Advanced Side Lighting Techniques

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Eight Strategies

- Light Shelf with sun-tracking
- Optically treated light shelf
- Louver and blind systems
- Prismatic panels
- Laser-cut panels
- Light-guiding shades
- Sun-directing glass
- Anidolic zenithal collectors
Sun-Tracking Light Shelf

- Use reflective films with tracking mechanism.
- Functions at all sun angles.
- Downward tilt and upward tilt can be possible.
- Maintenance can be an issue.
- Can increase distribution depth in room with smaller aperture area.
Sun-Tracking Light Shelf

Figure 4-3.5:
View of Interior/Exterior Light Shelf at the SMUD Headquarters, California
Optically Treated Light Shelf

- Curved and segmented to passively reflect sunlight at specific solar altitudes.
- Commercially-available films can increase efficiency.
- Usually external shelf.
- Block direct sun, minimize solar heat gain.
- No active adjustment or control.
Optically Treated Light Shelf
Louver and Blind Systems

- Multiple horizontal, vertical or sloping slats.
- Exterior, interior, between two layers of glass.
- Many studies by LBL in past.
- Glare problems under clear skies.
- Must be operable – manual or motorized.
- Maintenance an issue.
Louver and Blind Systems

- Overhang
- Louvres
- Blind
- Tinted or reflective glass

- View airflow
  - ✓ ✓
  - ✓
  - ✓
  - ✓
Prismatic Panels

- Thin, planar, saw tooth devices made of clear acrylic.
- Best in temperate climates.
- Re-direct or refract light.
- Fixed or sun-tracking.
- Color dispersion a problem without filter.
- Can produce glare.
- Primary purpose – achieve deep penetration of daylight.
Prismatic Panels

Figure 4.5.1: Four types of commercially available prismatic panels.

Figure 4.5.2: Cross-section of a linear prismatic panel and visualization of the light redirection achieved by the panel.

Figure 9.5: The working principle of a triangular daylighting system comprising two prismatic components and a reflector. The first prismatic element rejects sunlight while admitting light rays from high altitudes. The second prismatic element redirects the light mainly towards the ceiling of the room. A similar system has been installed on a building in Switzerland.
Laser-Cut Panels

- Re-directs daylight through making laser cuts in thin panels of acrylic.
- Divided into array of rectangular elements.
- Surface of each laser cut becomes a small mirror.
- High proportion of light re-directed through a large angle (120°) by refraction.
- Maintains view through panel.
Laser-Cut Panels
Light-Guiding Shades

- Consists of a diffusing glass aperture + two reflectors.
- Diffuses light from aperture into building within a specified angular range.
- Angles are set for best light distribution and to avoid glare.
- Light guiding shade is fixed to block direct sun from the window.
- Good solution for sub tropics.
- Directs light deep into a room.
Light-Guiding Shades

4.8.7 Some Examples of Use
Sun-Directing Glass

- Concave acrylic elements stacked vertically in a double-glazed window.
- Re-directs light from all angles of incidence to the ceiling.
- Usually the view window location.
- High cost at present.
- Deflects light in horizontal and vertical planes.
Sun-Directing Glass
Anidolic Zenithal Collectors

- A non-imaging optic system.
- Collects and transmits daylight with minimum light loss across distance.
- Usually interior and exterior to window.
- Depends mainly on geometrical optics; does not give precise indications of attenuation of light flux.
- More system-like use of these systems in future.
Anidolic Zenithal Collectors

Figure 9.8: Ray paths through the anidolic zenithal collector as calculated by a ray-tracing program for incident beams inclined at 30° (top), 60° (middle) and 80° (bottom) above the horizon.

Figure 9.9: Outside facade of a test module equipped with an anidolic ceiling. Surrounding obstructions are not higher than 10° above the horizon.
Key Sources


- Daylight in Buildings ...