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Holistic Design
Building Performance

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Green Design

Shades of Green
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Services
Tools and Analyses

CPGreen's building simulation services are designed to help architects and engineers evaluate energy use and occupant comfort at the drawing board.

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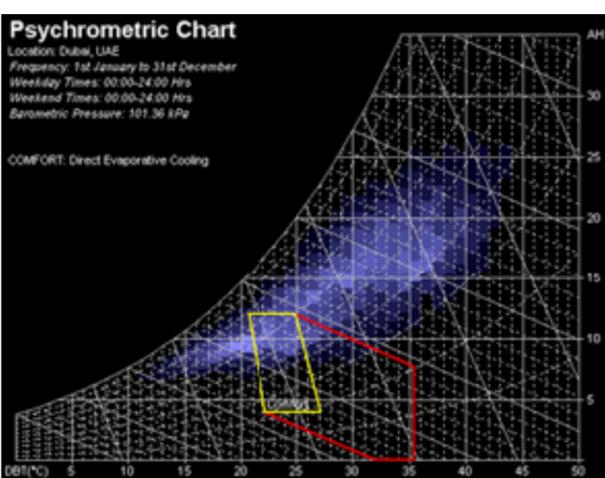
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Climate Analyses

Green design begins with appropriate response to climate. With our global weather database we are able to assist with over 3000 locations worldwide. The chart, for instance, shows weather in Dubai for a typical year – hourly coordinates of temperature, relative humidity and wind speeds marked in blue. Against this psychometric plot, any design strategy, say evaporative cooling, can be assessed for its impact on human comfort (red zone extending from the yellow box). This tool communicates in visual language, for how much of the year any design strategy is likely to work in a particular location.
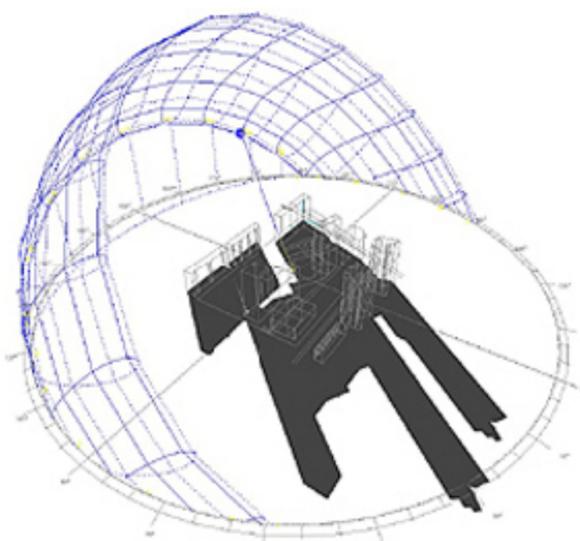
Dubai weather, in blue, is superimposed on a Psychometric Chart. Conditions for human comfort, delineated by yellow box, are extended into the red zone by applying the passive strategy of evaporative cooling

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Shadow Casting and Shading Analyses

Click on the image below to open a window and drag your cursor over the scroll bar to animate the sunpath diagram

This tool calculates the precise position of the sun at any time of the day/year, anywhere in the world. It yields 3-D images of any given building and the shadows it casts, based on the geometry of the sun's path over its location. In the images shown, sun-path analysis for condominium in Beijing helped determine location and size of windows and sunshades. The objective here was to reduce heat load in summer and increase it in winter, thereby minimizing the need for mechanically induced comfort.
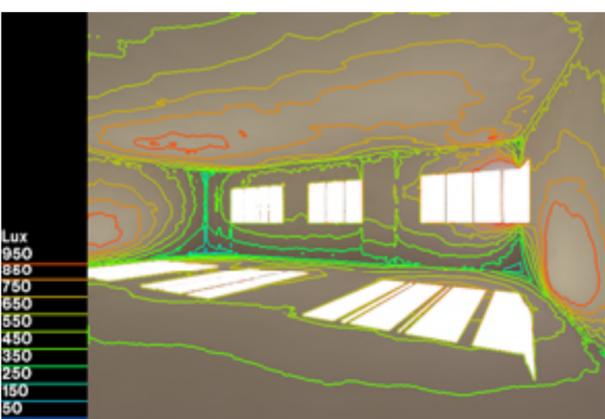
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Shadow casting analysis for a development in Beijing was used to identify areas on the ground plane that receive sunlight in winter

Solar Insolation

Solar insolation offers a snapshot summary of full-year radiation falling on a surface. The images shown for a tertiary institution in Singapore raise several questions: how much of the space between the blocks is exposed to sunlight; how will this affect the usefulness of these outdoor spaces; at the more exposed areas, might landscaping be used to reduce heat build-up?

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Solar insolation diagrams illustrate the total solar load on a surface in the course of a year, assisting landscape design

Illuminance

CPGreen has light-modeling software used to predict illuminance levels within the building. Shown here are outputs for an office space in Singapore. The architect requested assessment of two sunshade options. With our analysis, we were able to shed light on which is likely to work better for various times of the day and year.
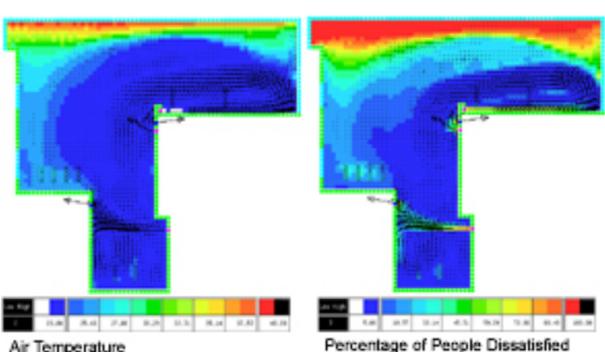
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Illuminance delivery can be assessed in any space, combining the effect of natural and electrical light sources, and summarised as Lux contour diagrams

Thermal Transmission and Stratification

Heat flows in and out of a building through its envelope, its HVAC systems, via occupants and equipment such as desktop computers. This pattern of thermal transmission and stratification helps in decisions about the envelope, placement of HVAC supply and return points. In the Singapore History Museum project, for instance, architects have designed an atrium with a vast surface area of glass in contact with the tropical exterior. Heat stratification and occupant comfort outputs were generated for a range of envelope glass options and varying positions of air conditioning outlets.

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Thermal stratification outputs illustrate the build-up of temperatures across a space, plus offer a prediction of impact on occupant comfort