


TECHNICAL BULLETIN NO. 14-08	 BC Housing
Date Issued: January 18, 2008	
Subject: Section 3 Energy Performance	
Reference: Independent Living BC Non-Profit Housing Design and Construction Standards, Revised October 2006 Provincial Homelessness Initiative Design Guidelines and Construction Standards, October 2006	
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SUBJECT:

BC Housings energy performance requirements as described in Section 3 Energy Performance Standards. The same revisions apply to the Independent Living BC Non-Profit Housing Design and Construction Standards, Revised October 2006, and the Provincial Homelessness Initiative Design Guidelines and Construction Standards, October 2006

PURPOSE:

To issue BC Housings new High Performance Greenhouse Gas Neutral Strategy for BC Housing New Construction Projects and to delete and replace Section 3 Energy Performance Standards of the PHI and ILBC Construction Standards.

REFERENCE:

Independent Living BC Non-Profit Housing Design and Construction Standards (ILBC Standards), Revised October 2006:

- Section 3 Energy Performance Standards.

Provincial Homelessness Initiative Design Guidelines and Construction Standards, (PHI Standards), October 2006:

- Section 3 Energy Performance Standards.

DESCRIPTION:

Section 3 Energy Performance Standards.

Delete Section 3 Energy Performance Standards in its entirety and replace with:

High Performance Greenhouse Gas Neutral Strategy for BC Housing New Construction Projects

Technical Bulletin No 14-08

High Performance Greenhouse Gas
Neutral Strategy

For

BC Housing New Construction Projects

Issued:
January 17, 2008

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Introduction

BC Housing recently implemented two major environmental initiatives in an effort to respond to global environmental concerns and to become provincial leaders in environmental stewardship.

LEED Gold certification is now a minimum requirement for eligible new BC Housing construction projects. Projects that are eligible to qualify for LEED Gold are also required to meet the intent of BC Housing's High Performance Green House Gas Strategy (GHG).

This document provides a strategy for reducing GHG emissions generated directly from the buildings operating energy¹. The document also provides a baseline for appropriate GHG calculation and reporting procedures.

BC Housing High Performance GHG Neutral Strategy

BC Housing High Performance Greenhouse Gas Neutral Strategy

The building's energy consumption shall be reduced as much as possible. Remaining greenhouse gas emissions shall be mitigated through fuel switching to low GHG emission energy sources, including low GHG emission electricity and on-site renewable energy, and/or implementation of on-site GHG emission offset projects where practical.

To achieve its GHG neutral goal, new BC Housing projects shall achieve:

- *Minimum six points for Optimised Energy Performance with the LEED rating system,*
- *Maximum of 10% end use energy from fossil fuels, and*
- *Projects are encouraged to exceed this and attempt to further maximize reduction of greenhouse gas emissions if cost effective*

Projects must report their estimated annual GHG emissions and percentage reduction relative to the reference building designed to the Model National Energy Code for Buildings 1997 or ASHRAE/IESNA 90.1 1999.

Relationship to Other Documentation & External GHG Policies

The Province of British Columbia has recently implemented a Carbon Neutral policy for Provincial Ministries and Crown Agencies, where their operations are required to be carbon neutral by 2010.

¹ *Embodied energy of the building and the in-suite energy use is not within the scope of the GHG neutral goal.*

While BC Housing must meet this requirement for its directly managed buildings, by reducing energy consumption and GHG emissions as much as possible, and offsetting remaining emissions with the purchase of carbon credits, new construction projects operated by non profit societies will not have to meet this requirement.

BC Housing however has independently adopted a GHG neutral policy for new construction projects that it funds, with the goal of reducing GHG emissions to the greatest extent possible, and does not intend to use the purchase of carbon credits as a measure to offset GHG emissions from these buildings.

In addition to the GHG neutral strategy, BC Housing is also developing a strategy to integrate LEED requirements into its new construction projects. BC Housing's Provincial Homelessness Initiative Design Guidelines and Construction Standards will be updated and revised to recognize and support the implementation of BC Housing's LEED and GHG Strategies.

Calculating GHG Emissions

Requirement

New construction projects funded by BC Housing shall report their estimated annual GHG emissions for the final building design, and percentage reduction relative to the reference building designed to the Model National Energy Code for Buildings 1997 or ASHRAE/IESNA 90.1 1999. Report data is to be submitted to BC Housing at final design stage.

Procedure

GHG emissions are generated from direct combustion for space and water heat on-site as well as indirect emissions resulting from the consumption of electricity. In cases where projects are connected to district heating and cooling systems, indirect emissions may also be produced in the generation of thermal energy.

Estimation of GHG emissions involves the following steps:

1. Determine annual consumption of each fuel including direct combustion and indirect consumption (such as electricity or thermal energy from district energy),
2. Determine the appropriate GHG emission factors for each fuel, and
3. Combine annual energy use and emission factor to calculate each fuel's GHG emissions and convert to metric tonnes.
4. Report GHG emissions for the final building design, and percentage reduction relative to the reference building designed to ASHRAE/IESNA 90.1 1999 or the Model National Energy Code for Buildings 1997.

Each of these steps is described below.

Determination of Annual Energy Consumption

Energy consumption for new projects may be estimated from energy simulations. Acceptable energy simulation programs include:

- DOE2.1 E
- EE4
- Other simulation programs that meet the requirements for LEED certification.

Determination of Emission Factors

GHG emissions may be generated from the direct combustion of fuel on site, as well as indirect emissions created in the generation of electricity.

Direct Emissions from Combustion

Emission Factors for the direct combustion of fuel is summarised in Table 1. While most of the Province of British Columbia has access to natural gas, a number of communities remain dependent on propane and fuel oil for space heat. While biomass (including landfill gas) is considered to be CO₂ neutral, it may still be a source of methane or nitrous oxides. Methane and nitrous oxide emissions from biomass processes are technology dependent² and must be calculated on a case by case basis.

Table 1: Emission Factor for Direct Combustion

Fuel Source	Emission Factor
Natural Gas	0.0494 Tonnes/GJ
Propane	0.06 Tonnes/GJ
Fuel Oil	0.073 Tonnes/GJ
Biomass (including landfill gas)	Technology Dependent

Indirect Emissions From Electricity

BC Hydro reports its greenhouse gas emissions annually³. Based on the emissions generated and electricity consumed in 2006, the GHG emissions factor for the BC Hydro Service territory was 22 tonnes per gigawatt hour.⁴ A summary of emission factors for average and marginal electricity generation is summarised in Table 2.

Projects shall report electricity emissions using both an average and marginal emissions factors.

Table 2: Electricity Emissions Factors

Electricity Emissions Factor	Emission Factor
Average Electricity Emission Factor	22 Tonnes/GWh (0.006 Tonnes/GJ)
Marginal Electricity Emission Factor⁵	0 Tonnes/GWh (0 Tonnes/GJ)

² http://www.ec.gc.ca/pdb/ghg/inventory_report/2004_report/ann13_e.cfm#sa13_6_2

³ <http://www.bchydro.com/info/reports/reports11858.html>

⁴ No emissions information was identified for the West Kootenay service territory

⁵ Incremental electricity loads from new construction will use electricity generated at the margin, which could be assumed to be GHG neutral due to the Provinces new energy policy requiring all new generation to achieve net zero GHG emissions. The BC Energy Plan entitled A Vision for Clean Energy Leadership outlines objectives and targets for energy efficiency and clean energy. Specific to defining GHG neutral, the plan states that:

Offsetting GHG Emissions

GHG emissions may be offset by the generation and export of renewable energy. Other innovative approaches for offsetting emissions, such as providing bicycles or other alternative transportation options to reduce emissions from tenant or staff vehicle use, could be used to offset emissions if it can be shown that the GHG reduction caused by the measure would not have occurred otherwise.

Calculation of GHG Emissions

Direct emissions from combustion is the product of annual fuel use and the fuel emission factor. Indirect emissions is the product of indirect energy use and the indirect energy emission factor. Total emissions are the sum of direct and indirect emissions. Acceptable offsets may be subtracted from the sum of direct and indirect emissions. GHG emissions shall be reported on the basis of tonnes per year.

Discussion

Cost Effectiveness of Achieving a GHG Neutral Project

In general, reducing GHG emissions also reduces lifecycle building costs due to operational savings and may therefore be justified on a purely financial basis. Consultants should target cost effective GHG emission reduction strategies.

General Approach to Achieving GHG Neutral Projects

Without limiting design flexibility, the recommended approach to achieving LEED Gold and GHG neutral construction requires optimization of the building's energy performance. To eliminate GHG emissions from direct combustion, it is recommended that the building enclosure and domestic hot water systems be designed to minimise demand. Once energy consumption is minimised, a GHG neutral project may be achieved by fuel switching from fossil fuel to low GHG emission energy sources, including low GHG emission electricity and on-site renewable energy.

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1. All new electricity generating facilities constructed in British Columbia will be required to achieve zero net greenhouse gas emissions.
 2. By 2016, existing thermal generating power plants will achieve zero net greenhouse gas emissions.
 3. Coal thermal electricity facilities are required to produce zero greenhouse gas emissions.
 4. Clean or renewable electricity generation will continue to account for at least 90 per cent of total generation. These include sources of energy that are constantly renewed by natural processes, such as large and small hydroelectric, solar, wind, tidal, geothermal, wood residue and energy from organic municipal waste.

In summary, by 2016, it is expected that British Columbia will be electricity self sufficient and electricity the BC Hydro grid will be GHG neutral.

Exceptions

For small buildings built in accordance with Part 9 of the BC Building Code, projects shall be constructed to meet an Energuide⁶ 80 rating. Compliance shall be demonstrated by providing the Energuide evaluation report.

Prescriptive packages of energy efficiency measures that can generally achieve an Energuide 80 level of energy performance in single family style buildings are summarized in the Table 3. All packages of energy efficiency measures are cost effective and positive on a lifecycle cost basis for electricity and gas heated homes in their respective regions of the province.

⁶ The Energuide for New Houses program is a Federal initiative to encourage enhanced performance in new Part 9 housing. The program provides modelling tools to encourage enhanced building performance. An Energuide 80 (EGH80) rating corresponds to an R2000 house.

Table 3 Energuide 80 Prescriptive Measures Sets

	Electric Heat	Natural Gas Heat
Lower Mainland	<ul style="list-style-type: none"> • R 12 full height basement insulation • R 22 wall insulation with advanced framing • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill 	<ul style="list-style-type: none"> • Condensing Furnace • Electric DHW • R 12 full height basement insulation • R22 wall insulation with advanced framing • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill
Vancouver Island	<ul style="list-style-type: none"> • R 12 full height basement insulation • R 22 wall insulation with advanced framing • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill 	<ul style="list-style-type: none"> • Condensing Furnace • Electric DHW • R 12 full height basement insulation • R22 wall insulation with advanced framing • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill
Southern Interior	<ul style="list-style-type: none"> • R 12 full height basement insulation & 38 mm extruded polystyrene • R 22 wall insulation with advanced framing and 38 mm extruded polystyrene • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill 	<ul style="list-style-type: none"> • Condensing Furnace • Electric DHW • R 12 full height basement insulation & 38 mm extruded polystyrene • R 22 wall insulation with advanced framing and 38 mm • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill
North	<ul style="list-style-type: none"> • R 60 attic insulation • R 12 full height basement insulation & 38 mm extruded polystyrene • R 22 wall insulation with advanced framing and 38 mm extruded polystyrene • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill 	<ul style="list-style-type: none"> • R 60 attic insulation • Condensing Furnace • Electric DHW • R 12 full height basement insulation and 38 mm extruded polystyrene to 600 mm • R22 wall insulation with advanced framing and 38 mm extruded polystyrene • Improved air tightness • Heat recovery ventilator • Double glazed low-e windows with argon fill