Daylight and Comfort in the Indoor Environment
Daylight and Comfort

• Comfort is a pre-requisite for energy efficiency

• Discomfort leads to extra energy consumption
Conclusions

• Boundary between comfort, discomfort, and health is not well defined

• Comfort is a dynamic state, depending on time and other factors

• Daylight is important, but comfort cannot be achieved by good lighting only

• State of mind of the user is often dominant in perception of (dis)comfort
Daylight comfort assessment

• Model and assessment scale
What is comfort?

• “A state of physical ease and freedom from pain or constraint”

• “The absence of discomfort”

Depends on

• Climate and environment
• Social aspects and culture

• Mood/motivation
• Timing
• Perception
Visual comfort

- Theory
  - Lighting quantities (illuminance and luminance values)
  - Information given by daylight (weather, time of day)
  - Outside view (window)
  - Surroundings

- Prior experience
- State of mind

(adapted after Vink, 2004)
Daylight and (dis)comfort

- Individually determined
- People are creative with measures and solutions
Daylight and (dis)comfort

• Architectural solutions
Daylight and (dis)comfort

• Man-made architectural solutions…
• People are creative with measures and solutions
Comfort in the indoor environment

- Model

![Diagram showing relationships between user, organisation, workspace, and comfort](image)

- Time (e.g.)
How to assess comfort?

- **Comfort**
  - "A state of physical ease and freedom from pain or constraint"

- **Discomfort**
  - "Absence of discomfort"

- **Illness**
  - "A state of physical ease and freedom from pain or constraint"
Comfort scale

- Comfort
- Inconvenience
- Discomfort
- Illness

Actual tasks, perception, and performance not limited, slightly more effort
Comfort scale

- Comfort
- Inconvenience
- Discomfort
- Illness

A situation with clear opportunities for physical disability
Conditions cause a serious health risk and damage
Complete scale

- Comfort
- Inconvenience
- Discomfort
- Unhealthy
- Illness

Comfort scale

- Poor task performance
- Physical disability
- Potential damage
Ranking comfort

- Inconvenience
  - Lighting
  - Cooling
Ranking comfort

- Discomfort
  - Lighting
  - Ergonomic
  - Physiological
Ranking comfort

- Unhealthy
  - Lighting
  - Psychological
  - Physiological
Practical conditions

- Comfort
- Inconvenience
- Discomfort
- Unhealthy
- Illness

Comfort scale:
- Duration: short
- Importance: high
Method comfort assessment

- Model

![Diagram showing user, organisation, time, space, comfort, performance hierarchy]
Method assessment comfort

• Match between ‘preferences’ and ‘tasks’

TNO Office Field Lab: concentration

30 years
Modern interior
Short stay
Concentration
Cool color
temperature
Direct bright lighting
Method assessment comfort

• Match between ‘preferences’ and ‘tasks’

TNO Office Field Lab: conversation

Different ages
Informal interior
One hour
Conversation
Warm color
temperature
Indirect lighting
Daylight and comfort

- Comfort cannot be achieved by good lighting only!
  - Indoor air quality
  - Acoustics
  - Ventilation
  - …

- Motivation
- State of mind
Conclusions

• Boundary between comfort, discomfort, and health is not well defined

• Comfort is a dynamic state, depending on time and other factors

• Daylight is important, but comfort cannot be achieved by good lighting only

• State of mind of the user is often dominant in perception of (dis)comfort
Thank you