

Fundamentals

Why is daylight important?

- Light and health
- Research topics in daylighting (productivity, photobiology, luminous variability, biophilia)
- Research Methods (laboratory science, case study/POE, statistical analysis)
- Energy use

What is daylight?

- Basic physics
- Climate, weather
- Primary sky conditions
- Sky models
- Weather data analysis
- Architectural response to sky conditions
- The challenge and beauty of variability

Lighting and daylighting criteria

- Metrics for light (Luminance and Illuminance)
- Daylighting criteria, visual comfort metrics (horizontal Illuminance ranges, daylight factor, daylight autonomy, UDI, DSP, etc.)
- Daylight programming, synthesis (patterns of climate/sky condition/time of use/criteria)
- Glare metrics
- Curatorial standards and daylight
- LEED
- Challenges with current metrics
- Energy performance (thermal and lighting power metrics)

Design Methodologies

First Principles

- Site analysis
- Building Orientation
- Building Massing and Fenestration
- Programming for daylight
 - Space layout: correlating space function with daylight zone
 - Interior obstructions: walls/partition type, height, and location
 - Interior surfaces: reflectance, finish, and color
 - Luminance strategies: transparency, vertical surface illumination

Sidelighting

- Rules of thumb
- Inter-relationships of daylight, sunlight, views in sidelighting for visual comfort (When are they aligned and when are they at cross-purposes?)
- Glazing technology
- Solar shading design
- Interior and exterior glare control design

Toplighting

- Rules of thumb
- Design strategies
- Diffusion methods (scattering, refraction, reflection)
- Lighting design strategies for toplighting
- Toplighting in conjunction with sidelighting

View Design

- View and Amenity
- The Viewshed
- Designing for View: Fenestration size, proportions, location

Integrated Design: Process and Practice

Interactions with Other Building Systems

- Daylighting integration with natural ventilation
- Thermal comfort and HVAC systems

Occupant Behavior and Controls

- Factors that reduce performance or operational life
- Thermal comfort and HVAC systems

Design and delivery process for daylighting

- Pre design
- Schematic design
- Design Development
- Construction Documents
- Construction
- Calibration
- Functional Testing
- Occupancy
- Operations
- Post Occupancy Evaluation

Retrofit

- Control Upgrades and Retrocommissioning

Design and Analysis Tools

Parametric Analysis

- The Scientific Method
 - Asking daylighting design questions (hypothesis)
 - Setting up an analysis
 - Interpreting results

- Synthesizing simulation data into design action

Analogue Based

- Sun Angle Calculator
- Nomograms
- Charts, Diagrams and Spreadsheets

Physical Models

- **Digital Models** Modeling Issues: Scale, Materials and Construction
- Real and Artificial Skies
- Heliodon
- Photography and Photometry

Digital Models

- Visualization
 - Representation of daylight
- Simulation
 - Point in Time Calculations
 - Annualized Calculations

HDR

- Luminance/Glare Analysis
 - Maximum Threshold
 - Luminance Ratios