Canadian Team Report
Sustainable Building Challenge 2008
Team Activities
and
World Sustainable Building Conference 2008

Team Sponsors

Athena Institute
Enbridge
CMHC
SCHL
Natural Resources Canada
Ressources naturelles Canada
Canada
Manitoba Hydro
Contents

1.0 Introduction ........................................................................................................................................ 3
2.0 Description of Team Operations ............................................................................................................. 4
   2.1 Objectives ........................................................................................................................................... 4
   2.2 Membership ........................................................................................................................................ 4
   2.3 Canadian Sustainable Buildings 2008 Team ...................................................................................... 5
   2.4 Committees ......................................................................................................................................... 5
   2.5 Project Selection ................................................................................................................................. 6
3.0 Project Evaluation ......................................................................................................................................... 10
   3.1 Evaluation Teams ............................................................................................................................... 10
   3.2 Evaluation Procedure .......................................................................................................................... 10
   3.3 Energy Simulation and Embodied Energy Tools and Procedures ....................................................... 11
   3.4 Information Gathering for Evaluation .............................................................................................. 11
   3.5 Evaluation .......................................................................................................................................... 11
   3.6 Evaluation Results ............................................................................................................................... 11
   2. Gulf Islands Operations Centre ........................................................................................................... 13
   3.7 Key Performance Indicators .............................................................................................................. 16
4.0 Conference ................................................................................................................................................ 16
   4.1 Canadian Team Participation ............................................................................................................. 16
   4.2 Melbourne .......................................................................................................................................... 17
5.0 Technology Transfer ................................................................................................................................... 21
6.0 Sponsors .................................................................................................................................................. 21

Appendix A: Technology Transfer Presentation

Appendix B: Poster: Climate Change and the Rise of Architectural Fundamentalism

Appendix C: Housing Case Studies
Disclaimer

The activities of the Canadian SB08 Team were partially funded by Canada Mortgage and Housing Corporation (CMHC) but the views expressed are the personal views of the authors and CMHC accepts no responsibility for them.
1.0 Introduction

The Canadian Team for Sustainable Buildings 2008, the fifth such conference in which a Canadian Team has participated, is comprised of a group of Canadians from across Canada, each having specialized expertise in sustainable buildings. They participate on a volunteer basis to find the most sustainable buildings in Canada that have been designed and either constructed, or are under construction. A small number of buildings are selected from those submitted, evaluated against a baseline that represents the way a building designed for the same purpose would have been designed in a normal manner, using a detailed evaluation methodology developed by the International Initiative for a Sustainable Built Environment (iiSBE). The Team then participates in an international conference to compare design and performance, and to expand the knowledge and research in this subject. For the 2008 Canadian Team, the World Sustainable Buildings Conference 2008 was held in Melbourne Australia in September.

2.0 Description of Team Operations

2.1 Objectives

The objectives of the iiSBE Canada National Team are to:

- Represent iiSBE International nationally, and identify a representative who will represent Canada on iiSBE International activities.

Participate in the SB08 International process to:

- Contribute to and learn from the development of an international evaluation methodology and tool in order to benefit efforts to adapt or adopt a tool for the building industry in Canada and to foster market transformation;
- Assess the potential environmental performance of buildings in the design stage;
- Encourage the transfer of the knowledge gained to all sectors of the industry, including;
- Design
- Regulation
- Construction
- Ownership and Development
- Promote the “Greening” of the construction industry in Canada
- Showcase abroad Canadian industry achievements in sustainable buildings

2.2 Membership

Membership in iiSBE - SB08 Canadian Team is by invitation only, and includes individuals having the following background and qualifications:

* Commercial/Institutional/Multi-Unit Residential building owners, developers, designers and operators
* Government and utility managers of building focussed energy and/or environmental programs
* Consultants having specialized expertise in areas of building environmental and energy performance
* Other individuals whose contribution to the Team, based on their skills and experience, is judged to be significant and useful

* A desire to contribute to the activities of the Team.

Members of the iiSBE SB08 Canadian Team must also be members of iiSBE International.

### 2.3 Canadian Sustainable Buildings 2008 Team

The SBC-2008 Canadian Team was composed of volunteer professionals representing a broad cross-section of architects, engineers and other practitioners in the field from across Canada. Team Members include:

- **Bob Bach** Energy Profiles Limited (Team Captain)
- **Anne Auger** CaGBC
- **Marc Beaudoin** Public Works & Government Services Canada
- **Maria Cinquino** RCMP
- **Jim Clark** Office of Energy Efficiency, NRCan
- **Teresa Coady** Bunting Coady Architects
- **Doug Corbett** Smith Carter Architects
- **Jackie Evans** Interface Flooring Systems (Canada) Inc.
- **Ken Klassen** Manitoba Science, Technology, Energy & Mines
- **Woytek Kujawski** Canada Mortgage & Housing Corporation (CMHC)
- **Nils Larsson** International Initiative for a Sustainable Built Environment (iiSBe)
- **Jean-François Lepage** Teknika-HBA
- **Rodney McDonald** Government of Manitoba
- **Jamie Meil** Athena Sustainable Materials Institute
- **Daniel Pearl** L’OEUF Architects
- **Doug Pollard** Canada Mortgage & Housing Corporation (CMHC)
- **Stephen Pope** CANMET Energy Technology Centre, NRCan
- **Gord Shymko** G.F. Shymko & Associates Inc.
- **Jiri Skopek** ECD Energy & Environment Canada
- **Wayne Trusty** Athena Sustainable Materials Institute
- **Doug Webber** Halsall & Associates
- **Richard Williams** HOK Architects

### 2.4 Committees

A key part of the tasks required to undertake the selection, evaluation and conference preparation and participation, and technology transfer, is performed by the Team Committees. The following describes the activities, and the members who served thereon.

**Nominating Committee**

Responsible for soliciting individuals who have an interest in joining the team and who bring expertise and knowledge to the team, and for recommending individuals for membership in the team. This
responsibility continues from commencement of the conference cycle up to the commencement of the next conference cycle and the formation of the new team.

This committee will be formed as the need for new members arises.

**Project Solicitation/Technical Committee**

Responsible for defining the application process, finding projects, and requesting applications from project owners/developers and/or design teams. Final selection of projects is done by the entire Team, but this committee can make recommendations as to project selection. Also responsible for establishing baseline criteria for the projects selected for full evaluation, and for reviewing energy and embodied energy simulations.

Committee Chair: Gord Shymko
Committee Members: Teresa Coady, Stephen Pope, Jiri Skopek

**Fund Raising Committee**

Responsible for sourcing funding from governments, NGOs, and the private sector.

Committee Chair: Doug Corbett
Committee Members: Teresa Coady, Jackie Evans, Doug Webber.

**Conference Committee**

This committee is responsible for managing the details of the Canadian Team presence at the Melbourne conference. This includes liaison with the conference organizers, selecting and confirming the exhibit space, assembling information from proponents and evaluation teams for primary projects, and from proponents for poster projects, ensuring funders are recognized, and coordinating the efforts of Team members with exhibit responsibility, including the assembly and dismantling of the exhibit. Also coordinates with the Technology Transfer Committee where the display materials are required at events subsequent to SB08.

Committee Chair: Rodney McDonald
Committee Members: Jackie Evans, Doug Webber

**Technology Transfer Committee**

Responsible for assembling information about Canadian projects during the selection, evaluation and presentation process, and about projects from other countries during the SB08 conference, assembling the information into one or more presentations, promoting and organizing presentations following the conference, and disseminating information to audiences of all categories.

Committee Chair: Doug Webber
Committee Members: Maria Cinquino, Ken Klassen, Woytek Kujawski, Jean Francois LePage, Stephen Pope.

### 2.5 Project Selection

The SBC-2008 Canadian Team had a number of objectives in participating in the SBC 2008 International process:

- Assess the potential environmental performance of buildings at the completion of the design stage;
- Encourage the transfer of the knowledge gained to all sectors of the industry;
- Design
- Regulation
- Construction
- Promote the “Greening” of the construction industry in Canada
- Contribute to and learn from the development of an international evaluation tool in order to benefit efforts to adapt or adopt a tool for the building industry in Canada and to foster market transformation;

In determining the scope of effort for buildings to be assessed, the Canadian Team decided, as in GBC 1998, GBC 2000, and GBC 2005, to issue a public call for participation and selection of buildings to be assessed. A significant shift of emphasis for this round was to have, as one of the selection criteria, exemplary sustainability improvement as a major objective. The primary purpose of participation would be to report on the real world experience of projects attempting to incorporate a green design process from their inception, using the SBTool 2008 framework as the assessment tool, as well as featuring the result of other assessments such as LEED and Green Globes as they were available.

The Team decided to attempt full assessment of three projects, and feature additional “poster” projects. Selection of all projects was based on ranking against pre-determined criteria, as described in the Project Call for Entries:

**Eligibility Criteria:**

Commercial, institutional and multi-unit residential building types from the public or private sector will all be considered for the Sustainable Building Challenge. Minimum size is 1,000 m². Eligibility will be restricted to projects that demonstrate potential exemplary and balanced sustainable performance objectives as part of the design process. All projects must be of the highest architectural quality and must have completed design documents and, if not built, must be under construction by June 1st, 2007. In order to qualify for the Sustainable Building Challenge, projects must have completed energy simulations using either CBIP EE4 or other DOE2 based simulation programs.

Projects will be selected based on:
- Architectural quality
- Potential exemplary and balanced sustainability performance
- In depth outline of the design process and performance outcomes
- Rationalization of innovative solutions to one or more of the problems faced by designers
- Relevance and potential for project replication, including economic feasibility
- Demonstration of Life Cycle Assessment (LCA) approach to the selection of building assemblies and materials

Priority will be given to projects that support the SB08 conference theme of “connected, viable and livable” cities. These projects must sustain the immediate community and demonstrate innovative solutions to one or more of the problems faced by the building designers.

The final project submissions were as follows:
The Team met in Toronto on August 27/28th 2007 to undertake the final project selection. The Team reviewed the Project Evaluation worksheet prepared by the Project Selection Committee, and established a set of fixed weights for each Submission Element that would be applied to all projects. There was considerable discussion about the interpretation of each submission element, and about the weighting. The following clarifications were offered for each Submission Element:

1. Relationship to site and to region; volume versus site space; proportion of individual spaces to the whole
2. Process and Objectives
3. Actual performance
4. Innovation in solving problems; elegant solutions; material that supports technology transfer
5. Project replicability, or features that could be replicated; economic viability.

The Project Evaluation worksheet and the weights are shown in the following table.

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Proponent</th>
<th>Project Name</th>
<th>Project Location (nearest city)</th>
<th>Completion Date</th>
<th>Gross floor area (m²)</th>
<th>Building type / major occupancy</th>
<th>Design population (persons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GTAA &amp; Kleinfeldt Mychajlowycz Architects</td>
<td>Fire &amp; Emergency Services Training Institute</td>
<td>Toronto, ON</td>
<td>Jan-07</td>
<td>2,363</td>
<td>Education</td>
<td>160</td>
</tr>
<tr>
<td>2</td>
<td>Bunting Coady Architects</td>
<td>Kwantlen University College Building</td>
<td>Vancouver, BC</td>
<td>Aug-07</td>
<td>4,330</td>
<td>Education</td>
<td>1169</td>
</tr>
<tr>
<td>3</td>
<td>Bunting Coady Architects</td>
<td>NRC Institute for Fuel Cell Innovation at UBC</td>
<td>Vancouver, BC</td>
<td>Jun-06</td>
<td>6,598</td>
<td>Education/ Research</td>
<td>767 (GHETS) &amp; 284 (plumbing fixtures)</td>
</tr>
<tr>
<td>4</td>
<td>Manitoba Hydro</td>
<td>Head Office</td>
<td>Winnipeg</td>
<td>May-08</td>
<td>64,810</td>
<td>Office</td>
<td>2200</td>
</tr>
<tr>
<td>5</td>
<td>Larry MacFarland Architects</td>
<td>Gulf Islands National Park Preserve Operations Centre</td>
<td>Sidney, BC</td>
<td>Nov-05</td>
<td>1,070</td>
<td>Office/ Marine Operations/ Interpretive Centre</td>
<td>35</td>
</tr>
<tr>
<td>6</td>
<td>Johnson Controls LP</td>
<td>Durham Consolidated Courthouse</td>
<td>Oshawa, ON</td>
<td>2009</td>
<td>41,957</td>
<td>Institutional/ Courthouse</td>
<td>2350</td>
</tr>
<tr>
<td>7</td>
<td>Manasc Issac Architects</td>
<td>Manchester Water Centre</td>
<td>Calgary</td>
<td>Aug-07</td>
<td>15,421</td>
<td>Institutional/Office</td>
<td>460</td>
</tr>
<tr>
<td>8</td>
<td>PWC/Provencher Roy et Associés</td>
<td>Edifice Normand-Maurice</td>
<td>Montreal</td>
<td>Dec-05</td>
<td>24,600</td>
<td>Institutional/Office</td>
<td>200</td>
</tr>
<tr>
<td>9</td>
<td>Gomberhoff Bell Lyon Architects</td>
<td>South False Creek 2010 Olympic Athlete's Village</td>
<td>Vancouver</td>
<td>Nov-09</td>
<td>5,543</td>
<td>MUR</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>MintoUrban Communities Inc.</td>
<td>Minto Roehampton</td>
<td>Toronto</td>
<td>May-07</td>
<td>9,666</td>
<td>MUR</td>
<td>200</td>
</tr>
<tr>
<td>11</td>
<td>Larkin Architect Ltd.</td>
<td>St. Gabriel's Parish</td>
<td>Toronto</td>
<td>Aug-06</td>
<td>2,008</td>
<td>Church</td>
<td>444</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUBMISSION ELEMENTS</th>
<th>Score (1-5)</th>
<th>Weight (1-3)</th>
<th>Weighted score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Weighted Score</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Team Captain requested that each Team member identify those projects for which they had a direct interest. It was agreed that a Team member having an interest in a specific project would be able to provide information on the project to other members of the project review subcommittee, but would not participate in the scoring for that project.

The process followed was to break into three project review subcommittees. Each subcommittee would review all of the project submittals, and would then assign a score on each submission element. The score from each subcommittee would be assembled into a single scoresheet for final discussion, and final selection of the projects for full evaluation and for poster projects.

The Team met as a whole to consider the 11 projects submitted and scored by the project review subcommittees. Some issues were addressed as follows:

On a motion duly moved and seconded and passed, it was proposed that the South False Creek 2010 Olympic Athlete’s Village be a poster project, with CMHC support and input. This project has significant community and social aspects, although there was inadequate design information to fully understand the energy, water and other sustainable topic areas. It was also noted that CMHC will evaluate this project separately.

The discussion was then narrowed down to those projects that had a significant aggregate score, following which there was a project-by-project review of the subcommittee submission element scores. Where a significant difference existed between the subcommittees, there was a discussion amongst all members of the Team, following which an opportunity for adjustment was provided. The final decision was based on the final aggregate scores.

On a motion duly made and seconded, it was proposed that the selection of projects be accepted. Carried.

A summary of the projects selected for full evaluation and for poster display is shown in the following table.

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Proponent</th>
<th>Project Name</th>
<th>Project Location (nearest city)</th>
<th>Completion Date</th>
<th>Gross floor area (m²)</th>
<th>Building type / major occupancy</th>
<th>Design population (persons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Manitoba Hydro</td>
<td>Head Office</td>
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<td>May-08</td>
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<td>Office</td>
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</tr>
<tr>
<td>E2</td>
<td>Larry MacFarland Architects</td>
<td>Gulf Islands National Park Preserve Operations Centre</td>
<td>Sidney, BC</td>
<td>Nov-05</td>
<td>1,070</td>
<td>Office/ Marine Operations/ Interpretive Centre</td>
<td>35</td>
</tr>
<tr>
<td>E3</td>
<td>MintoUrban Communities Inc.</td>
<td>Minto Roehampton</td>
<td>Toronto</td>
<td>May-07</td>
<td>9,666</td>
<td>MUR</td>
<td>200</td>
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<tr>
<td>P1</td>
<td>GTAA &amp; Kleinfield Mychajlowycz Architects</td>
<td>Fire &amp; Emergency Services Training Institute</td>
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<td>5,543</td>
<td>MUR</td>
<td>444</td>
</tr>
<tr>
<td>P4</td>
<td>Larkin Architect Ltd.</td>
<td>St. Gabriel’s Parish</td>
<td>Toronto</td>
<td>Aug-06</td>
<td>2,008</td>
<td>Church</td>
<td>444</td>
</tr>
</tbody>
</table>

Full Evaluation  Poster Project
3.0 Project Evaluation

3.1 Evaluation Teams

The Evaluation Teams were formed to be responsible for assessing and evaluating the primary projects using SBTool and/or other evaluation protocols. This included a review of energy simulation, embodied life cycle analysis, project data inputs, and final evaluation and summary report. Teams were selected on the basis of having a mix of expertise, with one evaluation team per primary project. The Evaluation Teams were as follows:

**Evaluation Team 1: Manitoba Hydro Head Office**
- E-Team Lead: Doug Corbett
- E-Team Members: Jim Clark, Ken Klassen, Rodney McDonald, Gord Shymko, Doug Webber (corresponding)

**Evaluation Team 2: Gulf Islands Operations Centre**
- E-Team Lead: Stephen Pope
- E-Team Members: Maria Cinquino, Jean-Francois LePage

**Evaluation Team 3: Minto Roehampton**
- E-Team Lead: Woytek Kujawski
- E-Team Members: Jiri Skopek, Doug Webber

At a later time, the Team elected to include the South False Creek Olympics Village as a full evaluation. The Evaluation Team was structured as follows:

**Evaluation Team 3: South False Creek Olympic Village**
- E-Team Lead: Woytek Kujawski
- E-Team Members: Jamie Meil

3.2 Evaluation Procedure

The adaptation process involves adjusting SBTool to suit the project being assessed, including the following three areas:

1. Adaptation required for National conditions
2. Adaptation required for Regional conditions
3. Adaptation required for “Other” building type(s).

This is undertaken by the Project Selection/Technical Committee based on regional considerations.

For special issues unique to the region that must be considered, these were undertaken by regional sub-committees of the SB08 Team. Considerations that arise would likely relate to the existing legislative/regulatory/policy framework related to green building issues. For quality assurance issues, all information provided by the primary project proponents was examined in detail by the respective evaluation teams. In addition, energy and embodied energy simulations were reviewed by members of the Project Selection/Technical Committee.
3.3 Energy Simulation and Embodied Energy Tools and Procedures

Energy simulation tool had to be, at a minimum, EE4, or other simulation tool based on DOE 2.1(d). The level of effort to do so is not considered to be onerous as projects that came forward had been part of the LEED and/or CBIP process and therefore will already be screened by that process.

For energy benchmarking, CBIP criteria was used. CBIP became the de-facto standard in Canada. Other benchmarks were to be established by regionally-based sub-committees once the projects were selected. The intention was to reach out to local architectural and engineering organizations in setting those benchmarks and by their participation, to increase tech transfer.

Modelling was undertaken by the proponent project teams, with oversight by the iiSBE SB08 Canadian Team.

Embodied Energy calculations were included as there remains a significant level of interest in this topic among architectural and other practitioners. The Athena tool was available on the web for teams to undertake their own analysis, and Athena SMI offered to provide assistance.

3.4 Information Gathering for Evaluation

For the first time, SBTool, an Excel-based tool, was separated into three modules, one of which was provided to the proponent team to input the significant volume of information required to undertaken the assessment. Proponent project teams provide with this module, and received significant guidance from the Evaluation Teams. When the three modules were brought back together, there were a number of issues that prevented them from being linked, but this was eventually overcome by the Evaluation Teams, with assistance from iiSBE.

The Evaluation Teams for each of the buildings performed quality assurance on the data input. The method and detail was determined by each Evaluation Team.

3.5 Evaluation

The Evaluation Teams worked closely with the proponent teams to collect the information necessary to conduct the evaluations. The information gathering was extremely intensive, and required considerable contact between the respective teams, as well as with iiSBE for interpretations related to the information requirements. This was by far the most time consuming activity for both evaluation and proponent teams.

Following the data collection phase, the Evaluation Teams followed the national and regional weights for each project as recommended by the Technical Committee. They then applied their own project weights, and established the baselines for a building built for the same purpose in the same location.

3.6 Evaluation Results

The results of the evaluation exercise for each project are summarized in the charts and tables that are the output of SBTool.
1. Manitoba Hydro Head Office

Manitoba Hydro Head Office, Winnipeg, MB, Canada

60% energy efficiency in an extreme climate, which is almost double the efficiency of any office tower in Canada; targeting LEED Platinum; over 94% of the city is accessible by public transit from the site; urban catalyst with the influx of 2000 employees to downtown
2. Gulf Islands Operations Centre

<table>
<thead>
<tr>
<th>Relative Performance Results</th>
<th>Active Phase (set in Region file)</th>
<th>Design Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Information**

This is a new construction project with a total gross area of 1070 m². It has an estimated lifespan of 75 years, and contains the following occupancies: Office and is located in Sidney, BC, Canada. The assessment is valid for the Design Phase.

Assumed fire span is 75 years, and meeting limits are in C0. Amortization rate for embodied energy or existing materials is set at 5%.

<table>
<thead>
<tr>
<th>Design target scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>With current content and building data, the number of active/total parameters is 97 Macadam $115$</td>
</tr>
<tr>
<td>The number of active or new mandatory parameters with a score of 0/10 or less is 9</td>
</tr>
</tbody>
</table>

| With a tabular list of issues, categories and criteria, go to the lower right-hand cell. |
|-------------------------|--------|--------|
| A Site Selection, Project Planning and Development | 11% | 3.0 |
| B Energy and Resource Consumption | 13% | 3.9 |
| C Environmental Loadings | 25% | 2.8 |
| D Indoor Environmental Quality | 14% | 4.2 |
| E Service Quality | 17% | 3.0 |
| F Social and Economic aspects | 6% | 3.3 |
| G Cultural and Perceptual Aspects | 4% | 4.3 |

**Total weighted building score**

3.3
3. Minto Roehampton

This is a new construction project with a total gross area of 18,233 m². It has an estimated lifespan of 75 years, and contains the following occupancies: apartment and indoor parking and is located in Toronto, Canada. The assessment is valid for the Design Phase.

Assumed life span is 75 years, and monetary units are in CAD. Normalization rate for embodied energy of building materials is set at 6%.

<table>
<thead>
<tr>
<th>Performance Issue Areas</th>
<th>Assessment Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Active weights</td>
</tr>
<tr>
<td>A Site Selection, Project Planning and Development</td>
<td>9%</td>
</tr>
<tr>
<td>B Energy and Resource Consumption</td>
<td>18%</td>
</tr>
<tr>
<td>C Environmental Loadings</td>
<td>28%</td>
</tr>
<tr>
<td>D Indoor Environmental Quality</td>
<td>18%</td>
</tr>
<tr>
<td>E Service Quality</td>
<td>17%</td>
</tr>
<tr>
<td>F Social and Economic aspects</td>
<td>4%</td>
</tr>
<tr>
<td>G Cultural and Perceptual Aspects</td>
<td>2%</td>
</tr>
</tbody>
</table>

Total weighted building score: 2.8

The project contains 148 apartment units.

With current content and building data, the number of active low-level parameters is 97. The number of active low-level mandatory parameters with a score of less than 2 is 1. Active low-level mandatory parameters: 8.
4. South False Creek Olympic Village
3.7 **Key Performance Indicators**

For the first time at the conference, the organizers requested that a set of Key Performance Indicators (KPIs) be developed for each project, as more meaningful way to compare similar projects from a variety of countries. The requirements were very extensive, and were grouped in 10 Topic Areas, each with a significant number of individual criteria, as follows:

1. Project Identification (including local climate, occupancy, and indoor climate – 16 criteria)
2. Public Transport (2 criteria)
3. Reduction of Individual Traffic (6 criteria)
4. Energy and Primary Energy (14 criteria)
5. CO₂ Emissions (5 criteria)
6. Material Input and Embodied Energy (11 criteria)
7. Potable Water Demand/Potable Water Consumption (9 criteria)
8. Indoor Air Quality (2 criteria)
9. Construction Cost (1 criterion)
10. Operation Cost (10 criteria)

The preparation of these data represented a significant additional level of effort for the Evaluation and Proponent Teams.

4.0 **Conference**

The World Sustainable Building Conference 2008 (SB08) was held in Melbourne, Australia, from September 21 – 25th, 2008. The theme for the conference was Connected, Viable, Liveable.

Three years in the planning, the event brought together major partners the CSIRO, Sustainability Victoria, the United Nations Environment Program, the International Initiative for a Sustainable Built Environment (iiSBE) and the International Council for Research and Innovation in Building and Construction (ciB). Some statistics about the conference include the following:

- Number of delegates - 2,059
- From over 60 countries
- 50% of the delegates were from Australia
- 48 exhibitors
- 26 sponsors
- 22 auspicing societies
- Over 350 papers and speeches delivered
- 185 posters

The conference was held in the Melbourne Conference Centre, which is soon to be replaced by a new conference centre located nearby. The facility was more than adequate for SB08, with ample meeting rooms, a large exhibit hall where lunch and breaks also took place, and staffed by a very willing and helpful corps of individuals who assisted and guided the delegates whenever required.

4.1 **Canadian Team Participation**

The Canadian Team was an active participant in the conference, participating in the SBChallenge through the display of posters on Canadian evaluated projects and poster projects, being part of a continuously running PowerPoint presentation on all projects submitted by every participating country, delivering a Canadian Team presentation on the evaluated projects, having a Canadian Team booth in the associated exhibition with posters
on all the selected projects (3 each for evaluated projects and 1 for each poster project) and with Team members available to discuss aspects of all of the projects. Members of the Team who attended the conference are shown in the Canadian Team Booth.

In addition, some members of the Team delivered presentations and presented posters on specific topics on sustainable building. In particular, Team member Woytek Kujawski delivered a presentation on housing in Canada, while Team Member Teresa Coady provided a Poster entitled *Climate Change and the Rise of Architectural Fundamentalism*, included as Appendix B. An interesting presentation on low income housing was delivered by Keir Brownstone of Toronto Community Housing Corporation. All of these were very well received.

The Team was awarded the Honourable Mention (second place) for the Best SB Challenge Presentation at the conference.

**4.2 Melbourne**

Melbourne proved to be an interesting city in which to attend the conference and to spend time sightseeing. Melbourne lies on the north shore of the Yarra River, which empties into Phillips bay, and is located in the southwest corner of the continent, in the State of Victoria.
Melbourne is the second largest city in Australia, with a population of approximately 3.7 million inhabitants. It sits on the north side of the Yarra River, which empties into Philip Bay. The area was already inhabited by indigenous Kulin people, and Melbourne was "purchased" by John Batman from them in 1835 for some tools, flour and clothing. In 1836, Melbourne was declared as the administrative capital of the Port Phillip District of New South Wales by Governor Bourke who also commissioned the first survey plan for the Central Business District (CBD) by Robert Hoddle in 1837. The settlement was named Melbourne in the same year after the British Prime Minister William Lamb, Second Viscount Melbourne, and on June 25 of that year, Melbourne was declared as a city of Australia by Queen Victoria. The foresight exhibited by Governor Bourke can be seen in the area of the map entitled "City Centre" which is laid out in alternating two lane and six lane streets, both east and west, providing ample room for both private automobiles and surface trams on the wider thoroughfares.

With the discovery of gold in Victoria in the 1850s, Melbourne started growing rapidly, providing the majority of service industries and serving as the major port for the region. Melbourne became the capital of the Victorian state with its establishment in 1851 as a separate colony. In a very short time, the city became a major financial hub, home to several banks and first stock exchange to Australia. Melbourne became the largest city in the British Empire during 1880s. During this period, the construction of many high-rise Victorian buildings, coffee palaces, terrace housing, grand boulevards and gardens throughout the city took place. Today, the many
historical buildings in the CBD share the streetscape with more modern buildings.

**Transportation**

Public transportation is excellent, with a combination of surface trams in the CBD and beyond, trains and buses, as well as two airports. Melbourne is served by two train stations, Southern Cross Station for local trains to the suburbs, and Flinders Station for longer distance trains to other parts of Victoria and the rest of Australia. In addition, Melbourne Harbour has the largest container port in the southern hemisphere, and is a major stop for cruise ships.

Melbourne CBD is very much a walking city, and to a large extent, pedestrians rule. Every intersection has pedestrian lights, a push button to request a light change, and an audible signal for the visually impaired (see photo above). The CBD is filled with sites of interest, and Team members and other conference attendees walked its length and breadth several times to see some of these, and to find excellent bars and restaurants for dinner.

The width of the major streets in the CBD can be seen in the photographs of the two stations. This, and the fact that automobiles are not permitted to drive on the tram tracks except to cross them, has resulted in the creation of the unique-to-Melbourne “hook” turn on designated intersections. The photograph shows a taxi prepared to make this turn. Remembering that traffic in Australia drives on the left side of the road, when a vehicle wishes to make a right turn on one of these streets, the driver pulls across the intersection and waits in the left lane until the traffic light is just ready to change to the other direction, then precedes the traffic coming from the cross street to his left by making a right turn across all lanes of the street he is on – including the tram tracks - to proceed up the cross street. It takes some cooperation and timing, but it all seems to work.

**Weather**
The weather for the conference was what we would expect in the spring in Vancouver. It rarely snows in Melbourne, but the weather is very changeable – the locals say “whatever the weather is this morning, it’ll be different this afternoon.” We enjoyed pleasant temperatures that ranged from 3 to 16 °C – perfect weather for sightseeing. Meanwhile up in Sydney, it was running well in the 30s. The drought that much of Australia has been seeing for about 10 years does not seem to apply the Melbourne.

**Development**
The CBD has a very large number of older buildings that were built in the latter nineteenth century, and these share the streetscape with newer buildings, offering an interesting contrast in architecture. One example can be seen in the photograph on the right.

Much of Melbourne seemed to be under construction – there was a very large number of construction cranes in evidence on the skyline, most of them for multi-family high-rise buildings. Melbourne has been remaking its waterfront, and much of the activity is taking place in former industrial areas.

One of the interesting features of these newer buildings is the extensive use of colours on the exterior, particularly on multi-family residential buildings. A couple of examples are shown in the photographs shown below.
5.0 Technology Transfer

Following the conference, the Technology Transfer Committee prepares a very extensive PowerPoint presentation complete with detailed notes for the use of Team members to deliver at local and regional meetings and conferences. One example was the Toronto Green Building Festival, where the presentation was consistent with the theme of the conference, and was very well received. Other Team members delivered the presentation at similar events.

A copy of the presentation is included in Appendix A.

All of the Team’s evaluated projects are displayed on the iiSBE website at the following link:
http://www.iisbe.org/iisbe/sbc2k8/sbc2k8-teamsf.htm

For each project, a link is provided to the project website.

The SEFC project, as a Net Zero Energy residential building, received significant interest. Team member Woytek Kujawski delivered presentations at Algounquin College, the recent CaGBC 2010 Conference in Ottawa, and a number of other events and venues.

Following the conference, iiSBE Executive Director Nils Larsson prepared a summary presentation entitled Housing Case Studies that featured a number of housing projects presented at the conference, including Minto Roehampton. This has been delivered at a number of international events, and is included in this report as Appendix C.

Team members continue to make use of the evaluation methodology and materials to improve the knowledge of designers across Canada, consistent with the Team’s objectives. In addition, the knowledge gained is being used extensively as the Team looks forward to SB11.

6.0 Sponsors

One key aspect of the activities of the Team is to raise funds to cover expenses for travel and accommodation for face-to-face meetings, communication costs for conference calls, travel to view evaluated projects and discuss information and evaluation issues with proponents, direct expenses for production of posters, and conference expenses for the exhibit booth. All travel and accommodation to the conference is paid for directly by individual members or their employers. In total, the Team required a budget of almost $40,000 to cover operations for the three years leading up to, and following the conference.

For SB08, the Team was fortunate in receiving assistance from a number of sponsors, who are listed herein.

- Enbridge Gas Distribution
- Natural Resources Canada
- PCL Construction
- Athen Institute
- Canada Mortgage and Housing Corporation
- Manitoba Hydro

The logo of each sponsor was featured on all Team correspondence, and is shown on the cover page of this report.
Appendix A

Technology Transfer Presentation
SB08 CANADIAN TEAM

Projects Assessed:
- Minto Roehampton
- Manitoba Hydro
- Gulf Islands Operation Centre

MintoRoehampton, Toronto, Canada

Location
MintoRoehampton is a 16-storey apartment located in the heart of midtown Toronto within walking distance of countless restaurants, retail outlets, and public transportation routes. Bicycle parking has been provided for more than half of the occupants and a hybrid car sharing program will make it easy for residents to reduce their personal carbon footprint.

Promoting Occupant Conservation
The unique electricity, hot and cold water sub-metering system, where residents pay for what they use, empowers the residents.

Water Conservation:
- Front Loading Wash Machines
- Dual Flush Toilets
- Rainwater Harvesting

Energy Management:
- Condensing boilers, variable frequency drives, heat recovery systems, ENERGY STAR appliances, and front-loading washing machines reduce energy usage by 38% compared to MNECB.
- Motion-controlled stairwell lighting reduces electricity consumption by 97% in stairwells which are typically empty.
- A solar wall pre-conditions incoming make-up air to the building to reduce heating costs.

Energy Savings

MintoInspired All-Off Switch allows residents to turn off all fixed lighting and exhaust fans with one flick of a switch.

Minto's green energy program provides wind-power to new developments through the purchase of Renewable Energy Certificates. Minto's contribution ensures enough wind-generated energy to power all common areas for the first two years of occupancy.
Indoor Air Quality/Energy Performance:

Heat Recovery Ventilators

The Minto Roehampton complex utilizes heat recovery ventilators in every suite. The heat recovery ventilator (HRV) extracts heat from suite exhaust air to heat incoming filtered fresh air. This process enhances overall energy efficiency by providing a direct source of fresh air into every suite that increases ventilation effectiveness.

Indoor Air Quality:

- Fully automated and networked air flow and temperature control in each suite with automatic motion sensor control and manual override
- Generous use of low-e thermal glass with operable windows to maximize natural illumination and ventilation
- Environmentally friendly underlays, laminate and ceramic flooring and low toxicity paints significantly reduce volatile organic compounds

Green materials used in EVERY suite

Over 35% regional content in building materials

Over 20% recycled content in building materials

Access to 8 different public transportation routes

Green materials used in EVERY suite

Over 90% of Construction Waste diverted from landfills

Building Assessments based on predicted performance:

- Athena Environmental Impact Estimator v 3.03
- SDTool - comprehensive analysis
- LEED® - market requirement
- Green Globes - Web Based Tool
Green Awards:

- Green Award of the Year 2007
- The City Livability Award 2007
- LEED®-Canada Gold Certification
- Environmental Excellence Award 2006

MintoRoehampton, Toronto, Canada

Canada’s first LEED®-Canada Gold Certified Multi-Residential Building
WORLD SB08 MELBOURNE | Project:

Client: Manitoba Hydro
Architects: Kuwabara Payne McKenna Blumberg (design architects)
Architects (architects of record): Smith Carter Architects & Engineers
Prairie Architects Inc. (advocate architects)
Energy analysis: Transsolar (Energy/Climate Engineers)

Wind Rose, strong south gusting winds, high average winds
Annual Temperature Profile swings 70°C: (thermal storage potential)
High Solar Radiation: (solar heating potential)
Instant Sublimation @ -40° C

Manitoba Hydro – Site Selection

1. Supportive, Healthy Workplace
2. Urban Revitalization
3. Global Standards in Energy Efficiency & Sustainability
4. Design Excellence
5. Cost-effective Design

Integrated Building Systems + High Technical Excellence

INTEGRATED DESIGN PROCESS - IDP
To ensure all the goals were embodied in the design and in the right balance, Manitoba Hydro mandated the project be developed using the IDP, with 3 key models.
How do you activate a city when people stay inside 6 months of the year?

Manitoba Hydro – Urban Revitalization

A catalyst to the positive and proactive revitalization of Winnipeg by bringing 2000+ employees from the suburbs into one central downtown location.

Publicly accessible Galleria links ground plane through block. Connection to city’s elevated Skywalk system facilitates access to downtown amenities.

Energy Consumption – 60% Savings

Recent modelling predicts a 64.5% reduction.

Exterior & Interior Climate Synergy

Massing, orientation and sections mitigate realities of extreme climate and comfortable, healthy interior environment – without compromise.

Integration Building Systems

High Performance Double Facades

Intelligent facades integrate climate responsive technologies, like solar shading, humidification, radiant heating and passive solar collection.

Manitoba Hydro Head Office, Winnipeg

How do you create a healthy supportive community in a 22-storey tower?

Daylight factor in office area – 97% daylight autonomy.

Shared stair with interconnected stair, lounges, views

GULF ISLANDS OPERATION CENTRE

Institutional
Canada
Parks Canada, Public Works and Government Services Canada
Larry McFarland Architects Ltd.
2005
GULF ISLANDS OPERATION CENTRE

SUSTAINABLE DESIGN PRINCIPLES

• Respect for the site:
  • Minimize impact of project construction
  • Preserve neighborhood character
  • Protect and enhance existing ecosystems
• Incorporate the natural operating systems occurring at the site:
  • Water
  • Light
  • Air
  • Heat
• Integrate sustainable components into the architectural expression of the building.

GULF ISLANDS OPERATION CENTRE

SUSTAINABLE SITE DESIGN STRATEGIES

1. Utilize heat from the ocean.
2. Protect existing native trees, remove invasion species.
3. Remove contaminated soils.
4. Take advantage of sea & land breezes.
5. Use sun for day lighting & to generate energy.
6. Preserve existing character house and protect existing ornamental garden.
7. Protect marine environment.
8. Minimize building footprint.
9. Harvest rainwater for non-potable applications.

GULF ISLANDS OPERATION CENTRE

BUILDING ENVOLPE DESIGN

• Each façade designed in response to its orientation: sunshades provided on the south and east facades for passive shading. Continuous glazing on the north façade takes advantage of the expansive views.
• Exterior sunshades limit amount of direct sun into the building and help prevent heat gain in summer.
• The exterior wall assembly engineered to minimize air leakage and heat losses.
• Materials selected to resist the marine environment.
• Assemblies designed to be easily maintained and replaced.

GULF ISLANDS OPERATION CENTRE

ENERGY EFFICIENCY STRATEGIES

• Ocean based geothermal system coupled with in-floor radiant heating
• Exhaust air heat recovery
• Photovoltaic system provides 20% of the building's energy requirements
• The exterior wall assembly has been engineered optimize thermal performance and durability
• Lighting density is 9.3 w/m²
• Exterior sunshades control direct solar radiation
• Open atrium promotes natural ventilation
• Ventilation system consists of 100% outside air system with high induction diffusers
• Occupancy demand ventilation control including carbon dioxide sensors

GULF ISLANDS OPERATION CENTRE

INTERIOR ENVIRONMENTAL QUALITY

• Design of building encourages natural ventilation
• Daylight is the primary means of illumination during daytime hours
• All work spaces adjacent to opening windows
• Workstations & offices have lighting, temperature and air controls
• Minimal finishes and materials used in the interior of the building
• Low VOC emission finishes, materials and furniture selected
• Green housekeeping products and procedures implemented
• Ventilation system supply air delivers 100% outdoor air
Appendix B
Teresa Coady Poster
CLIMATE CHANGE AND THE RISE OF (ARCHITECTURAL) FUNDAMENTALISM

Our buildings used to be inspirational forms of human expression. Point-based design rewards complexity. A building containing a huge mass of energy and a glut of mechanized systems should not earn a platinum award.

If we don’t value what we create, we will destroy it.
Housing case studies

January, 2010
Nils Larsson

Hamnhuset – The Harbour House, Gothenburg, Sweden

Building concept

Aims
- To build the first large passive house in Sweden
- To reach a quarter of normal heating demand
- To emit a quarter of normal CO2 emissions
- To create a very good indoor environment
- To make extensive simulations and LCC-calc.
- To have reasonable rents

Solutions
- Highly insulated envelope with no cold bridges
- No conventional heating system
- Very tight envelope and efficient heat recovery
- Environmentally sound and certified materials
- Solar panels for hot water
- District heating for additional heating
- Energy efficient appliances and lighting
- Individual metering of hot and cold water
- No PVC and halogens
- Moisture control and monitoring first year

Cost
- Additional investments for energy saving: 2,5% = 5 million SEK ~ 550 000 EURO
- Same rent as normal due to low running costs

Building description & performance

ByggRo (SE) A-D
- Energy B
- Indoor B
- Chemicals B

EcoEffect (SE) 1-6 stars
- Energy
- Indoor
- LEED Ex. build (US) – Gold
- Site 4-6 (of 12)
- Water 6 (of 10)
- Energy 15 (of 30)
- Materials 4-6 (of 14)
- Indoor 10-18 (of 19)

Innovation 1-3 (of 7)

Summary of Key Performance Indicators (KPI)
- Primary Energy from first renewable energy source [kWh/m²/year] 13
- Final Energy / Primary Energy of Renewable Energy Sources [kWh/m²/year] 56
- Total Energy, not adjusted [kWh/m²/year] 79
- CO2 Emissions (CO2 equivalent) [kg/m²/year] 2
- Initial Water Demand Consumption, annual data [l/m²/year] 630
- Construction Cost, price level 2007 [EUR/m²] 110
- Operating Costs, annual, price level 2007 [EUR/m²] 33
Sunrise project, Spain

**Design Process**
This project belongs to Eco-Valle strategy, the aim is to develop a new urban area to support experimental initiatives that incorporate the new values of sustainability.

**Energy efficiency**
The occupation defined in the urban planning has been studied to optimize natural ventilation and its protection. The principal issues are:
- **High insulation envelope (10cm polystyrene, low-E glass)**
- **Solar protection**
- **Efficient energy control systems**
- **Efficient elevators and illumination**
- **Renewable (solar)**

**Other relevant Building Features**
- Urban
  - Crossings corridors to increase urban permeability
- Materials
  - Use of local materials
  - Certified wood
  - Recycled aluminum

**Assessment of Competition Jury**
This social housing was focused on sustainability, specially in order to improve CO2 reduction and indoor environmental quality. It reaches energy certification “A” and also includes passive systems that shape the building image. As an experimental construction it has been controlled, and it uses various sustainability measures. On the other hand, it represents a good example of possible improvements on Madrid social housing.

**Objectives of Competition**
- Environmental sensibility
- Representative of Spanish architecture
- Replicable technical solution proposed
- Ability to carry out the assessment process
- High energy efficiency

**SBTool-verde ASSESSMENT**
1. Climate change
   Estimate annual emissions of GHG gases on kg CO₂ eq per m² year
   - **Reference building**
   - **Object building**
   - **Total**
   - **Transport**
   - **Heating, cooling and hot water**
   - **Electrical**
   - **Non emissions**
3. Loss of aquatic life - Estimated of annual emissions of PO₄ kg per m² year

<table>
<thead>
<tr>
<th>Reference building</th>
<th>Object building</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.57</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Total = 3.46 kg

5. Depletion of raw material - Estimated kg of Sb per m² year

<table>
<thead>
<tr>
<th>Reference building</th>
<th>Object building</th>
</tr>
</thead>
<tbody>
<tr>
<td>6305</td>
<td>4905</td>
</tr>
<tr>
<td>4200</td>
<td>1699</td>
</tr>
</tbody>
</table>

Total = 10,905 kg

7. Comfort and indoor quality

Improvement Percentage

Natural ventilation: 25%
Temperature and RH: 12.5%
Noise: 4.17%
Daylighting: 25%
Total = 67%

8. Health

Improvement Percentage

Natural ventilation: 25%
Temperature and RH: 12.5%
Noise: 4.17%
Daylighting: 25%
Total = 95%

9. Economic and social imbalance - Estimated cost in € per m² year

<table>
<thead>
<tr>
<th>Reference building</th>
<th>Object building</th>
</tr>
</thead>
<tbody>
<tr>
<td>4905</td>
<td>1699</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>4000</td>
</tr>
<tr>
<td>6000</td>
<td>6000</td>
</tr>
</tbody>
</table>

Total = 67,62 €

Assessment is related to a scale that ranges from 0 to 5 leaves, as follows:

- 0 - 0.5
- 0.5 - 1.5
- 1.5 - 2.5
- 2.5 - 3.5
- 3.5 - 4.5
- 4.5 - 5

The building design and performance is focused in operating phase, with a significant reduction in GHG emissions and cost, and the improvement on indoor environmental quality. On the other hand, it could take a better approach in waste and material management and urban environment.

55 social housing flats in Bermeo, Vizcaya, Spain

Assessment by: Manuel Macías, Irina Tumini, Javier Marín, Carmen Alonso, Dora Guzmán, Francesca Olivieri

Evaluation Data

1. Climate change - Net annual GHG emissions in kg CO₂ equivalent per m² year

<table>
<thead>
<tr>
<th>Criteria</th>
<th>RB</th>
<th>OB</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy used for transport of construction materials</td>
<td>0.17</td>
<td>0.01</td>
<td>4.9</td>
</tr>
<tr>
<td>Renewable energy systems</td>
<td>27.56</td>
<td>57</td>
<td>4.0</td>
</tr>
</tbody>
</table>

2. Loss of fertility - Net annual acidifying components emissions from building operations, kg of SO₂ equivalent per year

<table>
<thead>
<tr>
<th>Criteria</th>
<th>RB</th>
<th>OB</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy used for transport of construction materials</td>
<td>0.005</td>
<td>0.002</td>
<td>4.8</td>
</tr>
<tr>
<td>Reduction of energy systems</td>
<td>18.67</td>
<td>0.050</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Evaluation Data

3. Economic and social imbalance - Total present value of life-cycle cost for total project, € per m².

Criteria | RS | OB
---|---|---
Installation of control systems of consumption of water | 0.94 | 0.63

The estimated cost of the construction is 647 EUR/m² of constructed area.

Result obtained with the SBTool Verde:

**Results of relative evaluation**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>RS</th>
<th>OB</th>
<th>% of Absolute Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net annual GHG emissions from building operations, kg CO₂ equivalent per year</td>
<td>51.88</td>
<td>22.18</td>
<td>57%</td>
</tr>
<tr>
<td>Net annual ozone depleting emissions from building operations, kg CFC-11 equivalent per year</td>
<td>0.005</td>
<td>0.005</td>
<td>0%</td>
</tr>
<tr>
<td>Load of chemical nutrient, kg PO₄₄ equivalent per year</td>
<td>1.91</td>
<td>1.27</td>
<td>33%</td>
</tr>
<tr>
<td>Net annual acidifying components emissions from building operations, kg SO₂ equivalent per year</td>
<td>71.01</td>
<td>44.3</td>
<td>38%</td>
</tr>
<tr>
<td>Net annualized depletion of non-renewable resources</td>
<td>2908.62</td>
<td>1946.21</td>
<td>33%</td>
</tr>
<tr>
<td>Net annual hazardous and non-hazardous waste to disposal, kg/m²</td>
<td>11.83</td>
<td>11.34</td>
<td>4%</td>
</tr>
</tbody>
</table>

**Results of the absolute evaluation**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>RS</th>
<th>OB</th>
<th>% of Absolute Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total impact avoided</td>
<td>1.57</td>
<td>3.43</td>
<td>100%</td>
</tr>
</tbody>
</table>

Other relevant Building Features

- Urban: Use of permeable paving to save the existing trees and planting of new green spaces.
- Materials: Most of the materials used in the building are recyclable, reusable and have low environmental impact in their own manufacturing.
- Water: Grey water with recovered grey water storage systems to reuse in toilets and irrigation.
- Renewable: Installation of solar panels for domestic hot water consumption.

Energy efficiency

Windows are maximized in the north facade to maximize solar gains. The south façade contains horizontal shadings to reduce solar gains during the summer, although allowing them in winter. The dark internal floors use their own high thermal mass to increase passive solar gains. All apartment typologies have balconies and open to cross ventilation.

Social housing for the elderly, Palma, Spain
Social housing for the elderly, Palma

- Building Type: Social Elderly Housing Building
- Country: Spain
- Client: MIVAU (Instituto de la Vivienda)
- Architect: L. Velasco, A. Molla, A. García, M.A. García
- Occupation: September 2006

Assessed by: Manuel Pascual, Ines Turchi, David Moraes, German House-Now, Carla Zúñiga, Francisco Ollero

Design Process

The design process was developed by Prof. M. Santamouris and José Marcos. The results of a dual cooling system were evaluated through the mathematical approach developed by the authors. The approach was validated using the software tool for natural lighting simulation.

Other Relevant Building Features

- Natural light simulation in order to improve the social relations between residents.
- Heat exchanger storage for later use.
- Energy saving equipment.
- Passive solar energy.
- Natural light system.
- Natural light simulation in order to reduce the electrical consumption.
- Advanced ventilation systems.
- Common areas and recreational areas were designed to provide natural cross-ventilation.
- Porch, community areas, dining room, interior courtyard.

Energy Efficiency

- Passive house measures have been integrated to the building, such as:
  - Ventilation Passive Cooling using underground air pipe lines.
  - PV electric fans provide forces to air movement through the rooms connected with chimneys.
  - Green house for gaining solar energy during winter.
  - Solar protection system during summer.

Social housing for the elderly, Palma-SPAINEnergy Efficiency

- Passive house measures have been integrated to the building, such as:
  - Ventilation Passive Cooling using underground air pipe lines.
  - PV electric fans provide forces to air movement through the rooms connected with chimneys.
  - Green house for gaining solar energy during winter.
  - Solar protection system during summer.

Social housing for the elderly, Palma-SPAINEnergy Efficiency

- Passive house measures have been integrated to the building, such as:
  - Ventilation Passive Cooling using underground air pipe lines.
  - PV electric fans provide forces to air movement through the rooms connected with chimneys.
  - Green house for gaining solar energy during winter.
  - Solar protection system during summer.

Social housing for the elderly, Palma-SPAIN

- Passive house measures have been integrated to the building, such as:
  - Ventilation Passive Cooling using underground air pipe lines.
  - PV electric fans provide forces to air movement through the rooms connected with chimneys.
Social housing for the elderly, Palma-SPAIN

1. Climate change
   Estimate annual emissions of GHG gases on kg CO2 eq per m2

2. Depletion of non-renewable resources, kg. Of Sb per m2 year

3. Loss of aquatic life - Estimated of annual emissions of PO4 kg per m2

4. Energy consumption for facility operations

5. Depletion of row material - Estimated kg of Sb per m2 year

6. Ventilation influence

7. Comfort and indoor quality - Percentage

8. Economic issues Euros € per m2

9. Economic and social imbalance - Estimated cost in € per m2 year

Minto Roehampton condominiums, Toronto, Canada
High-rise residential tower in Toronto; 38% more energy efficient than the Canadian Model National Energy Code for Buildings.

A solar wall pre-heats the main make-up air to provide 202.1 GJ of renewable energy.

100% of the building’s electricity is purchased from a green energy provider.

Rain water harvesting and the use of drought tolerant plants eliminates the need for potable water use for irrigation. Rain water is also used to supplement water use in the toilets.

39% reduction in water consumption is expected.

Low emitting materials including carpets, paints, and cleaning products reduce building contaminant levels.

Heat recovery ventilators, carbon dioxide monitors, and user controls for interior lighting and operable windows contribute to a healthier living experience.

A minimum of 20% of construction material came from recycled sources.

Contacts & Info

- Nils Larsson, larsson@iisbe.org
- www.iisbe.org