

Integrated Building Design (PS-01-09)

The Illuminating Engineering Society advocates the use of Integrated Building Design because, in comparison to other more compartmentalized models of building design, it has the greatest potential to lead to buildings that are cost-effective, resource-efficient, and comfortable for the end users.

Integrated Building Design is a holistic approach to the design of the built environment. It is driven by collaboration between specialized professionals in fields such as architecture, lighting, HVAC, power distribution, interior design, acoustics, landscape design, structures, and construction. Integrated Building Design projects may be large or small, new construction or renovation, and of any architectural style.

As an example, consider daylight in buildings. Successful daylighting balances many considerations, including: the shape of the building; orientation on the building site; the size, placement, and materials used for skylights, windows, and shading devices; furniture layouts; both interior and exterior surface reflectances; and electric lighting integration. Decisions related to each of these items affect multiple building systems and, in the best case, inform the design decisions made by professionals that are specialized in different disciplines. For example, the massing and shape of the building is central to the building's aesthetic appeal. But it is also responsible for the thermal loading and the design of the building mechanical systems, and it is central to the availability of daylight within the building interior. When integration is a foremost goal, available daylight will influence the design of the electric lighting system, the sizing of mechanical equipment, the occupants' access to views, and the design of the building control systems.

Daylight considerations might also affect the landscape design. For example, the use and placement of deciduous and coniferous trees may be employed to alter the direct sunlight striking the building, and the choice and placement of roof materials, paving materials, ground plantings, water features, walls, trellises and other landscape elements will influence the daylight that is reflected onto (and into) a building.

Likewise, interior design decisions such as furniture choice and placement, as well as surface reflectances, influence the way that daylight is reflected within the interior and resulting occupant comfort. For example, the occupant could suffer from visual fatigue caused by frequent transient adaptation if there is excessive contrast between surfaces within their field of view. Furthermore, the sources and distribution of daylight and electric light will affect the color, appearance and maintenance of interior materials. Thus, the design of an appropriate luminous environment—which includes a comfortable balance of luminance between windows and walls, and between visual tasks and surrounding areas—demands collaboration between the interior and lighting design professionals.

Interrelationships like those identified above are embraced when design professionals take an integrated approach. They are seen as opportunities to create high quality buildings while recognizing that individual contributions are more likely to be fully realized through cooperation. Professionals committed to Integrated Building Design help to ensure that all systems are optimized for the whole building performance goals, rather than on the more limited criteria within their own industry.

Integrated Building Design has gained traction with the rise of sustainable design, a renewed focus on energy efficiency, and the emerging interest in high performance buildings. Integrated Building Design spans the entire design process, from Programming through Schematic Design, Design Development, Contract Documents, Bidding/Negotiation, Construction, Commissioning, and finally Occupancy.

Integrated Building Design is a process of structured decision making that begins with Programming. It is not a specific outcome, nor is it a rigidly prescribed methodology. An effective way of initiating the process is with a charrette, which is an intense collaborative session that brings together the owner, all expertise within the design team, and other stakeholders to collectively set goals and identify strategies for achieving the desired outcomes. Integrated Building Design is rarely successful if it does not begin with project conceptualization. The inclusion of each specialty within the design team early in the design process ensures that integration issues can be coordinated and prioritized. It is unrealistic to expect a building to exhibit exceptional systems integration if the team members do not design the building using collaborative methods and focus on shared goals.

The use of Building Information Modeling (BIM) promises to greatly facilitate the Integrated Building Design process. BIM is a set of coordinated data-rich computer tools. BIM models encompass building geometry, spatial relationships, geographic information, and quantities and properties of building components that allow for detailed analysis and performance simulation. In the best case, BIM models are developed collaboratively as part of Schematic Design and Design Development, are then used to generate Contract Documents that are used for Bidding and Negotiation, which are then used for Construction. BIM allows for the possibility of more integrated design because many design professionals can share information and concurrently apply their discipline-specific knowledge to a single model. This stands in contrast to the more conventional design process that relies on sequential hand-offs from one specialization to the next. In comparison to the conventional method, BIM modeling has the potential to reduce errors, streamline design costs, and improve building performance by making it easier to identify and develop synergies that will lead to high performance buildings. Although BIM modeling has not yet reached a stage of maturation to permit full lighting analyses and complete systems integration, IES supports the concept and the further development of this capability.

Integrated Building Design is a process with the potential to result in high performance buildings that have harmonious systems that are greater than the sum of their parts. IES supports this collaborative and integrated approach because the potential synergies are in the best interest of building owners, design professionals, and the public.

About the Illuminating Engineering Society

The IES is a collegial community dedicated to improving the lighted environment. The IES is composed of a diverse membership, all with an interest in and a dedication to good lighting. 25% of the membership is involved in manufacturing (lamps, sources, luminaires, accessories); another 25% is composed of lighting designers and architects. The remaining 50% is composed of consultants, electrical and building contractors, distributors, and wholesalers, individuals working in affiliated lighting fields, those working for utilities and energy services, and people in government and education. Over one thousand of these members serve on committees, most serving on the Society's document development committees; these committees develop standards, design guides, technical memoranda, lighting energy management materials, guidelines and lighting measurement, testing and calculation guides.