

Team 304 - Evolve Sustainable Design Competition

The community Library proposes an inviting and functional space for its users while aiming to meet high standards for energy use, water conservation and sustainability. The Library sits at the south west corner of the property and maintains the continuity of the streetscape along Dundas st. Two forms organize the program into its multipurpose and library functions while vertically, the program is arranged from public to private spaces. The multipurpose spaces occupy the area closest to the busy street while the quieter library, study and office spaces are located away from the street to maintain a low volume. Public spaces were located on the ground and second floor to maximize public exposure and accessibility while private offices were located on the third floor.

Net-Zero energy goals were achieved by offsetting energy use with renewable energy sources. Photovoltaic panels cover most of the south facing facades and the roof to connect renewable energy from the sun to offset energy loads. Low energy lighting with programmable controls, motion sensors and automatic dimming also reduces the electrical load. A ground source heat pump system uses stored energy in the ground for heating and cooling of the building. A heat recovery system also maximizes efficiency in heating and cooling. An open atrium with interconnected floors allows for air circulation that works with operable openings to provide fresh cool air in the summer. The north facing walls use Aerogel filled translucent panels for natural day lighting and superior thermal properties, saving energy in heating cost and reduced lighting.

In addition, rainwater harvesting and grey water systems reduce the water use of the building. Grey water is collected and treated to be used in plumbing fixtures. Low consumption fixtures reduce water use to minimize the reliance on municipal water. These energy saving techniques and sustainable measures contribute to creating a building that is mindful of its impact on the environment and its surroundings. The library is a community oriented space that is also geared towards being a space that is efficient and economical. The open, bright and spacious library aims to be a pleasant space for the present community and also keeps the future needs of the community at its forefront.



COMMUNITY LIBRARY

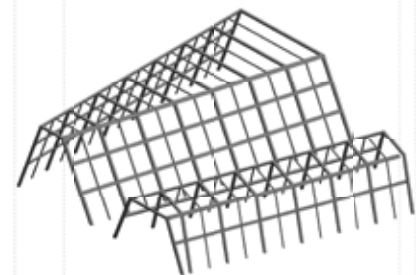
NET-ZERO ENERGY / WATER WISE
1484 DUNDAS ST W TORONTO

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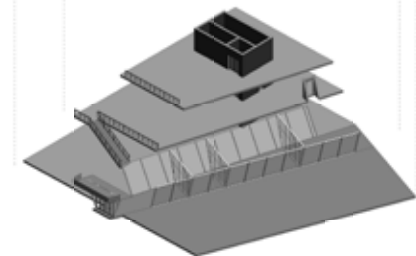
PHOTO-VOLTAIC PANELS



PV SHELL



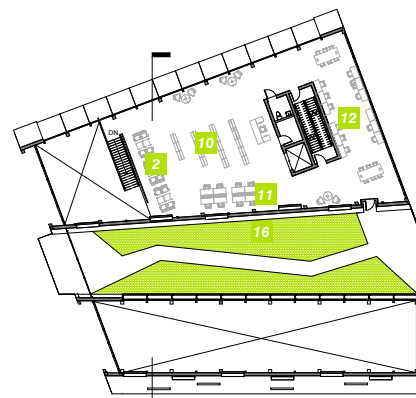
STRUCTURE



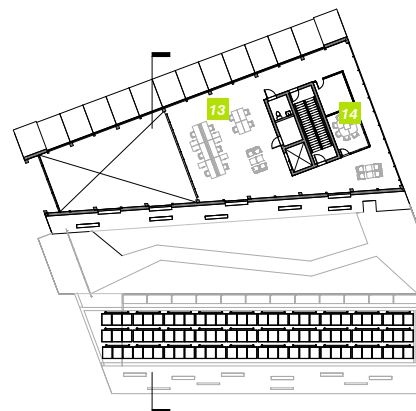
FLOOR



FIRST FLOOR 1:250



SECOND FLOOR 1:250

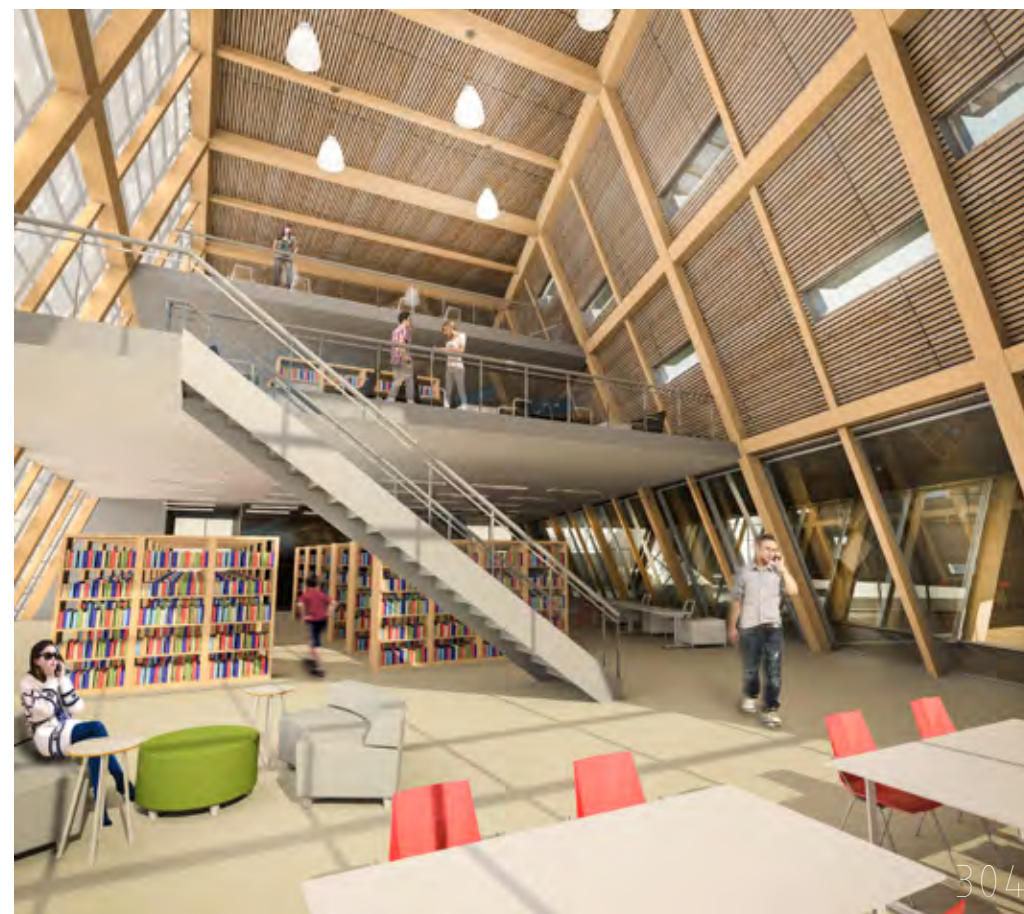


THIRD FLOOR 1:250

1. COLLECTIONS
2. INFORMAL WORK AREA
3. CONFERENCE/RECEPTION AREA
4. MEETING ROOM
5. MULTI-PURPOSE ROOM
6. RECEPTION
7. OFFICE
8. WORK ROOM
9. LOADING
10. REFERENCE/PERIODICALS
11. COMPUTERS
12. INFORMATION COMMONS
13. OPEN OFFICE
14. MEETING ROOM
15. REFERENCE/PERIODICALS
16. GREEN ROOF



SITE PLAN 1:1000



SECTIONAL PERSPECTIVE

INTERIOR MATERIAL PALETTE
Sustainable, local, and low environment impact materials were considered for this project. Brighter colours ensure lighting will be most effective. Non-toxic and low VOC materials ensure a safe environment.



Carpet



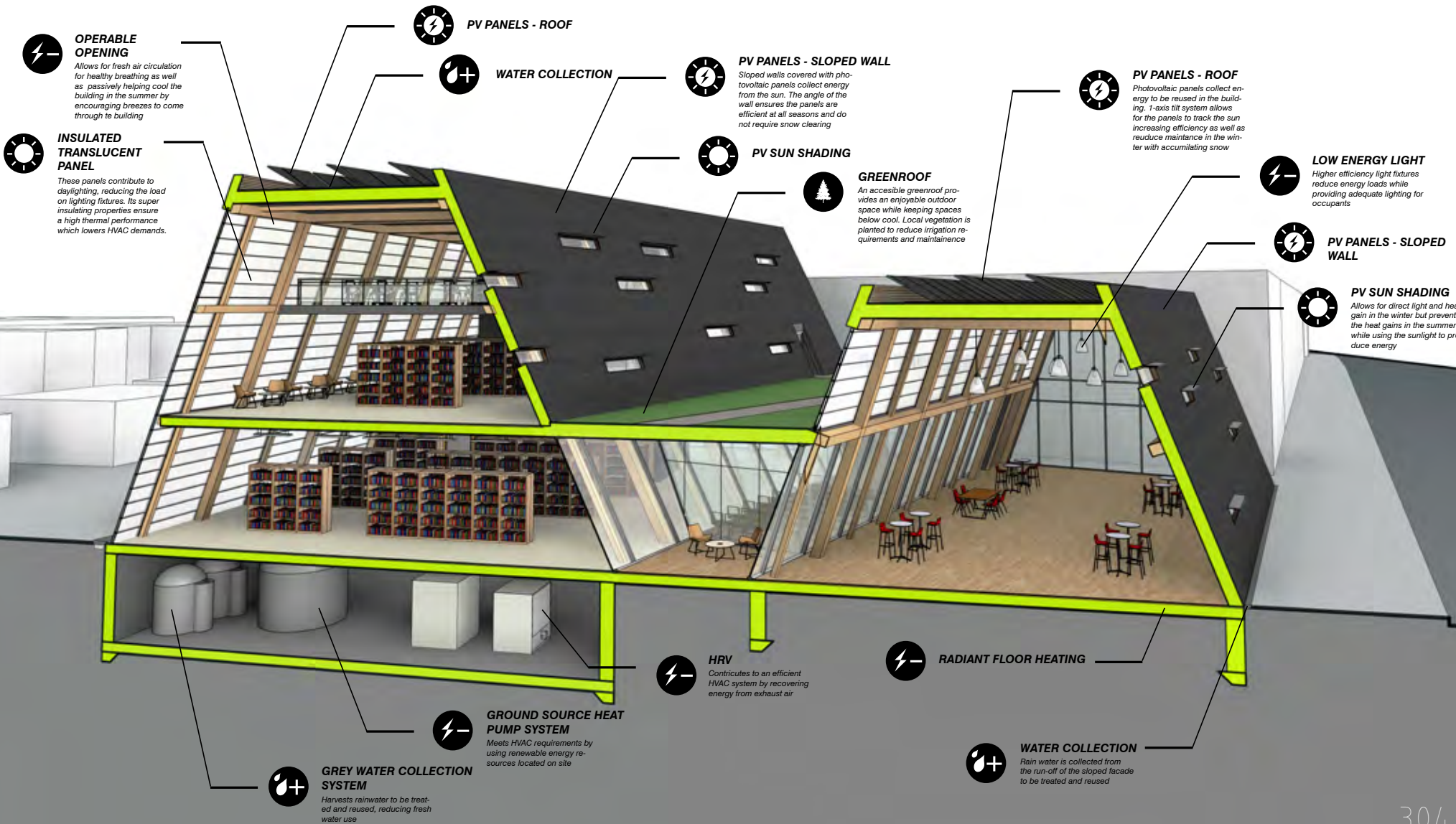
Hardwood Floor



Acoustic Wood Paneling



Glulam



ENERGY

51%

REDUCED ENERGY LOAD

18%

LIGHTING EFFICIENCY SAVINGS

98%

TOTAL ENERGY OFFSET

BASE MODEL

214,156 kWh

ALTERNATIVE ENERGY MODEL

119,300 kWh

EFFICIENT LIGHTING SYSTEM SAVINGS

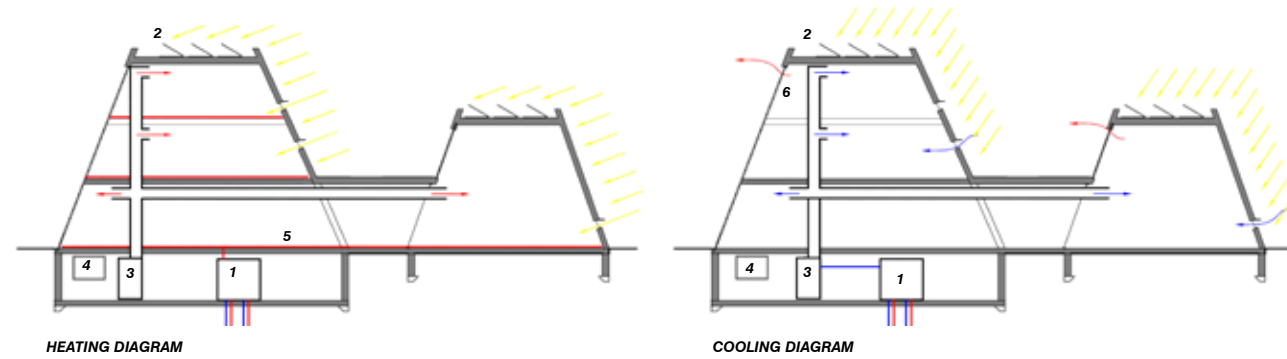
9,343 kWh

TOTAL ENERGY LOAD

109,957 kWh

PHOTOVOLTAIC ENERGY PRODUCED

106,803 kWh



HEATING DIAGRAM

COOLING DIAGRAM

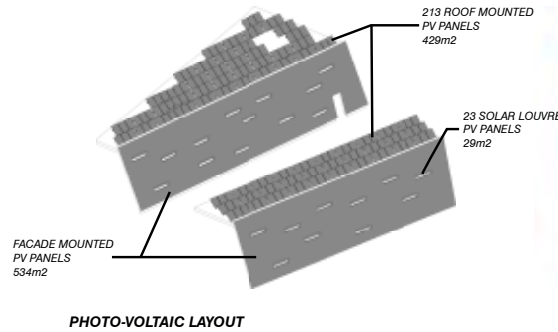
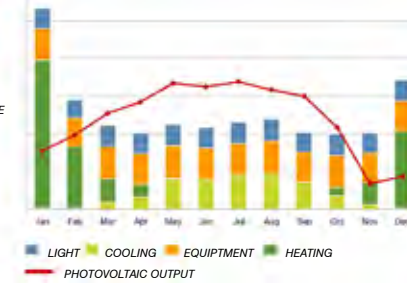


PHOTO-VOLTAIC LAYOUT



ENERGY LOAD VS PHOTOVOLTAIC OUTPUT

The goal of the library is net-zero energy use and at 98% of total energy being offset by renewable power sources, the building achieves this designation. By implementing energy saving techniques such as increased insulation, better glazing, higher airtightness and a more efficient HVAC system, the library was able to reduce the energy load by 51%.

To further energy use reduction, high efficiency lighting was implemented. By switching to high efficiency lighting and implementing sensors for motion and daylighting, energy use was reduced by another 18%.

To maximize daylighting, the east and west walls are glazed while the north wall uses translucent, Aerogel filled panels which provide daylighting and also offer superior insulating value.

HVAC requirements are met by a ground source heat pump which uses the ground underneath the library for energy. In the heating season, the GSHP provides water to water heat transfer for radiant floor heating. In cooling, the GSHP uses water to air cooling. A heat recovery system an efficient fan system and passive techniques also reduce the HVAC load requirements.

A crucial part of this net zero energy proposal is Photo-voltaic panels. To maximize the harvest of energy the south walls are completely covered in PV panels as well as the roof and louvers over the windows. By using PV panels, the total energy use of the Library is reduced by 98%.

WATER

17%

WATER USE REDUCTION

114%

NET WATER USE HARVESTED

BASE MODEL

1,464,134 L/yr

WATER EFFICIENCY SAVINGS

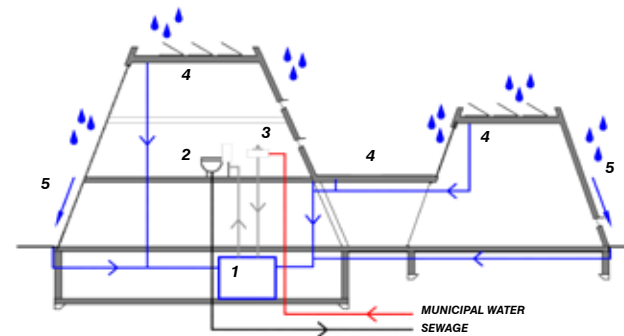
217,064 L/yr

ON-SITE WATER HARVESTING

1,188,052 L/yr

NET USE

+59,018 L/yr



WATER DIAGRAM

1. GREYWATER SYSTEM
2. LOW FLOW TOILET
3. HANDS FREE SINK
4. RAIN HARVESTING ROOF
5. RAIN HARVESTING FACADE

The form of the library lends itself to excellent water harvesting potential. The sloped walls direct rainwater down into troughs and drains to be collected along with the water from the roofs to be collected and treated before being reused.

Water conservation technology can be found in the bathroom fixtures. Toilets and sinks are both low flow while urinals are flushless. The sinks are automated to prevent accidental waste. The fixtures are used in conjunction with the greywater system. Waste water from the sinks is collected, treated and then reused as toilet water.

A publicly accessible green roof is used for energy conservation. To prevent the need for irrigation, native species of plants are planted. This conserves water and reduces the need for maintenance.

By using water conservation technology, the overall water use is reduced by 17% and water collection for greywater reuse surpasses the requirement for water. Only a small amount of fresh municipal water is required.

