

EDMONTON PUBLIC SCHOOLS

February 10, 2009

TO: Board of Trustees

FROM: E. Schmidt, Superintendent of Schools

SUBJECT: Responses to Trustee Requests for Information

ORIGINATOR: J. Bidulock, Assistant Superintendent
R. MacNeil, Assistant Superintendent

RESOURCE
STAFF: John Edey, Kathy McCabe, John Nicoll, Corrie Ziegler

INFORMATION

TRUSTEE REQUEST #174, JANUARY 13, 2009 (TRUSTEE COLBURN) PROVIDE A REPORT TO BOARD ON CURRENT DISTRICT PRACTICES AND KNOWLEDGE REGARDING GEOTHERMAL HEATING AND HOW IT MIGHT BE APPLIED IN THE DISTRICT. Ground Source Heat Pumps (GSHP) are commonly referred to as geothermal systems. This system of providing heating and cooling energy is considered more efficient than conventional heating and cooling options by utilizing the earth as a source of heat in the winter, and a source for cooling in the summer. The heat is extracted from the ground by an extensive series of underground pipes circulating an anti-freeze solution. At this time, implementation of GSHP technology is not economically favourable in Edmonton Public Schools due to high Alberta electrical energy costs, relatively low natural gas costs and high installation costs. The additional coal fired electricity needed to run the heat pumps and the significant size of the underground “heat sink” field create additional environmental concerns. Heat Pump heating systems require a totally different design approach to meet heating and cooling requirements in a building than a conventional hot water or steam heating system.

The following factors limit application in Edmonton Public Schools:

- Application is limited to new construction in schools which require combined heating and cooling applications. It is not a viable retrofit option for boiler replacement retrofits
- The physical size of a school building requires a significant energy input driving the size of the plant and heat sink field requirements
- Significant excavation or drilling is required to provide the ‘heat sink’ field
- High cost of equipment and implementation
- Current energy pricing conditions in Alberta (low gas prices, high power prices)
- Higher associated green house gases production associated with Alberta coal based electrical generation
- Underground geology must support a balanced “heat sink” capable of replacing the removed heat, within a reasonable period of time
- Heat pumps produce low temperature heat (40C)
- The temperature extremes experienced in Edmonton create challenges in sizing of the plant to meet all temperatures or require supplemental heating.

Technically, the best application for a ground source heat pump system is:

- When new heating/ventilation and air conditioning systems are being installed
- Where combined cooling and heating is required
- Low electrical energy rates are available
- Locations where low cost natural gas is not available.

In all modernization projects, Edmonton Public Schools challenges the designers to use as much sustainable design as can be economically supported. The use of a geothermal heat source will be considered in any new school design and construction undertaken by Edmonton Public Schools.

Publications:

Feasibility of Ground Source Heat Pumps in Alberta, Climate Change Central, March 2008.

<http://www.climatechangecentral.com/publications/discussion-papers/renewable-energy>

Geothermal Central System, ASHRAE Journal, August 2007.

http://www.ashrae.org/doclib/20070727_Durkin.pdf

A New England School & Climate Master Geothermal Heat Pumps. Hastings School, Westborough MA. First Successful 100% Geothermal School in New England – 1997

<http://www.northeastgeo.com/pdf/hastings.pdf>

Ground-Coupling With Water Source Heat Pumps. <http://geoheat.oit.edu/pdf/tp15.pdf>

Ground Source Heat Pumps versus High Efficiency Natural Gas Furnaces in Alberta, February 2, 2003. <http://solaralberta.ca/LIBRARY/ARTICLE1.PDF>

Maintenance and Service Costs of Commercial Building Ground-Source Heat Pump Systems.

<http://www.wfiglobal.com/documents/research/7-4.pdf>

Ground-Source Heat Pump Project Analysis. RETScreen International, Clean Energy Centre.

http://www.retscreen.net/ang/g_ground.php

TRUSTEE REQUEST #179, JANUARY 13, 2009 (TRUSTEE ESSLINGER) ARE DISTRICT SCHOOLS MARKED WITH WHEELCHAIR ACCESSIBILITY SIGNS? The District has 33 schools that are fully barrier free according to the current building code requirements, and 55 schools that are primarily accessible for the public. Not all programming areas are accessible, as the remaining schools have varying degrees of accessibility challenges.

Clear and sufficient signage is required to indicate the location of all doors designated for use by the public with physical disabilities or mobility issues. Facilities Services will be reviewing all district buildings for conformance to this requirement. Signage will be provided to schools and district buildings along with instructions about where to place signs appropriately. This review and installation of signage will be completed by August 31, 2009.

Each year Facilities Services, Consulting Services and the Planning Department review the accessibility needs of schools to ensure that all students have a school that meets their particular needs in each high school catchment area. Where practical, changes are made to schools. The District has an ongoing program within the annual major maintenance plan to improve accessibility to district schools for students, staff, parents and the public.

TRUSTEE REQUEST #180, JANUARY 27, 2009 (TRUSTEE GIBSON): PROVIDE INFORMATION REGARDING THE DIFFERENT METHODS OF INSTRUCTION IN MATH AND DIFFERENT FORMS OF ASSESSMENT FOR AND OF LEARNING IN MATH. This is the first year of implementation of the Revised Program of Studies for Mathematics K-9. The program identifies achievement indicators and beliefs about mathematics.

Methods of Instruction

Students are curious and active learners who learn best when they can attach meaning to the mathematics they are studying. Students need to experience mathematics from the concrete to the abstract. Teachers are encouraged to use a variety of pedagogical methods, including the use of manipulatives, to develop deep mathematical understanding, proceeding from the simple to the complex. Students need to make connections among the concrete, pictorial and symbolic representations of mathematical concepts. Students learn mathematics through problem solving; therefore, teachers need to provide them with rich learning tasks that allow problems to be solved in a variety of ways.

When planning for instruction teachers are encouraged to:

- Integrate the seven mathematical processes (communication, connections, mental mathematics and estimation, problem solving, reasoning, technology and visualization) in the instruction of the curriculum outcomes
- Increase the time spent on concept development by decreasing the emphasis on rote calculation, drill and practice and the size of numbers used in paper and pencil calculation
- Increase mathematical fluency by integrating problem solving, reasoning and connections throughout the program
- Have a balance between paper and pencil calculations, mental mathematics and the use of technology
- Introduce concepts using manipulatives, followed by concrete, pictorial and symbolic concept development.

Forms of Assessment

Assessment in a mathematics classroom should reflect the research on assessment for and of learning in all subject areas. Assessment should become an integral part of the daily mathematics instruction. Teachers should not just spot student errors but encourage students to explain the thinking behind their answer to discover misconceptions. Teachers must be able to engage students in mathematical communication to gain insight into the learning needs of the students. Students should be presented with problems that require them to go beyond the rote manipulation of algorithms. They should be encouraged to notice relationships and make connections between facts, procedures and concepts.

Support through the Math 4 All Initiative

The District's Math 4 All initiative is currently supporting approximately 400 math teachers in divisions I, II and III. This is to support teachers in the mandatory implementation of the Revised Program of Studies K-9 in Grades Kindergarten, 1, 4, and 7. The teachers are examining research-based best practices in instruction and assessment. They are enhancing their skills to use manipulatives and technology in their classroom instruction to engage students in their learning. The teachers are exploring what it means to go deeper in a concept and what mastery of the concept looks like with their students. Teachers are gaining increased mathematical proficiency to enhance student learning.

During the second year of the Math 4 All initiative, teachers will work in grade/divisional groups to develop common assessments, resulting in consistent teacher understanding of and expectations for student mastery of mathematical concepts. Teachers will become cognizant of multiple ways for students to demonstrate their understanding of math concepts.

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