | $D_T$    | 2.17 DF[%] | Pass (323 lux) |
| $F_{plane, \%} \geq 95\%$          | $D_{TM}$ | 1.76 DF[%] | Pass (262 lux) |

|                           |    |            |                |
|---------------------------|----|------------|----------------|
| <b>Active House</b>       |    |            |                |
| $F_{plane, \%} \geq 40\%$ | C4 | 2.42 DF[%] | Pass (360 lux) |
| $F_{plane, \%} \geq 50\%$ | C3 | 2.17 DF[%] | Pass (323 lux) |
| $F_{plane, \%} \geq 60\%$ | C2 | 2.03 DF[%] | Pass (303 lux) |
| $F_{plane, \%} \geq 70\%$ | C1 | 1.95 DF[%] | Fail (290 lux) |

|                |                       |             |  |
|----------------|-----------------------|-------------|--|
| <b>Default</b> |                       |             |  |
| Average        | $D_{average}$         | 2.88 DF[%]  |  |
| Median         | $D_{median}$          | 2.17 DF[%]  |  |
| Minimum        | $D_{min}$             | 1.51 DF[%]  |  |
| Maximum        | $D_{max}$             | 12.47 DF[%] |  |
| Uniformity 1   | $D_{min}/D_{average}$ | 0.5249      |  |
| Uniformity 2   | $D_{min}/D_{max}$     | 0.1212      |  |

**SATISFIES**

## CONCLUSION

Overall, the house and its rooms have great daylight quality. The rooms and the tattoo studio are oriented to the south to ensure better natural lighting. In areas where the daylight requirements may not be fully met to the client's satisfaction, several recommendations can help improve the lighting quality:

- place the working desk near the window,
- use light-coloured furniture at the back of the room,
- reduce the size of the functional area within the room,
- use furniture with more reflective surfaces