**WHAT IS AN INTELLIGENT BUILDING**

Over the last 20 years, there has been a lot of discussion and debate about the concept of an “intelligent building.”  Work has gone on in many forums to define and quantify what the term really means. The end result of all of these efforts is that an intelligent building is not just one thing. My definition of intelligent buildings is as follows:

**“Use of technology and process to create a building that is safer and more productive for its occupants and more operationally efficient for its owners.”**

The results from implementing these technologies and processes are buildings that cost less to operate and are worth more to their occupants. For projects that are owner occupied, such as corporate, government, and institutions, the benefits of an intelligent building provide an immediate ROI in terms of higher employee productivity and reduced operating expenses. For commercial developments, these projects are expected to result in above market rents, improved retention, higher occupancy rates, and lower operating expenses.

Let’s start by looking at the design process for intelligent buildings. The decision to make a project “intelligent” needs to come early in the design process. Making the decision to create a new project or retrofit an existing one to make it intelligent is similar to what goes into creating a LEED®-certified project. There needs to be a commitment from the owner and their design team to invest in a project with superior performance and value. Once this occurs, the design process can continue as usual. But it is important to keep the focus on creating a superior project and avoid the temptation to “value engineer” out the intelligent components.

**PROJECT SCOPE AND PURPOSE**

One of the first attributes in an intelligent design is to carefully evaluate the current and future use of the project. This starts by clearly identifying the purpose and needs of the targeted building occupants. This process will vary depending on whether it will be an owner occupied or a commercial development. For an owner-occupied building, surveys and focus groups can be held with the building occupants, analyzing and prioritizing their needs to select proper project features. For a commercial development, the project target market needs to be identified and attributes designed to suit. For example, an office building might target technology companies that would benefit from an urban environment, high-speed network access, and 24/7 availability.

It is important to realize, however, that few projects are used as originally envisioned. A good intelligent design should incorporate flexibility to allow for easy change. Examples of this type of design characteristic include CLA (communications, life safety, automation), structured cabling design, and open space with movable or demountable partitions. An intelligent building needs to be designed to meet the needs of initial occupants and be flexible to meet the needs of future occupants.

**CONCEPT AND BUDGET**

When setting initial project budgets, intelligent attributes must be included. Creating an intelligent building does require an investment in advanced technology, processes, and solutions. An upfront investment is required to realize a significant return later on. It is unrealistic to expect to make a project intelligent unless there is early buy in on investment. Again, these decisions need to happen prior to the start of design work. One of the challenges is to educate owners on the benefits of an intelligent building design. Waiting until the MEP is brought on to the design team may be too late. This makes the education of both owners and architects about the benefits of intelligent solutions critical for success.

**ENVIRONMENTAL DESIGN**

An intelligent building starts with an environmentally friendly design. Creating a project that is environmentally friendly and energy efficient ties in closely with many of the intelligent attributes. Intelligent buildings are designed for long-term sustainability and minimal environmental impact through the selection of recycled and recyclable materials, construction, maintenance and operations procedures. Providing the ability to integrate building controls, optimize operations, and enterprise level management results in a significant enhancement in energy efficiency, lowering both cost and energy usage compared to non-intelligent projects.

Intelligent buildings are intended to be the preferred environment for occupants. This requires focused attention to environmental factors that affect occupants’ perception, comfort, and productivity. An intelligent design finds the balance, providing a superior indoor environment and minimizing energy usage and operating labor. This is where the technology becomes valuable. Using integration and automation we are able to implement solutions that both provide a superior environment and minimize energy (Table 1).

**USGBC LEED**

The USGBC LEED program provides an excellent mechanism to promote, measure, and quantify environmental and energy efficiency in both new and existing projects. There is a very strong synergy between an intelligent building design and a LEED-certified design. Intelligent buildings demand reduced energy usage through optimization, system integration, and enterprise applications. LEED certification requires energy efficiency, monitoring, validation, and control of all building systems. The goals and benefits of LEED and intelligent building design go together arm and arm. An intelligent building program should start with LEED certification and work to improve the building beyond that.

**BUILDING MODELING**

An intelligent design needs to start with a complete model. This modeling begins early on with CAD designs that evolve into project renderings. Using new standards such as AEC-XML and GB-XML, this information can readily be shared with HVAC and other system models. Modeling of an intelligent building will be used not just in design, but will continue into construction and operation.

In the past, building modeling has been widely used as a design tool and often for construction as well. In an intelligent building we would expect that this model will be used by new sophisticated tools that will actually be able to use the original modeling information to make decisions about optimization and continuous recommissioning of critical building systems. Ideally, the model will follow through the lifespan of the building, be updated as necessary and serve as a digital document of the building.

**CONCLUSION**

The goal of having an intelligent building only starts with early planning in the design stage. In many ways, this mirrors the design and fulfillment of many green or LEED projects today, but it uses technology to provide for a superior space. There are enormous benefits to be gained by creating intelligent buildings.

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| **FEATURE** | **BENEFIT** |
| Dimmable fluorescent lighting integrated with sun blind control | Optimal lighting level and quality can be determined by the occupants. |
| Lighting control with motion sensors integrated with security | Only provide lighting as needed. Reduces energy use and increases security. |
| Natural and displacement ventilation. | More efficient and effective distribution of ventilation. |
| Use of economizers for free cooling. | Energy efficiency. |
| Individual temperature and lighting control. | Improved comfort is shown to improve productivity. Addresses the number one concern of tenants as found in BOMA surveys. |
| Radiant heating and cooling. | Improved comfort, reduced energy use. |
| Optimized control algorithms. | Reduce energy use with little or no impact on comfort. |
| Combined heat and power plants. | Improved energy efficiency and sustainability. |
| After hours control of lights and HVAC integrated with security. | Improved security while reducing energy use. |
| Monitoring of IAQ and contaminants. | Improved comfort, safety, and productivity. |

***TABLE 1. Examples of how technology helped provide energy efficiency and a superior environment.***