



Portfolio

t o t t e n s i m s h u b i c k i a s s o c i a t e s

The TSH Building Services group designs heating, ventilating, and air conditioning systems for schools, colleges and other institutions, both for new and renovated facilities. Knowledgeable building managers are demanding that these systems provide the latest energy reduction technologies. TSH has responded to this expectation on several recent projects where innovative methods are used to optimize energy consumption and minimize objectionable environmental impacts.

One recent example is Humber College in Toronto, where TSH was retained to assess the energy profile and condition of the chilled water system for the North Campus. Following the study, TSH was retained by the college to implement the chosen system, which doubles the chiller efficiency by using

variable frequency drives that set the chiller machinery at the speed required to provide the needed cooling rather than running at full capacity at all times.

from heating and ventilation systems to building envelopes and site plans, TSH integrates sustainable solutions

Mechanical systems included use of Direct Digital Control (DDC), using the "Hartman Loop" principle, to optimize the operation of fans and pumps. Another benefit of this upgrade is the elimination

of the ozone-depleting refrigerant used in the old chiller. This \$3 million upgrade will be completed in early 2007.

When the Lake Simcoe Region Conservation Authority decided to expand and modernize its Newmarket headquarters, environmental sustainability was imperative. TSH responded by designing HVAC systems which incorporated innovative, yet proven, technologies to minimize energy consumption, while improving occupant comfort. The project utilizes energy recovery ventilators, DDCs with a programmed system for off-hour setbacks, and in-floor heating. The project complies with the requirements of the federal government's Commercial Building Incentive Program and with the LEED program. Construction will be completed in the spring of 2006.

Neighbourhood Traffic Infiltration Explained using "Micro-simulation"

Thornhill Community, within the Town of Markham, had a long history of traffic problems, including widespread infiltration, or "commuter short-cutting," on neighbourhood streets. TSH was contracted to model the entire area using the Paramics micro-simulation model, including all the arterial and collector roads, as well as some critical local roads, including 26 signalized and all-way stop controlled intersections. The modeling efforts included: traffic data collection; a plate trace survey to identify predominant infiltration routes; model calibration; and identification and evaluation of the impacts of proposed measures.

The recommended measures included turn restrictions, signalization, and signal timing adjustments at key intersections in the community. Simulation animation of traffic operations incorporating those measures demonstrated their impacts in a realistic way. There was strong resident support, and the recommended turn restrictions were implemented.

Following implementation, traffic volume counts were conducted to evaluate the effectiveness of the measures, and to ensure that model predictions were accurate.



Screen Image of Paramics Analysis Showing Roadway Queuing

Planning a Roundabout Corridor

The United Counties of Leeds and Grenville retained TSH to complete a Master Plan Study for a 6.5 km section of County Road 43, including a 3 km section along the northern edge of the Kemptville urban area, west of Highway 416. An improvement plan was developed to address: expected traffic growth, collisions related to multiple entrances and intersections, pressure for multiple new entrances to serve new developments, long delays for side street traffic at two-way stop controlled intersections, and a desire to make the corridor more attractive.

With one roundabout, designed by TSH, successfully operating in the area, TSH was asked to assess additional roundabouts



as an alternative to conventional intersection controls. TSH used traffic operations analysis to demonstrate that roundabouts can accommodate the projected traffic volumes at major intersections in the study area with substantially lower delay than traffic signals, while reducing side street delay, and improving safety at key intersections where traffic signals will

not be warranted. A corridor plan was proposed that includes four two-lane roundabouts west of Highway 416, and two single-lane roundabouts in the rural area east of Highway 416.

Both the roundabout corridor plan and a conventional plan with multiple traffic signals and a two-way left turn lane in the semi-urban area, were presented to the public. The feedback was three-to-one in favour of the roundabout option, which has been recommended in the final Master Plan.

Providing Practical Solutions to Infrastructure Related Problems

- Problem:** Grading and drainage problems in new residential developments impact normal operation of municipal departments.
- Solution:** TSH will audit existing lot grading and drainage protocols and procedures to ensure the design and construction of new residential developments are properly managed throughout the planning approval process and are consistent with best practices.
- Problem:** Utility coordination is impacting both road improvement project schedules and capital budget planning processes.
- Solution:** TSH will establish a Utility Coordination Committee for your municipality, including a framework for successful operation of the committee, clear goals and objectives, and will facilitate the initial committee meetings to ensure that all the road allowance stakeholders work together towards the long-term, efficient management of the public road allowance.
- Problem:** Fluctuating demand for development-related technical expertise is difficult to manage.
- Solution:** For over 40 years, TSH has provided professional engineering services to municipal clients, assisting them with processing their development applications by providing experienced support staff. TSH can assist with any of the following development approval process tasks:
- Preparation of engineering reports on Official Plan and Zoning By-law Amendments;
 - Review of engineering feasibility reports for proposed Draft Plans of Subdivision;
 - Preparation of reports to Council recommending conditions of Draft Plan Approval;
 - Review of landscape and engineering drawings for Subdivision and Site Plan Developments;
 - Review of Storm Water Management Reports;
 - Preparation of Subdivision and Site Plan Agreement Schedules;
 - Administration of Subdivision and Site Plan Agreements;
 - Preparation of storm drainage reports; and
 - Representing municipal clients as an expert witness at Ontario Municipal Board Hearings.

The Nickel Rim South Vent Shaft Headframe

The Canadian Institute of Steel Construction's (CISC) 2005 Ontario Steel Design Awards awarded an Honourable Mention in the Engineering Category to the Nickel Rim South Vent Shaft Headframe. TSH worked together with a project team that included: fabricator Noront Steel Ltd., a steel detailer, an erector, a general contractor, and a design firm. At almost 43 m (141 ft) tall, the structure's framing is over 600 tonnes of fabricated structural steel.

Pin-connected backleg columns were fabricated from 19 mm (3/4 in.) thick plate steel, stretching 37 m (121 ft)

and 1.5 m (5 ft) in diameter. These columns, angled at 60°, will resist the overturning loads applied at the top of the structure by hoist cables that access the excavated shaft. The columns weigh 30 tonnes each and require specially-designed lifting lugs for erection to prevent localized buckling of the column walls. TSH engineers prepared connection designs for numerous heavily-loaded floor beams, some that required as many as 34 one-inch diameter high strength bolts. The entire structure required installation of 17,600 field bolts.



Lake Simcoe Region Conservation Authority - Administrative Centre

Additions and renovations to the Lake Simcoe Region Conservation Authority (LSRCA) Administrative Centre in Newmarket are 80% complete. TSH is providing the integrated design and construction administration services to complete this project. The facility features a comprehensive design approach based on LEED energy and environmental performance criteria. To qualify under LEED, the building is designed to exceed requirements for energy efficiency by 25% under the Model National Energy Code. The site and landscape have been designed to minimize the requirement for supplemental watering and capitalize on the passive solar opportunities of the adjacent woods. Components of the building, designed to work together to deliver this performance, include increased daylighting through triple-glazed windows, reduced light density from high efficiency lamps, ventilation system heat recovery and in-floor radiant hot water heating. The facility is also fully accessible and includes a LULA elevating device providing barrier-free travel between floors using less energy. LSRCA are very excited about moving into the new areas in May 2006. As one staff member said "People often have photos of home on their desk at work to give them a lift during the day. This will be one of the first places I've worked where people will take pictures of the office home!"



Go Transit Fixed Asset Management Catalogue

In 2006, TSH will begin a project for GO Transit that builds upon our extensive experience in Asset Management and Building Condition Assessment. TSH has been retained to prepare a Fixed Asset Management Catalogue for GO Transit. This assignment involves reviewing, assessing, and documenting the condition of platforms, tunnels, parking areas, and mechanical and electrical systems at each of GO Transit's 53 rail stations. TSH will report on the existing condition and useable life of GO Transit's physical assets and recommend repairs. The information collected will be input into an Asset Management Catalogue and this will become the benchmark document for referencing the inventory of rail station assets, as well as the condition of each asset.

This Asset Management Catalogue will enable GO Transit to manage planning of budget projections for minor repairs, major retrofit, and capital inventory replacements as station components reach the end of their useful life.

Toronto Streetcar Rebuild Project

TSH has been helping keep the Toronto Transit Commission's fleet of streetcars rolling. The City of Toronto's famous electric streetcars reflect the heritage of the city, but are also a significant component in the city's drive for sustainability. The streetcars offer commuters a convenient mode of transportation, while eliminating the exhaust fumes associated with cars and buses. In good structural condition, but thirty-years-old, approximately 200 streetcars are being rebuilt and modernized. To facilitate these rebuilds, major alterations are needed at the three downtown "car houses" where the streetcars are maintained and repaired. Because of TSH's familiarity with these facilities through many previous projects, TSH was recently retained to design the building modifications, including a large sand-blast and paint facility, new work platforms and cranes, electrical upgrades, floor repairs, and a parts storage warehouse with offices. The project construction cost is estimated at \$12 million and will be constructed in 2006.

Damaged Steel Railway Bridge Repaired by Heat Straightening

An over-height vehicle struck the superstructure of CP Rail's bridge over Meadowvale Road in the City of Toronto, and severely distorted the bottom flange of the south steel girder. CP Rail retained TSH to assess the damage and to develop a repair program. A field inspection identified three separate distortions on the south girder. The bottom girder flange was misaligned 70 mm, over a longitudinal distance of 1 m.

TSH repaired the girder flange using heat straightening, a new technology in Canada. A repair procedure, consisting of sequentially heating and jacking the bent flange, was developed. Specifications included pre-determined heat patterns and restrictions on heat temperature, cooling cycle, and jacking force.

Six heat-jack-cool cycles were completed over a four-hour period, reducing the distortion to less than 10 mm. The next night, the remaining two, smaller distortions, were straightened.

Both CP Rail and TSH deemed the repair successful, and will continue to use this technology. TSH also designed and administered the construction of protective, concrete-filled steel beams on both sides of the bridge to prevent a reoccurrence of impact damage.

Millbrook South Cavan Public School - Renovation and Addition

Kawartha Pine Ridge District School Board - Millbrook South Cavan Public School re-opened on schedule for Fall 2005. TSH provided full services through two phases of work, expediting tasks while the school was in operation. This required diligent safety management by the general contractor and exceptional team effort from the school administration, Board personnel, and TSH.

LEED-based features of the project include daylighting strategies for the Kindergarten and Resource Centre areas. The



Resource Centre also features Solera translucent insulation. This innovative window system disperses natural light throughout the library, making daylight the main source of illumination. In-floor radiant heating in the Kindergarten area allows children to do activities on the floor, closest to the heat source. The Kindergarten wing also accommodates a future green roof that

moderates interior temperatures and reduces heat loss. Using LEED-based principles, the addition also features fabric ducting, designed for periodic removal, cleaning, and reinstallation to maintain optimal air quality.

Salt Management Protects the Environment

The adverse environmental effects of salt have been a dilemma for road maintenance managers. TSH is working with Renfrew County and the City of Kawartha Lakes to develop Salt Management Plans (SMP) that respond to Environment Canada's Code of Practice for the Environmental Management of Road Salts, and draw upon the Transportation Association of Canada's Synthesis of Best Practices for Road Salt Management. Identifying salt-vulnerable areas, developing and implementing specialized salt application procedures, and conducting ongoing monitoring programs are the cornerstones of SMPs.

While the SMP for the City of Kawartha Lakes is being developed, the preliminary results for Renfrew County are encouraging.

Renfrew County's SMP incorporated a multistep plan that was evaluated and refined to address the specific requirements of the County. The Renfrew County SMP, together with Snow Route Optimization, revised operations, equipment upgrades, and road weather information systems, achieved reductions in: chloride use (25%); total winter collisions not involving animals (16%); winter patrol costs (32%); and diesel fuel consumption (30%). The SMP minimized the effects of salt on road infrastructure, roadside vegetation, and vehicles, while maintaining road safety.

Highway 417 Bridge Rehabilitations

TSH prepared a Transportation Environmental Study Report and Preliminary Design Report for the major rehabilitation of 10 bridge structures, at five sites, carrying Highway 417 over the City of Ottawa's streets. The superstructures of these bridges needed replacement due to concrete delamination, deteriorated decks, and fatigue and corrosion of the steel girders. The provision of traffic detours to maintain three lanes of traffic in each direction provided an opportunity to address other issues, such as shoulder widths and drainage improvements. The recommended plan involved replacement of the decks using rapid replacement techniques to minimize traffic and impacts on property. Other features included new bearings, semi-integral abutments, and improvements to drainage and shoulders.



View of bridge deterioration



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