Climate Based Daylight Modelling and the Optimisation of School Classroom Design – An Industrial View

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Climate Based Daylight Modelling

• Local Weather Files
• Orientation
• Direct Sunlight
• Can do more detailed analysis
• Takes into account quality & quantity
Process Development

Ecotect with Daysim

DIVA plugin for Rhino

Custom scripts to get results and help automate
Standardised Window

• Pass CBDM metrics can then be used on all designs
• Based on 55m² classroom
• Applied to all orientations
• What to benchmark against
Metrics

• PSPB & FOS
• To improve quality of daylight within schools
• Sets out criteria & metrics to be met
• Daylight Autonomy
• Useful Daylight Illuminance
Standard Room
Daylight Autonomy

sDA (x>300)

Avg: 53.5%
Floor Area Pass: 57.0%
UDI Supplementary

UDI-s $x<100$

Avq: 12.9
UDI Acceptable

UDI-a (100 < x < 3000)

Avg: 87.1%
UDI Exceednance

UDI-e \( (x>3000) \)

Avg: 0.0%
Standard Window

UDI-e

UDI-a

UDI-s

20%
Orientation

% Occupied Hours between 100 & 3000 lux

UDI-A

- 88.3
- 87.7
- 88.3
- 85.0
- 82.5
- 79.3
- 81.0
Glazing Amount

• Started off by trialling one big central window
• Found that less than 28% of glazing was needed
• Used this figure to then create a window configuration with this amount of glazing
• Visible Transmittance
Height of Window

Window needs to be close to top of soffit
Blinds

Horizontal venetian blind modelled
Blinds Operation

Shading Group 1 - shading_group_1 Schedule
Redirection Film

Light Redirection Film

Standard Diffusion Film

No Film
Conclusions

• High as possible to soffit
• 28-30% Glazing of one wall
• Blinds needed on south or 2 sources of light
• Appropriate reflectances & visible transmittance (VT)