INTRODUCTION

Integrated Sciences Building, Philadelphia, Pennsylvania is a 6 story, 130,000 ft² building. The estimated construction cost is $460/sq.ft.

Integrated Sciences Building is described as follows:

Multi-story academic laboratory building with teaching and research laboratories, faculty and administrative office suites, first floor auditorium and classrooms (shared university use), student study and lounge spaces.

The client is Drexel University. The architect is Diamond and Schmitt Architects, Inc. The mechanical engineer is CEL International, Inc., the electrical engineer is CEL International, Inc. and the structural engineer is Halcrow Yolles.

Summary of Your Achievement: Integrated Sciences Building achieved an overall rating of 57%.

To find out how the performance of Integrated Sciences Building compares to other buildings that have been assessed, and to obtain certification, the data must be verified by a licensed engineer or architect who has undergone the Green Globes training and certification.

Percentage of points achieved by Integrated Sciences Building for each module:

<table>
<thead>
<tr>
<th>Module</th>
<th>Percentage Scores</th>
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</thead>
<tbody>
<tr>
<td>Management</td>
<td>100%</td>
</tr>
<tr>
<td>Site</td>
<td>66%</td>
</tr>
<tr>
<td>Energy</td>
<td>46%</td>
</tr>
<tr>
<td>Water</td>
<td>52%</td>
</tr>
<tr>
<td>Resources</td>
<td>28%</td>
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<tr>
<td>Emissions</td>
<td>96%</td>
</tr>
<tr>
<td>Indoor Environment</td>
<td>68%</td>
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PROJECT MANAGEMENT POLICIES AND PRACTICES Rating Earned: 100%

This section evaluates the extent to which an integrated design process and a team approach have been used to generate design solutions that will meet the needs identified in previous stages of the project delivery process. It also addresses the purchasing policy and development of commissioning documentation and an emergency response plan.

Integrated Sciences Building achieved a score of 100% on the Green Globes™ rating scale for its integrated design process, integration of environmental purchasing, a commissioning plan and emergency response plan.

Integrated design process
Summary of Your Achievements
  An integrated design process was used for the design development.
  A team approach was used throughout the progressive stages of the design process. It involved collaboration of
the architect, engineers, consultants, and other stakeholders. Green design facilitation was used to support integration of energy and environmental considerations throughout the design stages.

Environmental Purchasing
Summary of Your Achievements
Aspects of green specifications have been incorporated (e.g. interior finishes with recycled content, recycled steel see 016113 other products refer back to spec.). Environmental purchasing has been integrated, including the procurement of energy-saving, high-efficiency equipment.

Commissioning Plan - Documentation
Summary of Your Achievements
A best-practice, project commissioning plan is being implemented that includes the following:
• A Commissioning Authority has been engaged.
• “Design Intent” and “Basis of Design” documentation has been reviewed.
• Commissioning requirements are included in the Construction Documentation.
• A Commissioning Plan has been developed.

Emergency response plan
Summary of Your Achievements
Division 1 includes the project's environmental goals and procedures with regard to emergency response. The response plan will be in place prior to project start-up to mitigate the likelihood of environmental emergencies occurring on-site during site preparation or construction.

SITE Rating Earned: 66%

This section evaluates the design strategies for optimal use of the site based on information about the site, and in response to the requirements set out at the previous stages of the project delivery process.

Integrated Sciences Building achieved a score of 66% on the Green Globes™ rating scale for the site design and enhancement measures to minimize the building's impact on the site.

Development area
Summary of Your Achievements
The building is constructed on an existing serviced site.
The building is constructed on a site with a development density of at least 14,000 m²/ha (60,000 ft²/acre).
The building is constructed on land that is neither a wetland nor a wildlife corridor.
The design accommodates the building's functions while minimizing disturbance to the site's topography, soils and vegetation.

Minimization of ecological impact
Summary of Your Achievements
Erosion control measures are in place in accordance with best management practices (BMPs) to protect the site during construction as well as over the long term.
High albedo materials (reflectance of at least 0.65 and emissivity of at least 0.9) on at least 75% of the roof surface will reflect heat and avoid creating a heat island.

Opportunities for improvement
The design should provide natural cover such as trees, shrubs or vines to shade at least 35% of impermeable surfaces of the property (or approximately 1 tree for every 1,000 ft² of impermeable surface.)

Specify measures to prevent obtrusive exterior lighting by designing interior and exterior lighting so that zero direct-beam illumination leaves the building site. Provide an exterior lighting design plan that meets the luminance requirements in the IESNA Recommended Practice Manual: Lighting for Exterior Environments RP-33-99 and that minimizes glare, light trespass and sky glow. Reduce collisions of birds with buildings by making glass visible to birds.

Enhancement of watershed features
Summary of Your Achievements
- Storm water run-off will be controlled to prevent damage to the building and vegetation, and to minimize run-off into waterways.
- Run-off from the roof will be controlled and directed to a pervious area.
- The pre-development ratio of pervious to impervious area was 65. The post-development ratio of pervious to impervious area will be 31.

Enhancement of site ecology
Summary of Your Achievements
- The site-planning documents specify a naturalized landscape using native trees, shrubs and ground cover, with minimal lawn.

ENERGY Rating Earned: 46%

This section evaluates the design strategies to minimize the building's energy consumption using the site's features and microclimate, space optimization, the integration of energy-efficient systems and renewable energy, and alternatives to automobile transportation.

Integrated Sciences Building received a score of 46% based on the assessment of best-design practices and energy performance on the Green Globes™ rating scale for energy efficiency.

Building energy performance
Integrated Sciences Building achieved a sub-score of 0% for its energy consumption. Energy consumption target figures were not entered.

Energy demand minimization
Summary of Your Achievements
- Space optimization
  - The floor area has been optimized to efficiently fulfill the building's functional and spatial requirements while minimizing the amount of space that needs to be heated and cooled (i.e. consolidated laboratories for similar functions. Utility and service rooms are vertically stacked. Shared and public space also vertically stacked.)
  - The construction process will be phased.
- Integration of daylighting
  - The amount of daylighting is optimized through building orientation and window-to-wall size ratios (i.e. All rooms will have daylight, skylights in the atrium, offices have windows into the atrium catching the light.)
  - The indicated visible transmittance(VT) of the window glazing is 0.63.
Building envelope
The thermal resistance of the exterior enclosure meets Building Energy Code levels. The reported thermal resistance (R) of the exterior wall is 9 and of the roof is 31.
Window glazing with a low U value and window treatments that enhance interior thermal comfort are specified. The indicated U value of the window glazing is 0.3.

There are measures to prevent groundwater and/or rain penetration into the building.
The integrity of the building envelope is optimized, using best air/vapor barrier practices:
• air barrier materials meet the requirements of local and national building codes
• drawings provide air barrier detailing between components of the building envelope and around penetrations
• field review and testing is required for air and vapor barrier systems

The building design and construction prevent the “stack effect”.

Opportunities for improvement
Response to microclimate and topography
Site and orient the building to optimize the effect of microclimatic conditions for heating or cooling.

Ensure that the building orientation and site topography provide natural control of snow deposition and help to minimize thermal losses due to wind-driven infiltration.

Include measures to maximize natural ventilation and cooling or to integrate hybrid ventilation. These might include, operable windows, trickle vents, openings located to catch prevailing breezes, or horizontal pivot windows. Consider the room depth and height ratios and the possibility of open floor plans to optimize cross-ventilation.

Integration of daylighting
Provide specifications for daylighting systems, integrated electrical lighting and daylighting control systems. An account of the daily and seasonal variations should be included in the construction documents. Provide the modeling results and manufacturers’ information on the lighting controls. Develop an operating manual to ensure that appropriate adjustments can be made to the lighting systems to account for daily and seasonal changes.

Building envelope
Detail the continuous air/vapor barrier and show how it will avoid thermal bridging, provide thermal comfort to the occupants and prevent condensation in the building. Include product data on air/vapor barrier materials.

Energy metering
Specify the sub-metering of processes which are considered major energy consumers (i.e. any area, system, group or item of equipment that uses over $2,000 worth of fuel per year (typically 20,000 kWh of electricity, 25,000 ft³ of gas, or 2,000 G of oil), such as lighting, motors, hot water heaters, boilers, fans, the cooling and humidification plant, computers and catering facilities. Provide a summary of the instrumentation and controls for the equipment monitoring categories, highlighting the I/O data points. Provide manufacturers’ information on sensors and the data collection system used to provide continuous metering.

Energy-efficient systems
Summary of Your Achievements
The building's energy efficiency is increased through the use of energy-efficient equipment. The design includes the following:
• Energy-efficient lighting fixtures, lamps and ballasts
• Energy-efficient HVAC equipment
• High efficiency chillers
• Building automation systems
• Variable speed drives
• Energy-efficient motors
• Energy-efficient elevators

Opportunities for improvement
Consider integrating the following energy efficient equipment:

• Lighting controls
• High efficiency (modulating or condensing) boilers
• Energy-efficient hot water service systems

Renewable sources of energy
Opportunities for improvement
Consider integrating renewable energy sources. Provide details of the complete system and calculations that demonstrate the renewable energy contribution.

Energy-efficient transportation

Summary of Your Achievements
Public transport/car-pooling
Public transport is easily accessible, within 0.3 miles and with service at least every 15 minutes during rush hours. There will be reasonable access to alternative-fuel re-fueling facilities.

Cycling facilities
Safe, covered storage areas with fixed mountings for securing bicycles against theft are included in the design.

Opportunities for improvement
Public transport/car-pooling
Include features that will promote car/van pooling, such as sheltered waiting areas and priority parking.

Cycling facilities
Indicate in the construction documents, changing facilities or separate or enlarged washroom facilities for building tenants and staff. Locate the facilities near the route to the bicycle storage area. Provide facilities for hanging and drying clothes.

WATER Rating Earned: 52%

This section evaluates the design strategies to conserve treated water and minimize the need for off-site treatment of water.

Integrated Sciences Building achieved a score of 52% on the Green Globes™ rating scale for water consumption and measures to minimize its use.

Water performance
Summary of Your Achievements
The building will reportedly achieve the water consumption target of Less than 1150 gallons/student/year.

Water-conserving features
Summary of Your Achievements
Opportunities for improvement

Minimal consumption of potable water

The design includes the following of water-efficient equipment:

- water-saving devices or proximity detectors on urinals
- low flush toilets (less than 6 L)
- water-saving fixtures on faucets (4 L/min) and showerheads (9.0 L/min.)
- other water-saving appliances

Minimal use of water for irrigation

The specified landscaping uses plants that are able to withstand extreme local weather conditions, and that require minimal irrigation.

Opportunities for improvement

Minimal consumption of potable water

In addition to a water meter to measure the total amount of water supplied to the building, major water consumption operations such as boilers, cooling tower make-up lines, water-cooled air-conditioning units or special laboratory operations, should also be individually monitored.

Minimal use of water for cooling towers

If air-conditioning is to be used, specify air-cooling towers where feasible. Alternatively, select cooling towers that minimize the need for make-up water, and features that will conserve water such as an automatic control (to shut off the unit when the facility is unoccupied such as at night or on weekends, or to operate it concurrently with chillers); automated blowdown systems (so that blowdown is done only as needed, rather than routinely); conductivity probes (to measure the total dissolved solids so as to minimize the blowdown cycle); delimiters (to reduce drift and evaporation); and water meters (to measure water that is not discharged to sewage system, such as water that has evaporated from the cooling tower). Provide manufacturers’ data and proven-in-use documentation.

Minimization of off-site treatment

Consider integrating a graywater collection, storage and distribution system. Provide design drawings and specifications documentation for the system.

Where feasible, integrate a biological waste treatment system for the site and building such as peat moss drain fields, constructed wetlands, aerobic treatment systems, solar aquatic waste systems (or living machines), and composting or ecologically-based toilets. Another alternative to conventional septic filtration is the Waterloo Biofilter.

RESOURCES, BUILDING MATERIALS AND SOLID WASTE

This section evaluates the selection and specification of environmental requirements for construction materials. Documentation to ascertain the environmental sourcing of materials such as timber and timber products, blocks, bricks, plasterboards, paints etc. used on the project should be available.

Integrated Sciences Building achieved a score of 28% on the Green Globes™ rating scale for managing resources through waste reduction and site stewardship.

Systems and materials with low environmental impact

Opportunities for improvement

Specify materials with low embodied energy. Provide evidence that the foundations, floor, structural system (column and beam, or post and beam combinations), roof and envelope (cladding, windows etc.) assembly materials have undergone a life cycle assessment. The specifications should reflect the results of the “best run” life cycle assessment of the building's materials. “Best run” here means the specification with the lowest life cycle impact out of the number of
the alternatives investigated. In Division 1, state the project's environmental goals and the general environmental procedures with regards to material selection and specification.

Materials that minimize consumption resources
Summary of Your Achievements
  Building materials with recycled content will be used in the construction (i.e. Steel, flooring, asphalt, see spec section 016113).
  Materials that come from renewable sources and/or are locally manufactured have been specified and have undergone life-cycle assessment (i.e. locally manufactured good encouraged see section 016113).

Opportunities for improvement
Specify the reuse of building materials and components such as, bricks, flooring, paneling, hardware, doors and frames, fixtures, cabinetry, and large-dimension structural lumber (beams and posts) or steel. Highlight reused items in drawings so that they receive special attention. Avoid older components that may contain hazards such as lead paint, older toilets and showerheads that do not meet current water consumption standards, and older windows that do not insulate well. In Division 1, state the project's environmental goals and the general environmental procedures that address reused materials and re-manufactured products. Identify reused and re-manufactured items in appropriate CSI/Masterformat specification sections.

Specify that only wood products from certified and sustainable sources will be used. Provide references to local, provincial, federal, and industry certified wood standards, regulations, and requirements. Provide a written confirmation from suppliers regarding the composition of the wood-based panel products and/or certification ((SFI), (FSC), (ATFS), (CSA-SFM)) that the wood products have been monitored from origin to end consumer. In Division 1, state the project's environmental goals and the general environmental procedures that address certified sustainable wood. In Divisions 6, 9, and 12, list at least three different suppliers of certified wood.

Reuse of existing buildings
Building durability, adaptability and disassembly
Summary of Your Achievements
  Building assemblies and materials have been specified for their durability and low maintenance (i.e. stone panel system, aluminum, glass, concrete,).

Opportunities for improvement
Specify structural, cladding and detailing building assemblies, mechanical systems, and components that will maximize building adaptability and flexibility. Provide the rationale that shows how these promote building adaptability.

Specify structural, cladding and detailing materials, mechanical systems, and components that facilitate building disassembly. Where possible, use standard sized construction materials. The use of adhesives should be minimized and reversible mechanical fasteners used wherever practical. Show evidence in the design report, design drawings and specifications documentation that the building design allows for easy disassembly.

Reuse and recycling of construction/demolition waste
Summary of Your Achievements
  The construction documents indicate that a construction, demolition and renovation waste management plan is incorporated into the project. The management of all construction waste will be carried out according to the plan.

Facilities for recycling and composting
Summary of Your Achievements
  The construction documents indicate that there will be space designated for the storage of recyclable waste.
EMISSIONS, EFFLUENTS AND OTHER IMPACTS Rating Earned: 96%

This section evaluates the strategies to avoid or minimize air emissions, ozone-depleting substances, effluents, pesticides, and hazardous materials. Note that it is assumed that halon-containing materials will not be introduced into the building.

Integrated Sciences Building achieved a score of 96% on the Green Globes™ rating scale for emissions, effluents and other environmental impacts.

Minimization of air emissions

Minimization of ozone-depletion
Summary of Your Achievements
- A refrigeration system has been specified that avoids ozone-depleting substances (ODS) and potent industrial greenhouse gases (PIGG) (i.e. r410a).
- The ozone-depleting potential of the refrigerant is equal to 0.

Control of surface run-off and prevention of sewer contamination
Summary of Your Achievements
- There are measures to intercept and/or treat contaminated water to prevent pollutants including toxic materials, oils, and suspended materials from entering sewers or waterways.

Pollution minimization
Summary of Your Achievements
- Compliant storage tanks
  - The construction documents indicate that soil and surface water contamination will be prevented.
- Control of other pollutants (PCBs, asbestos, radon)
  - There will be measures appropriate to the region to prevent the accumulation of harmful chemicals and gases such as radon or methane in spaces below the substructure, and their penetration into the building.
- Integrated pest management
  - Components, materials and the protection of structural openings are specified to avoid infestation by pests.
- Storage and control of hazardous materials
  - There will be secure, appropriately-ventilated storage areas for occupants to store hazardous and flammable materials.

INDOOR ENVIRONMENT Rating Earned: 68%

This section evaluates the implementation of strategies used to ensure that the indoor environment is healthy and comfortable, in terms of providing a high level of indoor air quality, effective lighting, thermal comfort and suitable acoustic conditions.

Integrated Sciences Building achieved a score of 68% on the Green Globes™ rating scale for measures to provide a healthy, productive and comfortable environment.

Effective ventilation system
Summary of Your Achievements
To avoid re-entrainment, air intakes and outlets will be positioned at least 10 m apart, and inlets will not be downwind of outlets.

Air intakes will be located more than 60 ft from major sources of pollution and at least the minimum recommended distances from lesser sources of pollution.

Vent openings will be suitably protected.

Systems and components are specified that will avoid the release of pollution and fibers into the ventilation air path.

Sufficient ventilation will be provided to obtain an acceptable IAQ, in accordance with ANSI/ASHRAE 62.1-2004 using the Ventilation Rate Design Procedure.

The mechanical systems will provide effective air exchange (i.e. VAV mechanical system with perimeter base plates supplying cool air from above; Ventilation effectiveness is .9 ).

The mechanical ventilation system will have the capability of flushing-out the building with 100% outside air at ambient temperatures above 0°C.

The filters have a minimum efficiency of 65% arrestance, or 40% atmospheric dust-spot efficiency for air distributed to occupied spaces.

Opportunities for improvement

Specify an indoor air quality monitoring system either as an independent system or as a function of the BAS. Locate the CO₂ monitors in areas with high occupant densities and at the ends of the longest runs of the distribution ductwork.

Specify that personal control over the ventilation rates will be provided for a maximum of four to six occupants, either through personalized HVAC controls or, for naturally ventilated buildings, operable windows or operable trickle vents.

Source control of indoor pollutants

Summary of Your Achievements

There are measures to minimize the accumulation of moisture within the building and prevent the growth of fungus, mold, and bacteria on building surfaces and in concealed spaces.

There will be easy access to the air-handling units (AHUs) to facilitate their maintenance and drainage and avoid the accumulation of debris.

Humidifiers that are specified to avoid the growth of microorganisms.

There are measures to avoid pollution at-source (i.e. see section 018119 ).

The domestic hot water system is designed in such as way as to prevent the occurrence of *Legionella*.

Interior materials are specified that are low-VOC emitting, non-toxic, and chemically inert (i.e. see section 018119 ).

Lighting

Summary of Your Achievements

Daylighting

The construction documents indicate that there will be views to the building exterior, or to atria from all primary interior spaces.

Lighting design

Lighting levels will meet those recommended in *IESNA Lighting Handbook, 2000* for the types of tasks to be anticipated in the various building spaces.

Opportunities for improvement

Daylighting

Ensure that 80% of the floor plan receives direct daylight into the work area or to any fixed work surfaces, tables or
desks with a height of 2.3 ft. Provide specifications, design drawings, documentation and engineering calculations for representative spaces, predicting anticipated amounts of daylight.

Provide specifications, design drawings, documentation and lighting calculations for representative spaces to ensure that the required daylight factor is being achieved. The design should aim for an average daylight factor of 5%, for a well daylit work place. For a partially daylit workplace or a living/dining area aim for at least 2%.

Specify the use of solar shading devices to enable occupants to control brightness and avoid glare from direct daylighting.

Lighting design

In office occupancies ensure that the ambient natural light in primary spaces does not produce excessive direct or reflected glare, as defined in *IESNA RP-5, 1999, Recommended Practice of Daylighting*. Provide the design report and engineering calculations.

Specify local lighting controls related to room occupancy, circulation space, daylighting, and the number of workstations, with the provision that they can be operated over a full range of conditions. Provide documentation demonstrating the implementation of lighting controls.

Thermal comfort

Summary of Your Achievements

The building design appears to conform to the *ASHRAE 55-2004* for thermal comfort.

Acoustic comfort

Summary of Your Achievements

The building is sited, and spaces within the building are zoned so as to provide optimum protection from undesirable outside noise, and fall within acceptable noise criteria (NC) ranges.

The construction documents specify the sound level transmission through the building envelope.

The construction documents specify noise attenuation of the structural systems, and measures to insulate primary spaces from impact noise.

The design provides acoustic controls to meet the acoustic privacy requirements.

Speech intelligibility requirements are met for the various spaces and activities such as face-to-face communication and conferences.

There are measures to mitigate acoustic problems associated with mechanical equipment noise and vibration, and plumbing systems.