



ABBOTSFORD
SCHOOL DISTRICT
RESPECT OPPORTUNITY INNOVATION



ABBOTSFORD SCHOOL DISTRICT: GREEN TOUR

TOMORROW'S SUSTAINABLE SOLUTIONS TODAY

Welcome to the Abbotsford School District: **Green Tour**. Our goal is to create an interactive learning experience for visitors to Abbotsford Middle School and Abbotsford Senior Secondary School. The experience is designed to showcase the innovative planning, engineering and technology of the two state-of-the-art facilities, and educate and entertain visitors of all ages.

Each icon on this map represents the physical location of a ‘station.’ Use the map to help you find the specific ‘station’ then read the write up to learn more about it. We’ve worked hard to create a great space for people to meet and learn. Thank you for taking our ‘green tour.’





The map outlines the the physical location of each station on the campus.



PUMP HOUSE - GEOEXCHANGE HEATING AND COOLING SYSTEM

Both Abbotsford Senior Secondary and Middle Schools use well water as a means of heating and cooling the buildings. This water is pumped out of the aquifer and stored in a large reservoir under the 'pump house.' The water is kept at a constant 11 °C (52 °F) on a year-round basis.

From here it is pumped to a heat exchanger in the school's main boiler room where it gives up its heat to the building and returns to an underground piping system that slowly releases it back to the aquifer. Every drop of water that is taken from the ground is returned at a temperature that's only 3 or 4 degrees warmer or cooler than the temperature at which it was gathered.

In Abbotsford Senior Secondary's boiler room the water passes through a heat exchanger into a piping loop and is pumped around the building to over 80 (eighty) Water Source Heat Pumps (WSHP). This technology has the ability to move energy from the water into the space as a way of controlling the temperature. Each WSHP unit responds to the cooling or heating load requirements of the individual room that it serves. This results in close control over the temperature and humidity in each zone, leading to excellent occupant comfort. Energy use is kept to a minimum because units will only operate when the room is occupied (we use an occupancy sensor to determine that) and when there is a call for ventilation. If the geoexchange water system ever breaks down, heat can be added or rejected from the water loop using a boiler or a cooling tower, providing 100% standby capability.

At Abbotsford Middle the water is pumped through a heat exchanger to two large heat pumps that send the energy around the building.

The overall effect of this design is that both buildings will enjoy lower utility costs, up to 25% to 50% below conventional systems, as well as require less maintenance and provide higher levels of year-round comfort.





EFFECTIVE RECYCLING PROGRAM

Abbotsford Senior Secondary is a proud leader in the practice of '5R Recycling.' Reduce, reuse, recycle, renew and respect.

See if you can add to this list:

Reduce your stuff, driving, energy consumption, magazine subscriptions, and purchasing habits.

Reuse your stuff, shopping bags, clothing, and paper.

Recycle your stuff, glass, tins, paper, oil, electronics, plastics, and clothing.

Renew your resources, energy.

Respect your environment (Earth is the only planet we have).



ABBOTSFORD MIDDLE SCHOOL WIND TURBINE AND SOLAR – POWERED COMPUTER LAB



The wind turbine and photovoltaic (PV) panels on top of Abbotsford Middle School generate the power needed to run the computer lab. The computers in the lab won't work without the power generated by these sources; if it's not windy, or if there is no sunshine, a third means of generating power is needed. The lab has this third form; it's a stationary bicycle pedaling station. As the students pedal on the bikes they generate power to charge the storage batteries and run the computers.





USE OF DAYLIGHTING / SHADES

Abbotsford Senior Secondary has been designed with a predominantly east-west orientation and a high percentage of glass and light/bright internal reflective surfaces, offering the benefit of using the Sun's light energy to our best advantage. The rotunda, together with several 3-storey light wells, brings the light from the top of the school all the way to the bottom.

Daylight is by far the best light source. It's free, sustainable, and can give a sense of health and well-being. By maximizing our ability to use it more effectively, we can turn lights off during the day, saving energy. Using daylight does not require electricity generation, does not produce greenhouse gas emissions, and generally involves little to no natural resource extraction, manufacturing, or shipping.

You will also notice that we've added exterior window shades above the south-facing windows. These create shade on the glass during the mid-day periods so that the Sun doesn't shine directly into the classrooms. This effectively reduces the cooling load on the room and increases the comfort level for the students and teachers.



GREEN ROOF

Our green (or living) roof is an area above the Library; we have partially covered it with live vegetation in the form of grasses and flowering shrubs interlaced with walkways. Besides its decorative effect, our green roof can provide temperature control, hydrological benefits, architectural enhancement, food sources, as well as habitats and nesting spaces for birds. The plants also have the ability to reduce the overall heat absorption of the building, which then reduces energy consumption.





DAYLIGHT HARVESTING – HIGH EFFICIENCY LIGHTING

‘Daylight harvesting’ is a term used in sustainable architectural design. The concept centers around the idea that the correct placement of windows, in conjunction with the building controls, helps reduce the use of artificial lighting when natural daylight is available, reducing energy consumption.

When you approach Abbotsford Senior Secondary, you will see we’ve used a lot of glass in the form of windows and clearstories. The result is that natural daylight can reach right down to the ground floor from the roof.

With this effect, we have located ‘daylight sensors’ that turn the lighting off, when the lighting level reaches a predetermined value. They are in every space, including corridors, classrooms, and the rotunda. When a space is unoccupied and there is no need for lighting at all, the controls tell the lighting to not come on, even during darker evening and nighttime hours!



WASTE HEAT RECOVERY

There is a lot of warm air exhausted from Abbotsford Senior Secondary from various locations throughout the school. We remove the air through several special Energy Recovery Ventilation (ERV) units located on the roof. An ERV is a device that removes the heat from the warm air, and adds it to the cooler air entering the building for fresh air ventilation. There are many different commercial ERVs used for the transfer of this energy. The ones we use are of a thermal wheel type, which consists of a slowly rotating circular honeycomb matrix of heat absorbing material that takes up heat from the exhaust stream and adds it to the incoming stream.



SWEENEY NEIGHBOURHOOD CENTRE & ABBOTSFORD COMMUNITY LIBRARY

Looking over at Abbotsford Senior Secondary School you will see the Sweeney Neighbourhood Centre at the west end. This section of the building offers access to resources, conference rooms, and other amenities to members of the community. The single storey circular section in the centre of the building is home to the 15,000 square foot Abbotsford Community Library.

To encourage sustainable transportation the parking area is outfitted with a number of electric vehicle plug-in stations.





OCCUPANCY SENSORS

As we travel around inside Abbotsford Senior Secondary, we see lots of tiny circular ceiling-mounted sensors scattered about. Some of these are 'occupancy sensors' that use infrared and ultrasonic technology to determine if the space is occupied by people or not.

They have several important uses that include the control of the security, heating, ventilation, air conditioning (HVAC) and lighting systems. From the HVAC point of view, we like to know if the space has any people in it or not. If it's empty, why cool or heat it? From the standpoint of lighting, if the space is empty, there is no need to turn the lights on.

From the 'security' standpoint these sensors are used to cause an alarm if someone enters the building after hours.



SOLAR PANELS FOR HOT WATER PREHEATING

Looking up at Abbotsford Senior Secondary School, one can see hundreds of bright, shiny 'tubes' on the roof. These are solar collectors, an integral part of the domestic water preheating system. The Sun shines on them and heats them up; we pump the water circulating through the system down into the boiler room, and store it in two large tanks.

These tubes are different than regular solar heating collection tubes because they are 'evacuated' (empty). When they get hot, the heat is conducted upwards to a water pipe at the top where it flows to and from the storage tanks. In winter, when there is a risk of cold temperatures, the water is 'drained back' into a small tank inside the building, leaving the system empty and protecting it from freezing. Instead of using a natural gas boiler to do all the water heating, the solar hot water system saves consumption and reduces associated greenhouse gases.



ENERGY STAR® APPLIANCES

ENERGY STAR® equipment is rated for higher energy efficiency, lower levels of hazardous materials, and longer product life. They include a vast majority of electrical and electronic products that are available in the marketplace.

Over the last twenty years, technology advancements have shown us that there are better, more efficient ways to use our electricity and reduce consumption. Approved products include home appliances and electronics, building products, power tools, HVAC equipment, and lighting and plumbing equipment too.

All appliances in the school are ENERGY STAR®!





FIELD IRRIGATION USING THE AQUIFER WATER

In conjunction with the aquifer water being stored under the 'pump house' for heating and cooling, when the school is unoccupied (at night) we use the stored water to irrigate the sports fields through buried sprinkler systems. This saves us from using city water for irrigation, leaving more of our precious resources for others to use. The system is designed to ensure the well pumps replenish the reservoir long before the water is needed when school starts again in the morning.

MIDDLE SCHOOL

BEVAN AVENUE



3 STOREY BUILDING AND SITE CONSIDERATIONS

The design intent for the construction of the new school is to meet requirements for LEED Gold design considerations. Constructing Abbotsford Senior Secondary as a 3 storey building instead of a more traditional 2 storey school helped reduce our building's footprint and energy consumption while providing more green space outside. More green space within a city can vastly improve the urban environment. Green spaces help regulate air quality and create a localized micro-climate, reducing energy consumption by adding shade and countering the warming effects of paved surfaces. They also help replenish groundwater supplies and protect groundwater from polluted runoff.

The building is constructed using a 'tilt-up' concept, where the 3 storey slabs of concrete were lifted into place by a massive crane.



ROTUNDA

The concept of the 'rotunda' is to form a centralized gathering place for the students and teachers, and to form a link to the existing school to the East that remained.



BIO SWALES

At Abbotsford Senior Secondary, all the rain that falls on the various parking lots is channelled into specially constructed 'bio swales'. These are depressed grassy areas, planted with rocks and natural vegetation, where the water is retained, and soaks away slowly into the ground, while special filters trap any dirt, grime, and unwanted liquids from going into the storm water system.





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THANK YOU