

# 9.36: Trade-off Calculator

9.36.2.11 Worksheet  
(2016/06)

Alberta Building Code 2014 Article 9.36.2.11 Worksheet for Building Envelope Trade-Off															
Project Name:							Building Permit Number (Completed Internally)								
Project Address:															
Applicant Name:															
Applicant Address:															
Trade-off Calculations for Above-ground Building Envelope Assemblies															
Description or Identification of Building Envelope Assembly	Opaque Portions			Fenestration Portions			Area of Assembly in Reference Building: $A_{ir}$ (m <sup>2</sup> )	Area of Assembly in Proposed Building: $A_{ip}$ (m <sup>2</sup> )	Minimum Allowable Thermal Resistance of Assembly in Reference Building (prescriptive values): $R_{ir}$ (m <sup>2</sup> •K)/W	Thermal Resistance of Assembly in Proposed Building: $R_{ip}$ (m <sup>2</sup> •K)/W	$A_{ir} / R_{ir}$ (W/K)	$A_{ip} / R_{ip}$ (W/K)			
	Wall	Roof	Floor	Fenestration	Door	Skylight									
Fenestration Trade offs are limited to fenestration on the same elevation. Please indicate which elevation contains the fenestration being calculated								North	<input type="checkbox"/>	South	<input type="checkbox"/>	East	<input type="checkbox"/>	West	<input type="checkbox"/>
											0	0			
											0	0			
											0	0			
											0	0			
											0	0			
											0	0			
											0	0			
											0	0			
											0	0			
<b>TOTALS:</b>							<b>0</b>	<b>0</b>			<b>0</b>	<b>0</b>			
Is building envelope compliant with simple trade-off path? ( $A_{ip} / R_{ip} \leq \text{total } A_{ir} / R_{ir}$ and $A_{ip} = A_{ir}$ )															
<b>Yes</b>															
The areas used in the above calculation shall be clearly indicated on the accompanying drawings.															



## 9.36 Project Summary Form

### Introduction

Section 9.36 of the Alberta Building Code (ABC) 2014 details new energy efficiency requirements for housing and small buildings. It includes three options for compliance; Prescriptive, Trade-Off, and Performance Compliance.

To facilitate compliance, The County of Grande Prairie has created the 9.36 Project Summary form outlining the requirements and compliance options for ABC 9.36. This guide provides information and direction on how to complete this form. A completed 9.36 Project Summary form is required for all relevant Building Permit applications starting November 01, 2016.

### Completing the 9.36 Project Summary Form

#### Basic Building Information

Regardless of the compliance path chosen, certain information is required for all buildings seeking compliance with ABC 9.36. This information must be completed for all projects and be consistent with the accompanying drawings.

Basic information includes:

**Climate Zone** County has 5000-5999 HOD (climate zone 7A). If you have suitable climate data that shows otherwise please supply it with your application.

**Building Area** This is as defined in 1.4.1.2 of ABC 2014

#### Selecting a Compliance Path

Select only one compliance path; multiple compliance paths are not permitted on a single building.

Specific requirements associated with the individual compliance paths are found on the form, and explained in greater detail below

#### Prescriptive Compliance Path

This section describes the minimum information that must be included for prescriptive compliance. It may take the form of notes or additional drawings. If the proposed assemblies and components meet the required values of 9.36.2- 9.36.4 you will have demonstrated compliance.

A list of drawing details to illustrate how air barrier and insulation continuity at joints, transitions and changes in assemblies is also included. These details will be specific to the chosen air barrier/insulation system.



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### Trade-off Path

A second compliance path allows applicants to 'trade-off' building envelope requirements, subject to limitations found in

ABC 9.36.2.11. These include;

Total areas must be the same for both parts of the calculation

You may only tradeoff between assemblies from the building envelope, not HVAC or Hot Water.

You may only trade opaque for opaque assemblies \_or transparent for transparent assemblies. D If you trade windows for windows, then they must be on the same elevation.

Demonstrating compliance under the trade off path requires all the information for prescriptive compliance, with the additional requirements of

Trade off calculations must be submitted (calculator available

Using a hatch, shading, or other mean, the trade-off areas must be indicated on the accompanying drawing submission.

### Performance Compliance Path

Performance Compliance path employs a computer simulation software or calculations to compare a proposed design with a hypothetical reference building to show that the proposed design will use less energy over the course of an operational year. ABC 9.36.5 outlines the procedures for performing this comparison.

The 9.36 Project Summary requires a number of values to be provided in order to allow verification of the model inputs. A brief outline of some of these inputs and their requirements follows:

### Reference Model

The reference model must be constructed according to 9.36.5.13. – 9.36.5.16 In the Reference building **Airtightness**, **SHGC**, **Thermal Mass** and **Solar Absorbance** must use values specified in 9.36.5.14.

**FDWR** for the Reference building is based on the FDWR of the proposed building, according the to the following table;

Buildings Containing 1 or 2 Dwelling Units	
Actual FDWR	FDWR for Reference Model
<17	17
17-22	Match actual FDWR
>22	22



## 9.36 Project Summary Form

Buildings containing More Than 2 Dwelling units	
Actual FDWR	FDWR for Reference Model
0-40	Match actual FDWR
>40	40
<p><b>NOTE:</b> For the purposes of the reference building, the area of glazing arrived at above shall be divided equally among the elevations of the building in the model. The following boxes on the form allow you to indicate the areas entered in the model for each elevation.</p>	

**HVAC System efficiency** is to be indicated based on the required efficiency rating from table 9.36.3.10 for the type and size of equipment specified in the proposed design. If the proposed design equipment is not included in the table then the reference house should be based on a gas fired warm air furnace with an efficiency of 92%.

**Space Cooling Efficiency** if installed shall meet the efficiency value for the relevant type of equipment as found in table 9.36.3.10

**Service Water Heater Efficiency** shall be indicated as the value shown in table 9.36.4.2 or if appropriate 9.36.5.16 and shall be the same type, size and fuel type as the proposed house.

**Ventilation Rate** shall be set at the value derived from table 9.32.3.3 based on the number of bedrooms.

### Proposed Model

**Airtightness** for the proposed house is a choice to be made by the designer.

Chosen Airtightness level	Construction Requirements
3.2	Install an Air Barrier system in accordance with 9.25.3
2.5	Install an Air Barrier system in accordance with 9.36.2.10
<2.5	Conduct a blower door test to verify that the specified air leakage rate has been achieved.
<p><b>NOTE:</b> The results of this test must be supplied to the Building Inspector prior to occupancy. Should the blower door test indicate that the air leakage rate is greater than that specified at permit stage then along with the blower door results, a revised model report using the actual test value will need to be submitted to the Building Inspector prior to occupancy.</p>	

**SHGC** will be based on the specification of the actual windows proposed for the house and calculated in accordance with 9.36.2.2.



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**Thermal Mass** can be calculated for the proposed house in accordance with 9.36.5.10 or the default value of 0.06 may be used.

**Solar Absorbance** is held constant between the proposed and reference models and therefore should be 0.4.

**FDWR** will be entered as the actual value calculated, distributed in the model per the design. The following boxes on the form allow you to indicate the areas for each elevation and should reflect the drawings.

**HVAC System Efficiency** will be the efficiency of the actual specified equipment.

**Space Cooling Efficiency** shall be the efficiency of the actual proposed equipment if installed.

**Service Water Heater Efficiency** will be the efficiency of the actual specified equipment.

**Ventilation Rate** may be set at a proposed value but may not be less than that derived from table 9.32.3.3 based on the number of bedrooms.

### Performance Data Summary

Enter the energy use values generated by the reference and proposed models. Compliance is demonstrated when the Calculated Energy use is equal to or less than the Target Energy Use.

### Software

The software used to perform the energy simulation will be detailed here. No specific software package is mandated however whichever software is chosen must have been tested to ANSI/ASHRAE 140 and have any changes or variations made to/within the software listed.

### Declaration

Code requires a declaration be made that the calculations have been completed in compliance with all the rules outlined in 9.36.5. In order that the Safety Codes officer can discuss anything arising from the calculations contact information shall be provided for the person who prepared them.

Should the project be particularly complex, or the calculations have significant deficiencies the Safety Codes Officer may request a professional stamp and signature accompany the calculations.



**County of Grande Prairie of Requirements for ABC 2014 Division B Section 9.36  
Compliance**

Please consult the companion 9.36 Project Summary User Guide for help in completing this form.

Project Name:		Building Permit Number
Project Address:		
Applicant:		
Applicant Address:		

**Basic Building Information**

Information provided below sets the buildings geometry to establish compliance with the ABC 2014 Division B Section 9.36

Climate Zone (HDD):		Building Area (m <sup>2</sup> ):	
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Please check the appropriate box to indicate your chosen compliance path  
(select only one)

<b>PRESCRIPTIVE</b>	<b>TRADE-OFF</b>	<b>PERFORMANCE</b>
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**SUBMIT THE FOLLOWING INFORMATION WITH YOUR APPLICATION BASED ON THE COMPLIANCE PATH CHOSEN**

**All Compliance Paths**

- Identify on the plans any/all assemblies containing heating pipes, cables, or membranes.
- Indicate if a Heat Recovery Ventilator is proposed and, if it is proposed, note the type and efficiency.
- Indicate **effective** Rsi values for all assemblies of the building envelope, both above and below ground (e.g. walls, floors, roofs, windows and doors).
- Provide the calculations used to determine the Rsi values (hand calculations or from a software program).
- Indicate the air barrier system being proposed.
- Indicate the type and equipment efficiency of the HVAC system components. Include dampers on intakes and outlets where required.
- Note the type and equipment efficiency of the Service Hot Water system components.
- Note if Hot Water recirculation is proposed, and the thickness and extent of pipe insulation in the Service Hot Water system.

**Provide the following architectural details indicating continuity of insulation and air barrier:**

Attic hatch, eaves/top of wall, upper floor rim joist, top of basement wall/main floor junction, slab/footing junction, cantilever, bonus room floor over attached garage including ducts, typical outlet box detail, and typical window/door jamb.

**And, if applicable:**

Party wall meeting outside wall, electric meter/vent pipe/duct in insulated wall, skylight shaft walls, slab edges in walkouts & heated slabs, masonry chimneys and fireplaces.

**Trade Off Compliance Path**

In addition to the information required above, a trade-off calculation, completed in accordance with 9.36.2.11, must be submitted for any Trade-off carried out for above ground assemblies.

The areas of assemblies used in the calculation shall be clearly identified on the drawings.

Performance Compliance Path (residential occupancies)			
Information provided below sets the input parameters for the energy simulation used to demonstrate compliance with ABC 2014 Division B Section			
Reference Model		Proposed Model	
Which direction does the front of the house face as modelled (N, NE, E, SE, S, SW, W, NW):			
Airtightness (ACH @ 50Pa)	2.5	Airtightness (ACH @ 50Pa)	3.2 2.5 other:
Solar Heat Gain Co-efficient Glazing (SHGC)	0.26	Solar Heat Gain Co-efficient Glazing (SHGC):	
Thermal Mass (MJ/m <sup>2</sup> °C)	0.06	Thermal Mass (MJ/m <sup>2</sup> °C):	
Solar Absorbance	0.4	Solar Absorbance:	
FDWR (%)	17 22 other:	FDWR (%):	
Area of Fenestration North Elevation (m <sup>2</sup> ):		Area of Fenestration North Elevation (m <sup>2</sup> ):	
Area of Fenestration South Elevation (m <sup>2</sup> ):		Area of Fenestration South Elevation (m <sup>2</sup> ):	
Area of Fenestration East Elevation (m <sup>2</sup> ):		Area of Fenestration East Elevation (m <sup>2</sup> ):	
Area of Fenestration West Elevation (m <sup>2</sup> ):		Area of Fenestration West Elevation (m <sup>2</sup> ):	
HVAC System Efficiency (%):		HVAC System Efficiency (%):	
HVAC System Efficiency (%):		HVAC System Efficiency (%):	
Space Cooling Equipment Efficiency (%):		Space Cooling Equipment Efficiency (%):	
Service Water Heater Efficiency (%):		Service Water Heater Efficiency (%):	
Service Water Heater Efficiency (%):		Service Water Heater Efficiency (%):	
Ventilation Rate (l/s):		Ventilation Rate (l/s):	
<b>NOTE:</b> If the ACH rate entered above for the proposed house is less than 2.5ACH a blower door test will be required prior to occupancy. A note to this effect shall be placed on the drawings.			
Performance Data Summary			
Target Energy Use (reference)		Calculated Energy Use (proposed)	
Software			
Software Title:		Version:	
Software Adaptations Made:			
Please attach the full modelling report generated by an ANSI/ASHRAE 140 compliant software package to this form. Failure to submit the complete report will result in your application being placed on hold.			
Declaration			
Please indicate the person responsible for preparing the calculations used to show compliance with ABC 2014 Division B Section 9.36			
Name:			
Representing Firm:			
Contact Information:	email:		tel:
Address:			
I hereby certify that the calculations submitted were prepared in full accordance with ABC 2014 Division B Section 9.36 and the operating procedures of the software		Signature	
<b>Nothing in this form, or the attached calculations, shall preclude the Safety Codes Officer reviewing this file and requesting an appropriate professional to stamp and sign the submission.</b>			