"Solar Architecture – from energy consumers to energy producers"

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Overview

- **Energy impact of buildings**
- **Driver of energy use**
- **Thermal comfort**
- **Design strategies**
- **Summary**

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Solar in Buildings

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Buildings use 40% of Energy

- **Basic building function: better indoor climate than outside**
- **Most buildings use the lion's share of energy *only to make them habitable***
- **The more energy used, the worse the architectural design**

Roadmap

- **Energy wasting building …**
- **Zero energy buildings…**
- **Energie Plus Haus…**

- **Solar buildings are energy efficient**
- **Faster to build than power stations**
- **Last longer**
- **More sustainable**
- **Lower life-cycle cost**

Driver of energy use

- **Energy use is driven by the lack of indoor comfort**
- **Indoor comfort: visual, acoustic, thermal**

Adaptive thermal comfort

For naturally ventilated & hybrid buildings

Tn = 17,8°C + 0,31To ±3,5K (80% acceptability)
Tn = 17,8°C + 0,31To ±1,2K (90% acceptability)

where

Tn = neutrality temperature

To = mean outdoor temperature

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Adaptive thermal comfort

For HVAC buildings

Tn = 22,6°C + 0,04ET* ±3,5K (80% acceptability)

Tn = 22,6°C + 0,04ET* ±1,2K (90% acceptability)

where

Tn = neutrality temperature

ET* = mean outdoor Effective Temperature

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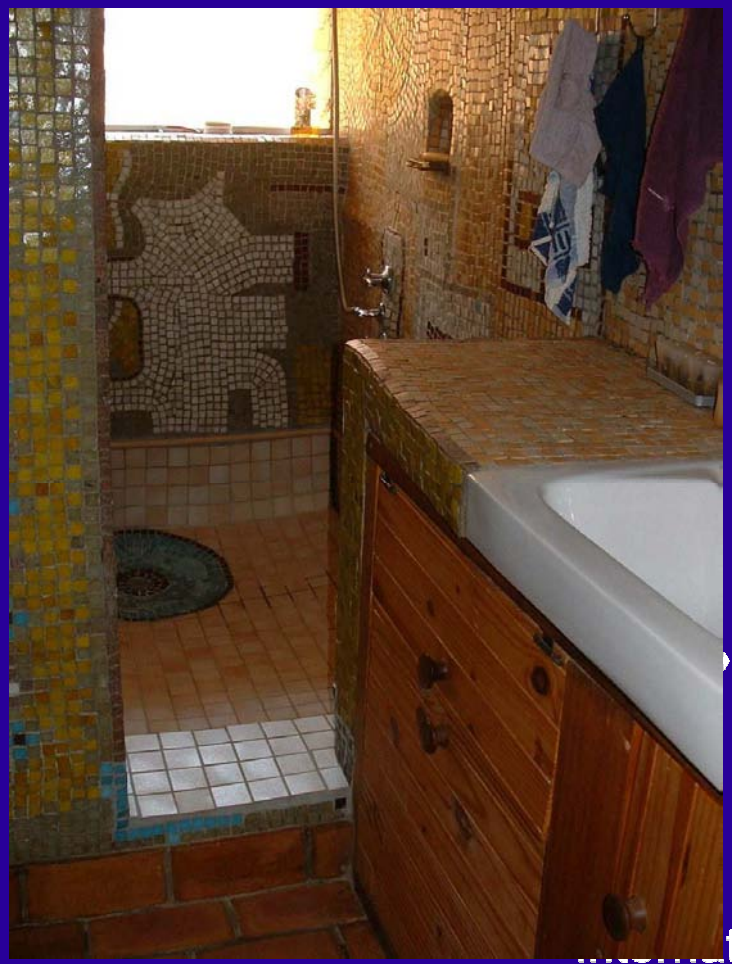
Adaptive thermal comfort

- **Thermal comfort is dynamic**
- **Depends on mean outdoor temperature**
- **Validity limits: 17,8°C < Tn < 29,5°C**
- **Different from static ISO7730**
- **Leads to energy efficiency**
- **Reduces Sick Building Syndrome**

Design strategies

- **Implement resource efficiency**
- **Implement energy efficiency**
- **Identify local climate**
- **Visualise potential climate control zone**
- **Develop detail strategy**
- **Account for building management**



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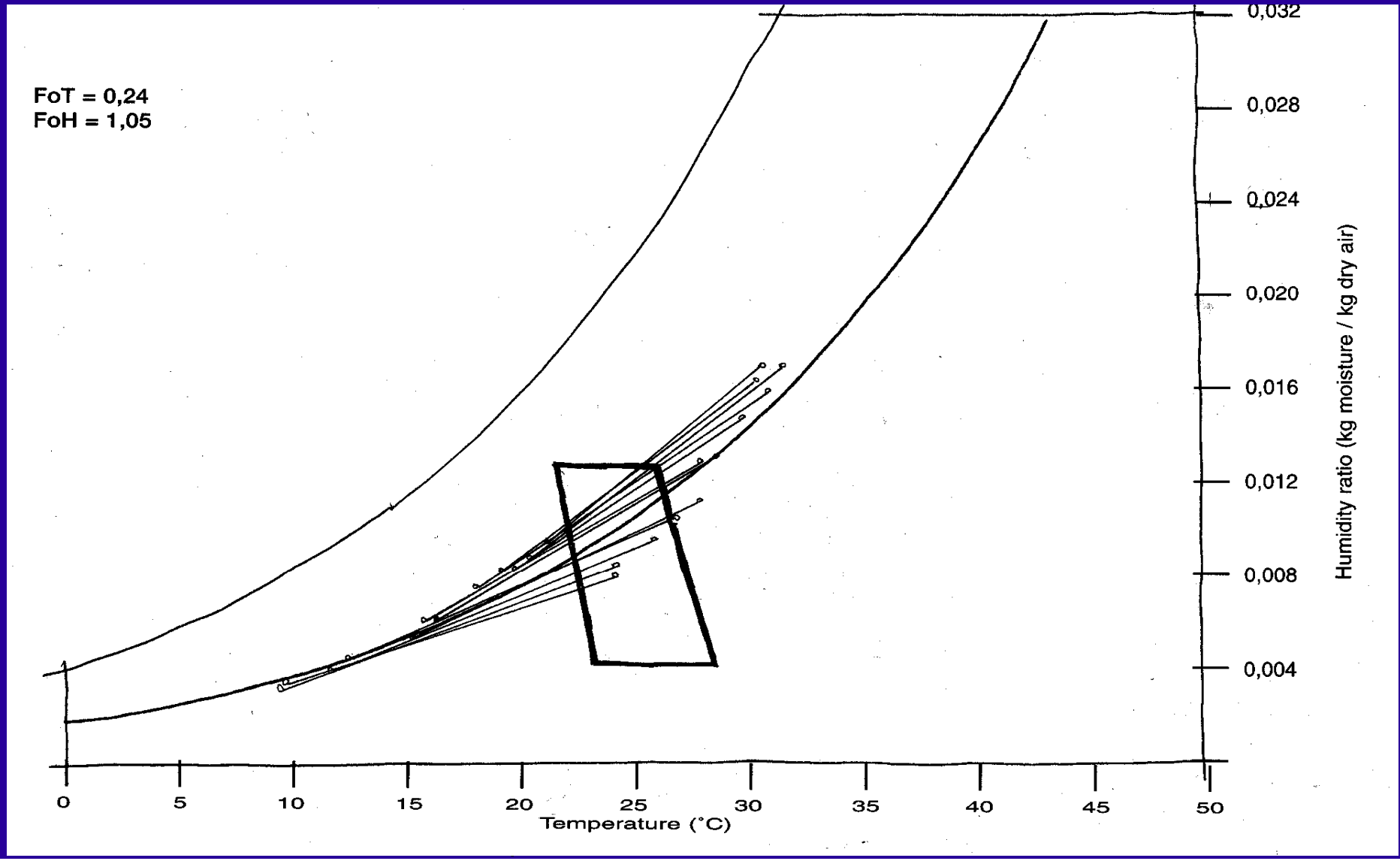
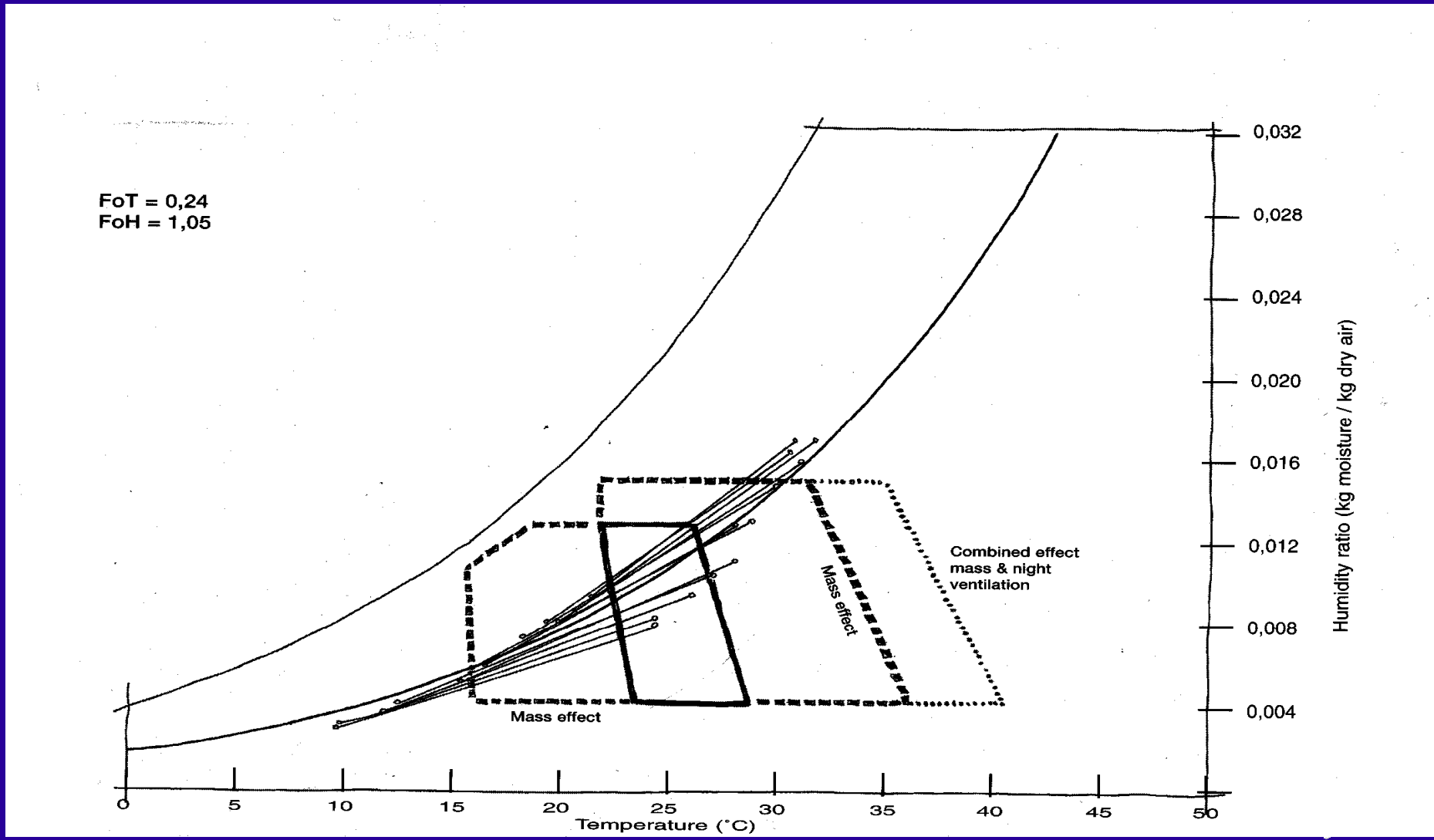
Psychrometric chart



Thermal mass strategy



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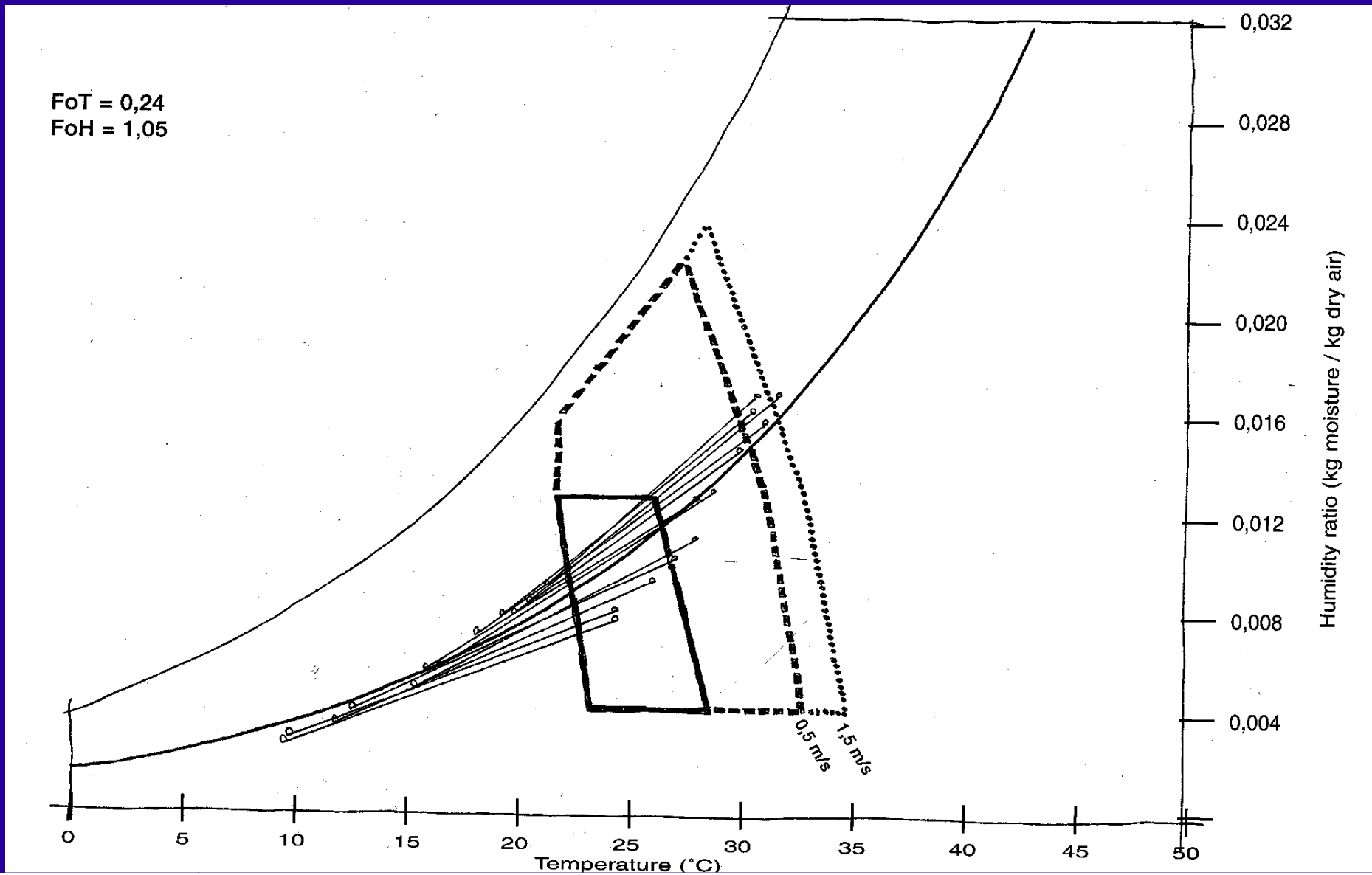
Air movement strategy



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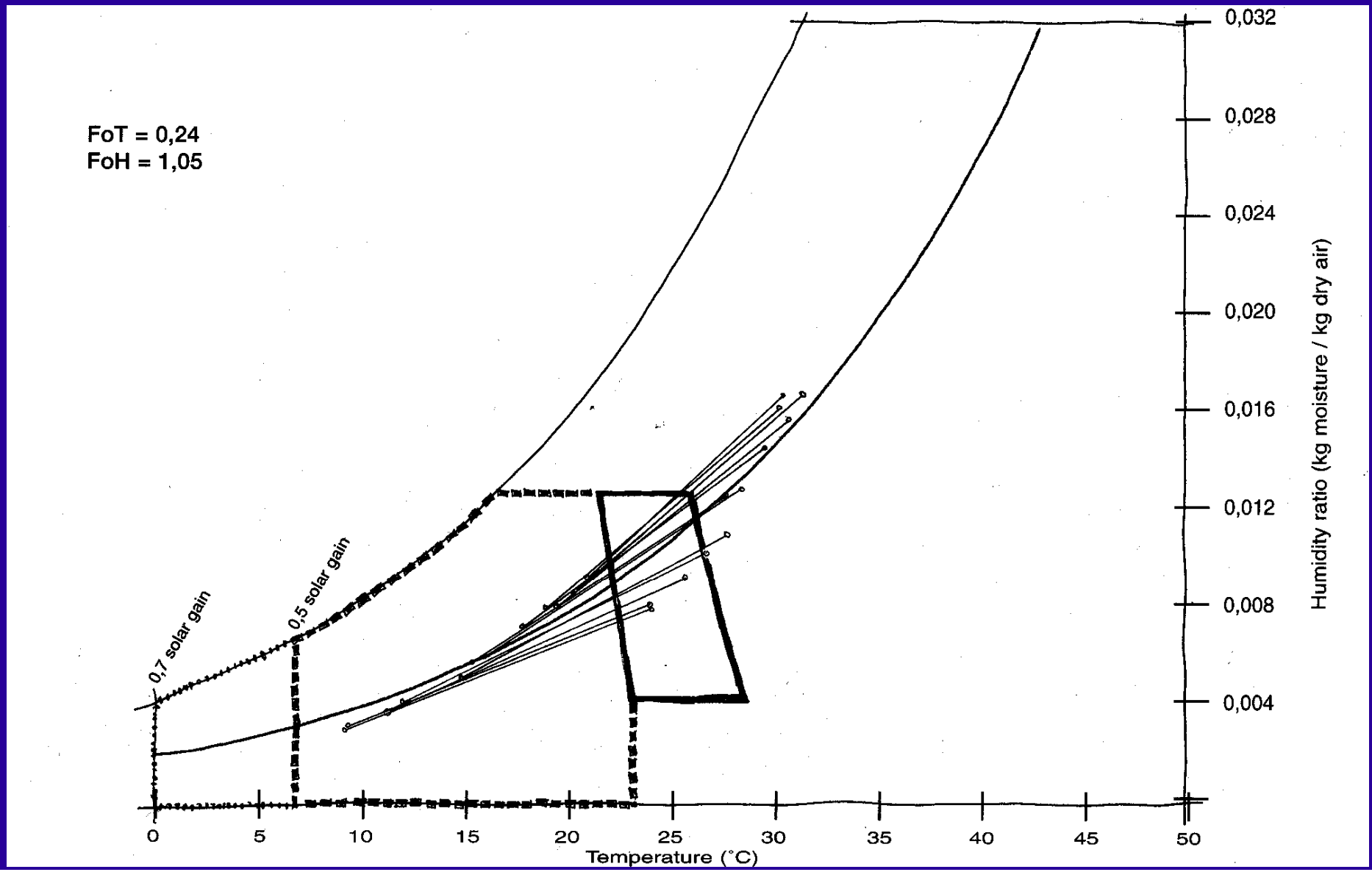
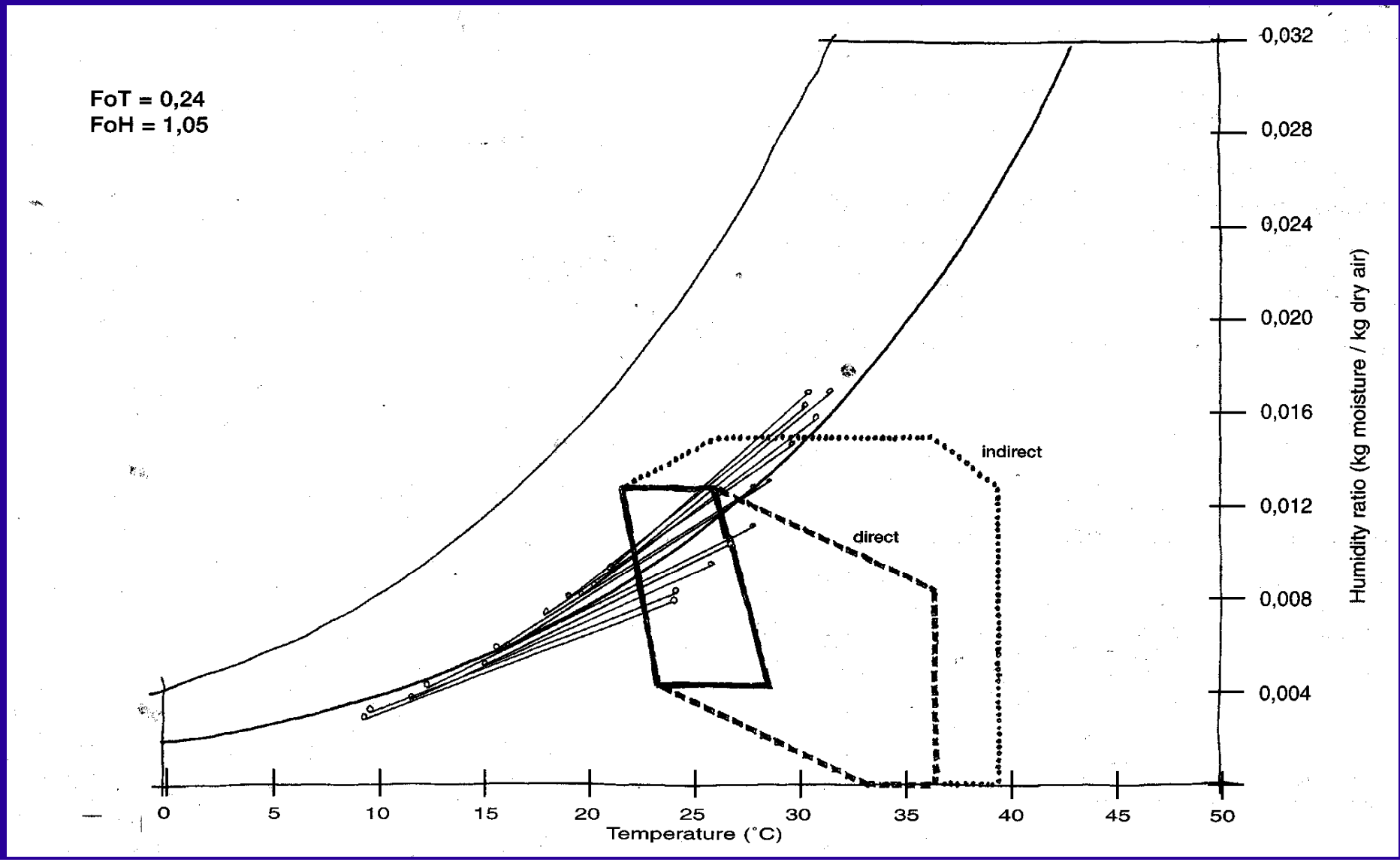
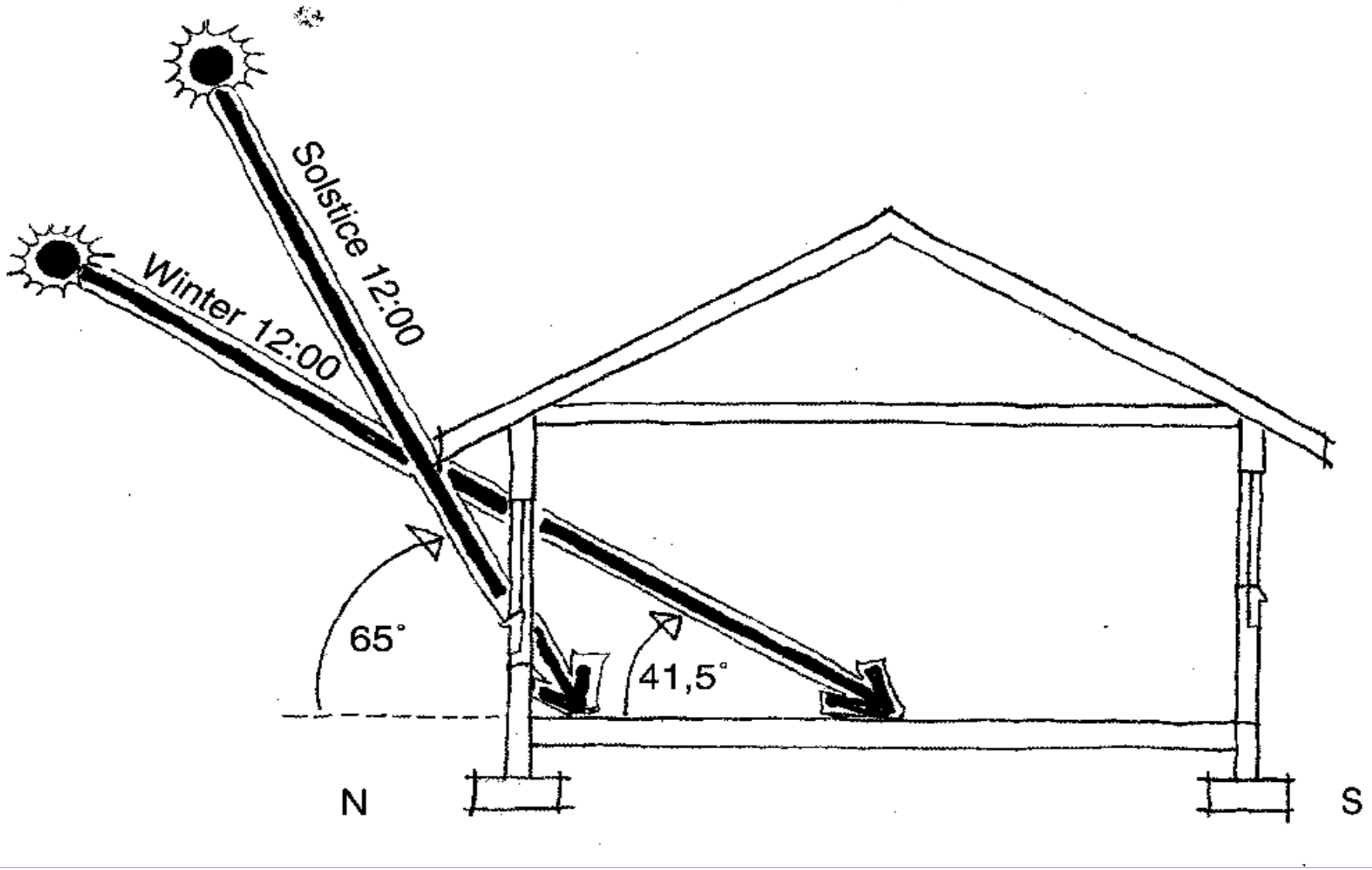
Heating strategy: North glass



Evaporative cooling strategy



Shading strategy for -25º



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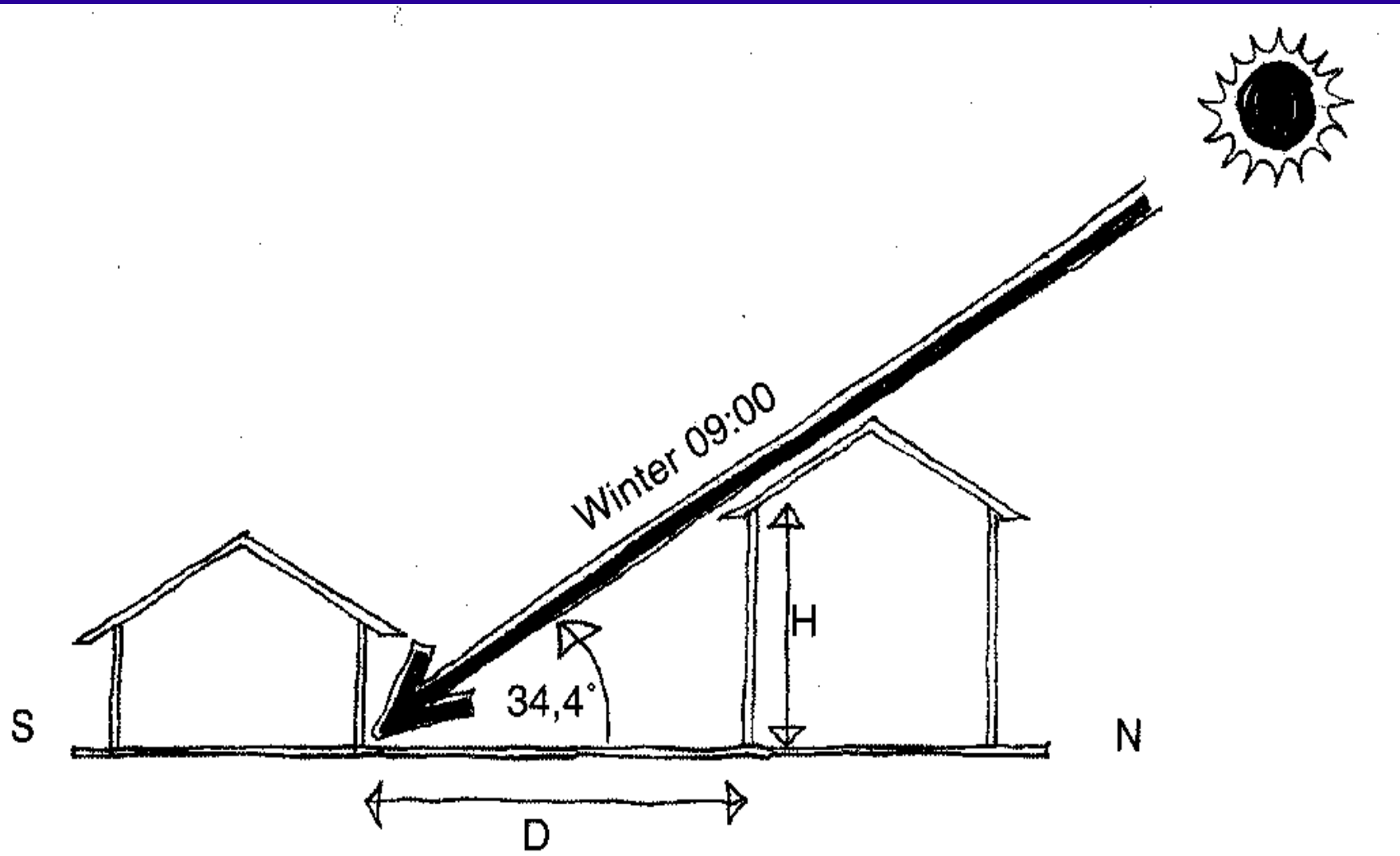
Building spacing strategy



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Summary

Solar architecture & EE in buildings

- **should be a national priority**
- **can be achieved by simple means**
- **demands more design input**
- **requires more capital outlay**
- **saves in the long-term: health and energy costs**
- **makes energy generating buildings!**

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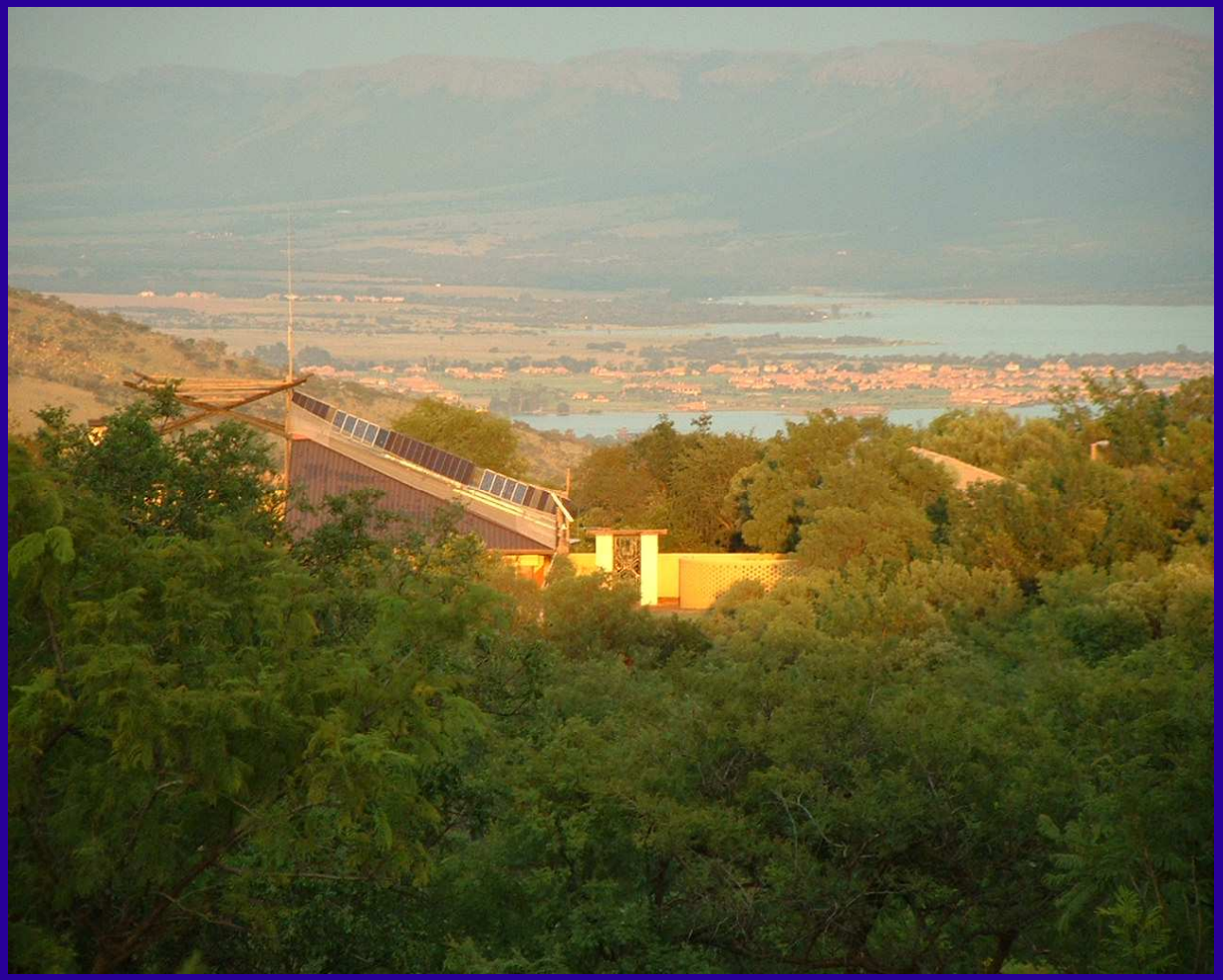
THANK YOU



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