FORM MEETS FUNCTION

Innovative and Sustainable Design at the Heart of Wisconsin Institutes of Discovery

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Conventional wisdom suggests that buildings with significant amounts of glass, while visually appealing inside and out, have major downsides for heating and cooling – especially in harsh climates. The building that houses the twin Wisconsin Institutes for Discovery (WID), however, is a sustainable departure. The public Wisconsin Institute for Discovery and the private Morgridge Institute for Research, now under construction and scheduled to open in late 2010, make extensive use of glass in a well-planned environmentally conscious design.

However, it is more than just glass that makes these buildings special. The manner in which the building spaces are organized not only works with the environment, but is also meant to encourage new ideas and interaction amongst research teams. The four-story building will encompass about 300,000 square feet of research/laboratory space - including wet and dry laboratories, research support areas, offices - and public areas.

From the very beginning, WARF and the Donors, John and Tashia Morgridge, along with the UW, have been committed to sustainable design and construction. One of the key goals is for this building is to consume 50% less energy than older UW-Madison laboratory/research facilities. But this building is more than just a hallmark of sustainable design and energy innovation – it is first and foremost created to provide a spark for creativity and ongoing interaction amongst researchers. The design innovation that meets both the sustainable and functional aspirations begins with nesting, a departure from the manner in which nearly every other research structure is organized.
NESTING AND THE ORGANIZATION OF SPACE

The building is organized around three “nested” pods of laboratory space on the upper floors, and a large “nested” meeting space on the ground floor. Radiating from these centers are offices, conference rooms, and public spaces – plus a stack of teaching labs on one corner. This is depicted in the following diagrams:

This functional arrangement encourages the chance interactions that spark creativity – while at the same time nesting the spaces that are most affected by climate within the deepest layers of the building. In addition, spaces least affected by climate are on the outside edge of the building and serve as buffers.

To make the nesting concept most effective, the designers incorporated a great deal of permeability for the general public in and out of the buildings – without compromising laboratory security. This gives the scientists unrestricted views to the outside, while also affording the public the opportunity to see and experience the evolution of science – the actual work taking place. The public is encouraged to come in and to enjoy the town center - and see the labs in a very unique way.

THREE BUILDING SKINS BUFFER LABS

In a research building, laboratories are the most resource intensive. Other areas in which people work, such as offices, are less sensitive to external circumstances, and finally, the least sensitive areas are the transitory spaces in which people pass through or areas that are occupied periodically. In this building, three separate layers of building “skin” provide a buffer between the laboratory spaces inside and the outside environment. These skins include an exterior wall skin, a floor plate skin, and a laboratory pod skin that effectively create the physical nesting strategy.
This design is a departure from convention - in which the transitory spaces are in the middle or at the ends of the buildings, or along one side, and not serving as a wrap-around buffer.

The diagram also depicts the ground floor “town center”, expressly included to facilitate interaction between the various research communities and others. Included in the town center are a garden, restaurant, and atrium. Productive science and research occurs at the interaction of social networks, as much as it occurs by virtue of individual discovery. By creating a functional pattern in the building that encourages chance interaction amongst scientific peers, better scientific results are more likely.

**PLANNING WITH THE TRIPLE BOTTOM LINE**

The Triple Bottom Line (TBL), initially formulated by John Elkington in Cannibals with Forks: The Triple Bottom Line of 21st Century Business, is a tool broadly used by many corporations to measure the economic, social and environmental performance of an enterprise.

The application of TBL analysis has been used for more than a decade in overall business strategy and planning, but it is a new application of TBL thinking when applied to building design and construction. The WID team used the TBL to holistically evaluate the proper amount of glass in terms of the social benefits, the economics - installation and operating costs – and the physical resource requirements associated with it. At the outset of the analysis, the team felt intuitive tensions between these factors.

The TBL analysis yielded surprising and sometimes counterintuitive results. For installation - glass did not represent a significant cost premium beyond that of a solid high performance wall. For energy – simulations showed that the energy use resulting from by a combination of double and triple glazing will be a negligible 3-percent of the total resource demands of the building. From the social perspective, it is no secret that human comfort and performance are strongly influenced by a visual connection to the outdoors. And, the further one is from a window, the bigger it needs to be for one to feel as though they have that connection. The large floor plates inherent to the design dictated that the building should have significant glass - so the inhabitants would feel good about where they are working.

The analysis also yielded a surprise – that the amount of glass had very minor quantitative “day lighting” benefit. While socially beneficial, the net amount of energy saved by dimming lights when daylight is available is negligible in this case.

This is how TBL principle was applied to the building planning process. In summary, the costs of using extensive glass were relatively neutral, the environmental footprint was relatively small, and the social benefit was large.
This conclusion is summarized below:

Physical Not a Critical Driver
- w/ “Skin to Plan” Aspect Ratio < .3 Range

Social & Economic Factors
- Balanced in Favor of Social

The results of this analysis can be generalized to other settings. While conventional wisdom holds that glass area should be minimized on buildings in harsh climates, those with low “skin to plan” aspect ratios (in the case less than 0.50) may be the exception.

"Skin to Plan" Aspect Ratio = Area of Exposed Vertical Surface / Gross Floor Area

THE DRIVE TO DISCOVER

The WID will create new avenues of discovery while challenging and stretching the boundaries of knowledge. The institutes will: engage investigators desire for discovery in a design built for inspiration and creativity; and, provide new avenues for investigators to develop solutions to improve human health and welfare. The Wisconsin Institute for Discovery and the Morgridge Institute for Research will defy the commonplace, and most certainly, conventional wisdom. And they will do so in a building that sets the standard for sustainable development.