Keep your Cool!

Exterior Passive House Motorized Shading and Controls
Why Exterior Shading?
Control/comfort/discomfort

- View
- Glare
- Light
- Privacy
- Reflection
- Heat

The sun moves!
It's dynamic
Active vs. passive
Why not interior shading?
Interior does not work

- Heat is already in the building
- Glazing is generally coated to lock heat gains in the building

Nick Grant @ecominimainick · Aug 11
Summer comfort isn’t just about air temperature. Radiant discomfort is a thing. Move away from the hot glass, internal blinds won’t help much as the blinds will probably be a similar temperature.
Applications?
Not just a Passive House Thing!

- Benefits are universally applicable
- Can be found on all building types in a variety of climate zones: Office, schools, housing
- Critical in a Passive House with high contribution of solar heat gain for winter, low sun angles (east and west in particular), cooling dominated climates
PHPP Temporary Sun Protection

Exterior shades provide factor 10x improvement over interior shades!

In reality, shades are not typically used all the time. The PHPP therefore automatically accounts for:

- Manual controls: PHPP assumes reduction of 70% of solar heat gains during cooling period.
- Automated controls: PHPP assumes reduction of 80% of solar heat gains during cooling period.
- For the calculation of the potential for overheating, the PHPP assumes reduction of 90% of solar heat gains during the cooling period.

<table>
<thead>
<tr>
<th>Location of shading</th>
<th>Triple Pane Glazing</th>
<th>Double Pane Glazing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exterior</td>
<td>Interior</td>
</tr>
<tr>
<td>Slats, shades vertical</td>
<td>0.06</td>
<td>0.70</td>
</tr>
<tr>
<td>Fabric shade, white</td>
<td>0.24</td>
<td>0.60</td>
</tr>
<tr>
<td>Fabric shade, grey</td>
<td>0.12</td>
<td>0.80</td>
</tr>
<tr>
<td>Foil</td>
<td>-</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Reduction of the g-value per table (PHPP 10 Manual) based on DIN V 18599-2, and/ or DIN EN 13363
# Code Challenge

## Max SHGC values vs. motorized shades

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR</th>
<th>SKYLIGHT U-FACTOR</th>
<th>GLAZED FENESTRATION SHGC$^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.50</td>
<td>0.75</td>
<td>0.25</td>
</tr>
<tr>
<td>1</td>
<td>0.50</td>
<td>0.75</td>
<td>0.25</td>
</tr>
<tr>
<td>2</td>
<td>0.40</td>
<td>0.65</td>
<td>0.25</td>
</tr>
<tr>
<td>3</td>
<td>0.30</td>
<td>0.55</td>
<td>0.25</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.30</td>
<td>0.55</td>
<td>0.40</td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.30</td>
<td>0.55</td>
<td>NR</td>
</tr>
<tr>
<td>6</td>
<td>0.30</td>
<td>0.55</td>
<td>NR</td>
</tr>
<tr>
<td>7 and 8</td>
<td>0.30</td>
<td>0.55</td>
<td>NR</td>
</tr>
</tbody>
</table>
Code Challenge

Max SHGC values vs. motorized shades

4 mixed heating season > cooling season

and 3C and 3A/B (it is complicated)

Climates Heating driven 5-8

<table>
<thead>
<tr>
<th>Climate</th>
<th>CDD50°F ≤</th>
<th>HDD65°F ≤</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A and 3B</td>
<td>6300</td>
<td>5400</td>
</tr>
<tr>
<td>4A and 4B</td>
<td>4500</td>
<td>5400</td>
</tr>
<tr>
<td>3C</td>
<td>3600</td>
<td></td>
</tr>
<tr>
<td>4C</td>
<td></td>
<td>5400</td>
</tr>
</tbody>
</table>

In all climates cooling should be avoided - passively first!

Stretch the “shoulder” season
System Components
The Motorized Shade

- Typ. Aluminum slats
- Various widths and profiles
- Line-voltage motors
- Various track and cable-guided options
- Exterior, recessed, or integrated mounting
- Generally about a dozen standard colors and access to entire RAL color system
- Considerations: Looks, wind resistance, shading factor

Images: Warema
Coverage, Slats and Wind Resistance

Simple slats: None, or not rated

Folded slats: Up to 80 kph (by manf.)

Rated in accordance to DIN EN 13659

Slat widths typ. 63 to 93mm, or 2-½” to 3-⅝”

Typ. up to 6m or 20’ tall

Typ. up to 20m2 or 215 sf coverage

Maximum coverage area and heights, as well as “slat stack heights” set by system selected.
The Shade Box

- Houses the shade mechanism when retracted
- Can be integrated, or bolted to the face of the building
- Can be invisible, or decorative
- Can be purchased, or site built
- Needs to be sized exactly to fit the shade and window dimensions = requires integrated planning

Images: Warema
New Construction and Retrofit

- Integration more likely in new construction or significant exterior retrofit like EnerPHit
- Exterior application more likely for existing buildings or retrofits to the interior
- Hardwired, or wireless (but needs line voltage power)
Integrated Shade Box
Integrated Design

- Detailing is key for aesthetics, performance and durability
- Close collaboration with window and shade vendor
- Detailed architectural and shop drawings
Exterior Shade Box
The Actuator

- Controls the movements of the motorized shade
- Can be wireless, or wired
- Can be as simple as an up-down switch, more convenient like a remote control, and as sophisticated as a smart, and/or automated control system
Automation

- Can do more than up, or down
- Can be preventative rather than chasing heat
- Timer controls
- Enhance daylighting
- etc.
Protection

- Wind Protection
- Frost Protection
Automatic Blinds: A Must for Passive Cooling & Heating
Shading that thinks for itself
Shading - Then and Now

Then:

- Manually operated
- Must be inside and protected
- No intelligence
- Protrusion of the airtight layer

Modern Building - “Smart Control”

- Shading controlled with wall switches
- Complex control through remotes and apps, always manually controlled
... and Today - Intelligent Operation & Automation
Loxone shading automation:

Why?

What is needed?

How does it work?
Products for intelligent shading
Multiple wiring options:
Centrally wired blinds to relays:

- Touch Tree
- Presence Sensor
- LED Spot
- Lighting Circuits

120 V AC

Blind Motor
Wired with Nano2 Relay Tree:

120 V AC
CYKY 3x1,5mm
Wired with Shading Actuator:
Loxone Config:

- Pre designed block for shading
- Automatically visualised in the app
- Can work with different shading types
- Can integrate with the heating function blocks
- Storm and Frost protection automatically for all blinds
- Built in logic for intelligent shading
+ more, see the: [Documentation](#)
Automatic Blinds

Inputs

- T5 - Loxone Touch
- Sps - Automatic Shading (Connected to Heating)
- Dwc - Door/Window Contact
- Co / Cc - Complete Open/Closed
- Slat - Slats to a specific position
Extra functionality with weather data

**Weather Station Air / Tree**

- **Storm Protection** - Information from weather service
- **Frost Protection** - Combine low temperature reading with rain
- **Sensors Included:**
  - Wind, Brightness (lux), Temperature, Rain
Loxone Auto-Config Automatic Wind and Frost Protection:
Technical parameters of the shading technology that affect the correct function:

Window orientation
Room temperature
Outdoor radiation
Times (drive up/down, tilt time, pre-excitation, ...)
Type of shading technology (blinds, blinds, awnings, ...)
Environmental influences (building corners, vegetation, ...)
The distance between the slats and their width (blinds)
Room type (sleeping vs. living)
Season (winter vs. summer operation)
Alarm (burglary, fire, ...)
Open window to the terrace
...
**Automatic Shading Parameters.**

- **(T) - Type of Shading**
- **(Opd / Cld) - Travel Time Up/Down**
- **(Dir) - Compass Orientation**
- **(Sw / Sd) - Slatted Blinds**

Measurements (With these measurements the blinds can be angled to prevent direct sunlight)
ephy 

comfort temperature heating

ecy 

temperature eco cooling

shy 

temperature shading heating

ccy 

comfort temperature cooling

ccy 

comfort temperature cooling

scy 

temperature shading cooling

chy 

comfort temperature heating

ehy 

temperature eco heating

Active heating / cooling

Passive heating / cooling
More than just protection from the sun

- Overheat Protection
- Frost Protection
- Privacy
- Security
- Flexible Grouping
- Storm Protection
Professional Cleaning
Thank You & Questions

475 High Performance Building Supply: https://foursevenfive.com
Loxone Smart Controls: https://www.loxone.com/enus/
TE Studio Passive House Design: https://www.testudio.com/