Message from the Chair

Since 2008, I’ve had the privilege of serving as Chair of the BOMA BESt Strategic Committee; a Committee responsible for providing oversight and strategic direction for this national Program. During my time as Chair, I have seen the Program grow, evolve, and take its present shape. Go Green became the Go Green Plus program which became the BOMA BESt Program in 2009. Along with these re-branding efforts, the Committee has changed, too; we’ve moved from being an operational committee to a more strategic one. As such, the Committee has been able to develop a focused strategic plan to accomplish numerous milestones to advance the program in the Canadian marketplace. Some of these milestones include developing and introducing new assessment modules for various asset classes other than office buildings, including light industrial buildings, retail plazas, shopping centres, and, most recently, multi-unit residential buildings. We’ve also completed a content review of all of our assessment modules which has led to BOMA BESt “Version 2” which was released in January, 2012. Additionally, the Program has gained greater traction in the industry; BOMA BESt has become a widely-adopted Program by industry leaders and the Program’s recognition among building owners and managers continues to grow. Certainly, we can celebrate these achievements through the on-going success of the Program. I’d like to thank all of the volunteers, staff, and other Program stakeholders who have helped us achieve these milestones and who continue to promote the Program.

Looking forward, the Committee has established a number of strategic priorities for the Program. We are looking at introducing new assessment modules for other asset classes where our members have indicated the need. We are looking to strengthen our marketing efforts, improve the consistency and efficiency of Program delivery, and continue to enhance the Program by adding new tools and resources to the existing structure.

Again, thank you to everyone who has contributed ideas, insights, resources, and time over the years. We look forward to building on your great work and hope that you will continue to join us on our journey.

Sincerely,
Tom Sullivan
Senior Vice President, Portfolio Management & Finance, GWL Realty Advisors
Chair, BOMA BESt Strategic Committee
Message from the Manager, Environment & Energy Sustainability Practices

On behalf of BOMA Canada and the BOMA BESt program, I am pleased to present the third annual BOMA BESt Energy and Environmental Report (BBEER). This year, we have revamped the report from previous years in an effort to engage wider audiences about the BOMA BESt program. For instance, we have put particular emphasis on a few key topics of interest to the commercial real estate industry, such as existing building commissioning and tenant engagement, by including “spotlight” articles on these subjects. We have also partnered with all of the eleven local BOMA associations across the country to feature one BOMA BESt building from each to give readers a good sense of the range of commercial buildings that seek BOMA BESt certification. Additionally, the format and content of this report have been tweaked to be more of an all-encompassing “showpiece” for the Program. We’re very pleased with the accomplishments of the Program to date and could not be happier with the support we’re receiving from the industry. The number of buildings that seek certification and recertification speak volumes of this industry’s commitment to sustainability and the pursuit of continuous improvement in building operations and maintenance. We’re pleased that this Program continues to add value to the industry as evidenced by this trend toward certification and recertification, and we look forward to continuing to improve this Program through increased marketing and communications efforts; improving the consistency and efficiency of BOMA BESt processes and procedures, including verification; and adding functionality enhancements and other tools to the Program over time to add even more value to its stakeholders.

As with our previous reports, BBEER 2011 represents our ongoing commitment to disseminate relevant and timely information related to the Canadian commercial real estate industry’s performance across a range of indicators including energy and water efficiency, waste diversion and site enhancement, improvements to the quality of the indoor environment, effectively managing emissions and effluents, and implementing environmental management systems.

On a more personal note, since joining BOMA Canada in April 2011, I have been astounded by the contributions and dedication of our volunteers and the local BOMA Associations. BOMA BESt would not be the leading assessment and certification Program of its kind for existing commercial properties were it not for the efforts of our volunteer committees and the great work of the Local Associations to promote this important Program to its members. Thank you to everyone who has contributed to the success of BOMA BESt to date and who continues to help guide the strategic direction of the Program. Thank you also for warmly welcoming me into the BOMA organization and into the broader commercial real estate community.

Sincerely,
Melissa Peneycad
Manager, Environment & Energy Sustainability Practices, BOMA Canada
# Table of Contents

## Introduction 7

### About BOMA BEST 8
- BOMA BEST Delivers Real Green Value 11
- Key Program Improvements 11
- BOMA BEST Version 2 11
- BOMA BEST for Multi-Unit Residential Buildings:
  - A Game Changer for Condos and Apartments 12
- New Website 14

## Performance Report: BOMA BEST Buildings 15

### Introduction 15
- Five Pillars of BOMA BEST 18

### Methodology 23

### Key Findings 23

### Data Sets 36

### Offices – Performance Report 43
- Overall BOMA BEST Scores and Ratings 43
  - Energy 49
  - Water 69
- Waste Reduction and Site Enhancement 77
- Emissions and Effluents 80
- Indoor Environment 85
- Environmental Management System 90

### Enclosed Shopping Centres – Performance Report 93
- Overall BOMA BEST Scores and Ratings 93
  - Energy 94
  - Water 94

### Open Air Retail (Plazas, Power Centres) – Performance Report 96
- Overall BOMA BEST Scores and Ratings 96
  - Energy 97
  - Water 97

### Light Industrial Buildings – Performance Report 98
- Overall BOMA BEST Scores and Ratings 98
  - Energy 100

### Conclusion 101

## List of Acronyms 102

## References 103
Special Features
Spotlight on Existing Building Commissioning 24
Close the Loop on Waste: A Case Study 32
Spotlight on Stakeholder Engagement in the Commercial Real Estate Industry 44
What are the Primary Motivations to Implement “Green” Retrofits? 53
Linking BOMA BEST with Energy Projects: A Case Study 56
Greener Campuses 82
Spotlight on Continuous Improvement: How Building Occupants Can Help 92

Featured Buildings
Ontario Government Building, Thunder Bay 20
121 Research Drive, Saskatoon Innovation Place, Saskatoon 22
Jamieson Place, Calgary 30
Halifax Shopping Centre, Halifax 35
1500 University, Montreal 39
Daniel J. MacDonald, Charlottetown 48
Royal Bank Building, Winnipeg 62
3383 Gilmore Way, Burnaby 67
TD Tower, Edmonton 73
Scotia Centre, St. John’s 88

Tables of Figures, Tables and Charts
FIGURE 1: BOMA BEST Certifications (Levels 1 through 4) by Year 17
FIGURE 2: Improved scores of re-certified buildings 21
FIGURE 3: Reduced energy use per square foot of re-certified buildings 21
FIGURE 4: Percentage and Number of BOMA BEST Buildings by Asset Class included in this Portfolio Report 37
FIGURE 5: Percentage and Number of Office Buildings by Size 38
FIGURE 6: Percentage and Number of Office Buildings by Age 38
FIGURE 7: Distribution of BOMA BEST Certified Office Buildings by Age and Size 38
FIGURE 8: Percentage and Number of Enclosed Shopping Centres by Size 40
FIGURE 9: Percentage and Number of Open Air Retail Buildings by Size 41
FIGURE 10: Number of Light Industrial Buildings by Size 42
FIGURE 11: Overall BOMA BEST Scores by Region for Office Buildings 43
FIGURE 12: Percentage of BOMA BEST Level 2, 3, and 4 Certified Office Buildings by Year 46
FIGURE 13: Number of BOMA BEST Level 2, 3, and 4 Certified Office Buildings by Sector (Public vs. Private) 47
FIGURE 14: BOMA BEST Average Energy Scores by Region for Office Buildings 50
FIGURE 15: BOMA BEST Average Energy Consumption by Year for Office Buildings 51
FIGURE 16: Energy Intensities of BOMA BEST certified Office Buildings 52
TABLE 3: Incidence of Water Consumption Fixtures and Management Practices by Water Consumption Range and Building Age for Office Buildings

TABLE 4: Incidence of Waste Reduction, Recycling, and Site Enhancement Programs by Score Ranges and Building Age for Office Buildings

TABLE 5: Incidence of Air Emissions and Refrigerant Management Practices by Score Range and Building Age for Office Buildings

TABLE 6: Incidence of Emissions, Effluents and WHMIS Practices by Score Ranges and Building Age for Office Buildings

TABLE 7: Incidence of Features to Improve Indoor Environment by Score Ranges and Building Age for Office Buildings

TABLE 8: Incidence of Environmental Management Practices by Score Range and Building Age for Office Buildings

CHART 1: Natural Gas Use compared to Heating Degree Days for Building 1

CHART 2: Natural Gas Use compared to Heating Degree Days for Building 2

CHART 3: Engagement Strategies Continuum

CHART 4: Improvement in Energy Intensity
Welcome to the third annual BOMA BEST Energy and Environmental Report. This report is meant to showcase the BOMA BEST program and highlight its accomplishments over the past year. This report is also part of BOMA Canada’s ongoing commitment to inform and educate the industry and wider public audiences about this leading environmental assessment and certification program for existing buildings and how the commercial real estate industry is performing from an environmental performance and management perspective.

Several feature articles and case studies are included throughout this report to bring greater recognition and understanding to issues of importance to the commercial real estate industry. Also featured in this report are BOMA BEST certified buildings from across the country. And finally, this report includes a detailed analysis of the state of the commercial real estate industry in terms of energy and water efficiency, waste reduction and site enhancement, the management of emissions and effluents, indoor environment, and environmental management systems (the six key areas of environmental performance and management critically evaluated by the BOMA BEST program). Results are presented in the form of a Portfolio Report; performance data for commercial buildings across the country was aggregated for this analysis which was conducted by ECD Jones Lang LaSalle.
BOMA BEST (Building Environmental Standards) is Canada’s largest environmental assessment and certification program for existing buildings. It is a unique, voluntary program designed by industry for industry; it provides owners and managers with a consistent framework for assessing the environmental performance and management of existing buildings of all sizes. BOMA BEST certification recognizes excellence in energy and environmental management and performance in commercial real estate. The Program is managed by the Building Owners and Managers Association of Canada (BOMA Canada)\(^1\) and delivered by the eleven local BOMA Associations throughout Canada.

---

1. BOMA Canada is the voice of the Canadian commercial real estate industry. A national not-for-profit association, with strong regional association in each major region in Canada, BOMA Canada is comprised of over 3200 members, representing close to 2.1 billion square feet of commercial space in the country. Members include building owners, managers, developers, facilities managers, asset managers, leasing agents and brokers, investors, and service providers. For more information, please visit [www.bomacanada.ca](http://www.bomacanada.ca).
BOMA BESt's mission is to create a sustainable environment, one building at a time. One of the ways in which the Program is able to support this aim is by facilitating the continuous improvement of building operation and maintenance through the use of a questionnaire, or survey-based assessment. This assessment provides a consistent framework for owners and managers to critically assess six key areas of environmental performance and management including energy, water, waste diversion and site enhancement, emissions and effluents, indoor environment, and environmental management system.

The Program also provides the reasoning for and importance of specific practices and initiatives. Further, one of the Program’s main principles is the demonstration of on-site knowledge, as well as education and skill building.

BOMA BESt is the next “generation” (or iteration) of the former “Go Green” and “Go Green Plus” Programs (originally launched in 2005). The full program, under the name “BOMA BESt” was adopted and formally launched nationally by BOMA Canada in 2009.

Since the Program’s inception, BOMA BESt has seen tremendous uptake by the Canadian real estate industry, with over 2,900 buildings, representing hundreds of millions of square feet of Canadian commercial real estate, having applied for certification or recertification to date. This trend toward certification – and recertification – speaks to the value this Program has provided the commercial real estate industry and speaks to the industry’s commitment towards improving the sustainability of building operations and maintenance.

BOMA BESt has helped many building owners and managers realize greater energy and water efficiencies for their buildings, improve the sustainability of Canada’s built environment, and the quality of life for building occupants.

BOMA BESt is based on the Green Globes™ platform and model of assessment survey. The Green Globes system is a revolutionary building environmental design and management tool. It delivers an online assessment protocol, rating system and guidance for green building design, operation and management. It is interactive, flexible and affordable, and provides market recognition of a building’s environmental attributes through third-party verification. BOMA Canada has acquired the rights to use this platform in Canada under the name BOMA BESt.
BOMA BESt has helped many building owners and managers realize greater energy and water efficiencies for their buildings, improve the sustainability of Canada’s built environment, and the quality of life for building occupants.

With four levels of certification, users can progress through the Program and continually use the framework of the BOMA BESt Practices and full assessment to improve environmental performance and management.

The Program currently offers five assessment modules tailored to different asset classes: office and light industrial buildings, retail plazas, shopping centres, and, most recently, the Program launched a new module for multi-unit residential buildings.
BOMA BESt Delivers Real Green Value

Operations and Management: BOMA BESt certification helps owners and managers reduce building operating costs and achieve greater energy and water efficiencies.

Asset Value: Each dollar spent implementing sustainable management practices and technologies can increase the overall value of a building.

Differentiation: Building owners and managers are pursuing certification as a means of differentiating their buildings from others. Certification is a way for owners and managers to remain competitive and enhance their reputation; it is a way to publicly show their commitment to sustainability.

Occupant Satisfaction: Greener buildings provide healthier places to work, thereby improving the health and productivity of building occupants. Also, greener buildings can be quicker to secure tenants and can enjoy lower tenant turnover.

Inclusive: BOMA BESt is designed to be implemented by the very individuals who are responsible for the management of buildings. With its four levels of certification, the Program helps all building owners and managers – regardless of where they are on their sustainability journey – to continuously improve.

Performance: BOMA BESt certified buildings have better energy performance than the national average identified in Natural Resources Canada’s “Commercial and Institutional Consumption of Energy Survey”:
- BOMA BEST Level 2 certified buildings perform 6% better;
- BOMA BEST Level 3 certified buildings perform 18% better; and
- BOMA BEST Level 4 certified buildings perform 46% better than average.

Key Program Improvements

BOMA BEST Version 2
BOMA BEST has come a long way since 2005; the industry’s support of the BOMA BEST program has been invaluable to its success and evolution over time.

[Greener buildings provide healthier places to work, thereby improving the health and productivity of building occupants.]
The Program has evolved over time in terms of branding (Go Green, Go Green Plus, BOMA BEST) and in terms of the types of assets it is able to serve. For example, in addition to the original office building assessment survey, the BOMA BEST program has introduced new assessment surveys for light industrial buildings, shopping centres, and retail plazas. Now, in 2012, the BOMA BEST program has evolved once again with the launch of “BOMA BEST Version 2”.

As the industry advances and building management practices continue to improve and become ever more efficient, the Program must also evolve to keep pace and reflect industry best practices.

BOMA BEST Version 2, launched in English in the first quarter of 2012 (scheduled to be launched in French in early May 2012), includes revised building assessments for four types of commercial properties (office and light industrial buildings, retail plazas, and shopping centres); updated references to other standards and helpful resources; expanded “tip” language to help guide applicants through the process and better understand each question’s requirements; and a host of additional user-friendly features to facilitate a more efficient application process. Some of the notable changes to the content of the questionnaires include updated energy and water performance benchmarking scales; the addition of innovation questions to capture the use of innovative technologies and practices on-site; additional questions on existing building commissioning; and an enhanced indoor environment section. Version 2 also includes a long-awaited, highly-anticipated assessment for Multi-Unit Residential Buildings.

BOMA BEST Version 2 includes a host of enhanced user-friendly features including:

- A recertification function for all previous BOMA BEST certified buildings: static information about each BOMA BEST building will be incorporated into the system to reduce the amount of information that must be entered by the applicant at the time of recertification;
- Transparent scoring to enable applicants to see how many points each question is worth;
- Automatic conversion of consumption data to enable applicants to enter this data in whichever units appear on their utility bills.

**BOMA BEST for Multi-unit Residential Buildings: A Game Changer for Condos and Apartment Buildings**

The new assessment module for multi-unit residential buildings (MURBs) was officially launched as part of BOMA BEST Version 2. Now, apartment buildings and condominiums can attain BOMA BEST certification to communicate their environmental accomplishments to their residents. The development of this new module began in 2010 and was led by BOMA Canada and the Chair of the BOMA BEST program, Tom Sullivan, of GWL Realty Advisors. An ad-hoc committee of industry experts was assembled to provide input into this initiative. Once the draft module for MURBs was developed, BOMA Canada launched a national pilot program to test this
new assessment and ensure on-the-ground relevance and acceptance by industry. In total, 11 buildings across the country participated in this pilot initiative which took place over the course of 2011. Nine (9) of the pilot participants have since achieved certification. The pilot process was a great experience that ultimately led to improvements to the module based on pilot participant feedback. The pilot program also helped generate wide-spread interest and enthusiasm for this module among major landlords. In fact, in 2011, GWL Realty Advisors made a formal commitment to put through a portfolio of over 50 MURBs across the country.

The MURB module is composed of the same sections as other BOMA BESt assessment modules; it critically examines building performance and management across six key areas including energy, water, waste reduction and site enhancement, emissions and effluents, indoor environment, and environmental management system. Each one of these sections is weighted according to its materiality to this asset class.

BOMA BESt “Version 2”, launched in early 2012, includes updated assessment surveys for several asset types including office and light industrial buildings, retail plazas, and shopping centres. It also includes a brand new assessment survey for multi-unit residential buildings (MURBs).
The MURBs energy intensity benchmarking scale was developed based in part on several studies by Andrew Pride, then at Minto, and Duncan Hill of CMHC\(^2\). Their studies examined the energy performance of 133 MURBs and concluded that the average energy intensity of MURBs is 22 kWh/ft\(^2\)/yr.

Based on these studies, the BOMA BESt energy intensity benchmarking scale for MURBs ranges from 23 kWh/ft\(^2\)/yr (8 points would be awarded to buildings that achieve this energy intensity) to 14 kWh/ft\(^2\)/yr (80 points). As more MURBs come into the BOMA BESt program, this scale may be adjusted. For now, the Pride-Hill studies serve as an excellent baseline from which to work.

**New Website**

In late December, 2011 the BOMA BESt program unveiled a whole new online look and feel with the launch of a new website. The site is much more modern, includes updated Program information, publications, and research. *It also acts as a showcase for BOMA BESt certified buildings across the country.* BOMA BESt program applicants are also able to apply directly to the BOMA BESt program from this site. See the changes for yourself! Visit www.bomabest.com.

---

INTRODUCTION
The following Portfolio Report details the energy and environmental performance of 415 buildings certified to BOMA BESLevel 2 through 4, which represent 102.71 million square feet of Canadian commercial real estate. All 415 buildings were assessed and certified using the BOMA BES framework between January 1 and December 31, 2011.
BOMA BESt is an online energy and environmental assessment framework that rates existing commercial buildings against industry best practices, standards, and principles of green building systems and management. The BOMA BESt program generates ratings and recommendations for improvement. This Portfolio Report is an overview of the results from a compilation of all building data. Its aim is to provide a snapshot of the current performance of Canada’s commercial buildings, as well as explore ways to improve the program, thereby helping to accelerate progress towards the environmental sustainability of our built environment.

The report shows quantitative and qualitative results for the six key areas of building performance and management that are evaluated by the Program: energy; water; waste reduction and site enhancement; emissions and effluents; indoor environment; and environmental management system. The energy component makes up a significant portion of the BOMA BESt assessment, and as such, is the primary focus of this Portfolio Report. It is also important to note that in an effort to compare similar buildings, buildings in this Portfolio Report were compared by age and size and, in some cases, whether they were private or public sector buildings.

The results show that there is a wide range of performance in some areas such as energy and water use. This is to be expected in a large sample where buildings have different types of tenancies and hours of operation. There appears to be a more consistent level of achievement in areas such as waste and hazardous materials management, and response to tenant concerns.

The data also suggests that there is room for improvement in some areas such as energy, water, and waste, whereas there is a higher level of compliance with the BESt Practice requirements for emissions and effluents, indoor environment, and environmental management systems.

This is the third annual BOMA BESt Energy and Environmental Report (BBEER). The first BBEER, published in 2009, presented results based on an analysis of more than 450 office buildings (representing 132 million square feet) that had achieved BOMA BESt certification Levels 2 through 4, from 2005 to 2009. The 2010 BBEER presented data on approximately 300 existing office buildings, representing 92.3 million square feet of commercial real estate, which were certified to Levels 2-4 between June 2009 and July 2010. This 2011 BBEER is an update of the 2010 report which

With over 1,360 currently certified buildings (as at December 31, 2011), BOMA BESt has more energy and environmental third-party verified data for existing buildings than any other program in North America.
examines data on 415 buildings (102.71 million square feet), which received BOMA BESt certification Level 2 through 4 between January and December 2011. For the first time, building data for asset classes other than offices will be presented; results on the performance of enclosed shopping centres, open air retail (plazas), and light industrial buildings will also be presented in this report. With over 1,360 certified buildings (as at December 31, 2011), BOMA BESt has more energy and environmental third-party verified data for existing buildings than any other program in North America.

BOMA Canada commissioned environmental consultants at ECD Jones Lang LaSalle (ECD/JLL) with analysing BOMA BESt data to produce this 2011 report. Where possible, industry trends have been established, as have benchmarks for energy performance. ECD was the original founder of Green Globes (the platform upon which BOMA BESt rests) and has been involved with BOMA Canada in developing and enhancing this program since its inception. ECD/JLL has years of experience with BOMA BESt and a strong understanding of the data collected through the Program, making them well suited to perform the data mining and analysis needed for this Portfolio Report.

Figure 1, below, shows the number of buildings that have received certification since the Program’s inception in 2005. Certification lasts for a three-year period.
FIVE PILLARS OF BOMA BEST

Assessment
The online BOMA BESt Assessment consists of approximately 175 questions (14 of which are “BESt” practice requirements), typically requiring a “yes or no” response. Applicants must be able to support each answer with back-up documentation which is presented to the third-party verifier during the mandatory on-site audit of the building. A report is automatically generated that gives a rating as a percentage, as well as scores for each of the six sub-sections. The report also lists the building’s achievements and provides recommendations for improvement.

Education
The process of completing a BOMA BESt application offers building management teams with a hands-on, practical education opportunity. BOMA BESt guides managers through a building review from an environmental perspective, which addresses all aspects of building operations in an effort to understand the environmental impacts of the operation. By answering the 175 questions in the BOMA BESt assessment, managers learn about the environmental impacts of their operations, and most importantly, what they can do to improve.

Ease of use and the cost effectiveness of delivery also allow building operators to directly conduct the assessments and in the process, learn about the energy and environmental issues affecting their building(s). This has a significant impact on the culture of the building management. To sustain continuous improvement, best practices must become engrained in the culture of the organization. BOMA BESt builds a framework to ensure a culture of continuous improvement within the organization.

Verification
Information submitted by BOMA BESt applicants is verified through a third-party audit of energy and water utility data, a review of documented policies and procedures and operations manuals, as well as a walk-through of the building, including the mechanical room and a typical occupant space.

Certification
All buildings that achieve BOMA BESt certification must, at a minimum, meet BOMA’s 14 “BESt” Practices. Four levels of certification distinguish higher performing buildings based on their energy and environmental performance. The performance levels are established based on the score achieved on the online BOMA BESt assessment and a third-party onsite verification process. The certification levels are:
BOMA BEST Level 1 indicates that a building has met all of the 14 BOMA BEST Practice requirements. The requirements include performing an energy assessment and a water assessment, continually monitoring resource consumption and having in place a preventative maintenance program.

BOMA BEST Level 2 certified buildings not only meet all of the BOMA BEST Practices, but also achieve a score of 70-79% on the full BOMA BEST assessment (approximately 175 questions including the 14 BEST Practices). The certification demonstrates that a building is moving towards excellence in energy and environmental performance through better management.

BOMA BEST Level 3 certification is for buildings that meet all of the BOMA BEST Practices and achieve a score of 80-89% on the full BOMA BEST assessment. Buildings at this level of certification have achieved higher energy and environmental performance and demonstrate excellence in management.

BOMA BEST Level 4, the highest level of certification, is for buildings that have achieved a score of over 90% on the full BOMA BEST assessment specific to building type and meet all of the BOMA BEST Practices. These buildings are high performers with low energy consumption, excellent management, and often combine new technologies and industry leadership.

Improvement

A growing number of building owners and managers, including major property management firms and many government organizations, are measuring the energy and environmental performance of their buildings using BOMA BEST.

The BOMA BEST program provides building owners and managers with a framework for environmental management and improvement. It is a tool that gives managers the opportunity to identify their baseline performance, and then work towards improvement over time as they go through cycles of recertification. Applicants can also use BOMA BEST as a tool for improvement before achieving certification by taking advantage of the recommendations in their assessment report to improve the property before submitting for certification.

There is growing evidence that BOMA BEST contributes to energy and environmental improvement. As the buildings certified in the early years of the program are now being recertified – many for the second time – there is a marked improvement in the overall scores, particularly in buildings that had low initial scores (Figure 2). The average score of recertified buildings has improved from the initial average baseline of 79.2 to 81.8 at recertification. While the energy performance improvements in individual buildings are not consistent, this can be explained by factors such as changes in occupancy or the introduction of data centers. However, the majority of buildings do
The Ontario Government Building at 189 Red River Road in Thunder Bay, which overlooks glorious Lake Superior, stands as a tribute to building sustainability having achieved the highest-ever BOMA BESst score of 95% (earning the building the prestigious Level 4 with the Program). Continuous improvement is something the management team at Infrastructure Ontario (formerly Ontario Realty Corporation) takes seriously. The facility first received recognition from the Building Owners and Managers Association in 2008 when it received an Earth Award, BOMA Canada’s recognition of excellence in resource preservation and environmentally sound commercial building management. Three years later, as the building sought recertification, the building achieved even more notoriety by attaining a BOMA BESt score of 95%. Some factors contributing to this high score are the building’s smart lighting systems, daylight harvesting, and the installation of windows with reflective glazing as well as high-efficiency boilers and chillers. Other efforts implemented by management included a comprehensive on-site waste reduction and recycling program, a community garden, and a preventative maintenance program.
show a reduction in energy use intensities\(^3\) from an average of 29.1 equivalent kilowatt hours per square foot per year (ekWh/ft\(^2\)/yr) before recertification to 25.3 ekWh/ft\(^2\)/yr after recertification (Figure 3).

---

3 Energy Use Intensity (EUI) is a unit of measurement that describes a building’s energy use. EUI represents the energy consumed by a building relative to its size.
121 Research Drive, Saskatoon Innovation Place was the recipient of the prestigious Earth Award in 2010 from BOMA Regina and received a Level 4 certification from BOMA BEST. To achieve Level 4, the building went through the BOMA BEST assessment survey for Office Buildings and scored over 90% as verified by an independent third-party.
METHODOLOGY

Performance data was gathered from the online assessments database of 415 buildings certified to BOMA BESst levels 2, 3 and 4 during 2011. These included Offices, Enclosed Shopping Centres, Open Air Retail (plazas) and Light Industrial properties. This data was analyzed and is presented in aggregated form. Buildings that received BOMA BESst Level 1 certification were not included in this analysis because Level 1 certifies the management practices but does not require detailed performance data. The results of this report are meant to inform the Canadian commercial real estate industry and its stakeholders regarding the energy and environmental performance and benchmarks of these buildings.

KEY FINDINGS

This section presents a snapshot of the current performance of Canada’s commercial buildings including offices, enclosed shopping centres, open air retail (plazas) and light industrial buildings based on data submitted to the BOMA BESst program throughout 2011 for 415 buildings (representing 102.71 million square feet of commercial real estate). Opportunities for improvement within the industry are highlighted.

Sample Size and Characteristics: For the first time, the report contains data for not only office buildings but also for enclosed shopping centres, open air retail, and light industrial buildings. Offices still represent the largest proportion of BOMA BESst Level 2 through 4 certified buildings (81% or 336 buildings), followed by Light Industrial (11% or 46 buildings), Enclosed Shopping Centres (6% or 24 buildings), and Open Air Retail (2% or 9 buildings).
Spotlight on Existing Building Commissioning

BOMA Canada’s national Environment & Energy Committee initiated the development of an informational brief on existing building commissioning to clarify this complex subject that has garnered significant attention in recent years. This brief, entitled “Existing Building Commissioning (EBCx) for Commercial Real Estate” is available on www.bomabest.com under “News and Publications”.

The purpose of Existing Building Commissioning (EBCx) is to optimize the operation of existing systems and equipment. Undertaking an EBCx initiative can help owners, managers, and building operators identify actions to ensure existing systems and equipment function optimally and meet operational needs; EBCx also helps owners and managers avoid replacing perfectly serviceable equipment.

While commissioning is not a new concept, increasing interest in applying this practice to existing buildings has been spurred by research demonstrating value through energy savings. An EBCx project can be completed using a whole building commissioning approach which investigates the interaction of various building systems in the commissioning process. Alternatively, EBCx can be done using a system-specific approach which is narrower in focus but can produce substantial benefits. Choosing which approach to use for an EBCx initiative is dependent on the resources, needs, and objectives of a specific building or portfolio of buildings.

While every commissioning project has its own characteristics, there are general experiences that can be shared among industry – successes and lessons learned – that this informational brief, and others like it, aim to capture.
Existing Building Commissioning Can Lead to Dramatic Energy Savings: A Case Study

From a systems-operational perspective, commercial office buildings are complex and intricate. Large and dynamic mechanical and electrical systems operate together (or against each other at times) to deliver heating, cooling, lighting, humidification, air-quality, air-pressure, etc. Because of this complexity, dynamism, and accumulated changes in building configurations, it is common for buildings to drift away from their original design parameters and out of system control.

EBCx equips a building’s operating team with the specific knowledge they need to run their building’s systems as effectively and efficiently as possible, thereby improving comfort, reducing waste, and saving money.

Energy@Work Inc. recently completed an EBCx project of the heating system for a Toronto-area office tower. The project targeted a 30% reduction in natural gas. These potential savings were identified by comparing the natural gas use (cubic meters/hour for one month) of two similar buildings – shown in green above – against heating degree days (HDD) – shown in black. Building 1 is responsive to both occupancy (natural gas use consistently falls by about two thirds during nights and weekends) and weather (the peaks track the HDD line).

In response, the EBCx project was approved for Building 2’s heating systems. Operational and maintenance measures were identified and implemented. The 30% targeted natural gas savings were achieved through this EBCx initiative and independently verified by Enbridge.

In Energy@Work’s experience, in most existing buildings, a well designed and implemented EBCx project will improve tenant comfort, and, without major capital investments, achieve a utility savings of between 15 and 30 percent.
The largest segment of Office buildings by size in the past 12 months consists of smaller office buildings under 100,000 ft² (37%) and under 250,000 ft² (36%). Larger buildings, those over 500,000 ft² in size, make up a relatively small portion (11%) of buildings that received BOMA BEST certification Levels 2 through 4 in 2011.

The largest segment of Office buildings by age consists of buildings constructed between 1960 and 1989 (50%).

In 2011, forty six (46) light industrial buildings were certified to BOMA BEST Levels 2 through 4. The light industrial sector represents the second largest category in the Program. The majority (86%) of Light Industrial buildings included in this report are less than 100,000 ft² in size.

Twenty four (24) enclosed shopping centres were certified to BOMA BEST Levels 2 through 4. The majority (67%) were 250,000 to 750,000 ft² in size.

The open air retail category is by far the smallest category represented in this report. Only 9 retail plazas received BOMA BEST certification at Levels 2 through 4 in 2011. The majority (78%) of these buildings were smaller than 250,000 ft² in size.

**Energy (Offices)**

- BOMA BEST Office buildings tend to perform better in terms of energy intensity (i.e. the amount of energy consumed per square foot) than the national average of 36.65 ekWh/ ft²/yr, identified in the Natural Resources Canada’s (NRCan) Office of Energy Efficiency, Comprehensive Energy Use Database, 1990 to 2009. The average for BOMA BEST certified buildings is 30.8 ekWh/ft²/yr.

- When grouped regionally, BOMA BEST Office buildings in all regions show average annual energy intensities better than NRCan’s national average. Office buildings that have higher overall BOMA BEST scores tend to also have better energy performance than those that have overall lower scores.

- The majority of BOMA BEST Office buildings (66%) certified in 2011 have energy intensities that are better than the BOMA BEST average. The overall BOMA BEST average is being negatively impacted by a few buildings that have large additional loads such as data centres. This suggests the need for a more detailed classification of buildings that have applications such as data centres. This is now being addressed in BOMA BEST version 2.
• By ordering all the BOMA BEST certified offices according to their energy intensity and dividing the samples into four groups, the following benchmarks are obtained:
  − Lowest performing 25% of buildings: 35-92 ekWh/ft²/yr
  − Lower middle 25-50% of buildings: 27-34 ekWh/ft²/yr
  − Upper middle 50-75% of buildings: 22-26 ekWh/ft²/yr
  − Top performing 25% of buildings: 10-21 ekWh/ft²/yr

• It is noteworthy that grouping the office buildings by BOMA BEST energy score levels reveals similar orders of magnitude of energy consumption as were found in the sample. This provides validation of the BOMA BEST energy scoring system, which takes into account not only energy intensity but also energy features (e.g. energy efficient lighting) and operational practices to improve energy efficiency. Average energy use per square foot for each BOMA BEST level is as follows:
  − Level 2 certified buildings average 35.3 ekWh/ft²/yr;
  − Level 3 certified buildings average 28.9 ekWh/ft²/yr; and
  − Level 4 buildings average 19.6 ekWh/ft²/yr.

The Yonge Richmond Centre, Toronto, BOMA BEST Level 3 (certified 2010)
• Average energy consumption in 2011 at 30.8 ekWh/ft²/yr is better than it was in 2008 (31.52 ekWh/ft²/yr). However, the current rate of improvement signals that significant effort on the part of industry is still required if ambitious targets, such as the “20x15 target” are to be met (“20x15” is a target, initially established by REALpac, which aims to achieve 20 ekWh/ft²/yr of total energy use in office buildings by 2015).

• There appears to be some correlation between office building size and energy intensity. The smaller buildings – those under 100,000 ft² – average 27.7 ekWh/ft²/yr, or about 18% less than medium to large buildings (250,000–500,000 ft²), which average 33.9 ekWh/ft². On the other hand, very large buildings – buildings greater than 500,000 ft² – also use less energy (29.1 ekWh/ft²) than medium-large buildings. A possible explanation could be that the largest buildings have dedicated energy management teams to ensure optimal performance.

• There is a significant range between the energy consumption of the best performing office buildings and that of the worst performing offices. The median for energy per square foot in the best performing quartile is 17.75 ekWh. The median for energy per square foot in the worst performing quartile is 38.35 ekWh. This wide range represents a large standard deviation.

• The total carbon dioxide from all of the office buildings, representing 82.2 million square feet of office space certified to Levels 2 to 4, is 560,814 metric tonnes. If these buildings were performing at the national average, they would be emitting 667,332 metric tonnes. The difference is 106,518 metric tonnes, which is equivalent to 20,886 cars not driven for one year or 22,712 acres of pine forest storing carbon dioxide for one year.

• BOMA BEST carbon intensities show regional variations, with highest carbon intensities in Atlantic and Central Canada and the lowest in Quebec and British Columbia.

**Water (Offices)**

• By ordering all the BOMA BEST certified Office buildings into quartiles according to their water consumption (measured in m³ water per m² of area), the following benchmarks are obtained:
  - Top performing 25% of buildings: 0 - 0.2 m³/m²
  - Upper middle 50-75% of buildings: 0.21 - 0.54 m³/m²
  - Lower middle 25-50% of buildings: 0.55 - 0.97 m³/m²
  - Lowest performing 25% of buildings: 0.98-8.85 m³/m²
These performance ranges suggest that over half of the buildings have significant room to improve their water consumption.

- The results for 2011 show that office buildings less than 500,000 ft² in size use less water per square foot than buildings that are 500,000 ft² or more in size. This may be due to the presence of food courts, cooling towers, water cooled HVAC (heating, ventilation, and air conditioning) systems or other special uses in larger buildings. Also, newer Office buildings tend to use less water per square foot perhaps due to newer, more efficient water fixtures in these buildings.

**Waste Management (Offices)**

- About 42% of office buildings in our sample size of 336 buildings divert between 60 and 90% of their waste from landfill. However, many office buildings (23%) have not reported their exact diversion rate. Results indicate that there is a higher incidence of better waste management practices in buildings constructed after 1990.

---

Robinson Place, Peterborough, BOMA BEST Level 3 (certified 2011)
Jamieson Place is a 38 storey, AAA building located in downtown Calgary. The building was completed in early 2010 and fully occupied in mid 2011.

Both bcIMC Realty Corporation, the building owner, and Bentall Kennedy Canada LP, the building developer and property manager, have a long standing commitment to the environment and are dedicated to sustainable property performance.

Jamieson Place was certified Gold in the LEED Core and Shell program, but, as Keri Cormier, property manager with Bentall Kennedy explains, “We also wanted to measure and evaluate how sustainably we were operating the building.” The BOMA BEST program, says Cormier, “Was a great way for us to assess what sustainable systems and practices we had in place. The questions were simple to understand, easy to answer, and our score was calculated with just a click of a button. The BOMA BEST program not only provided immediate scores, but also offered instantaneous suggestions and ideas on how to improve in each of the categories that are assessed. These opportunities for improvement are valuable to help us plan for future improvements and push us further towards meeting our sustainability targets.”

Jamieson Place recently completed the BOMA BEST program and certified as Level 4.
Emissions, Effluents and Hazardous Materials (Offices)

- Performance across the portfolio with respect to managing emissions and effluents is fairly consistent, with percentage scores in the mid to high 80s. This finding indicates that there is a strong culture and management infrastructure to support environmental management in the industry. Policies and protocols are well established for managing pollutants such as emissions from boilers, and hazardous materials such as those found in cleaning products, lubricants, water treatment chemicals, fuels, and pesticides.

- While there are well-established refrigerant management practices such as properly maintaining inventory of ozone-depleting refrigerants and providing training to staff, there is still room for refrigerant replacement, particularly in Office buildings built prior to 1960. Almost all office buildings use certified contractors to do refrigerant maintenance.

- Seventy percent (70%) of office buildings in the top-scoring quartile use only refrigerants with low ozone-depleting potential.

- Notwithstanding the high standard of overall management practices and the strong performance of the top-scoring quartile, results indicate that the vast majority of office buildings (those in the other three quartiles) still have room to improve. Many still use refrigerants with high ozone-depleting and global-warming potential although most reportedly have a phase-out plan. And although three quarters of buildings that use ozone-depleting, global-warming refrigerants do have recovery systems for use during system servicing, repairs, or disposal, the majority (71%) of buildings in the very lowest quartile lack refrigerant leak detectors.

- Fewer than 40% of buildings have low nitrogen oxide (NOx) boilers. However, about two thirds of buildings do have a regular documented schedule for cleaning burners, monitoring controls, and analyzing flue gas.

Indoor Environment (Offices)

- The majority of office buildings score very well in terms of indoor environment, which includes air quality, lighting, and acoustic privacy. The average indoor environment score achieved by office buildings is 88.5%.

Environmental Management System (Offices)

- Almost all (99%) of the office buildings in this sample size of 336 have documented environmental policies and communications strategies with tenants to explain to them the environmental practices being implemented in the building and to encourage tenants to support such initiatives.

---

4 The Ozone-Depleting Potential (ODP) is the ratio of the impact on ozone of a chemical compared to the impact of a similar mass of CFC-11. Thus, the ODP of CFC-11 is defined to be 1.0. Other CFCs and HCFCs have ODPs that range from 0.01 to 1.0. HFCs have zero ODP because they do not contain chlorine. The US EPA defines refrigerants with high ozone depleting potential of more than 0.2 as Class I Substances and refrigerants with low ozone depleting potential of less than 0.2 as Class II Substances. http://www.epa.gov/ozone/defns.html
Close the Loop on Waste: A Case Study

Commercial building occupants can generate an awful lot of waste and, without a comprehensive recycling and good tenant awareness program in place, much of it could wind up – needlessly – in landfills. Building owners and managers play a huge role in helping to divert discarded materials from landfills by installing recycling bins in all offices and common areas of the building and by encouraging building occupants to make good use of these amenities. The BOMA BESt program recognizes the importance of waste diversion; in fact, there is a whole section in the Program specifically devoted to it. In the building featured next, we will see exactly how one building is making a tangible difference when it comes to reducing waste with the help of their flagship tenant and their waste collection service provider.

Air Miles Tower, located at 438 University Avenue in Toronto, Ontario is a 322,557 square foot office tower owned by Dundee REIT and managed by Dundee Realty Management Corp. Dundee has contracted Cascades Recovery Inc. to manage the discarded materials generated from this facility. Cascades Recovery Inc. recovers 5 metric tonnes of discarded office paper, 2.03 metric tonnes of cardboard, and 0.67 metric tonnes of discarded hand towels from the building each month (quoted figures are based on the building’s January 2012 waste diversion report) and sends most of this fibre off to a Cascades Paper Mill to be re-pulped and manufactured into office paper (and other paper products). This office paper, produced by Cascades Fine Papers Group, is purchased by LoyaltyOne, Inc., the building’s major tenant. LoyaltyOne occupies 53% of the building (in terms of square footage) – or 11 of the building’s 21 floors – and exclusively purchases 100% recycled paper from this Canadian company for everyday office use. They are presently looking to expand their green purchasing program to include 100% recycled tissue products (e.g. paper towel).

Dundee has supported LoyaltyOne’s environmental objectives by providing recycling bins for all offices in the building, as well as all common areas. Says Lyn Crooks, Senior Property Manager for the building, “We’re proud to partner with LoyaltyOne on this commitment towards the environment; they have set the bar high in terms of their sustainability goals and we’re happy to support them in any way we can. BOMA BESt is a tool that has allowed us to examine our strengths in environmental management and has provided us with recommendations on how to improve. The Program, along with the strong initiative of our flagship tenant, has contributed to our building being a high environmental performer.” Because Dundee uses Cascades Recovery Inc., nearly all discarded paper in the building is placed back into production – and winds up right back where it originally came from – in the form of fine paper to be used yet again. This closed loop system of production —using fibre from the “blue bin” instead of fibre from the forest — is an efficient way of
using valuable forest resources, since each fibre can be used up to seven times!

The Dundee management team at Air Miles Tower has been able to realize a waste diversion rate of nearly 80% which contributed to this building's particularly high score in the waste reduction and site enhancement section of the BOMA B.E.S.T program, helping it to achieve BOMA B.E.S.T certification.

A good system of communication on the part of Dundee serves to inform all tenants of the environmental initiatives in the building, and motivates them to implement their own measures to contribute to the building's sustainability. Together, Cascades, LoyaltyOne, and the Dundee management team at 438 University Avenue are working to close the loop on waste for this building.
Enclosed Shopping Centres

- BOMA BEST certified enclosed shopping centers tend to perform better in terms of energy intensity than the Typical Annual Energy Intensity of 30.98 ekWh/ft², (1.2 GJ/m²) identified by NRCan⁵. BOMA BEST-certified enclosed shopping centers have an average energy intensity of 23.40 ekWh/ft² (0.90 GJ/m²).

Open Air Retail

- Initially, open air retail buildings were reporting only their energy consumption in common areas. As this does not provide sufficient basis for benchmarking, the latest version of BOMA BEST (BOMA BEST Version 2) now requires full energy consumption to be reported, including the tenants’ data. While recognizing the initial difficulty in obtaining a full data set, this requirement may lead to better cooperation, understanding, and dialogue between tenant and landlord with regards to the joint objective of reducing energy use.

Light Industrial

- Light Industrial buildings certified to BOMA BEST Levels 2 to 4 consist primarily of warehouses. They tend to perform better in terms of energy intensity (15.97 ekWh/ft²/yr) than the Typical Annual Energy Intensity identified by NRCan⁶ for the Transportation and Warehousing sector (35.9 ekWh/ft²).

---


Halifax Shopping Centre, managed by 20 VIC, recertified in December 2011 with the BOMA BESst program by going through the BOMA BESst Enclosed Shopping Centre assessment survey. After having achieved a score of over 80% as verified by an independent third party, the building was awarded with a Level 4 certification (up from their previous Level 3 certification).
This report is based on the compilation and analysis of BOMA BESt Assessment data for all BOMA BESt buildings certified to Levels 2 through 4 during January to December 2011. This represents 415 existing buildings, representing 102.71 million square feet of commercial real estate across Canada.

This Portfolio Report shows quantitative and qualitative results for energy, water, waste reduction and site enhancement, emissions and effluents, indoor environment, and environmental management systems. The energy section makes up a significant portion of the BOMA BESt assessment surveys, and as such is the primary focus of this report.

Within the BOMA BESt assessment, users enter the consumption values for all fuels and the total square footage for the building via a web-based interface. Energy usage information is then converted to equivalent kilowatt hours per square foot on an annualized basis (ekWh/ft²/yr). This energy intensity value is compared against a scale built into the BOMA BESt assessment, where energy intensity values lower than 36 ekWh/ft²/yr gain points on a sliding scale.

With respect to office buildings, the overall BOMA BESt score considers six areas of sustainability with the following weightings for each section: energy (35%), water (8%), waste reduction and site enhancement (11%; 5.5% for waste reduction and 5.5% for site enhancement), emissions and effluents (17.5%), indoor environment (17.5%) and environmental management system (11%). Users respond to questions about the building’s features, performance, and management in each of the six sections. The responses are used to calculate a score for each section as well as an overall score. The information is then verified by a third-party auditor who visits the property and confirms the information in the online submission.
For the first time, this BOMA BEST Portfolio Report has been expanded to include asset classes other than offices; information pertaining to the performance of enclosed shopping centres, open air retail (plazas), and light industrial properties has been included in this report. Figure 4 shows the number of buildings in each category that received certification at Levels 2, 3 and 4 between January 1 and December 31, 2011. This Portfolio Report provides more data on office buildings than it does on the other asset classes due to the smaller sample sizes of the latter.

**OFFICES**

The total number of Office buildings reviewed for this report is 336, which represents all Level 2, 3 and 4 buildings certified between January 1 and December 31, 2011. The following charts provide a profile of these office buildings by region, size, and age.

Nearly 85% of the buildings assessed were private sector commercial office buildings; 15% were public administration buildings. The regional distribution of buildings somewhat reflects Canada’s population density distribution: half of the buildings are from Ontario; and Ontario and Quebec together make up 57% of all buildings certified.

Figure 5 shows that more than 70% of the office buildings in the sample size are 250,000 ft² or less. Figure 6 shows that almost 50% of office buildings were built between 1960 and 1989. Figure 7 combines size and age information into one chart revealing that the bulk of certified office buildings in the program are post-war buildings under 250,000 ft².
FIGURE 5: Percentage and Number of Office Buildings by Size

- Under 100,000 ft²: 37; 11%
- 100,000 - 250,000 ft²: 125; 37%
- 250,000 - 500,000 ft²: 55; 16%
- Over 500,000 ft²: 119; 36%

FIGURE 6: Percentage and Number of Office Buildings by Age

- Before 1960: 106; 32%
- 1960-1989: 167; 50%
- 1990 and Newer: 58; 17%
- Not Reported: 5; 1%

FIGURE 7: Distribution of BOMA BEST Certified Office Buildings by Age and Size
1500 University, located in Montreal, Quebec, is a 600,000 square foot building that was built in 2002. It has 7 stories and over 2000 occupants. Notable tenants include Hydro-Quebec, Nuance, L’Oreal, Computershare, and CIBC. Owned and managed by Ivanhoé Cambridge, this building achieved a BOMA BESt score of over 90%; it has been awarded with a Level 4 certification. 1500 University has achieved this level of certification by introducing more energy efficient equipment, such as installing a cooling system that uses recycled water. Substantial savings in natural gas consumption have been achieved as a result. The building also generates energy on-site thanks to solar panels and has established a composting program.
**ENCLOSED SHOPPING CENTRES**

This report gives performance data for 24 Enclosed Shopping Centres that were certified to BOMA B.E.S.T Levels 2 through 4 over the course of 2011. The bulk of these properties (16 or 67%) are 250,000 to 750,000 ft² in size (Figure 8).

**FIGURE 8: Percentage and Number of Enclosed Shopping Centres by Size**

- Under 250,000 ft²: 3; 12%
- 250,000 - 750,000 ft²: 16; 67%
- 750,000 - 1 million ft²: 4; 17%
- Over 1 million ft²: 1; 4%

*Oshawa Centre, Oshawa, BOMA B.E.S.T Level 4 (certified 2009)*
OPEN AIR RETAIL (PLAZAS, POWER CENTERS)

This report gives performance data for 9 Open Air Retail buildings that were certified to BOMA BESt Levels 2 through 4 over the course of 2011. Seven of the nine retail plazas (78%) are less than 250,000 ft² (Figure 9).

![Figure 9: Percentage and Number of Open Air Retail Buildings by Size](image)

Meadowvale North, Mississauga, BOMA BESt Level 3 (certified 2010)
LIGHT INDUSTRIAL BUILDINGS

This report gives performance data for 46 leased light industrial properties that were certified to BOMA BESI Levels 2 through 4 over the course of 2011. Of these, forty (87%) are under 100,000 square feet in size and 37 (80%) are categorized as “warehouses” (see Figure 10).

![Figure 10: Number of Light Industrial Buildings by Size](image)

Many light industrial buildings are a combination of small administration office space, and warehouse or workshop space, BOMA BESI asks for the breakdown of the space use. Where more than 40% of the space is used as either as a warehouse, workshop or office, the building is assigned into that category.
OFFICES - PERFORMANCE REPORT

Overall BOMA BESt Scores and Ratings

The average BOMA BESt score increased slightly over the previous year from 77.8% to 78.1%. The Overall scores for Office buildings certified to Levels 2-4 show that the variance between regions and the national average is relatively small, with the lowest average in British Columbia and the highest in Ontario (see Figure 11).

![201 Portage Avenue, Winnipeg, BOMA BESt Level 3 (certified 2011)](image)

**FIGURE 11: Overall BOMA BESt Scores by Region for Office Buildings**

<table>
<thead>
<tr>
<th>Region</th>
<th>Score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>80.9%</td>
</tr>
<tr>
<td>Central Region</td>
<td>79.1%</td>
</tr>
<tr>
<td>Quebec</td>
<td>79.0%</td>
</tr>
<tr>
<td>Atlantic Region</td>
<td>75.8%</td>
</tr>
<tr>
<td>British Columbia</td>
<td>75.7%</td>
</tr>
</tbody>
</table>

Average 78.1%
Engaging stakeholders is a critical component of Corporate Social Responsibility. It is also an important component of building certification programs, such as BOMA BEst. Organizations of all types and sizes, including commercial real estate companies, do not necessarily have full control over who are their stakeholders, therefore, it is important to identify those organizations and individuals who can have a direct and indirect impact on business operations and identify strategies to engage each effectively.

A useful technique to identify stakeholders and their relative impact on one’s business is to conduct a stakeholder mapping exercise in which one visually represents the variety of stakeholders that can potentially impact business operations, as well as the types of relationships that currently exist with each group. It is important, at this stage, to articulate how one’s business is affected / impacted by each and vice versa. In the world of commercial real estate, key stakeholders can range from investors, owners and brokers, to property management teams, tenants / building occupants, government representatives, third-party service providers, and the community at large.

There are many reasons why a building manager may find it useful to engage stakeholders. For instance, it is a good way to enlist support for measurement and performance reporting or to communicate changes as to how a facility is managed that may require cooperation or consent. Engaging stakeholders such as unions or Non Government Organizations is also a good way to prevent or solve a crisis, or to proactively improve relationships. Proactive engagement is an important – and even mandatory – component of certification programs such as BOMA BEst. For instance, owners...
and managers often require the cooperation and support of tenants when seeking certification, especially in cases where tenants control their own utilities. Establishing partnerships with tenants not only helps a building achieve certification, but also helps to generate ongoing performance improvements.

Building managers have a multitude of engagement strategies to choose from; the strategy chosen will depend on the stakeholders and the desired outcome of the process. Engagement strategies can be plotted along a continuum from low to high in terms of effort required and anticipated outcomes (see Chart 3).

Examples of successful engagement strategies in the commercial real estate industry abound. Many leading companies have forged mutually beneficial partnerships with local and national environmental groups to support shared environmental objectives and enhance corporate reputation. Also, some managers engage tenants’ “green teams” to facilitate two-way dialogue about how best to improve the environmental performance of a building and to discuss how both groups can work together to achieve greater efficiencies. Other companies solicit input from tenants vis-à-vis quarterly surveys which are used to facilitate improved building management. Leading companies have developed reports and scorecards to communicate their environmental performance to their tenants, suppliers, and other stakeholders.
Since the inception of the Program in 2005, overall BOMA BESt scores have been improving incrementally. Figure 12 shows that the percentage of Office buildings achieving BOMA BESt Level 4 certification is still relatively small, indicating room for improvement in energy and environmental best practices.
A larger proportion of public sector buildings have achieved a BOMA BESt Level 3 and Level 4 certification than private sector buildings. Thirty five percent (35%) of the private buildings, compared to 50% of public buildings, have achieved Level 3, as shown in Figure 13.

**FIGURE 13:** Number of BOMA BESt Level 2, 3, and 4 Certified Office Buildings by Sector (Public vs. Private)

Duke Tower, Halifax, BOMA BEST Level 2 (certified 2011)
Daniel J. MacDonald, managed by SNC Lavalin O&M in Charlottetown, Prince Edward Island, received a BOMA BESt Level 3 certification, awarded by BOMA New Brunswick (the local association also responsible for PEI) in April 2011. It achieved all 14 BESt practices plus a score of over 80% on the full BOMA BESt assessment survey for Office Buildings.
Energy

Energy is an important environmental parameter; energy use relates directly to climate change as well as a variety of air emissions (hydrocarbons, CO₂, and airborne particles as well as sulphur dioxide and nitrogen oxides which contribute to acid rain). Energy is also an important operational expense. From a cost perspective, there is a direct correlation between energy savings and cost savings.

The score achieved in the Energy section of BOMA BEST is a measure of a building's energy consumption, its energy efficiency features, the energy management practices employed, and transportation alternatives.

The energy section is worth 35% of the total score for Office buildings. The distribution of points across the energy sub-sections is as follows:

- Energy consumption: 8%
- Energy efficiency features: 13%
- Energy management: 8%
- Transportation: 6%
Annual energy consumption is given for each building in equivalent kilowatt hours per square foot (ekWh/ft²), and is calculated based on the utility bill information entered into the BOMA BESt assessment survey. Criteria related to energy features include, among other items, the building’s envelope, HVAC system, lighting features, domestic hot water use, building controls, and the use of renewable energy. The best practices within the Energy section include conducting an energy audit; energy monitoring and targeting with steps being taken to analyze and reduce peak energy demand; preparing training plans for staff; budgeting for energy improvements; having in place operating manuals that include trouble shooting for all services equipment that may affect energy consumption; installing sub-meters; and having in place maintenance and preventive maintenance schedules.

“Transportation” is a subsection of the energy section. A daily journey totalling as little as 8 km by car can, over one year, emit as much CO₂ as that emitted to provide heat, light, and power for one office worker. The transportation section within the larger energy section addresses items such as the building’s proximity to public transportation and cycling facilities.

Figure 14 shows the average energy scores for each region. Here again, the range of performance is very narrow across regions.
The average energy intensity of Level 2 to 4 certified office buildings in 2011 is slightly lower than for those certified in previous years. Going forward, as more buildings come up for re-certification, it will be interesting to note the extent to which their energy consumption improves. Figure 15, which represents different samples of buildings year by year, shows that building stock in Canada may be improving their energy consumption by year. However, the current rate of improvement signals that there is still significant room for improvement in this area.
BOMA BEST buildings perform 16% better in terms of energy intensity than the national average. As Figure 16 shows, 78% of BOMA BEST certified buildings are performing better than the national average of 36.6 ekWh/ft² (1.42 GJ/m²). The greatest concentration of buildings in the sample has intensities that range between 20 and 36 ekWh/ft²/yr. More than half of the buildings perform better than 26 ekWh/ft²/yr.

FIGURE 16: Energy Intensities of BOMA BEST certified Office Buildings

---

What are the Primary Motivations to Implement “Green” Retrofits?

According to a 2009 joint study by Deloitte and Charles Lockwood⁹, there are many reasons why building owners and managers choose to undergo greener retrofits over conventional retrofits. The results of their study show that a surprising number of considerations go into the decision-making process for undergoing a green retrofit. For example, 88% of respondents cited a significant motivation to ‘improve indoor air and environmental quality’; 88% of respondents also said that adhering to their overall ‘corporate environmental commitment’ was a motivating factor. ‘Value of public relations and free publicity’, as well as ‘greater workforce productivity’ and ‘operational cost savings from energy efficiency’ was cited as motivating factors by 75% of respondents. ‘Attraction and retention of quality workforce’ was cited by 69% of respondents. Lower on the list of motivating factors, but still important ones to consider, are ‘greater overall building value’ (cited by 31%); ‘higher occupancy rates’ (19%); ‘Operational cost savings from water efficiency’ (19%); and ‘reduction of greenhouse gas (GHG) liability’ (13%).

What motivates you to “go green”? We’d love to hear from you. Send your response to info@bomacanada.ca. Your story could be featured in the 2012 BBEER report.

Figure 17 shows the distribution curve of energy intensity for office buildings. A greater number of buildings have lower energy intensities but there is a more consistent distribution in the high energy intensity range. This may be caused by the growing number of data centers, whose energy, up until now, have not been separated from the overall building consumption. BOMA BESt Version 2 separates data centre loads from the rest of the building’s consumption data. The 2012 BOMA BESt Energy and Environmental Report will be able to separate data centres from overall building consumption which should yield more accurate results.

The sample size is statistically meaningful and provides a balanced representation of the segment of the population that is actively engaged in improving the energy and environmental performance of buildings.

BOMA BESt Levels 2, 3, and 4 provide a meaningful representation of annual energy intensity. As Figure 18 shows, BOMA BESt Level 2 certified buildings average 35.3 ekWh/ft²/yr (1.37 GJ/m²), slightly worse than in the 2010 performance of 34.2 ekWh/ft²/yr (1.29 GJ/m²). On the other hand, the Level 3 certified buildings average 28.9 ekWh/ft²/yr (1.12 GJ/m²) which is an improvement over the 2010 performance of 31.9 ekWh/ft²/yr (1.18 GJ/m²); and Level 4 buildings average 19.6 ekWh/ft²/yr (0.76 GJ/m²), again a better performance than the 2010 consumption of 22.6 ekWh/ft²/yr (0.86 GJ/m²). The public sector shows a greater performance range than the private sector, ranging from 36.1 ekWh/ft²/yr for Level 2 certified buildings to 12.6 ekWh/ft²/yr for Level 4 certified buildings.

By ordering all the BOMA BESt certified office buildings according to their energy intensity and dividing them into four groups, the following benchmarks are obtained:

- Lowest performing 25% of buildings: 35 to 92 ekWh/ft²/yr;
- Lower middle 25-50% of buildings: 27 to 34 ekWh/ft²/yr;
- Upper middle 50-75% of buildings: 22 to 26 kWh/ft²/yr; and
- Top performing 25% of buildings: 10 to 21 ekWh/ft²/yr.
**FIGURE 17: Energy Intensity Distribution of BOMA BEST Certified Office Buildings**

![Energy Intensity Distribution of BOMA BEST Certified Office Buildings](image)

Average: 30.8%

**FIGURE 18: Average Energy Intensity by BOMA BEST Certification Level for Office Buildings**

![Average Energy Intensity by BOMA BEST Certification Level for Office Buildings](image)

<table>
<thead>
<tr>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector</td>
<td>28.9</td>
<td>19.8</td>
</tr>
<tr>
<td>Public Sector</td>
<td>28.9</td>
<td>12.6</td>
</tr>
<tr>
<td>Overall</td>
<td>28.9</td>
<td>19.6</td>
</tr>
</tbody>
</table>
ACCORDING TO THE INTERNATIONAL ENERGY AGENCY, ONE-THIRD OF ALL END-USE ENERGY CONSUMPTION IS DIRECTLY RELATED TO COMMERCIAL, RESIDENTIAL AND PUBLIC BUILDINGS.\textsuperscript{10} IN A WORLD WHERE GLOBAL CLIMATE CHANGE IS A VERY REAL CONCERN, AND, GIVEN THAT CANADA’S COMMERCIAL BUILDING SECTOR ACCOUNTS FOR ABOUT 14% OF END-USE ENERGY CONSUMPTION AND 13% OF CANADA’S CARBON EMISSIONS, OPPORTUNITIES TO IMPROVE ENERGY EFFICIENCY IN THIS SECTOR ABOUND.\textsuperscript{11}

BOMA BESt is one way for building owners and managers to identify how their building performs from an energy efficiency perspective. BOMA BESt requires that 12 months of consumption data be entered in order to establish a baseline for the building and ultimately to benchmark its performance. Annually, the results are aggregated and presented in the BOMA BESt Energy and Environmental Report; readers of this report can see for themselves how Canada’s commercial real estate industry is progressing towards reducing its energy consumption and lessening its impact on climate change.

Real cost savings can be achieved through energy conservation. In this example, we will see how Building A used the BOMA BESt program to identify energy conservation opportunities and how such opportunities were then implemented to realize efficiencies and cost savings.

Building A, located in Vancouver, BC, is a 57,567 ft\textsuperscript{2} 5-story office building that was built in 1985. HVAC features in this building include a natural gas boiler for hydronic heating and domestic water. The chiller supplies the chilled water loop, and there are 4 AHUs (air handling units) that provide mixed air to VAV (variable air volume) boxes on floors 2 through 5. Building A achieved BOMA BESt Level 1 certification; it met the 14 best practice requirements but achieved a 50% overall score on the full BOMA BESt assessment for office buildings. Substantial opportunities for improvement in this building were identified by going through the BOMA BESt assessment. For example, the energy audit requirement – one of the best practices in the BOMA BESt program – revealed specific energy conservation opportunities. Building A decided that it wanted to explore these opportunities further, and engaged the services of an energy manager – working through BOMA BC – to help them improve building performance. The energy audit provided all of the necessary information required to start the energy management process. Five specific projects were identified, all of which were directly in line with the energy audit results:

Project 1 Installation of variable speed drives (VSD) on AHU fans and cooling tower fan;
Project 2 Installation of VSD on condenser water loop pumps;
Project 3 Building Automation System (BAS) installation to replace existing pneumatic system;
Project 4 Installation of vending misers (similar to an occupancy sensor) on vending machines;
Project 5 Lighting controls.

Each project was eligible for incentives through BC Hydro. The total cost for Project 3, for instance, was $240,000, after incentives, the cost was brought down to $110,000 (a difference of $130,000). Energy savings associated with this project were calculated to be 456,700 kWh (a 26% reduction). Simple payback on this project was 2.02 years, return on investment (ROI) was calculated to be 22.25%, net present value (NPV) of the project was $367,088.66, and, by installing this BAS, Building A could realize an additional 40 BOMA BESt points. All 5 projects combined would yield these impressive results for Building A:

Simple Payback: 2 years
ROI: 18.17%
NPV: $378,794.96
Additional BOMA BESt points achieved: 49

The results presented above are impressive enough but let’s turn our attention to the building’s energy intensity as a result of implementing these 5 energy projects.

The following chart shows that before implementing these energy projects, Building A’s energy intensity was 33 ekWh/ft²/yr and after implementing these projects, Building A’s energy intensity decreased to 23 ekWh/ft²/yr – a remarkable difference of 10 ekWh/ft²/yr.

In addition, as a result of implementing these projects and realizing measurable energy savings, Building A earned an extra 24 BOMA BESt points.

In total (after project identification and installation), Building A realized a 31% electrical reduction. In addition to the 49 points this building was able to achieve by implementing these energy projects, Building A was able to gain a further 24 points as a result of this realized electrical reduction. Therefore, Building A gained 73 BOMA BESt points in total (equivalent to a 7% increase in score).

Clearly, there is tremendous value associated with green building assessment and certification systems, like BOMA BESt. BOMA BESt helps to provide a simple answer to a very complex question: Is My Building Green? Also, BOMA BESt is a tool to assist building owners and managers achieve reductions in energy, carbon, and other emissions that directly impact the bottom line. Green makes green.
Buildings in all regions across the country have annual average energy intensities that are less than the national average of 36.65 ekWh/ft²/yr. As shown in Figure 19, the Quebec Region continues to show the best performance (24.4 ekWh/ft²/yr overall), whereas the Central Region, which includes Alberta, Saskatchewan and Manitoba, has the highest energy intensity (33.4 ekWh/ft²/yr overall). The higher energy consumption in that region is in public sector buildings, which often also tend to be older buildings.

Public sector buildings also have the highest energy intensity average in Quebec but the lowest in British Columbia. The Quebec figure may be slightly skewed as some other asset classes, such as railway stations, were certified under the “office” category. Private sector buildings have the highest energy intensity in the Central region and the lowest in the Quebec and Atlantic regions.

![Figure 19: Average Regional Energy Intensities of Office Buildings](image)

Fuel and electricity intensities show the expected regional variations. As Figure 20 demonstrates, the highest electricity use is in Quebec, which is likely due to the low cost of electricity.

The highest natural gas usage is in the Ontario Region (Figure 21). No natural gas consumption data was available for private buildings in the Atlantic region, very likely because the majority of buildings use fuel oil for heating.
**FIGURE 20: Average Electricity Use by Region of Office Buildings**

![Average Electricity Use by Region of Office Buildings](image1)

**FIGURE 21: Average Natural Gas Use by Region of Office Buildings**

![Average Natural Gas Use by Region of Office Buildings](image2)
Buildings constructed after 1989 show, overall, better performance in terms of energy intensity and carbon emissions than those constructed prior to 1960, as shown in Figure 22. Taken across the public and private sectors, energy intensity averages 34.2 ekWh/ft²/yr for older buildings, compared with 31.0 ekWh/ft²/yr for those buildings built between 1960-1989, and 28.7 ekWh/ft²/yr for those built in 1990 or later.

There is a greater overall difference between the energy consumption per square foot of new buildings versus old buildings; this gap is wider than in previous years. One possible explanation for this widening gap between new and old is that the greener design principles employed in new buildings and higher awareness of energy and environmental issues — although still representing a fraction of the market — are starting to have an effect. The results also indicate some differences between the public and private sectors.

Interestingly, older buildings in the public sector seem to be performing comparatively better than newer buildings (Figure 22). One possible explanation for this could be that older buildings, while having less energy efficient envelopes and systems, tend to have less associated plug loads than newer buildings. These results could also reflect public sector efforts to address the overall energy and environmental performance of their older buildings. More research is needed to further understand this particular trend.
There appears to be some correlation between building size and energy intensity as shown in Figure 23. Lower (better) energy intensities are found in buildings under 250,000 ft² and higher (worse) intensities are found in buildings over 250,000 ft². The highest (worst) energy intensities are found in buildings in the 250,000 to 500,000 ft² range. The consumption is better for very large buildings greater than 500,000 ft². This may be due to the fact that small and mid-size buildings, which have simpler systems, experience a significant impact from any energy efficiency upgrades such as a lighting retrofit. On the other hand, medium-to-large buildings, with their more complex systems, require a wider range of integrated, and sometimes capital-intensive, solutions to achieve the same levels of reduction. Meanwhile, very large buildings often address energy by installing sophisticated features and management systems while also engaging highly trained and qualified operations staff – all of which can keep the consumption lower than in medium-to-large buildings.

**FIGURE 23: Average Energy Intensity by Size for Office Buildings**
The Royal Bank Building may be one of Winnipeg’s oldest skyscrapers but it shows no signs of slowing down in terms of continuing to pursue environmental excellence in building management and performance. The last three years have all been banner ones for this building, managed by CREIT Management LP. In 2009, the Royal Bank Building won the National Air Filtration Association’s Clean Air Award, for management’s commitment to indoor air quality and the utilization of high-efficiency filters. In 2010, the building achieved a BOMA BESt Level 3 certification. This high level of achievement indicates not only the building’s commitment to achieving 14
best practice requirements as they relate to energy, water, waste reduction and site enhancement, indoor air quality, emissions and effluent management, and the implementation of an environmental management system, but 80% on the more fulsome BOMA BESt assessment survey for office buildings. And if that weren't enough, the 45-year old building was recognized with two other prestigious awards in 2011: BOMA Manitoba’s Earth Award and The Outstanding Building of the Year Award.

“BOMA BESt is much more than a certification”, says Sue Ziemski, Property Manager for the building. “The Program’s framework allows users to continually monitor and implement operational improvements from the BESt Practices and recommendations. It is an excellent tool that outlines the building’s baseline performance, and then guides the user to implement further improvements”, says Ziemski.

Alex Fleming, President of Demand Side Energy, further adds, “Unlike a new building which can be certified green by design, BOMA BESt buildings have the opportunity to establish, improve, and maintain sustainability targets. As part of the certification, an action plan for the Royal Bank Building was developed with a commitment to invest in energy and water-saving technologies and strategies. Building owners should pursue sustainability as a value proposition, not just as a certification level.”

Building upgrades for the Royal Bank Building include:

• High-efficiency boilers used to reduce fuel consumption;
• Carbon dioxide sensors installed to accurately gauge the amount of fresh air required;
• Motion and sound sensors installed to control area lighting;
• Compact fluorescent bulbs and other high-efficiency lighting designs installed to lower electricity costs;
• Variable speed drives installed on fan and pump systems to reduce energy consumption;
• Use of on-site renewable energy (e.g. active solar and photovoltaic);
• Low flow toilets, urinals, and faucets installed;
• Written policy intended to minimize water use and encourage water conservation.
The BOMA BEST office buildings in this sample emit 106,518 metric tonnes of carbon dioxide LESS than if they were emitting at the national average. This is equivalent to 20,886 cars NOT being driven for one year or 22,712 acres of pine forests storing carbon dioxide for a period of one year.

The total carbon dioxide from all of the office buildings (representing 82.2 million square feet) is 560,814 metric tonnes. While BOMA BEST office buildings certified in 2011 range in age, size, location, and performance, the overall average energy intensity of these buildings is 30.8 ekWh/ft²/yr (1.18 GJ/m²), or about 16% better than Natural Resources Canada’s Comprehensive Energy Use Database, 1990 to 200912 which presents a national average of 36.6 ekWh/ft²/yr (1.42 GJ/m²)13. If these BOMA BEST buildings were at the national average, they would be emitting 667,332 metric tonnes of carbon – a difference of 106,518 metric tonnes, which is approximately equivalent to 20,886 cars not driven for one year or 22,712 acres of pine forests storing carbon dioxide for one year.14

Carbon intensities show regional variations consistent with the various sources of electricity generation across provinces. In regions with the greatest carbon emissions, the data indicates slightly better performance in the public sector. As shown in Figure 24, carbon emissions are highest in the Central and Atlantic regions and lowest in Quebec and British Columbia respectively, reflecting the use of fossil fuel-generated electricity in Alberta and the Atlantic, versus the use of hydro-electricity in Quebec and British Columbia.

The carbon dioxide emission intensities shown here are based on the equivalent kilowatt-hour per square foot annual intensities (ekWh/ft²/yr) and the relevant provincial conversion factors based on electricity generation in Canada. The intent is to communicate the differences in a general sense, as the details of different types of heating sources have not been factored into the values shown in Figure 24.

---

13 Other sources for a national average for energy intensity in commercial buildings indicate a similar value. Sustainable Development Technology Canada (SDTC) reported average energy intensity of 41.3 ekWh/ft² (1.60 GJ/m²) in the Commercial Buildings - Eco Efficiency SD Business Case™, November 2007. Similarly, NRCan’s Commercial and Institutional Building Energy Use Survey (2000) reported average energy intensity of 41.0 ekWh/ft² (1.59 GJ/m²).
Buildings constructed prior to 1960 show lower carbon emissions, and those built between 1960-1990 show highest carbon emissions, as shown in Figure 25. This finding could reflect the fact that many of these buildings were constructed during the era of inexpensive energy.
Several energy efficiency features are being implemented by the majority of buildings in the sample as shown in Table 1. These include lighting retrofits, temperature setback control, shading, and building automation. Table 1 groups the buildings based on their energy intensity performance.

**Table 1: Incidence of Energy Efficiency Features by Energy Consumption Range and Building Age for Office Buildings**

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>Energy Consumption Range (kWh/ft²/yr)</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact fluorescents</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>TB or T5 lamps</td>
<td>95%</td>
<td>96%</td>
</tr>
<tr>
<td>LED exit signs</td>
<td>90%</td>
<td>95%</td>
</tr>
<tr>
<td>Lighting controls</td>
<td>75%</td>
<td>76%</td>
</tr>
<tr>
<td>High efficiency boiler (Over 50% efficiency)</td>
<td>34%¹⁵</td>
<td>21%²⁰</td>
</tr>
<tr>
<td>Economizers on boilers</td>
<td>60%</td>
<td>51%</td>
</tr>
<tr>
<td>Vent dampers</td>
<td>39%</td>
<td>36%</td>
</tr>
<tr>
<td>Temperature setback controls</td>
<td>96%</td>
<td>97%</td>
</tr>
<tr>
<td>Full Building Automation System (BAS)</td>
<td>71%</td>
<td>84%</td>
</tr>
<tr>
<td>High efficiency hot water heaters</td>
<td>59%</td>
<td>50%</td>
</tr>
<tr>
<td>Hot water saving fixtures</td>
<td>71%</td>
<td>87%</td>
</tr>
<tr>
<td>Water temperature between 50-55 °C</td>
<td>98%</td>
<td>100%</td>
</tr>
<tr>
<td>High efficiency chillers (Over 50% efficiency)</td>
<td>22%¹⁶</td>
<td>30%²¹</td>
</tr>
<tr>
<td>Variable speed drives</td>
<td>90%</td>
<td>95%</td>
</tr>
<tr>
<td>Heat recovery</td>
<td>39%</td>
<td>34%</td>
</tr>
<tr>
<td>“Green electricity” purchasing</td>
<td>16%</td>
<td>29%</td>
</tr>
<tr>
<td>Energy efficient windows</td>
<td>80%</td>
<td>79%</td>
</tr>
<tr>
<td>Shading or reflective film to reduce cooling</td>
<td>93%</td>
<td>96%</td>
</tr>
<tr>
<td>Air seal top of building</td>
<td>78%</td>
<td>83%</td>
</tr>
<tr>
<td>Air seal bottom of building</td>
<td>76%</td>
<td>76%</td>
</tr>
<tr>
<td>Air seal vertical shafts</td>
<td>69%</td>
<td>76%</td>
</tr>
<tr>
<td>Wall Insulation per building condition report</td>
<td>67%</td>
<td>68%</td>
</tr>
<tr>
<td>Roof Insulation per building condition report</td>
<td>70%</td>
<td>67%</td>
</tr>
</tbody>
</table>

15 27 buildings do not have boiler.
16 32 buildings do not have boiler.
17 32 buildings do not have boiler.
18 27 buildings do not have boiler.
19 13 buildings do not have chiller.
20 13 buildings do not have chiller.
21 17 buildings do not have chiller.
22 14 buildings do not have chiller.
3383 Gilmore Way, located in Burnaby, BC and managed by Morguard Investments Ltd. scored very high in all six categories assessed by the BOMA BESt program (energy, water, waste reduction and site enhancement, emissions and effluents management, indoor environment, and environmental management system), earning it the highest level of certification possible – Level 4. Several architectural aspects helped this building achieve such a high score. For instance, this building’s green architecture incorporates design elements such as sunshades, high efficiency window glass to assist heating and cooling systems year-round, and televenting window shades that disperse interior heat build up through ceiling spaces.
Table 2 shows energy management measures grouped by energy score. Energy management measures are fairly uniform and show a high level of achievement, as some of these are pre-requisites of the BOMA BEST program. The greatest contributors to a higher score are demand response management measures, evidence of energy training and sub-metering. Despite growing evidence that sub-metering is a significant energy saving measure, many buildings still do not have sub-metering.

### TABLE 2: Incidence of Energy Management and Transportation Practices by Energy Consumption Range and Building Age for Office Buildings

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>Energy Consumption Range (kwh/ft²/yr)</th>
<th>By Building Age</th>
<th>1940</th>
<th>1960-1989</th>
<th>1990 and Newer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Policy</td>
<td>98% 97% 99% 96%</td>
<td>100% 97% 97%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy audit</td>
<td>83% 70% 75% 71%</td>
<td>78% 70% 80%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy monitoring</td>
<td>99% 96% 100% 98%</td>
<td>100% 98% 97%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flattening load profile</td>
<td>83% 92% 89% 86%</td>
<td>84% 90% 84%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy training and updates</td>
<td>71% 87% 89% 91%</td>
<td>76% 88% 83%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy improvement budget</td>
<td>99% 99% 100% 99%</td>
<td>100% 99% 98%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenant sub-metering</td>
<td>27% 38% 38% 35%</td>
<td>14% 35% 45%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-metering of major energy uses</td>
<td>46% 39% 46% 39%</td>
<td>48% 39% 45%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User-friendly operating manual for all services</td>
<td>98% 97% 98% 94%</td>
<td>97% 96% 97%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive maintenance schedule</td>
<td>100% 100% 100% 100%</td>
<td>100% 100% 100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to public transport</td>
<td>90% 95% 95% 99%</td>
<td>88% 98% 94%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent public transportation service</td>
<td>71% 80% 90% 93%</td>
<td>72% 87% 84%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheltered bike racks</td>
<td>70% 86% 77% 94%</td>
<td>83% 81% 81%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changing facilities for cyclists</td>
<td>57% 63% 53% 66%</td>
<td>57% 54% 70%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communications with building occupants to facilitate carpooling</td>
<td>67% 55% 55% 62%</td>
<td>50% 57% 70%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Water**

This section assesses water consumption performance, the water-conserving features of buildings, as well as water management practices. A successful water management program begins with an understanding of how the facility and its occupants use and dispose of water. This makes it possible to plan effective measures to achieve reductions. Figure 26 shows the BOMA BESt average water scores for each region. Ontario achieved the highest average score, and British Columbia the lowest. The water score provides a measure of a building’s water consumption, water conserving fixtures, and water management policies and practices.

**FIGURE 26: BOMA BEST Average Water Scores by Region for Office Buildings**

Alberta Legislative Building, Edmonton, BOMA BEST Level 2 (certified 2011)
Annual water consumption, given for each building in cubic metres per square metre (m³/m²), is calculated based on water bill review. The water section rewards low/efficient water use; the presence of water conserving fixtures including low flush toilets; and water management practices that include auditing, ongoing monitoring, and procedures for finding and fixing leaks.

This section is worth 8% of the total score for Office buildings, and it evaluates the water elements with the following breakdown: water consumption: 3%; water conserving fixtures: 3.2%; and water management policies and practices: 1.8%.

Similar to energy improvements that have occurred year after year, the average water use intensity of BOMA BESt certified buildings (Levels 2 to 4) has also been improving. In 2008, the average water use intensity was 1.13 m³/m² which has decreased to 0.97 m³/m² in 2011. These findings indicate that the various water consumption reduction programs and technologies in the marketplace are having an effect (see Figure 27).

**FIGURE 27: BOMA BESt Average Water Use by Year for Office Buildings**

![Graph showing average water use intensity from 2008 to 2011 for Office Buildings. The average water use intensity has decreased from 1.13 m³/m² in 2008 to 0.97 m³/m² in 2011.](image-url)
Water consumption intensity as calculated from water bills varies widely as shown in Figure 28, from 0.2 m³/m² to over 2.2 m³/m². By ordering all the facilities according to their water consumption intensity, and dividing them into performance groupings, the following benchmarks are obtained:

- Top performing 25% of buildings: 0.2 - 0.39 m³/m²
- Upper middle 50-75% of buildings: 0.4 - 0.74 m³/m²
- Lower middle 25-50% of buildings 0.75 - 1.04 m³/m²
- Lowest performing 25% of buildings 1.05 - 8.05 m³/m²
The overall average water consumption intensity for BOMA BESt office buildings is 0.91 m³/m² which is significantly better than the national average of 2.03 m³/m².

The overall average water consumption intensity for BOMA BESt Office buildings certified to Levels 2 to 4 is 0.91 m³/m², which is significantly better than the national average (2.03 m³/m²)23 for water consumption in commercial buildings as stated by Sustainable Development Technology Canada (2007). The highest water consumption (2 m³/m²) is in British Columbia, with most other regions showing overall consumption of less than 1 m³/m² (see Figure 29).

Although many buildings in Quebec do not have water meters, of the 81 buildings in the sample, 52 buildings did provide water consumption information.

TD Tower, located in Edmonton, Alberta is a 333,510 square foot office tower that is managed by Oxford Properties Group. The building has 29 stories and was built in 1976. In 1998, it underwent significant renovations, including a full exterior renovation including replacement of all windows, spandrels and granite, the addition of a street front main floor lobby and renovation of all lobbies and washrooms. There are about 1,500 occupants in this downtown building. This building has achieved BOMA BESt certification more than once; in early 2012, TD Tower received re-certification at BOMA BESt Level 2.
There is a correlation between building size and water consumption (see Figure 30), with buildings less than 100,000 ft² in size consuming twice as much per floor area as larger buildings 250,000 ft² and over. While the larger buildings may use water for a wider range of uses including cooling towers and food services, they nevertheless tend to consume water more efficiently. Further research is needed to explore why there is such a range in water consumption intensity among buildings of different sizes, especially since, as we shall see, there does not appear to be a direct correlation between good water management practices and policies and lower water consumption rates.

Figure 31 shows water consumption by building age and sector. Apart from those in the public sector, buildings constructed after 1990 show the lowest water consumption rates per unit of floor area and those constructed before 1960 the highest. Public sector buildings constructed before 1960 appear to have lower water consumption rates than private sector buildings built in the same period.
FIGURE 31: Water Consumption by Building Age for Office Buildings

PRIVATE SECTOR
- Before 1960: 0.46
- 1960-1989: 0.84
- 1990 and Newer: 1.79

PUBLIC SECTOR
- Before 1960: 0.42
- 1960-1989: 0.84
- 1990 and Newer: 1.37

OVERALL
- Before 1960: 0.98
- 1960-1989: 0.84
- 1990 and Newer: 0.96

Lougheed House, Calgary, BOMA BEST Level 3 (certified 2011)
There appears to be no direct correlation between water efficient fixtures, management practices, and water consumption rates. Table 3 shows the percentage of buildings in each water consumption grouping that have implemented the fixtures and management practices listed. As mentioned previously, it is likely that the consumption depends largely on building functions, such as whether the building has a water-cooled HVAC system, a cooling tower, or has kitchens and other special-use areas. This additional, more granular data is being captured in the updated BOMA BESt assessment (BOMA BESt Version 2).

### TABLE 3: Incidence of Water Consumption Fixtures and Management Practices by Water Consumption Range and Building Age for Office Buildings

<table>
<thead>
<tr>
<th>PRACTICE</th>
<th>Water Consumption Range (m³/m²/yr)</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-0.2</td>
<td>0.21-0.54</td>
</tr>
<tr>
<td>Water-conserving toilets (more than 40% of fixtures)</td>
<td>52%</td>
<td>68%</td>
</tr>
<tr>
<td>Water-conserving urinals</td>
<td>57%</td>
<td>65%</td>
</tr>
<tr>
<td>Valve controls and/or proximity sensors</td>
<td>60%</td>
<td>67%</td>
</tr>
<tr>
<td>Water-conserving faucets</td>
<td>63%</td>
<td>82%</td>
</tr>
<tr>
<td>Written water conservation policy</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Water consumption monitoring</td>
<td>48%</td>
<td>99%</td>
</tr>
<tr>
<td>Water audit conducted within the last three years</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Water-reduction targets</td>
<td>65%</td>
<td>60%</td>
</tr>
</tbody>
</table>

One Stone Road, Guelph, BOMA BESt Level 3 (certified 2011)
Waste Reduction and Site Enhancement

Buildings use many resources, including land, materials used in construction and renovations, maintenance products, and equipment and products used by occupants, tenants, and visitors. This section evaluates waste management by buildings as well as site enhancement. The waste reduction and site enhancement section within the BOMA BESt assessment survey for office buildings makes up 11% of the total evaluation with 5.5% attributed to waste reduction and recycling, and 5.5% attributed to site enhancement. The waste portion of this section examines whether or not recycling programs and facilities are in place and whether or not waste audits are being conducted. The site section addresses whether the site is or was contaminated as well what site-enhancement measures are being implemented that would improve the site’s ecological value.

FIGURE 32: BOMA BESt Average Waste Reduction and Site Scores by Region for Office Buildings

<table>
<thead>
<tr>
<th>Region</th>
<th>Score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>83.5%</td>
</tr>
<tr>
<td>Central Region</td>
<td>82.3%</td>
</tr>
<tr>
<td>Quebec</td>
<td>79.9%</td>
</tr>
<tr>
<td>Atlantic Region</td>
<td>75.5%</td>
</tr>
<tr>
<td>British Columbia</td>
<td>72.5%</td>
</tr>
<tr>
<td>Average</td>
<td>78.7%</td>
</tr>
</tbody>
</table>

Centrium Place, Calgary, BOMA BEST Level 3 (certified 2011)
Figure 32 shows the BOMA BEST average scores for waste reduction and site enhancement for each region. The top performing region is Ontario, and the bottom performing region is British Columbia. To some extent, this could be a reflection of the waste management infrastructures and policies in regions across Canada. For example, some provinces legislate recycling of specific materials for commercial buildings. In other areas, the waste infrastructure (e.g. transfer stations) may allow for recycled materials to be mixed into one bin, whereas other regions may require complete separation at source.

42% of BOMA BEST certified office buildings divert between 60 and 90% of their waste from landfill; a few buildings have managed to achieve “zero-waste” (a diversion rate above 95%).

A large percentage of the buildings (42%) divert between 60 and 90% of their waste from landfill and 24% have diversion rates between 30% and 60% (Figure 33). Fewer than one fifth of buildings do not know their diversion rate.
There is some correlation between buildings with high waste diversion rates and the implementation of a waste management program. High waste diversion rates of over 80% are achievable in office buildings, but these rates can vary based on the recycling infrastructure in each region. In fact, a few office buildings in Ontario have achieved “zero-waste,” which is defined as having diversion rates above 95%. Table 4 categorizes the buildings based on waste reduction and site enhancement score groupings. Most of the office buildings in this Portfolio Report have facilities for collecting and storing recyclable materials as well as a ‘Construction, Renovation and Demolition Plan’. Setting targets in the areas of waste diversion and composting, as well as conducting a waste audit and implementing a waste reduction plan, appear to be the greatest contributors to higher scores in this area.

<table>
<thead>
<tr>
<th>RECYCLING FEATURE</th>
<th>Waste Reduction and Site Score Range</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36-74</td>
<td>75-80</td>
</tr>
<tr>
<td>There are facilities for storing recyclable materials</td>
<td>98%</td>
<td>99%</td>
</tr>
<tr>
<td>There are collection points for recyclables near sources of waste</td>
<td>97%</td>
<td>99%</td>
</tr>
<tr>
<td>Composting is done on- or off-site</td>
<td>34%</td>
<td>36%</td>
</tr>
<tr>
<td>A waste audit has been conducted within the last three years</td>
<td>25%</td>
<td>54%</td>
</tr>
<tr>
<td>The amount of waste to landfill and diverted waste is being monitored</td>
<td>58%</td>
<td>63%</td>
</tr>
<tr>
<td>Over 30% of waste is diverted from landfill</td>
<td>42%</td>
<td>66%</td>
</tr>
<tr>
<td>There are waste reduction targets</td>
<td>48%</td>
<td>64%</td>
</tr>
<tr>
<td>There is a construction, renovation and demolition waste management plan</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>The site is confirmed to be free of contamination based on document search or site assessment</td>
<td>81%</td>
<td>100%</td>
</tr>
<tr>
<td>The ecological value of the site has been enhanced</td>
<td>12%</td>
<td>33%</td>
</tr>
</tbody>
</table>
Emissions and Effluents

BOMA BESt addresses pollutants such as emissions from boilers; ozone-depleting substances found in refrigerants; fire-fighting equipment; asbestos; PCBs; radon; pesticides; and hazardous materials such as those found in cleaning products, lubricants, water treatment chemicals, and fuels.

The emissions and effluents section in the BOMA BESt assessment survey for office buildings makes up 17.5% of the total score. The section is broken down as such: air emissions and ozone depleting substances (7.5%), water effluents (2%), hazardous materials (4.5%), and hazardous products and WHMIS (3.5%). Figure 34 shows the average emissions and effluents scores for each region. The results show that the highest performing region is Ontario whereas the lowest performing region is British Columbia.

As Table 5 shows, the area where there is a wide range of performance (and room for improvement in some buildings) relates to ozone-depleting and global warming refrigerants. Refrigerant management practices are strong in terms of maintaining an inventory of ozone depleting refrigerants on the premises and providing training to staff on operations and maintenance of ozone-depleting refrigerants. Almost all buildings use certified contractors to manage their refrigerants.
70% of the top scoring 25% of buildings in the emissions and effluents section use only refrigerants that have low ozone-depleting potential.

Notwithstanding a high standard of overall management practices and the strong performance of the top-scoring quartile, results indicate that the vast majority of buildings (those in the lower three quartiles) still have room to improve. Many still use refrigerants with high ozone-depleting and global warming potential, although most reportedly have a phase-out plan. The majority of buildings with ozone-depleting, global warming refrigerants do have recovery systems for use during system servicing, repairs or disposal. Many buildings in the very lowest quartile lack refrigerant leak detectors.

<table>
<thead>
<tr>
<th>ACTION</th>
<th>Emissions and Effluents Score Range</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62-80</td>
<td>81-86</td>
</tr>
<tr>
<td>Low NOx emitting boilers (&gt;50%) or no boilers</td>
<td>6%</td>
<td>26%</td>
</tr>
<tr>
<td>Burners are cleaned, controls monitored and flue gas analyzed regularly</td>
<td>66%</td>
<td>66%</td>
</tr>
<tr>
<td>The building uses only high ozone depleting refrigerants</td>
<td>40%</td>
<td>29%</td>
</tr>
<tr>
<td>The building uses only low ozone depleting refrigerants</td>
<td>23%</td>
<td>31%</td>
</tr>
<tr>
<td>The building uses both refrigerants with low and high ozone depleting and global warming potential</td>
<td>33%</td>
<td>22%</td>
</tr>
<tr>
<td>There are refrigerant leak detectors</td>
<td>29%</td>
<td>36%</td>
</tr>
<tr>
<td>Refrigerant recovery system for use during system servicing, repairs or disposal</td>
<td>70%</td>
<td>56%</td>
</tr>
<tr>
<td>Inventory is maintained of ozone depleting substances on the premises</td>
<td>89%</td>
<td>75%</td>
</tr>
<tr>
<td>Reports are kept on-site of maintenance, leak tests and leak loss</td>
<td>91%</td>
<td>78%</td>
</tr>
<tr>
<td>Staff receive training on operations and maintenance of ozone-depleting refrigerants</td>
<td>88%</td>
<td>80%</td>
</tr>
<tr>
<td>There is a phase out plan to replace ozone depleting refrigerants</td>
<td>86%</td>
<td>67%</td>
</tr>
<tr>
<td>Refrigerant maintenance is by a certified contractor</td>
<td>85%</td>
<td>87%</td>
</tr>
<tr>
<td>Halons on the site</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>
On scenic Prince Edward Island, home to gorgeous red beaches, the famous Anne of Green Gables house, and Cows Creamery, is one of Canada’s BEST university campuses. In June 2011, the University of Prince Edward Island (UPEI) completed the BOMA BEST certification program; all 22 buildings that applied for certification obtained either BOMA BEST Level 1 or Level 2 (with the majority of buildings achieving Level 2). The University chose BOMA BEST for its economic benefits, benchmarking, and fully comprehensive structure. Another key feature for UPEI was the rigorous verification process; a process that helped UPEI from a strategic planning perspective to identify areas for investment. BOMA New Brunswick supported the University through its BOMA BEST application process and now the campus has become one of Canada’s first to receive BOMA BEST certification.

Another campus that has demonstrated its commitment to sustainability in a tangible way is the Nova Scotia Community College’s Waterfront Campus, a campus that serves up stunning views of the Halifax Harbour. This campus, having achieved a 93% on its BOMA BEST assessment, resulting in a Level 4 certification, clearly placed the environment at the centre of its operations, fittingly so since the campus is home to the “Centre for the Built
Environment” that provides students with the opportunity to learn design and management principles from a “living building”.

In 2007, Simon Frasier University (SFU) was the first University Campus in British Columbia to certify all buildings at its Burnaby campus with BOMA’s Go Green program. Since then, the Go Green program has evolved into the BOMA BESt program. SFU made good on its commitment to recertify their campus under the new iteration of the Program, making them the first campus in BC to attain certification against this rigorous standard, setting an excellent example for other campuses to follow. A total of 24 buildings at the Burnaby Campus received a Level 1, Level 2, or Level 3 BOMA BESt certification. The vast majority of buildings scored over 70% on the full BOMA BESt assessment survey indicating excellent performance in energy and water efficiency, emissions and effluents management, indoor air quality, environmental management system, and waste diversion.
BOMA BEST certified buildings score very high in terms of best practices for the management of effluents, hazardous materials, and health and safety. Table 6 shows the issues that are addressed in the emissions and effluents section of the BOMA BEST assessment surveys. Issues not listed below (but included in the BOMA BEST assessment) are storm water management practices, handling of glycol discharge from flushing cooling coils, and several other criteria related to health and safety.

TABLE 6: Incidence of Emissions, Effluents and WHMIS Practices by Score Ranges and Building Age for Office Buildings

<table>
<thead>
<tr>
<th>ACTION</th>
<th>Emissions and Effluents Score Range</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62-80</td>
<td>81-86</td>
</tr>
<tr>
<td>Drains are protected from chemical spills</td>
<td>63%</td>
<td>66%</td>
</tr>
<tr>
<td>There is an asbestos management program (or absence of asbestos in the building)</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>Region has low radon levels or there are radon mitigation measures</td>
<td>9%</td>
<td>12%</td>
</tr>
<tr>
<td>There are no PCBs in the building or there is a PCB management plan</td>
<td>94%</td>
<td>98%</td>
</tr>
<tr>
<td>Material safety data sheets (MSDSs) are present and up-to-date</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>There is appropriate storage of hazardous products</td>
<td>90%</td>
<td>94%</td>
</tr>
<tr>
<td>Minimal use of pesticides</td>
<td>66%</td>
<td>67%</td>
</tr>
</tbody>
</table>
Indoor Environment

The environmental management of a building should be done in a comprehensive way that considers several factors, including the health and comfort of occupants. Many environmental features enhance occupant well-being. The indoor environment section of the BOMA BESst assessment survey addresses issues such as indoor air quality, lighting, and noise levels.

The indoor environment section makes up 17.5% of the total evaluation. This section includes indoor air ventilation, filtration and humidification (worth 5%); cooling towers, parking and receiving areas, and control of pollutants at source (worth 5.8%); management practices (worth 2.5%); lighting (worth 3.2%); and noise (worth 1%). Figure 35 shows the average scores for indoor environment in each region. The results indicate that buildings in Ontario perform best in this area, whereas buildings in the Atlantic region lag.

![Cogswell Tower, Halifax, BOMA BEST Level 2 (certified 2011)](image)
Several features and management practices to improve the indoor environment are present in most buildings, even those that are in the lowest performance grouping. As shown in Table 7, these include having cleaning contracts that require the use of environmentally preferable products, a documented means to address tenant indoor air quality (IAQ) concerns, IAQ training for staff, appropriate lighting levels, providing access to natural light in work areas, and acoustic privacy.

There are, however, several features and management practices to improve indoor environment lacking in a large proportion of buildings, even in those buildings considered to be among the highest performers. Table 7 shows that the features lacking in most buildings include personal controls over ventilation, good lighting controls, a schedule for cleaning lamps, and group re-lamping.

Having a documented means to control pollutants at source; an IAQ construction and renovation checklist to avoid contaminating the indoor air during renovations and repairs; and having performed an indoor air quality audit are measures that are implemented in some buildings, but not others. These are the areas in which there is the greatest range of performance.
TABLE 7: Incidence of Features to Improve Indoor Environment by Score Range and Building Age for Office Buildings

<table>
<thead>
<tr>
<th>ACTION</th>
<th>Indoor Environment Score Range</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is permanent carbon dioxide monitoring</td>
<td>35%</td>
<td>51%</td>
</tr>
<tr>
<td>There are personal ventilation controls</td>
<td>26%</td>
<td>38%</td>
</tr>
<tr>
<td>There are documented measures to control pollutants at source</td>
<td>67%</td>
<td>75%</td>
</tr>
<tr>
<td>The contract with cleaning contractors requires use of environmentally preferable materials</td>
<td>94%</td>
<td>97%</td>
</tr>
<tr>
<td>There is a checklist of items connected to IAQ during renovations and repairs to avoid contaminating the air with fumes and dust</td>
<td>76%</td>
<td>94%</td>
</tr>
<tr>
<td>There is a documented protocol for addressing tenants/occupants concerns</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>An IAQ audit has been performed in the past year</td>
<td>39%</td>
<td>53%</td>
</tr>
<tr>
<td>Staff are sufficiently trained to implement an IAQ program</td>
<td>98%</td>
<td>97%</td>
</tr>
<tr>
<td>Lighting levels conform to IES standards (300-500lux)</td>
<td>88%</td>
<td>97%</td>
</tr>
<tr>
<td>80% of working area have access to day-lighting</td>
<td>70%</td>
<td>87%</td>
</tr>
<tr>
<td>There are good lighting controls to turn off lights in areas that are not being used</td>
<td>56%</td>
<td>69%</td>
</tr>
<tr>
<td>There is a schedule for cleaning light fixtures</td>
<td>21%</td>
<td>49%</td>
</tr>
<tr>
<td>There is a group-relamping program</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>There is sufficient acoustic privacy</td>
<td>99%</td>
<td>99%</td>
</tr>
</tbody>
</table>
Scotia Centre is a premier office building in St. John’s, Newfoundland. It was the first non-government building in Newfoundland and Labrador to obtain BOMA BESst certification. Scotia Centre received the *BOMA Award of Excellence* in 2003, achieved BOMA BESst Practices in 2007, BOMA BESst Level 2 in 2008, and achieved Level 3 in 2012. In 2009, the building also won another *BOMA Award of Excellence*.

“*BOMA BESst was the perfect tool to help us get started on a path to better management of our energy and water savings*” – Kim Saunders, East Port Properties
Energy saving features in the building includes:

• Scheduled equipment start times;
• Reduced hot water boiler temperature;
• Installed T8 light bulbs and electronic ballasts;
• Replaced exit lights with LED lighting (light-emitting diodes);
• Installed lighting sensors in garage and washrooms;
• Replaced chiller (30% more efficient);
• Upgraded lighting controller;
• Undertook a re-lamping program.

“BOMA BESst was the perfect tool to help us get started on a path to better management of our energy and water savings”, explains Kim Saunders, Property Manager with East Port Properties, the management company responsible for this building. “Scotia Centre was already a fairly energy efficient building however by going through the BOMA BESst process we identified many more areas for improvement”.

Also, says Saunders, “We continue to provide our tenants with information on our environmental initiatives and what they can do to help. As a direct result of working with our tenants, we have diverted from landfill on average 65% of the total waste we create at the Scotia Centre. In addition to paper and plastics, our tenants recycle batteries, ink cartridges and construction materials.” Since November 2008, Scotia Centre has diverted 6,363 light bulbs from the landfill preventing 27,500 milligrams of toxic, environmentally damaging mercury from being sent to landfill.

Giving back to the community is something the tenants and property management team at Scotia Centre take very seriously. For example, says Saunders “Our tenants actually now go beyond standard building recycling to play a role in helping the community. In the last 3 years, 17 pickup loads of non-recyclable materials were donated to local schools including printers and photocopiers, reception furniture, binders, desks, chairs, a boardroom table, computers, and other office supplies”.

"BOMA BESst was the perfect tool to help us get started on a path to better management of our energy and water savings", explains Kim Saunders, Property Manager with East Port Properties, the management company responsible for this building. “Scotia Centre was already a fairly energy efficient building however by going through the BOMA BESst process we identified many more areas for improvement”. Also, says Saunders, “We continue to provide our tenants with information on our environmental initiatives and what they can do to help. As a direct result of working with our tenants, we have diverted from landfill on average 65% of the total waste we create at the Scotia Centre. In addition to paper and plastics, our tenants recycle batteries, ink cartridges and construction materials.” Since November 2008, Scotia Centre has diverted 6,363 light bulbs from the landfill preventing 27,500 milligrams of toxic, environmentally damaging mercury from being sent to landfill.

Giving back to the community is something the tenants and property management team at Scotia Centre take very seriously. For example, says Saunders “Our tenants actually now go beyond standard building recycling to play a role in helping the community. In the last 3 years, 17 pickup loads of non-recyclable materials were donated to local schools including printers and photocopiers, reception furniture, binders, desks, chairs, a boardroom table, computers, and other office supplies”.

"BOMA BESst was the perfect tool to help us get started on a path to better management of our energy and water savings", explains Kim Saunders, Property Manager with East Port Properties, the management company responsible for this building. “Scotia Centre was already a fairly energy efficient building however by going through the BOMA BESst process we identified many more areas for improvement”. Also, says Saunders, “We continue to provide our tenants with information on our environmental initiatives and what they can do to help. As a direct result of working with our tenants, we have diverted from landfill on average 65% of the total waste we create at the Scotia Centre. In addition to paper and plastics, our tenants recycle batteries, ink cartridges and construction materials.” Since November 2008, Scotia Centre has diverted 6,363 light bulbs from the landfill preventing 27,500 milligrams of toxic, environmentally damaging mercury from being sent to landfill.

Giving back to the community is something the tenants and property management team at Scotia Centre take very seriously. For example, says Saunders “Our tenants actually now go beyond standard building recycling to play a role in helping the community. In the last 3 years, 17 pickup loads of non-recyclable materials were donated to local schools including printers and photocopiers, reception furniture, binders, desks, chairs, a boardroom table, computers, and other office supplies".
Environmental Management System

This section of the BOMA BES® assessment addresses how well building management is documenting certain elements of the environmental management system, for example, having targets and action plans; having an environmental purchasing policy; a documented emergency response plan to ensure that appropriate action is taken in the event of an environmental or other building emergency; and an ongoing tenant communications program to ensure tenants understand the environmental initiatives being undertaken in the building and ways in which they can become better energy and environmental stewards.

![Frank Slide Interpretive Centre, Municipality of Crowsnest Pass, BOMA BEST Level 2 (certified 2011)](image-url)
In total, this section is worth 11% of the overall score for office buildings. It includes documentation (3%), environmental purchasing (2.5%), emergency response preparedness (2%), and tenant awareness (3.5%). Figure 36 shows that overall, there is a high level of performance in BOMA BESt certified buildings, especially in Quebec, with a relatively low variance among regions.

Several environmental management system measures are present in most buildings, even in those in the lowest performance grouping. As shown in Table 8, these include having a written environmental policy and documented energy and environmental performance targets, documented procedures for appropriate response in the event of a building emergency including power failure, and a communications strategy for tenants which informs them of environmental initiatives in the building and ways in which they can contribute to the building’s energy and environmental performance.

Criteria which are not being met by a large proportion of the buildings are having site maps available showing the location of environmentally significant features to enable an effective response in the event of a building emergency, and undertaking a tenant satisfaction survey.

<table>
<thead>
<tr>
<th>MANAGEMENT ACTIVITY</th>
<th>Environmental Management Score Range</th>
<th>By Building Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>57-93</td>
<td>94-99</td>
</tr>
<tr>
<td>Written environmental policy</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Documented energy and environmental performance targets</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Written environmental-purchasing policy</td>
<td>97%</td>
<td>97%</td>
</tr>
<tr>
<td>Regularly updated list of environmentally preferred products for staff that do purchasing</td>
<td>80%</td>
<td>100%</td>
</tr>
<tr>
<td>Policy for purchasing energy saving equipment</td>
<td>71%</td>
<td>99%</td>
</tr>
<tr>
<td>Documented procedures for appropriate response in the event of a building emergency</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Plans for responding to power failures</td>
<td>94%</td>
<td>97%</td>
</tr>
<tr>
<td>Site maps showing location of environmentally significant features to enable an effective response in the event of a building emergency</td>
<td>45%</td>
<td>60%</td>
</tr>
<tr>
<td>Communications strategy to tenants on ways they can contribute to the building’s energy and environmental sustainability</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Tenant satisfaction survey</td>
<td>34%</td>
<td>58%</td>
</tr>
</tbody>
</table>
Even Canada’s BESt buildings rely on the support of tenants and building occupants to become more sustainable spaces; many measures can be implemented to make workplaces healthier and more environmentally sustainable. A few noteworthy ideas include:

- Incent employee car pooling and the use of public transportation (if available) to and from the office;
- Maximize the use of recycling facilities provided throughout the building;
- Promote good hygiene – hand washing and sanitizing – to reduce the spread of germs;
- Encourage ‘energy-smart’ behaviours in the office such as turning off lights, computers and other equipment when not needed or in use;
- Reduce the use of printing and/or encourage all employees to print double-sided;
- Develop and implement an environmental purchasing policy (e.g. purchase certified office paper, cleaning products, office supplies) and/or an organizational sustainability policy;
- Maximize the use of energy-efficient office equipment such as photocopiers, computers, printers and fax machines;
- Actively participate in tenant feedback surveys and share innovative ideas with the building’s management team;

- Use environmentally preferable office furniture (e.g. modular design, recycled content, high durability, low volatile organic compounds emissions, designs for ease of disassembly and repair);
- Encourage employees to enjoy available green spaces on the property and/or go for a walk or run at lunchtime;
- Set organizational targets for GHG reduction, waste reduction, and water conservation;
- Implement strategies to reduce travel and/or purchase carbon offsets for necessary business travel; and
- Encourage employee accountability, awareness and participation in sustainability and community-building activities such as Earth Day events and Farmer’s Markets.
ENCLOSED SHOPPING CENTRES - PERFORMANCE REPORT

Overall BOMA BESt Scores and Ratings

The overall scores for the 24 enclosed shopping centres included in this Portfolio Report show that the variance between regions and the national average is relatively small, with the lowest average being in British Columbia (79.4% average score) and the highest in Ontario (86.3% average score). The national average of BOMA BESt scores for enclosed shopping centres is 82.5% (see Figure 37).

Scores for most areas of the BOMA BESt assessment for this asset class vary little from region to region (see Figure 38). The lowest scores (74.9%) tend to be found in the waste reduction and site enhancement section (referred to as “resources” in Figure 38); and the highest score (94.6%) is the section related to environmental management (see Figure 38). The energy section is worth 35% of the total score for shopping centres; therefore, a lower score in that section of the BOMA BESt assessment has the greatest impact on a building’s overall score.

BOMA BESt certified shopping centres perform better in terms of energy consumption per square foot than the national average published by Natural Resources Canada.
Energy benchmarking of enclosed shopping centres is difficult because of the complexity of separating the anchor store tenant consumption, which is typically metered and managed separately from the common spaces, and smaller tenant spaces within the mall. BOMA BESt benchmarks only the energy intensity of mall common areas, provided the applicants supply this data (if the data is not supplied, benchmarking cannot be achieved). Factors such as building age, size, type of mechanical plant, and the number of “degree-days” in the region (a measurement of the energy required to heat or cool a facility to maintain a comfortable temperature) also influence the comparison. The energy intensity distribution (see Figure 39) shows an average annual energy intensity of 23.40 ekWh/ft² (0.90 GJ/m²), which is better than the NRCan\textsuperscript{24} annual energy intensity range of Enclosed Shopping Malls of 30.98-36.14 ekWh/ft², (1.2-1.4 GJ/m²).

Water

Water consumption benchmarks for enclosed shopping centres are expressed in litres/visitor/year. The average annual water intensity of the certified BOMA BESt enclosed shopping centres included in this Portfolio Report is 9.1 litres/visitor/year. As a com-

\small{\textsuperscript{24} NRCan. Retail and Shopping Centres: Energy Use and Intensities. Retrieved from http://oee.nrcan.gc.ca/publications/commercial/1577}
parison, the benchmark for European malls reported 4 Litres/visitor/year\textsuperscript{25} with the best practice being 1 litre/visitor/year. This indicates that there is room for improvement in Canada.

\textbf{FIGURE 39: Energy Intensity Distribution of BOMA BEST Certified Enclosed Shopping Centres}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{energy_intensity_distribution}
\caption{Energy Intensity Distribution of BOMA BEST Certified Enclosed Shopping Centres}
\end{figure}

\textbf{FIGURE 40: Water Use Distribution of BOMA BEST Certified Enclosed Shopping Centres}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{water_use_distribution}
\caption{Water Use Distribution of BOMA BEST Certified Enclosed Shopping Centres}
\end{figure}

**OPEN AIR RETAIL (PLAZAS, POWER CENTRES) – PERFORMANCE REPORT**

**Overall BOMA BESt Scores and Ratings**

The overall scores for the nine open air retail buildings certified to BOMA BESt Levels 2 - 4 in 2011 show that the variance between regions is modest, with the lowest average in Ontario (77.5%) and the highest average in the Central region (87.0%). The overall BOMA BESt average score for this asset class is 81.1%. Note that the sample size of retail plazas included in this Portfolio Report is not statistically significant; therefore, it is difficult to draw concrete conclusions about the performance of this asset class.

![FIGURE 41: Overall BOMA BESt Scores by Region for Retail Plazas](image)

Scores for most areas of the BOMA BESt assessment survey for retail plazas vary quite significantly from region to region (see Figure 42). The lowest scores tend to be found in the energy (71.6%) and indoor environment (83.1%) sections; and the highest in the emissions and effluents (88.9%) and environmental management system (86.3%) sections. Again, the sample size included in this Portfolio Report is too small to draw decisive conclusions.
Energy

According to NRCan\(^{26}\) the Typical Annual Energy Consumption Range for Strip Retail ranges from 30.98- 49.0 ekWh/ft\(^2\), (1.2-1.9 GJ/m\(^2\)). The analysis conducted for this Portfolio Report revealed the average annual energy intensity distribution for the nine strip retail buildings certified to Levels 2-4 is 4.21 ekWh/ft\(^2\). The considerable discrepancy between the NRCan published average and the BOMA BESt reported average could be attributed to the benchmarking scale being used by the Program and the type of data that was being captured. For instance, it appears that instead of full energy consumption, only the exterior lighting consumption was being reported. This problem, both for open air retail and light industrial buildings has been addressed in BOMA BESt Version 2, which requires that full building consumption data be input into the system for benchmarking purposes. One of the most effective ways to improve performance may be to promote more comprehensive data collection and monitoring using the BOMA BESt program, as well as other resources such as NRCan’s *Saving Energy Dollars*.\(^{27}\)

Water

Due to the very small number of retail plazas that achieved BOMA BESt certification at Levels 2, 3 and 4 in 2011, insufficient data exists to formulate meaningful benchmarks.

---


LIGHT INDUSTRIAL BUILDINGS - PERFORMANCE REPORT

Overall BOMA BEST Scores and Ratings

The overall scores for the 46 light industrial buildings certified to Levels 2 - 4 shows that there is variance among regions with the lowest average in the British Columbia (70.0%) and the highest in the Central Region (83.8%). The overall BOMA BEST average score for Light Industrial properties is 75.3% (see Figure 43). Note that no light industrial buildings in the Atlantic Region were certified in 2011.
Scores for most areas of the assessment vary quite significantly from region to region as shown in Figure 44 above. The lowest scores tend to be found for water (63.89%) and energy (64.48%) and the highest for environmental management (97.3%).
**Energy**

The average energy intensity of the BOMA BEST light industrial buildings classified as warehouses is 15.97 ekWh/ft²/yr, and for those classified as workshops, the average energy intensity is 23.08 ekWh/ft²/yr. For light industrial properties classified as offices, the average energy intensity is 16.71 ekWh/ft²/yr (see Figure 45).

Light industrial buildings are a combination of small administration office space, and warehouse or workshop space. Therefore, BOMA BEST asks for the breakdown of the space use. Where more than 40% of the space is used as either a warehouse, workshop, or office, the building is assigned to that category, hence the different energy benchmarks for light industrial buildings.
CONCLUSION

Results of the BOMA BESt assessment indicate that whilst a growing number of buildings are implementing environmental best practices in many areas, energy reduction remains a challenge for the industry at large. A collective national target for energy intensity in this Canadian office building sector can focus the industry on a common measurable goal.

BOMA Canada can help this effort with reports such as this BOMA BESt Energy and Environmental Report (BBEER) that disseminates pertinent information related to the environmental performance and management of existing buildings in Canada. With more verified building data than any other program in North America, BOMA BESt is the most widely applied and affordable real estate energy and environmental voluntary program for existing office buildings, and demonstrates the capability of the real estate industry to self-monitor and address the challenges of climate change.

BOMA BESt certified buildings represent a meaningful distribution of performance levels, ranging from average to high performance. The data demonstrates that the Program can be used to identify performance benchmarks and realistic industry targets for energy and water consumption.

The Program is characterized by objectivity, simplicity and transparency; the fact that it requires actual energy and water consumption data; represents all sources of energy as a single value (ekWh/ft²); requires third party auditing by qualified professionals; and requires buildings to be recertified every three years make this a reliable source of data for benchmarking and measuring industry progress.

Royal Tyrrell Museum of Paleontology, Drumheller, BOMA BEST Level 2 (certified 2011)
LIST OF ACRONYMS

AHU: Air Handling Unit
BAS: Building Automation System
BBEER: BOMA BEST Energy and Environmental Report
BOMA: Building Owners and Managers Association
BOMA BEST: BOMA Building Environmental Standard
CFC/HCFC: Chlorofluorocarbon/Hydrochlorofluorocarbon
CMHC: Canada Mortgage and Housing Corporation
ekWh/ft²/yr: Equivalent kilowatt hour per square foot per year
EBCx: Existing Building Commissioning
ECD/JLL: ECD Jones Lang Lasalle
EPA: Environmental Protection Agency (USA)
EUI: Energy Use Intensity
GHG: Greenhouse Gas
GJ/m²: Gigajoules per square metre
HDD: Heating Degree Days
HVAC: Heating, Ventilation, and Air-Conditioning
IAQ: Indoor Air Quality
MURB: Multi-Unit Residential Building
NOx: Nitrogen Oxide
NPV: Net Present Value
NRCan: Natural Resources Canada
ODP: Ozone Depleting Potential
PCB: Polychlorinated Biphenyl
ROI: Return On Investment
VAV: Variable Air Volume
VOC: Volatile Organic Compounds
VSD: Variable Speed Drives
WHMIS: Workplace Hazardous Materials Information System
REFERENCES


Want to apply for BOMA BEST certification?

Visit www.bomabest.com and contact your local BOMA Association

BOMA BC (includes the Yukon Territory): www.boma.bc.ca
BOMA Calgary (includes Southern Alberta from Red Deer to the Montana Border): www.boma.ca
BOMA Edmonton (includes Edmonton, the area to its north, and the Northwest Territories):
  www.bomaedmonton.org
BOMA Manitoba (includes Nunavut): www.bomamanitoba.ca
BOMA New Brunswick (includes Prince Edward Island): www.bomanewbrunswick.com
BOMA Newfoundland and Labrador: www.bomanl.com
BOMA Nova Scotia: www.bomanovascotia.com
BOMA Ottawa (includes Ottawa, Gatineau, and Kingston): www.bomaottawa.org
BOMA Quebec: www.boma-quebec.org
BOMA Regina (includes all of Saskatchewan): www.bomaregina.ca
BOMA Toronto (includes all of Ontario except for the Kingston, Ottawa, and Gatineau areas):
  www.bomatoronto.org

Stay connected!

Website: www.bomabest.com
Twitter: @BOMA_BEST

Like what you read and/or have suggestions for improvement?

Email info@bomacanada.ca with “BBEER feedback” in the subject line.