

LEEP

Architects designing for Engineers

The design uses leading-edge sustainable and engineering technologies to transform the dark, windowless atrium into a literal living environment for its users—the U of T engineering students. The space named Virtrium connects the users to the external natural world, digitally capturing real time changes in weather, lighting and sounds and reflecting them internally within the building for the students to experience.

Virtual + Atrium = Virtrium



1 Virtual Sunlight

A roof-mounted sunlight collector and tracking system (a parabolic dish) is connected to fiber optic cables. These cables efficiently pipe sunlight into the building and route the natural light to multiply hybrid light fixtures.

High efficiency hybrid light fixtures (ten times more efficient than photovoltaic for interiors) combine light from natural and electric sources to illuminate building interiors. Energy is saved because electric lights are dimmed in proportion to the amount of sunlight available.

2 Virtual Skyscape

Projector (or LCD) screens at ceiling of atrium mimicking a skylight from real-time rooftop video camera.

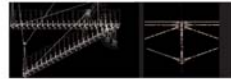
Other real-time sky images can be linked through the Internet from around the world. Sir Sanford devised our time zone system, so in homage we could propose projections from each time zone e.g. night over Waikiki, or a storm in the prairies.

3 Virtual Wind + Rain

Stimulating our senses through the pulses of the exterior world through various technical instruments.

Wind is rendered through an Aeolian harp (an auditory transducer) and the sound delivered to the interior.

The idea would be to have the harp on the outside of the building and to have it transfer the sound of the harp to the inside (presumably with volume control in case of extreme weather).



4 Virtual Jungle

A 2-storey "Heavy Breathing" wall (a vertical hydroponic garden) that purifies and oxygenates air terminating in a waterfall into a large aquarium with a wide variety of flora and fauna.

Irrigant temperature controlled to provide humidification, dehumidification and cooling.

A liquid desiccant (brine) fountain to dry the air with solar thermal regeneration of concentrated brine on the roof.

"Fog lights" that provide mist and localized adiabatic cooling perhaps along the balconies over planters for the "gorillas in the mist" effect.

5 Virtrium Architecture

As new sustainable and engineered technologies are introduced into the virtrium, the architectural design sets out to accommodate these new technologies so that they can function effectively in the space.

A new ceiling system made up of thick celled panels and reeded glass is designed to house the fibre optic cables.

The preformed seating is designed to be made of sustainable alternative non-fossil fuel material.

6 Virtrium Structure

There are two main structural interventions contemplated for the atrium space; a tension grid and an interconnection convenience stair.

The interconnecting stair would provide access to the tension grid as well as between floors.

The tension grid would serve the purpose of allowing suspended lighting, sets, engineering demonstration models.

Laboratory

A laboratory for the testing and experimentation of leading-edge sustainable and engineering technologies that will position the Engineering Society as a creative and forward-thinking force at the University and between Universities.

The leading-edge character of Virtrium's design has enabled the Engineering Society to supplement its construction budget by inviting companies to install and test their latest equipment in the space.

Ecology

The Virtrium is an invitation to ecological engineering. Its goal is to increase appreciation of natural processes and services rendered.

This virtual atrium mimics on a smaller scale several key ecological and natural processes. Lighting will be provided primarily by the sun, channeled through fiber optics to the windowless space. Humidity and room temperature will be controlled with assistance from the sun. Wind will be conveyed through a beer bottle instrument in the form of sound and will generate electricity.

Engineering

Visitors to the Atrium will breathe air purified by a Virtual Jungle. Look up at a Virtual Sky, bask in Virtual Sunlight and hear Virtual Wind & Rain mediated by rooftop light and audio collectors.

Together these systems will transmit the essential and ever-changing conditions of the outside environment as well as provide a permanent physical airfield showcasing the myriad disciplines within the sphere of Engineering. A virtual skylight will act as a window to the world, showing both local sky conditions and any image from around the world.

Performance

The Virtrium is an example of Performance Architecture, a space in constant flux, always evolving, subtly acting on the senses and transforming the notions of the exterior world projected into the interior world.

Performance Architecture promotes a shift in emphasis from architecture as form to architecture as performance. Buildings themselves actively perform for, and respond to, the user. The user is both spectator of the performance and a participant in it.



Darkness...

A dark windowless space sits in isolation awaiting its awakening.



A Changing Atmosphere...

Digital images are picked up from around the world and can be displayed onto the virtual skyscape created by LCD screens (like a mini imax).



Then there was light...

Sun is collected on the rooftop and brought into the space via fiber optic cables.



Alternating Current...

Changing weather patterns are picked up in realtime and transmitted into the building to a speaker which projects the sounds of falling rainwater and whistling winds to the indoors.

The rainwater when collected can be used to fill the pit at the center of the atrium.



A Breath of Life...

Light gives energy to plant life and a breathing wall thrives producing fresh oxygen and supplies aquariums and a waterfall with filtered water.

The rainwater is collected and fed to the virtual jungle via the mobile stair system which when activated shifts position and can move up and down dispersing appropriate amounts of hydration.



Concrete Schoolyard...

The engineers participate in many creative experiments throughout the year. Buoyancy testing for the concrete canoe competition takes place in the pit once it has filled with water.



Nocturnal Awareness...

Students are made aware of the outside conditions as the space is created so that when the night falls, the interior lighting dims. A system of fiber optic hybrid cables then begin to supply electrical energy to the space. This is a Beta site and is the first in Canada to use the technology.



Suspended Emissions...

Another of the engineering student projects involve the suspension of heavy objects from the structural tension grid at the top of the atrium.