LIGHTING CONDITIONS IN BUILDINGS

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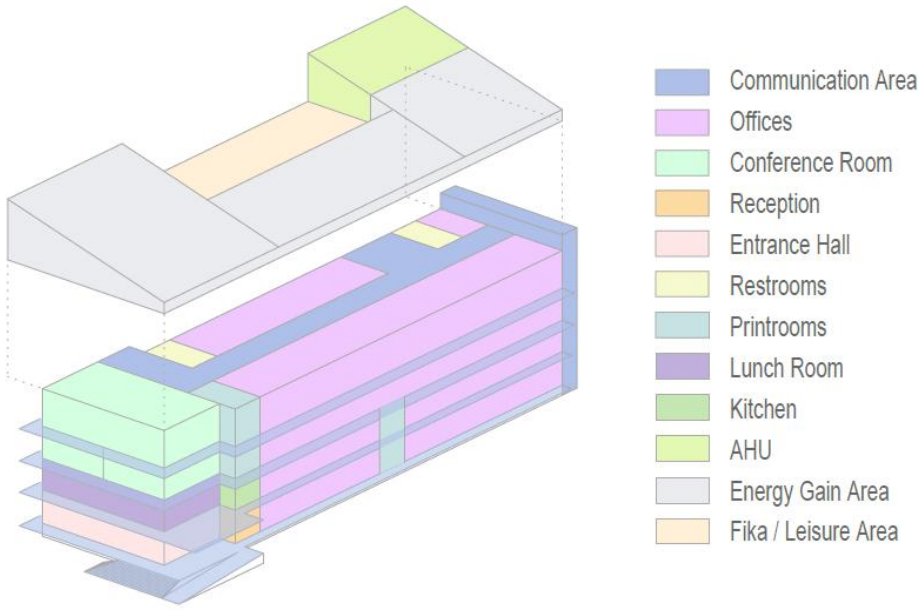
Improved Design

Parameters Improved

- Building envelope
- Windows
- Accessability
- Interior layout
- PV‘s added
- Shading device
- Glare issues
- Daylight harvesting

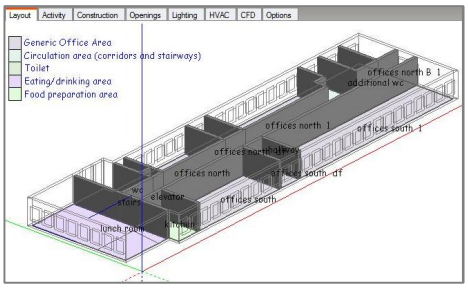


Design Builder

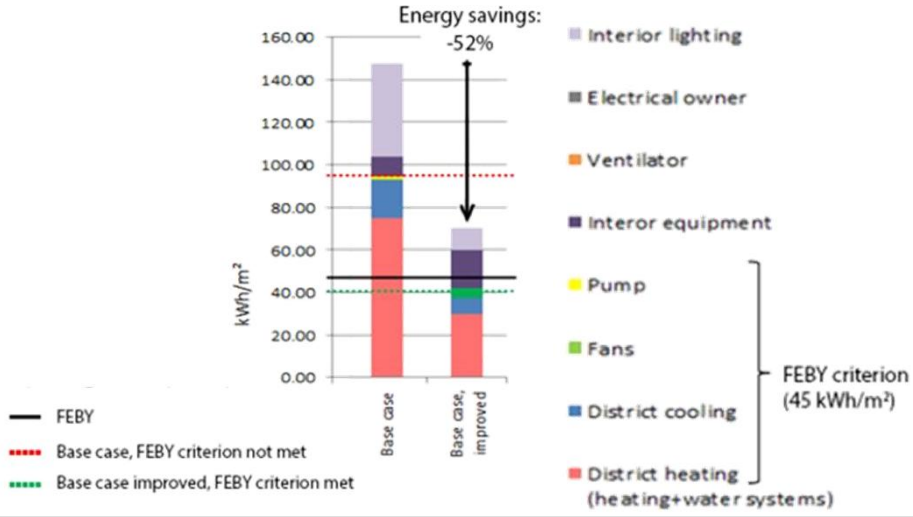
Energy consumption

Design Builder

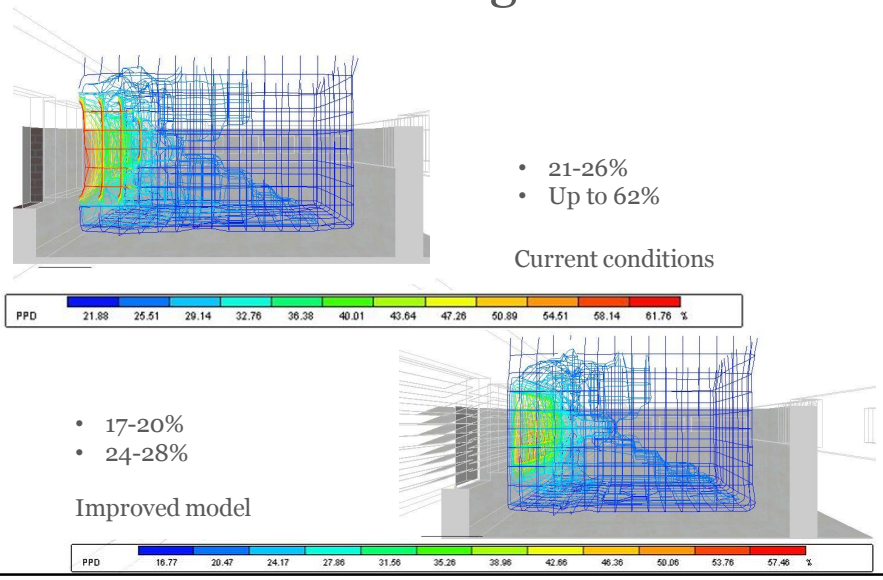
- Dynamic energy simulation program
- Detailed building model
- Facade options /Building materials
- Renderings
- Energy use
- Daylight
- HVAC system
- Building regulations
- BREEAM



Energy Consumption



Predicted Percentage Dissatisfied



- 21-26%
- Up to 62%

Current conditions

- 17-20%
- 24-28%

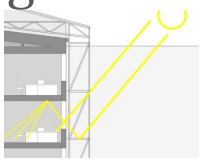
Improved model

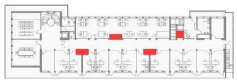
Daysim – Radiance – Ecotect

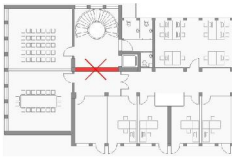
Daylight

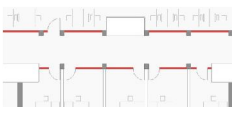
Daylight Harvesting

- Increased reflectances of interior surfaces
- Increased reflectances of balconies' surfaces
- Placing of light shafts
- Removing of wall between staircase and hallway
- Placing of difussive glass partition walls



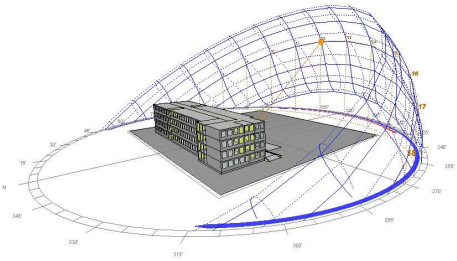






Ecotect

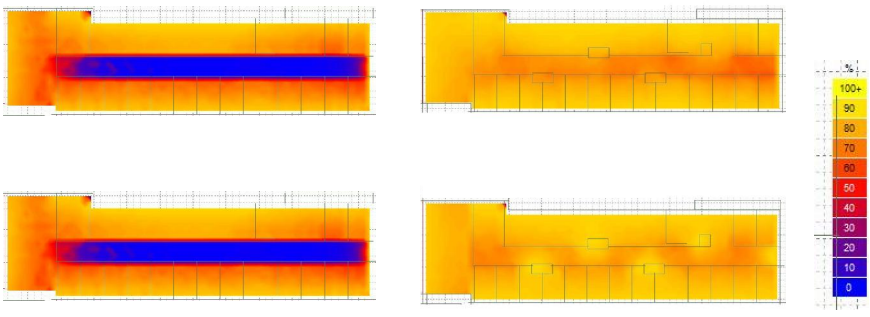
- Variety of building modeling options
- Analyse electrical lighting conditions
- Daylighting
- Solar irradiation
- Shading
- Reflections
- Sun path diagram
- Used for Daysim/Radiance



Continuous Daylight Autonomy

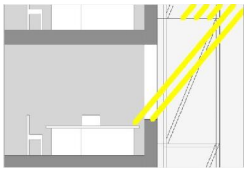
Current case

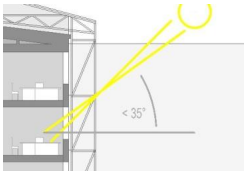
Improved model

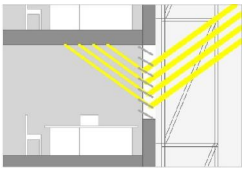


Shading Devices

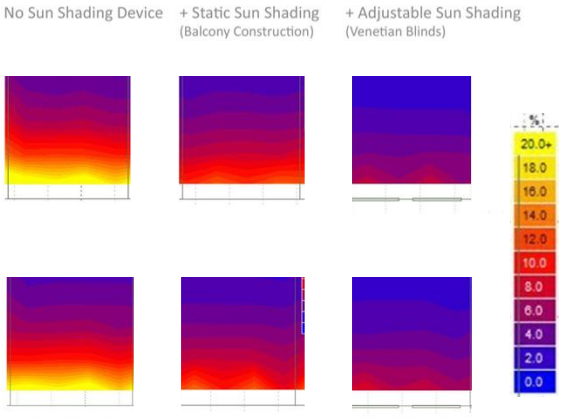
- Placing a static shading device:
  balconies
- Adjusting the depth of the static shading device
- Placing a dynamic shading device:
  venetian blinds







Solar Shading

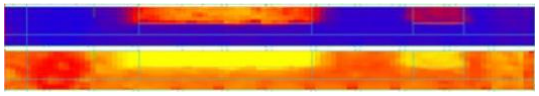


- Effects of different sunshading devices analysed
- Without shading device:
  DF > 20%
- With static shading device:
  DF > 10%
- With static + dynamic device:
  DF < 10%

Parametric Study – Hallway

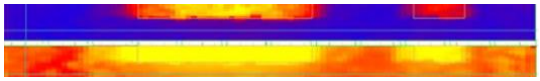
DF = 0,04%
DA_{av}= 4,10%
Energy need = 93,49 kWh/m²

Base case



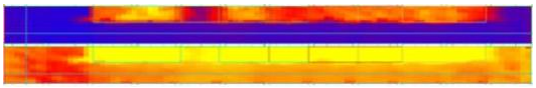
DF = 1,01%
DA_{av}= 59,20%
Energy need = 52,99 kWh/m²

Fixed light-well + stairs
Skylight placed accordingly



DF = 1,45%
DA_{av}= 61,20%
Energy need = 50,36 kWh/m²

Fixed light-well + stairs
Skylight placed from one end to the other



DF = 2,18%
DA_{av}= 66,00%
Energy need = 42,21 kWh/m²

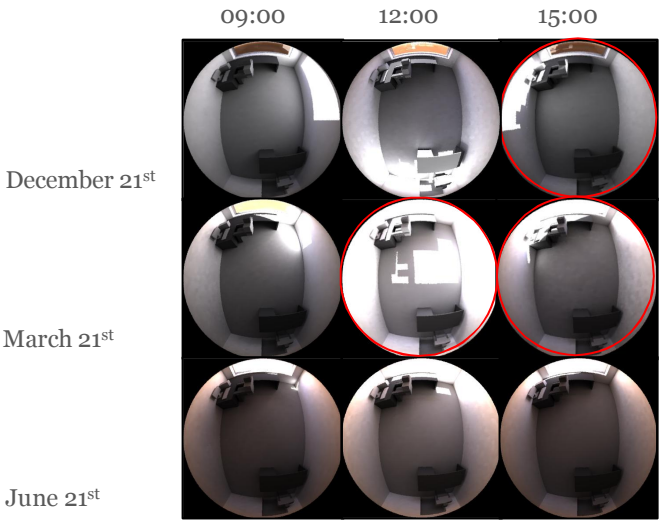
Stairs in straight line from 1st to 4th floor
Skylight placed from one end to the other

55%

Design Builder – Radiance

Glare Assessment

Light Patches



Glare Assessment – Critical Cases

December 21st - 15:00
1. 4:1
2. 2:1
3. 19:1

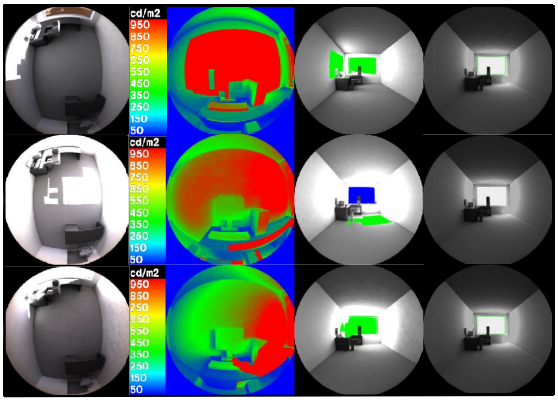
DGP: 25%
DGP: 0,61%

March 21st - 12:00
1. 2:1
2. 2:1
3. 14:1

DGP: 33%
DGP: 0,61%

March 21st - 15:00
1. 3:1
2. 3:1
3. 6:1

DGP: 26%
DGP: 0,63%



20:1 Window – adjacent walls

5:1 Computer screen – general surroundings

3:1 Computer screen –desk

THANK YOU

QUESTIONS?

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