ARCHITECTURAL PLANNING OF (DAY)LIGHT

NID
New
Interventions in
Depression

24.08.22
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Program

- Et regionalt, historisk perspektiv
- Hvad betyder dagslys for indlagte psykiatriske patienter?
- Hvad betyder dagslys for raske mennesker?
- Indeklima, udfordringer og potentialer
- Fra BR20 til BK/FBK: Fra >10 kg CO2 pr m2 pr år til 2,5 kg CO2 pr m2 pr år

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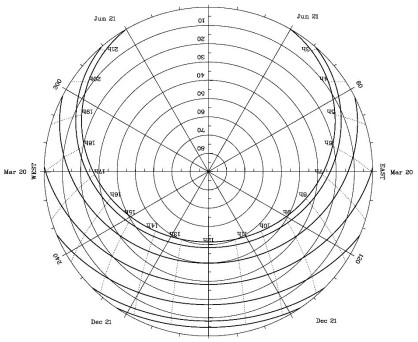

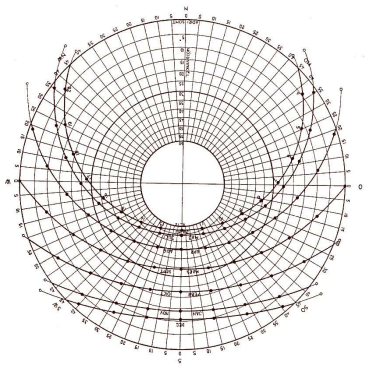

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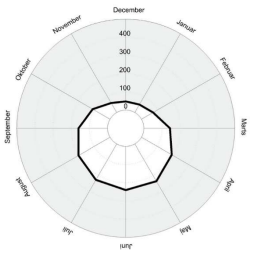
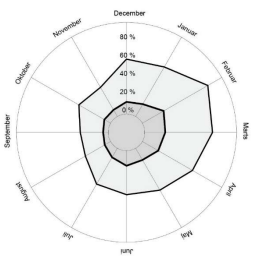
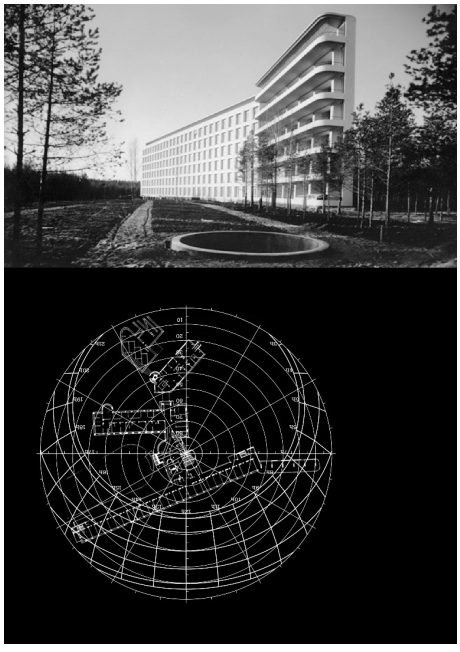


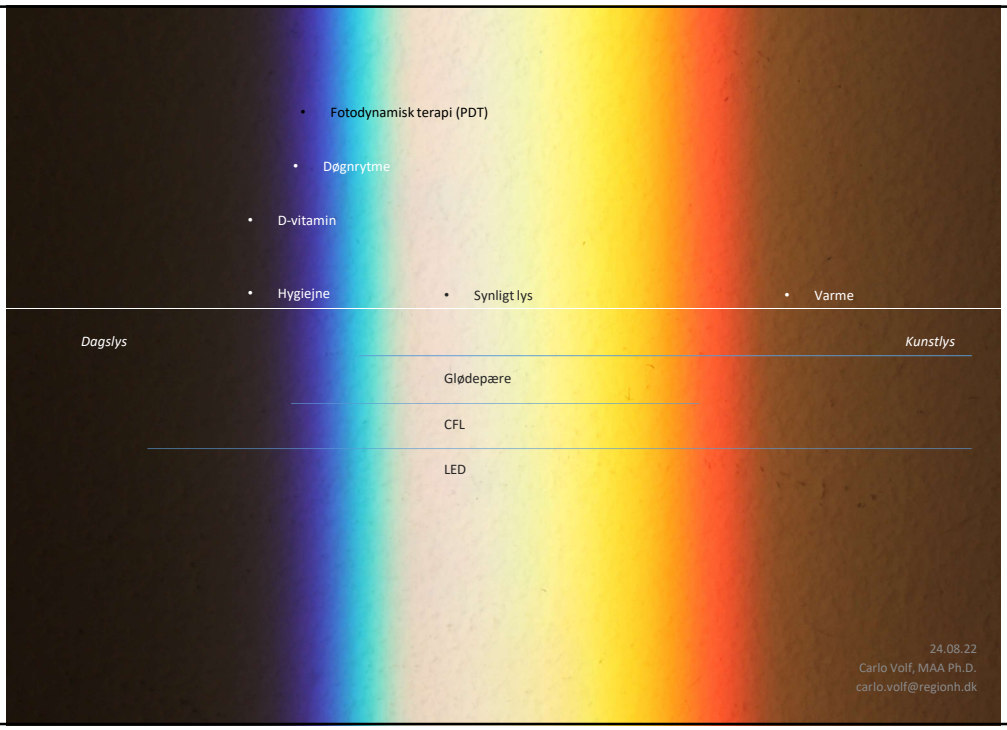
Hours with sunlight DK



Vitamin D deficiency

Severe vitamin D deficiency




Fotodynamisk terapi (PDT)
Døgnrytme
D-vitamin
Hygiejne
Synligt lys
Varme
Dagslys
Kunstlys
Glødepære
CFL
LED
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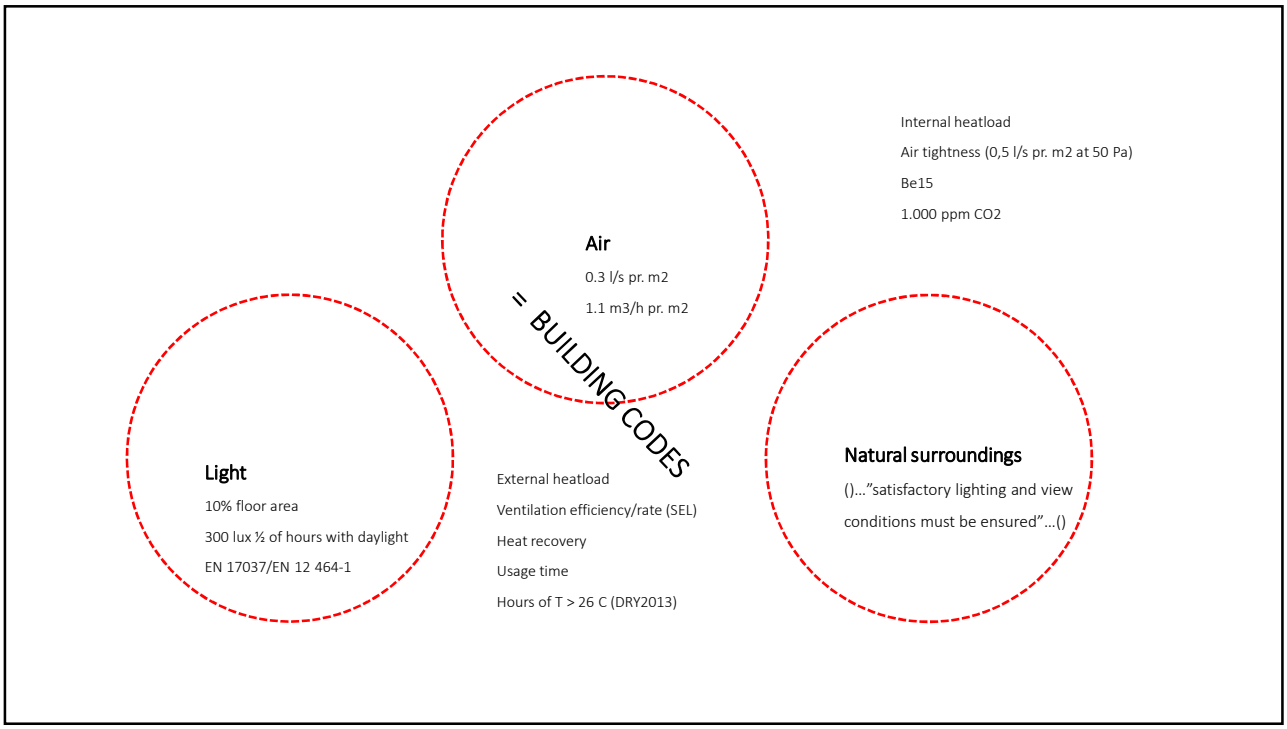
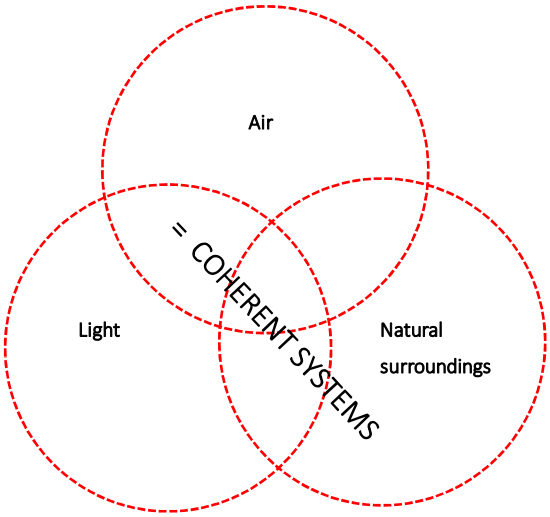
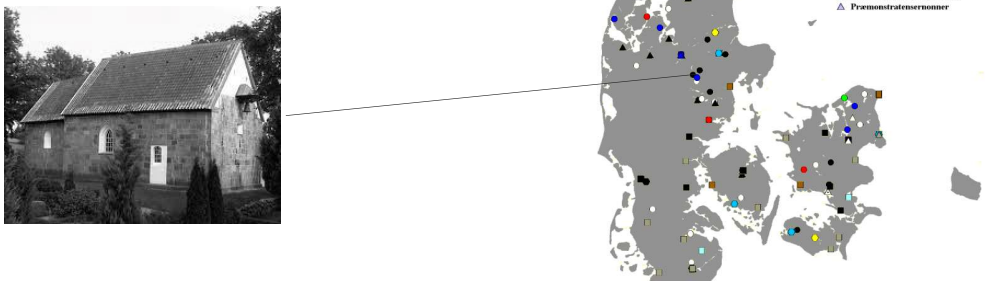
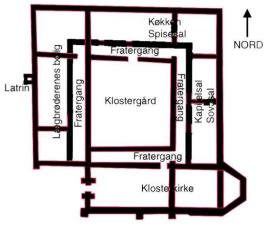

Air
0.3 l/s pr. m2
1.1 m3/h pr. m2
= BUILDING CODES
Internal heatload
Air tightness (0,5 l/s pr. m2 at 50 Pa)
Be15
1.000 ppm CO2
Light
10% floor area
300 lux ½ of hours with daylight
EN 17037/EN 12 464-1
External heatload
Ventilation efficiency/rate (SEL)
Heat recovery
Usage time
Hours of T > 26 C (DRY2013)
Natural surroundings
()…"satisfactory lighting and view conditions must be ensured"…()

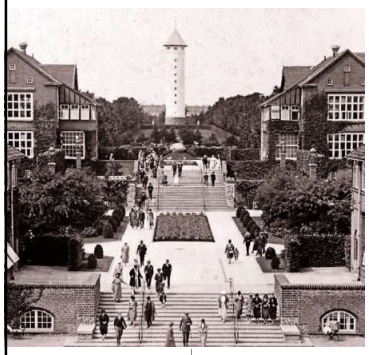


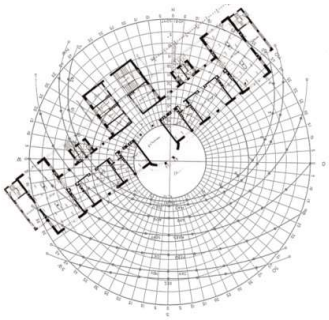


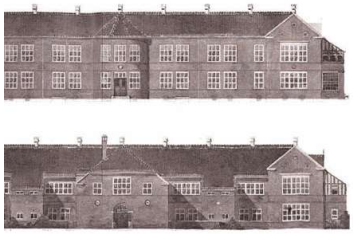
1531 - 1536

The Monastery









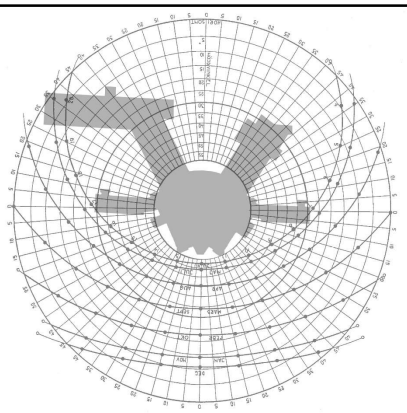
1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

The Pavillon Hospital

Aarhus Kommunehospital har primært flersengestuer, først 10-sengsstuer (t.h.) og efterfølgende 6-sengsstuer (t.v.). Aarhus Kommunehospital bliver et af de sidste hospitaler med dagslys i OP-rummene (t.h.)

1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

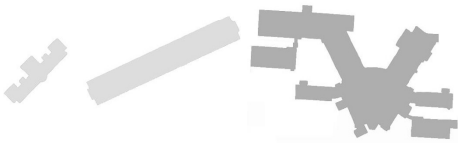
The Corridor Hospital

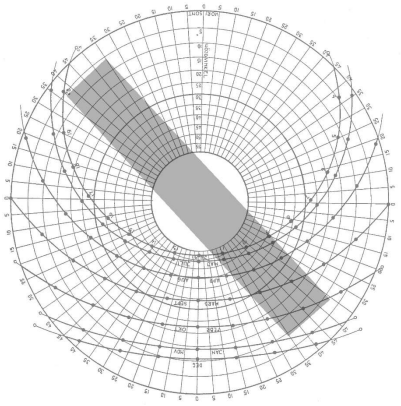


De kuppelformede OP-rum har nu ingen adgang til dagslys, men det kraftige kunstlys kan styres fra flere sider, så det ikke danner generende skygger på o-perationsbordet . Ligesom mekanisk ventilering nu sørger for, at luftskiftet på OP-rum nu kan ske kontrolleret, mange gange i timen (t.v.) Glostrup Hospital er renoveret i flere omgange - men har bevaret en hjemlig atmosfære (t.h.)

1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

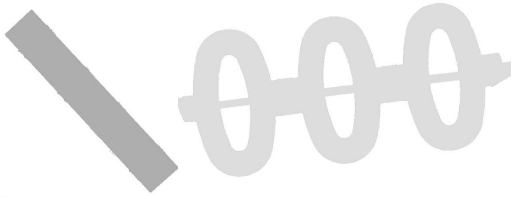
The Block Hospital

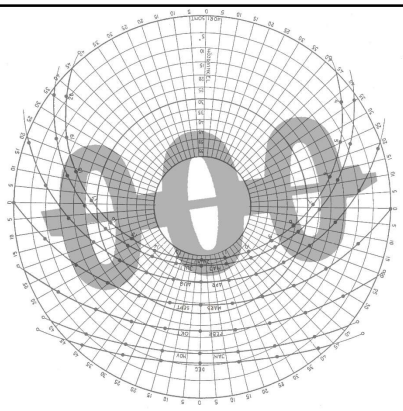




1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

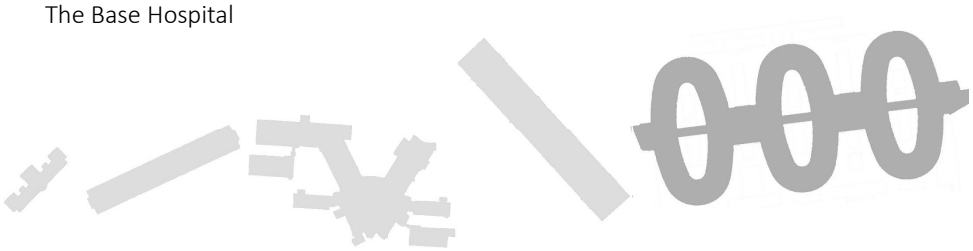
The Technology Hospital



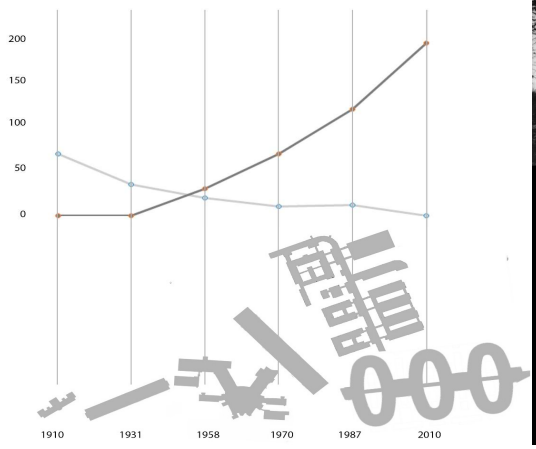


1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

The Base Hospital

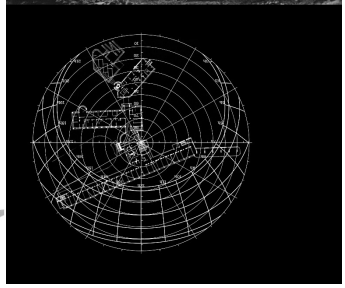


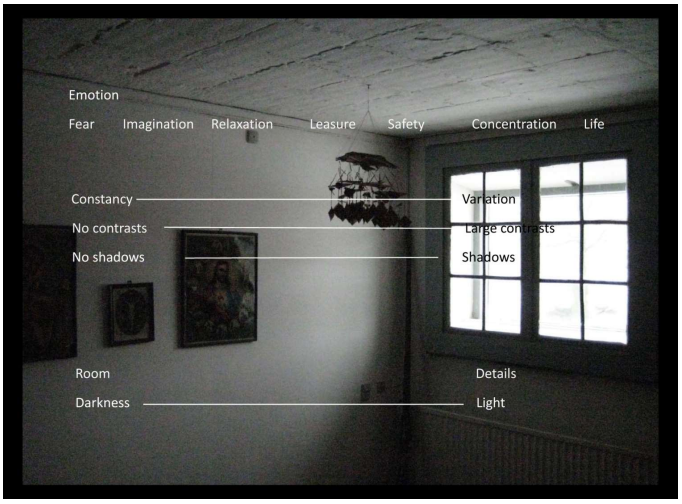
Er der en mellemvej…og kan vi lære noget fra tidligere?



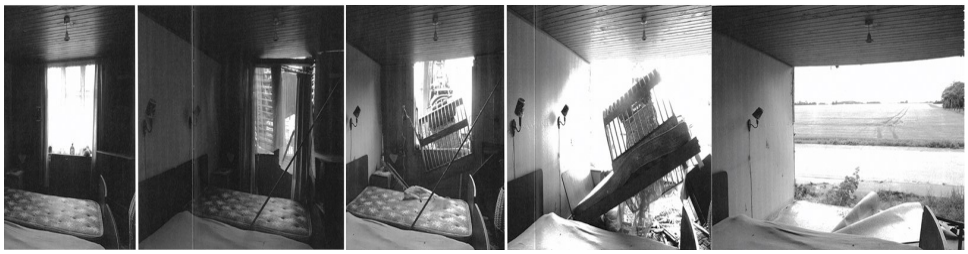
Mechanical

Natural




Emotion
Fear
Imagination
Relaxation
Leasure
Safety
Concentration
Life
Constancy
Variation
No contrasts
Large contrasts
No shadows
Shadows
Room
Details
Darkness
Light


THE NEXT TO GO
FIGHT TUBERCULOSIS!
Red Cross Christmas Seal
Campaign



- EN 17037: European Standard for Daylight
- EN 12464-1: Lighting of Workspaces

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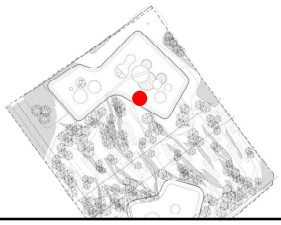

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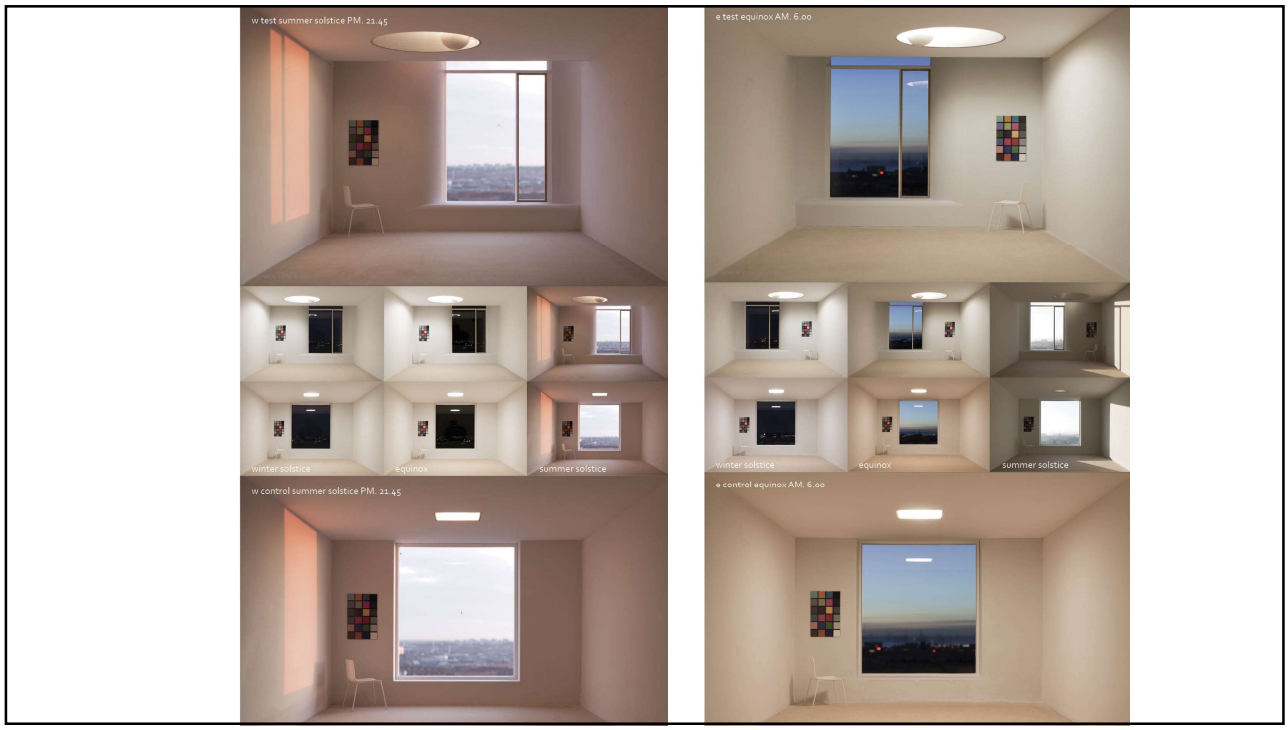
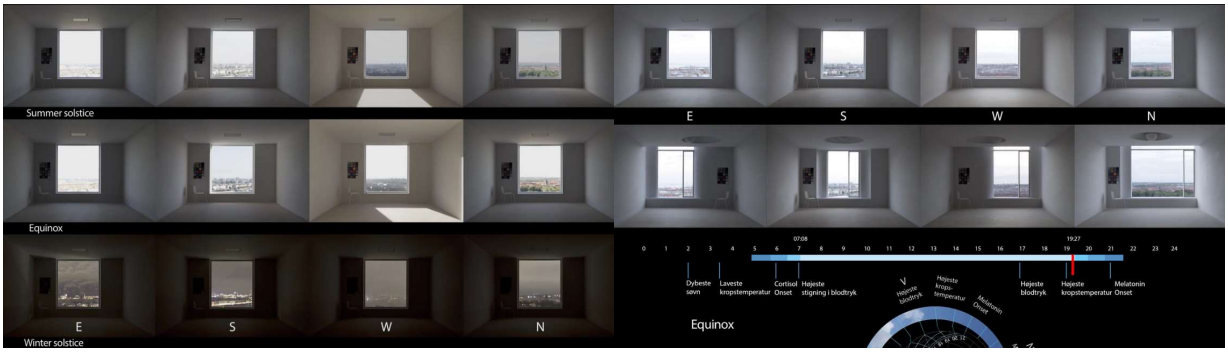
PUBLIC NOTICE

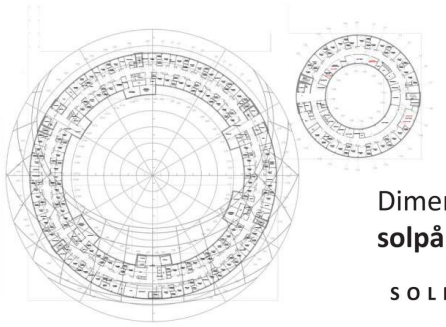
The Peckham Health Centre in 1938 (left), with the clear Vita glass, and the building today (right), renovated with solar protective glass.
The NS-axis, with the large facades facing E and W, opens equally up for the morning sun and for the evening sun. This may work further south, where there is less seasonal variations, and where the sun sets earlier during the summer. But here, at 51° N this orientation neither utilizes the sparse morning son during the winter, nor shields against the late evening sun during the summer.
The sunlight creates heat problems, especially in the W-facing facade, from early afternoon until late evening. At times of the day when the building is already warm.
Above: The result; an application for solar protective glass in front of The Peckham Health Centre, or The Pioneer Centre as it is named today

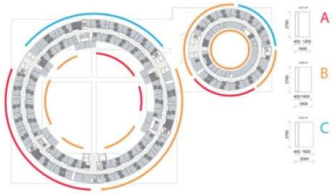
61


Carlo Volf, MAA
Light, Architecture and Health – a Method
Light, Architecture and Health
a Method
Carlo Volf, MAA Ph.D.-thesis


w test summer solstice PM. 21.45
winter solstice
equinox
summer solstice
w control summer solstice PM. 21.45
e test equinox AM. 6.00
winter solstice
equinox
summer solstice
e control equinox AM. 6.00

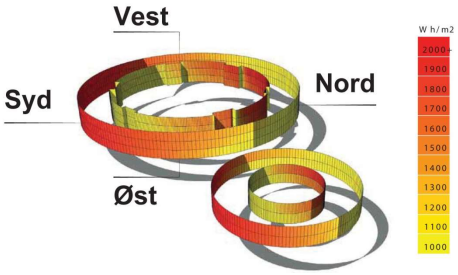


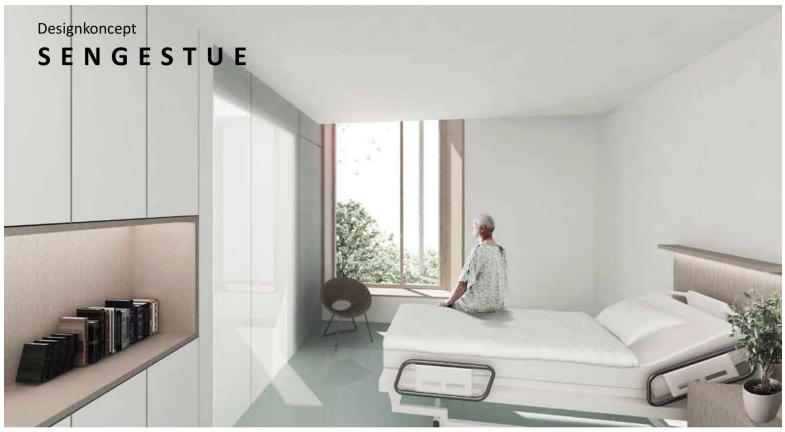




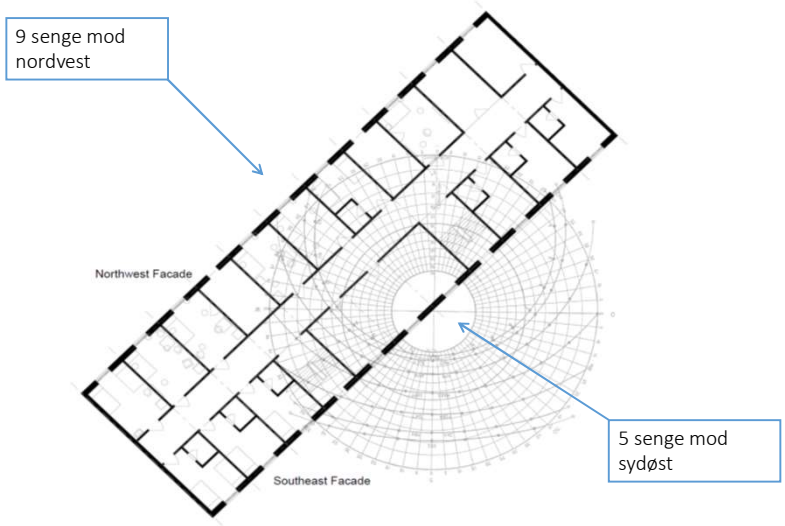
Dimensionering af vinduet i forhold til **solpårvirkning** og **døgnrytme**

SOLPÅRVIRKNING

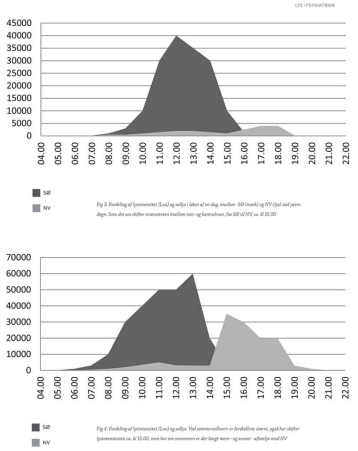




Hvad betyder dagslyset for indlagte patienter?



Lysfordeling på NV- og SØ-vendte stuer



Sydøst
12.00
Efterårs
jævndøgn

40.000 Lux

Nordvest
12.00
Efterårs
jævndøgn

2.000 Lux

Hvad fandt vi?

- Indlæggelseslængden
  - Sydøst: 29.2* dage (26.8)
  - Nordvest: 58.8 dage (42.0)
- Halvdelen af patienterne havde vitamin D niveauer under anbefalede niveau (gennemsnitligt 32.4 nmol/l fra 9 nmol/l til 44 nmol/l)

*Statistisk signifikant p=0.01 (Kruskal-Wallis test)

Hvad dagslyset for raske mennesker?

FACULTY OF HEALTH AND MEDICAL SCIENCES
UNIVERSITY OF COPENHAGEN

Glass Quality and Health in Public Housing

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[1] Psychiatric Hospital Copenhagen, University of Copenhagen Denmark, [2] DTU Fotonik, Roskilde Denmark, [3]Danish Building Research Institute, Aalborg University Copenhagen, [4]Rambøll Denmark

Objective
The objective of this study is to investigate the health impact of two kinds of window glass on healthy individuals in a public housing in Denmark. Since the invention of the *insulating glass units* (IGUs) in the 1970s, a lot of innovative effort and talent has been put into optimizing the performance of window glass as climate screens. Unfortunately these efforts have served only one purpose; energy. A development which seems to continue in the build environment in the near future, and seems to be the most rational choice, if we do not consider other parameters, such as health. Spending on average 90 % of our time in the indoor environment, the quality of the window glass plays an important and yet overlooked role for our circadian rhythm, sleep, mood, wakefulness and levels of vitamin D. Recent discoveries about the missing piece in the lighting puzzle, the non-visual IpRGCs, put emphasis on natural daylight and its beneficial effects as an efficient *Zeitgeber*; however until now studies have focused on artificial lighting and not daylight

Method
This randomized controlled study will investigate the effect of the daylight quality, establishing two different indoor daylight conditions by using two different types of window glass in building blocks, housing a total N = 90 healthy individuals in 72 apartments. As part of a building renovation, all windows will be renewed. Tenants participating in the study will have their apartment randomized to either:

a) 2-layered clear low iron glass (g-value = 0,67, Lt = 0,83, U-value = 1,1) that allows ultraviolet and blue light to pass
b) 3-layered float glass (g-value = 0,50, Lt = 0,71, U-value = 0,5) that limits the blue and ultraviolet parts of the daylight

G-value = Solar heat transmission, Lt = Light transmittance, U-value = Heat transfer coefficient

Spectral transmittance (St) of both glass types will be measured in a controlled environment. Subsequently the study will collect information on wellbeing, mood, sleep, health, and self-reported days of illness. The circadian response spectrum as well as the ability to produce 25(OH)D, the Standard Erythemal Dose (SED), is measured and compared for each glass type across seasons. The study will sample data during four seasons (autumn, winter, spring and summer). Primary outcomes will be self-ratings of sleep, wellbeing and circadian rhythms, based on Pittsburgh Sleep Quality Index (PSQI), WHO-5 Wellbeing and SF-12. Secondary outcomes will be general satisfaction, self-reported days of sick leave and causes of illness. Exploratory outcomes will be ability to produce 25(OH)D measured in Standard Erythemal Dose for each glass type and their effect on the use of additional artificial lighting

Results
Expected results in September 2018

Conclusions

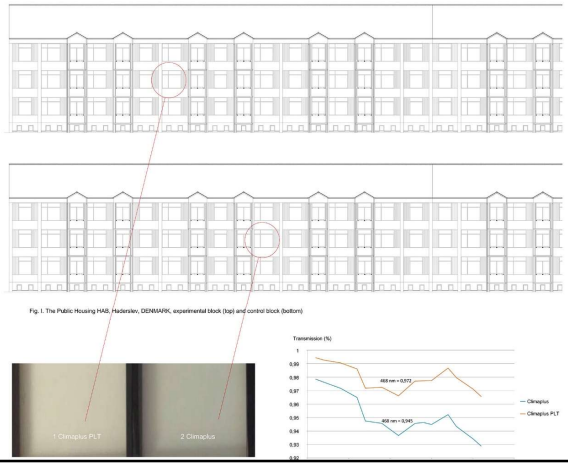
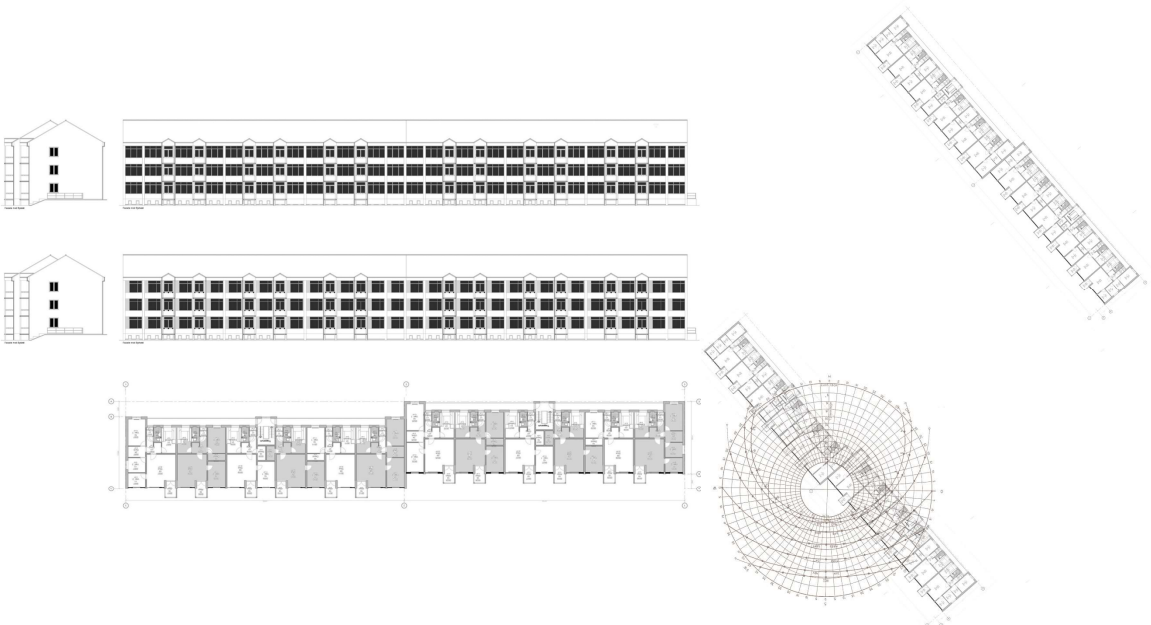
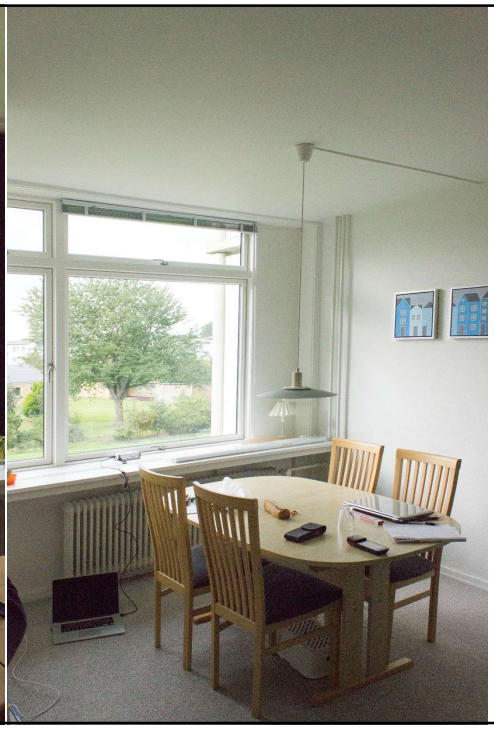
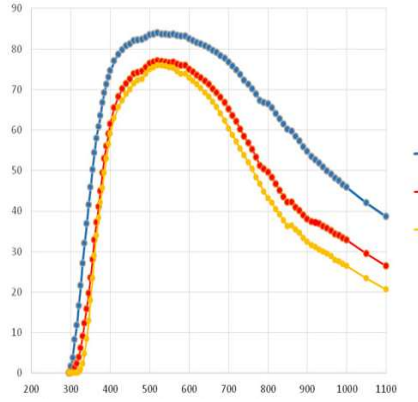


Fig. I. The Public Housing HAB, Hedensley, DENMARK, experimental block (top) and control block (bottom)



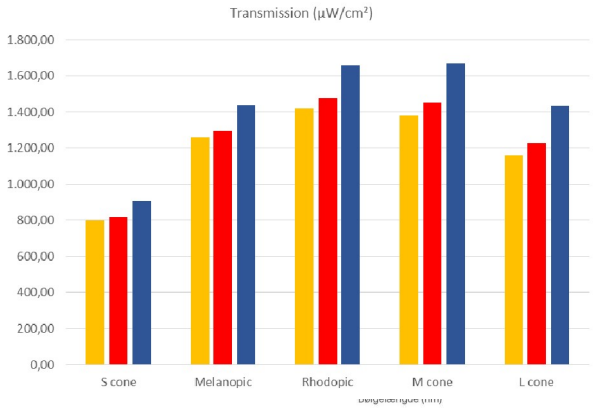




Spectralfordeling 4-16-4 Climaplus XN med 2 lag DIAMANT jernfattigt glas.

Spectralfordeling 4-18-4-18-4 Climatop XN med 3 lag DIAMANT jernfattigt glas.

Spectralfordeling 4-18-4-18-4 Climatop XN med 3 lag Planiclear Floatglas



Kortbølget lys som stimulerer døgnrytme

- 2-lags hospitalsglas transmitterer < 20 % mere kortbølget dagslys end 3-lags energiglas. *j.f. Toolbox, Measuring in the Melanopsian Age)*

D-vitamin og glaskvalitet

- 2-lags hospitalsglas transmitterer UVB-lys (285 – 315 nm) (5 %)
- 3-lags energiglas transmitterer ikke UVB-lys (0 %)
- 3-lags hospitalsglas transmitterer stort set ingen UVB-lys (<0,5 %)

5 % dosis svarer til, at en person der sidder 2-3 timer pr dag ved vinduet kan få dækket D-vitamin behovet i DK når 20% af kroppen bestråles

Resultater viste følgende signifikante resultater (p<0.05):

Socio-demography
5.9% of the residents were associated to the labor market, while 47.1% of the residents in the building with 2-layered low-iron glass were associated to the labor market (p=0.02 + Fishers exact test)

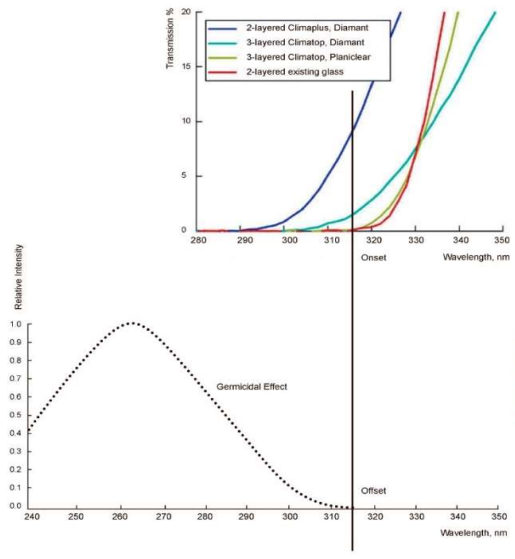
Health
The residents in apartments in the building with 3-layered low energy windows reported statistically significant problems sleeping after renovation (p=0.05).

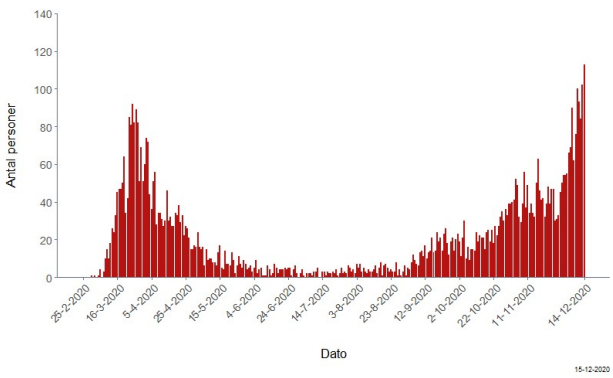
The residents in apartments with 2-layered low-iron glass experienced work difficulties due to physical pain over the last 4 weeks (p=0.05).

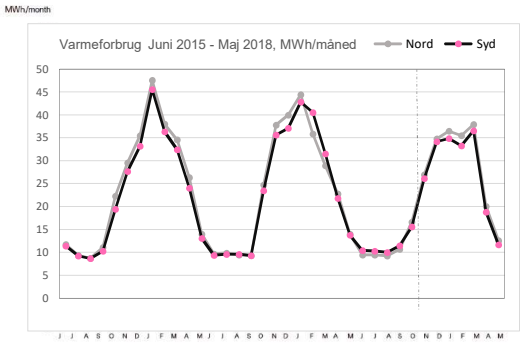
Satisfaction
Residents in apartments with 3-layered low energy windows were more satisfied with ventilation and air in their apartments after the renovation compared to the residents in apartments with 2-layered low-iron glass (p=0.04)

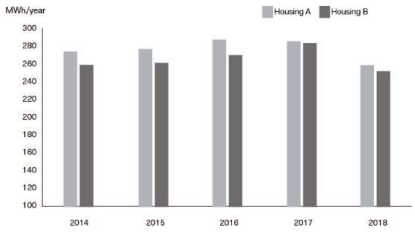
Residents in apartments with 3-layered low energy glass reported that satisfaction with the daylight in apartments (p=0.03) and colors of furniture, etc. (p=0.05) were higher after the renovation, compared to apartments with 2-layered low-iron glass

Residents in the apartments with 3-layered low energy glass reported fewer days with too much cold in apartments, compared to residents in apartments with 2-layered low-iron glass (p=0.02 X- 2 =5,7), although both groups reported fewer days compared to baseline







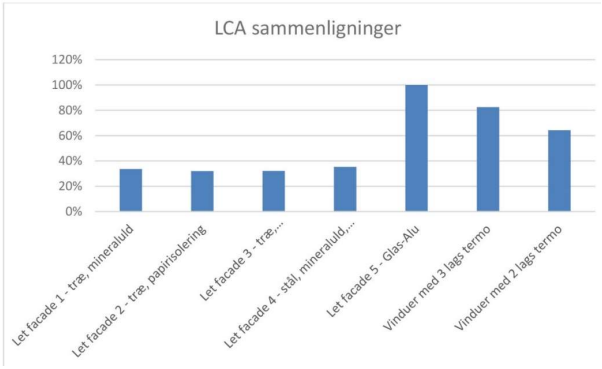


Energy consumption for heating:

Housing A with 3-layered low energy glass decreased by 9.4%
Housing B with 2-layered low-iron glass decreased by 11.0%

When comparing season 2016-17 (before renovation) with season 2017 – 18 (after renovation)

Forholdsmæssig betydning af lukket facade, 3-lags termorude og 2-lags termorude:



ARCHITECTURAL PLANNING OF (DAY)LIGHT

NID
New
Interventions in
Depression

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