Re-Arch: The Initiative for Renewable Energy in Architecture

Fact Sheet

Technology: Shading and Sun Control

Common Uses:

Shading elements are important to control the direct penetration of the sun's rays. These elements can be sized and configured to function differently on a seasonal basis and used to reflect or re-direct sunlight in a controlled fashion.

Site Considerations:

Evergreen and deciduous vegetation can provide seasonal variations in shading, especially on the west. Trees within the south-facing "solar window" of a building should be deciduous, to maximize winter sunlight. The winter sun rises in the southeast and sets in the southwest, with a low noontime sun angle in December allowing good solar penetration. The summer sun rises in the northeast and sets in the northwest, with a high noontime sun angle in June allowing good summer shading with overhangs. The sun is in the same position in spring and fall. In spring, the sun is sometimes welcome, in fall it often is not.

Size Considerations:

For southern exposures, a higher, longer overhang provides better winter sun penetration and summer shading. Taller glazing requires a longer overhang to prevent summer penetration. Consider multiple tiers of smaller overhangs for tall expanses of glass. Overhang sizing will vary with latitude and can be determined by plotting seasonal sun angles and optimizing for seasonal shading.

Design Considerations:

For south-facing glazing provide exterior overhangs, rather than interior devices. Provide a skirt overhang at the base of south-facing gable-end roofs,. For east or west-facing windows, use hip roof overhangs, or provide a skirt overhang across the base of gable-end roofs. For east or west-facing windows, consider vertical wings or fins. For north-facing glazing provide fins or no shading. Provide a separation between the bottom of the overhang and the top of the glazing. Avoid overhangs tight to top of glazing, to avoid permanently shading the upper portion of the glazing. Avoid standard truss or rafter framing with exterior overhang soffits tight to the top of the windows. Use raised-heel energy trusses, where the exterior soffit is at or near the interior ceiling height. For conventional stick-built framing, set rafters on a plate on top of ceiling joists, instead of on top plate of supporting wall.

System Costs:

Exterior shading elements need to be durable and can add to the incremental first cost of a building envelope. Where possible, consider using integrated building elements, such as soffits and overhangs, for dual purposes of shading and aesthetics or building function.

More Information:

There are several books and reference guides that outline basic principles of shading and sun control. In addition, there are several web-based sets of guidelines. Many of these have downloadable case studies and design briefs. Several have interactive programs to generate customized solar charts, size overhangs and model shading configurations.

Books and Resources:

- Passive Solar Energy Book, Ed Mazria, Rodale Press, 1979, ISBN 978-0878572373
- Sunlighting As Formgiver for Architecture, William Lam, Van Nostrand Reinhold, 1986, ISBN 978-0442259419
- Sun Angles for Design, Robert Bennett, Melrose Plantation Press, 1978, ISBN 978-0960171811
- Tips for Daylighting with Windows, Lawrence Berkeley Laboratory, www.lbl.gov
- Daylighting Guide for Canadian Commercial Buildings, Natural Resources Canada, www.advancedbuildings.org
- Window Systems for High-Performance Buildings, Stephen Selkowitz, Eleonor Lee, Dariush Arasteh, Todd Wilmert & John Carmody, Norton, 2003, ISBN 978-0393731217
- Residential Windows: A Guide to New Techonologies and Energy Performance, John Carmody, Stephen Selkowitz, Dariush Arasteh & Lisa Heschong, Norton, 2000, 2007, ISBN 978-0393732252

Websites:

- Build It Solar builditsolar.com
- Sustainable By Design susdesign.com
- U. of Oregon Solar Laboratory solardat.uoregon.edu/solarchartprogram
- Archi-Physics Solar Tools archiphysics.com

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