

**Assessment of Proposed Changes to the
Ontario Building Code to Increase the Energy
Efficiency of New Low & High Rise Buildings:
Cost/Benefit to Meet and Exceed OBC in the
Affordable Housing Sector**

For

**The Conservation Bureau
Ontario Power Authority**

By



**Addendum No. 1 -
Energy Efficient Measures for Projects
in the Planning Stage or the Preliminary Stage
of Construction**

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Acknowledgement and Disclaimer

SeeLine Group Inc. undertook this study for the Ontario Power Authority in May, 2006. The Project Team consisted of staff from SeeLine Group Inc. and Energy Profiles Limited. Any errors or omissions in this report are solely the responsibility of SeeLine Group Inc.

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1.0 Introduction

The Conservation Bureau requested that the SeeLine project team consider the options available to improve the energy performance of both Part 9 low-rise and Part 3 high-rise buildings where the planning is under way or construction is in and early stage. Table 1-1 shows the number of units of each type used in the analysis, based on information provided by MMAH-HD,.

Table 1-1: Phase of Development by Dwelling Unit Type

Number of Units	Planning Approval	Under Construction	Total
Row Townhouses	192	199	391
Multi-Unit Buildings	1731	1788	3519
Total	1923	1987	3910

In this report, there is no differentiation made between buildings in Planning Approval and those under construction.

2.0 Possible Energy Efficiency Improvements

For purposes of this analysis, the assumption has been made that the building envelope design cannot be modified, but that almost all other options remain open.

2.1 Townhouse Row Housing (OBC Part 9)

The measures that could be implemented in each dwelling unit in a row townhouse project that fall within the scope of the OBC include the following:

- Install high efficiency condensing gas furnace.
- Install energy efficient gas water heater

The provision of a high efficiency gas furnace (Annual Fuel Utilization Efficiency not less than 90%) over a mid-efficiency model (AFUE of 80%) will reduce natural gas for space heating by at least 12%. The installation of an energy efficient gas water heater (Energy Factor of 0.65 or higher) will reduce natural gas for water heating by 8%.

Additional measures that could be implemented but which fall outside the scope of the OBC include:

- Supply Energy Star appliances, including refrigerator and top loading washer.
- Install energy efficient lighting in all dwelling units, including T8 fluorescent lamps and electronic ballasts for permanent fixtures, and compact fluorescent lamps for tenant supplied lighting.

The use of Energy Star appliances will reduce annual electricity consumption in each dwelling unit by about 150 kWh/yr if a top loading washer is provided, and by over 500 kWh/yr if a front loading washer is selected.

Use of a gas stove and dryer instead of electric versions would reduce electricity consumption by over 1,000 kWh/yr.

Installing energy efficient lighting in each dwelling unit will reduce electricity consumption by about 500 kWh/yr.

2.2 High Rise Multi-Unit Residential Building (OBC Part 3)

The measures that could be implemented in each dwelling unit in a multi-unit residential project that fall within the scope of the OBC include the following:

- Install high efficiency non-condensing gas boiler.
- Install energy efficient service water heating plant.
- Install energy efficient lighting in all common area, including T8 fluorescent lamps and electronic ballasts.
- Install occupancy sensor controls in common areas having limited use such as stairwells in an elevator equipped building.
- Install energy efficient motors on all central fans and pumps.

The provision of a high efficiency gas boiler plant (approximately 84% efficiency) over a standard efficiency model (78% efficiency) will have the immediate impact of reducing natural gas for space heating by about 6%. Similar savings on energy for service hot water will result from installing a high efficiency service water heating plant.

Since most lighting in common areas operates 24 hours/day 7 days per week, simply changing to energy efficient lighting, including low or zero energy Exit signs, can reduce electricity consumption significantly. Adding occupancy sensors to those areas experiencing very limited use can significantly reduce consumption for illuminating these areas.

Motors driving central fans and pumps operate continuously throughout the heating season, and also during the cooling season for buildings with space cooling. Electricity savings can be significant due to the long periods of operation.

Additional measures that could be implemented but which fall outside the scope of the OBC include:

- Supply Energy Star refrigerator
- Supply central laundry facility with front loading clothes washers and natural gas clothes dryer.
- Install energy efficient lighting in all dwelling units, including T8 fluorescent lamps and electronic ballasts for permanent fixtures, and compact fluorescent lamps for tenant supplied lighting.
- Require that all room air conditioners meet Energy Star requirements.

The use of Energy Star appliances will reduce annual electricity consumption in each dwelling unit by about 150 kWh/yr if a top loading washer is selected, and by over 500 kWh/yr if a front loading washer is selected.

Use of front loading washers and gas dryers in the central laundry facility would reduce electricity and water consumption significantly.

Installing energy efficient lighting in each dwelling unit will reduce electricity consumption by about 500 kWh/yr.

3.0 Energy Savings and Capital Cost Estimates

3.3 Townhouse Row Housing (OBC Part 9)

The following measures are included in this analysis:

- i. High efficiency gas furnace.
- ii. Energy efficient water heater.
- iii. Energy Star refrigerator and top loading clothes washer.
- iv. Energy efficient lighting in dwelling units.

The summary of energy savings and incremental capital costs are presented in Table 3-1 for dwelling units using natural gas for space and water heating, and in Table 3-2 for dwelling units using electricity of all purposes.

Table 3-1: Energy Savings and Incremental Capital Costs – Gas/Electric

Row Townhouse Dwelling Unit - Gas/Electric	
Townhouse Unit	EE Upgrade
Annual Incremental Energy Savings	
Natural Gas	m ³
Inner	148
End	177
Electricity	kWh
Inner or End Unit	963
Incremental Capital Costs	
Inner	\$945
End	\$945

Table 3-2: Energy Savings and Incremental Capital Costs – All Electric

Row Townhouse Dwelling Unit - All Electric	
Townhouse Unit	EE Upgrade
Annual Incremental Energy Savings	
Electricity	kWh
Inner or End Unit	963
Incremental Capital Costs	
Inner or End Unit	\$430

3.2 High Rise Multi-Unit Residential Building (OBC Part 3)

The following measures are included in this analysis:

- i. Energy efficient non-condensing gas boiler.
- ii. Energy efficient service water heating plant.
- iii. Energy efficient lighting in common areas.
- iv. Energy efficient motors for central fans and pumps
- v. Energy Star refrigerator
- vi. Central laundry – front loading clothes washer and gas dryer

- vii. Energy efficient lighting in dwelling units.
- viii. Energy Star room air conditioners.

The summary of energy savings and incremental capital costs are presented in Table 3-3 for buildings units using natural gas for space and water heating.

Table 3-3: Energy Savings and Incremental Capital Costs

High-Rise MUR - 60 Unit Building		
Energy Saved per Dwelling Unit per Year		
	Electricity, kWh/yr	Natural Gas, m ³
Total	855	23
Percent Reduction	25.9%	2.3%
Capital Cost/Dwelling Unit		\$1,865

4.0 Impact on Energy and Summer Peak Demand

The annual energy impacts of the measures highlighted in Section 3.2 are presented in Table 4-1.

Table 4-1: Impact on Annual Energy Use

Overall Energy Savings Impact, kW - Enhanced EE Measures	No. of Units	Natural Gas Savings/Unit (Inner/End), m ³	Electricity Savings/Unit, kWh	Total Natural Gas Savings, m ³	Total Electricity Savings, kWh
Row Townhouses, Gas/electric	391	148/177	963	60,136	376,533
Multi-Unit	3519	23	855	80,937	3,008,745
Total	3519			141,073	3,385,278

The total impact on summer peak demand is presented in Table 4-2, based on a detailed analysis of each measure and the individual contribution to overall demand reduction in the summer. For this assessment, the peak period is that defined by the OEB approved avoided cost analysis¹ as used in the TRC screening assessment – summer weekday hours from 11:00 a.m. to 5:00 p.m. With the exception of the use of room air conditioners in the high rise MUR buildings, the other measures examined provide only a small contribution to reducing summer peak demand as their use is very limited during these hours. They all make a contribution to lowering annual energy costs for the housing service providers and/or the occupants.

¹ “Avoided Cost Analysis for the Evaluation of CDM Measures”, Navigant Consulting Ltd., June 24, 2005. Prepared for HydroOne Networks Inc

Table 4-2: Overall Impact on Summer Peak Demand

Overall Summer Peak Demand Impact, kW	Enhanced EE	Demand Impact/Unit	Total Demand Impact, kW
Row Townhouses	391	0.050	20
Multi-Unit	3519	0.124	437
Total	3910		457