The category of Integrated Sustainable Building Design (ISBD) is intended for undergraduate and/or graduate students of mixed disciplines with enough training to work collaboratively on the building, mechanical and electrical design. ASHRAE recommends that the team for the ISBD consist of at least three members with education covering architecture/construction, mechanical (HVAC&R) engineering, and electrical engineering.

These multidisciplinary teams will be expected to schematically design an energy efficient, sustainable project approaching a Zero Net Energy building with minimized energy demands for HVAC and all other technical systems that could be satisfied with locally available and/or building installed Renewable Energy Sources (RES). Students are asked to satisfy ASHRAE Standard 189.1 and then implement RES to approach Zero Net Energy if possible.

The fundamental goal of this design competition category is to encourage students to obtain experience in the ISBD process. Architects and engineers should work together from the very beginning to determine building orientation, layout, materials, mechanical systems, and electrical systems that meet the client’s needs and work with the surrounding environment to minimize energy consumption. Additionally, special attention should be given to sustainability, i.e. the needs of the future shall be as (or more) important as the needs of the present when designing the building layout and integral systems. The judging criteria will be centered on ASHRAE Standard 189.1; thus, areas of judging shall include *Site Sustainability*, *Water Use Efficiency*, *Energy Efficiency*, *Indoor Environmental Quality*, the *Building’s Impact on Atmosphere-Materials-Resources*, *and Construction and Plans for Operation*. ASHRAE student teams must locate the building in Prince George, British Columbia, Canada.

**DO NOT MOVE THE BUILDING TO ANOTHER AREA.** Teams that relocate the building to another location will be disqualified.

**Specific Design Guidelines**

Design Teams should imagine an Owner has approached them to schematically design a new building as described in the Owners Project Requirements. The Owner wishes to determine what building site layout, envelope construction, mechanical system, and lighting schemes produce the best life cycle cost over the life of the building. Design Teams should focus on “big picture item” energy design, for example the pros/cons of the envelope construction or outside air energy savings strategies over detailed design items like specific air handler design, ductwork layouts, and mechanical room layouts or where specific areas of the building are located in the final design.

Typically, preliminary design is mostly schematic and overall building energy reduction strategy focused. Final architectural layout of the building is typically secondary to meeting the energy goals of the building.  If a design team has specific recommendation on improving the building layout to increase energy savings, however, they are free to rearrange the building layout. Provide justification for all floor plan changes in the project submittal.

Additionally, in order to further develop the Owners energy goals, the Owner also wishes the design team to imagine, develop, and document in their report Energy Conservation Measures (ECMs) the building could use to further enhance the energy performance. Some of these ECMs may include solar hot water, airside energy recovery or other mechanical system upgrades, LED lighting, and other similar type ECMs. Design Teams are encouraged to develop their own ideas and prove to the Owner design enhancements above the minimum required which will be beneficial not only on the energy performance of the building but also pay for themselves in a reasonable life cycle cost analysis. An example of this type of preliminary schematic analysis is included in “It is not expected that Design Teams perform an Energy Charrette, but this document gives a good example on how to approach schematic energy performance of a new building and report the results to an Owner.

**Architectural**

The design should be connected to the site, be of appropriate scale, and minimize its impact on its surroundings. The team should adequately describe the selected site; each team should select an appropriate site for their project consistent with sustainable site selection practices such as those in ASHRAE Standard 189.1.  
   
The building envelope shall conform to ASHRAE Standard 189.1 as a minimum, this includes (but is not limited to) glazing, walls, roofs, fenestration, and foundations. The basic layout of this building is detailed in the accompanying Owners Project Requirements, which can be found on this webpage.

The interior wall construction shall be sensitive to noise transmission such that minimal noise shall be transmitted from one space to any adjacent space. If elements of the building are not clearly defined, refer to ASHRAE Standard 189.1 for required properties.  Aesthetic appearance is important; building systems (mechanical and electrical) shall not be visible from the street or neighboring buildings if possible.

Per ASHRAE Standard 189.1, the building is classified as Long Life, thus the sustainable life cycle analysis shall be 50 years and all building design decisions shall be based on this assumption. This assumption shall also be integral to decisions on building orientation, shape, envelope construction and materials, and systems within the building to maintain functionality, purpose, and energy efficiency.

The team shall include, per ASHRAE Standard 189.1, integrated combinations of building shading and natural day lighting to reduce electrical loads within the building. Additionally, teams shall include as a minimum the mandatory space requirements for photovoltaic power per Standard 189.1 in an effort to reduce peak electrical demand and annual electrical consumption. Per Standard 189.1, teams shall illustrate how the building will shave 5% of the peak electrical load through a combined balance of architectural, mechanical and electrical design, while still maintaining the comfort levels of occupants, per ASHRAE Standard 55, within the building.

**MEP Systems**

The minimum team goal is to meet ASHRAE Standard 189.1 levels of efficiency. Teams shall include illustrations of projected annual building energy consumption (including plug load), this annualized energy consumption shall be shown in *Energy Use Intensity* (EUI) value units of kBtu/ft2 or Mj/m2.

Teams shall illustrate their mechanical and electrical systems of choice such that examples of energy efficiency meeting (or exceeding) ASHRAE Standard 189.1 are included. Demonstration of acceptable Indoor Environmental Quality shall also be included; examples could include (but are not limited to) human comfort, ventilation effectiveness, and building air pollutant control. An ASHRAE Standard 55 and Standard 62.1 analysis should be included with the project submission.

Lighting levels within ASHRAE Standard 189.1 shall be maintained or exceeded, demonstration of this shall be illustrated by each team. Inclusive of the lighting level control shall be all outside lighting to illustrate the reduction of backlight, up-light and glare (BUG) to the building site. Teams shall include examples of lighting level control (occupancy control, daylight control, etc.) to illustrate reductions in overall building energy footprint.

**Sustainability**

Per ASHRAE Standard 189.1 teams shall include a “Plan for Building Operation.” Teams shall develop a means for the building owner to document steps during the construction phase, commissioning phase, and operational phase which will provide a sustainable performance plan for the building, its functionality for occupants, and its EUI performance for the future. Teams shall include examples from Standard 189.1 on how this would be implemented and maintained for future utilization.  Per the performance option of the Energy Efficiency section of Standard 189.1, teams shall illustrate annual building production of CO2 emissions from utility consumption.

**Utility Usage and Life Cycle Considerations**

Grid supplied electricity, natural gas, city water, and city sewer shall follow the “*Utility and Service Life Overview*” document.  
  
Life Cycle Factors shall include escalation, inflation, return on investment rate, and life span per the “*Utility and Service Life Overview*” document.

**Design Parameters and Assumptions**

Refer to the Owner’s Project Requirements for design parameters and assumptions.  Assumed people activity and related impact on building thermal loads shall follow ASHRAE Standard 55 and the Fundamentals handbook, the team shall illustrate the assumed levels of people activity and its impact on the building heating and/or cooling load.

If specific information on room populations is not available, Design Teams should assume the default populations as indicated in ASHRAE 62.1.

Building structural, architectural, mechanical, and electrical elements shall conform to ASHRAE Standard 189.1 as a minimum. Teams have the freedom to exceed this standard.