SCOPE OF NECB 2017

National Energy Code for Buildings (NECB) 2017, developed by Natural Resources Canada and the National Research Council to improve energy efficiency of buildings, is Alberta's new minimum construction standard for energy-consuming spaces and components in new buildings and additions. It offers three distinct compliance paths—**Prescriptive, Prescriptive with Trade-Offs**, and **Performance**. Each path offers a level of design freedom that is mirrored by a commensurate level of permit application submission requirements and professional involvement. NECB applies to new Core and Shell projects and their subsequent tenant fit-up or build-out, as well as to complete buildings and additions.

Buildings with a building permit issued before the introduction of NECB 2011 do not have to comply with NECB 2017. Any buildings or tenant improvements with building permits issued after November 1, 2016 must now comply with NECB 2017.

CHOOSING A PATH

PRESCRIPTIVE PATH to NECB 2017 compliance is through the strict construction of requirements prescribed or listed in NECB2017:B:3.2, 4.2, 5.2, 6.2 and 7.2. This path's simplicity affords the least flexibility from a design perspective. Size and occupancy of the project will govern in the first case whether the drawings must be authenticated per NBC(AE)2019:C:2.4.2.1. (3) - (5); where required, the NECB 2017 design must also be signed and sealed.

TRADE-OFF PATH may be appropriate for designs that may not otherwise be practically or economically achievable through fulfilling all prescriptive path requirements for some building components. Trade-offs allow prescriptive component U-values (thermal performance levels) to be traded off against others, only within each of Parts 3 to 6 of NECB 2017. An acceptable trade-off will be one that, despite one or more individual components falling short of prescribed values, is demonstrated to represent an equivalent or better level of efficiency than following the strictly prescriptive path. Key limitations and the calculations to be performed are found in NECB2017:B:3.3., 4.3., 5.3., and 6.3.; there is no trade-off path option in NECB 2017 Part 7.

The **Trade-Off Path** may be exercised in simple fashion for NECB 2017 within an individual part of Part 3 to Part 6, but does not allow trade-offs between components of other Parts of NECB 2017.

- **Trade-Off Path - Building Envelope** (NECB2017:B:3.3.3) deals ONLY with above-ground envelope assemblies and components, grouped into horizontal and vertical categories, allowing trading within:
    - horizontal assemblies and components: roofs, floors and skylights
    - vertical assemblies and components: walls, doors and windows, including adjustment to allowable Fenestration+Door to Wall Ratio (FDWR) if desired.

- **Detailed Trade-Off Path - Building Envelope** included in the 2011 version of the NECB is no longer an acceptable path in the 2017 code.

- **Trade-Off Path - Lighting , HVAC or Service Water Heating** (NECB2017:B:4.3., 5.3., and 6.3.) Trade-off options are available within each of these Parts, but trading may not occur between Parts.

Calculators for verification that proposed trade-offs conform to NECB 2017 are provided by NRCan. Other software resources may be employed, provided calculations supporting the trade-offs are available for review upon AHJ request.

PERFORMANCE PATH is a whole-building energy simulation model of all building systems, with the goal of demonstrating through modeling that the proposed building would require no more energy to operate than a hypothetical, equivalent, prescriptively-designed building. While affording the most design flexibility, this path to NECB compliance requires professional involvement due to the complexity of rules and limitations in the exchange between all building systems.

DRAWINGS, DETAILS, AND DOCUMENTS FOR BUILDING PERMIT APPLICATION SUBMISSIONS

Professional Involvement

Where the project **requires** professional involvement per NBC(AE)2019:C:2.4.2.1.(3),(4) and (5), then registered professionals shall be retained also for application of NECB 2017 as outlined on the A-1+ A-2, B-1+ B-2 and C-1+ C-2 schedules.

Where professional involvement is **not required** in relation to 2.4.2.1.(3), (4) and (5), NECB-related design will nevertheless require professional involvement for projects incorporating:

- Prescriptive with Trade-Off Path - except for Part 3 (Building Envelope) Simple Trade-Off Path
- Performance Path
- A proposal sufficiently complex that plans examination cannot readily confirm compliance.

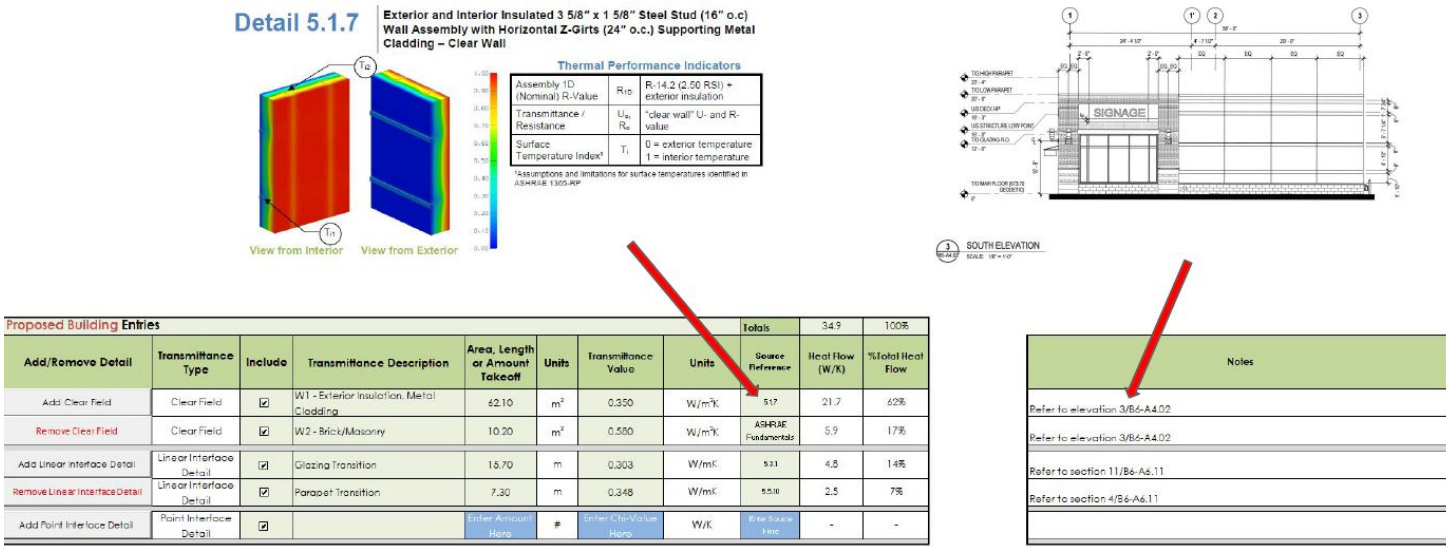
Each professional is responsible for field reviews for their scope of work as it relates to NECB 2017, as is the case for National Building Code (Alberta Edition) (NBC(AE)). When the performance path is selected, such field reviews will typically be performed by the registered professionals of record for each discipline in lieu of field reviews by the Building Energy Modeler to ensure NECB 2017 energy compliance is met. The submitted schedule letters of professional responsibility shall be completed in order to ensure clarity around who is responsible for reviews.

DRAWINGS, DETAILS, AND DOCUMENTS

The NECB 2017 Compliance Checklist shall be completed for the selected path to compliance and submitted.

PRESCRIPTIVE PATH NECB 2017 application includes drawings, details and documents that demonstrate the minimum prescriptive requirements are being met:

- U-value overall thermal transmittance of all above-ground opaque building assemblies and assemblies in contact with the ground; provide assembly details and U-values in wall/floor/roof schedules on drawings
    - Include thermal bridging calculations (authenticated by a registered professional). The Enhanced Thermal Performance Spreadsheet available on the BC Hydro website is recommended. Include a reference to the thermal bridging literature and the corresponding plan, section, or detail for each thermal bridging item entry. Refer to the image following this list.
- U-value overall thermal transmittance of all fenestration and doors: provide in window schedule. Centre of glass value unacceptable; provide overall heat transfer for entire unit considering frame, glass edge and centre of glass
- Air Leakage: detail air barrier sequence, joints and penetrations
- Lighting Power Density (LPD) Requirements (interior and exterior); indicate space-by-space or building area method
- Exterior lighting power for fixture
- Lighting Controls: show controls in drawings with symbols for interior and exterior spaces
- HVAC Equipment and Efficiency; list in equipment schedules, including any Economizers
- Service Hot Water Equipment and Efficiency; list in equipment schedules
- Piping Insulation, to be included in drawings for HVAC and SHW details



Thermal bridging documentation example

Generally these will be the details required to be on the drawings in any event in order that it can be constructed according to plan. While not required to be submitted at the time of Building Permit application, supporting calculations for lighting power densities and fan power shall be available for review upon AHJ request. Recall that calculations necessarily derived for prescriptive compliance are used as basis for establishing the "reference" building in support of other compliance paths

TRADE-OFF PATH NECB 2017 application includes the above and:

Trade-Off Path - Building Envelope calculations summaries, authenticated (signed and sealed) by a registered professional where the project itself requires professional involvement under NBC(AE). Some simple envelope trade-offs may be performed by hand, in which case all work should be shown and attached to the NECB 2017 Checklist.

Trade-Off Path - Lighting , HVAC, or Service Water Heating are each sufficiently complex that the trade-off calculation submissions shall be authenticated by a registered professional, and duly-signed schedules of professional involvement provided, whether the building itself requires professional involvement or not. Supporting calculations shall be available for review upon AHJ request.

PERFORMANCE PATH NECB 2017 application shall include the NECB 2017, energy model report and all necessary calculations, drawings, and tables required by NECB2017:C:2.2.2.8. (which includes the documentation requirements of 2.2.2.3 to 2.2.2.7) that are additional to that provided above.

Modeling report submission shall illustrate thermal blocks used in the reference and proposed buildings (floor plans and sections as applicable) as well as verification of input data, such as effective thermal transmittance of assemblies, thermal bridging calculations (refer to the image in the Prescriptive Path section above), equipment efficiencies, and verification of prescriptive performance levels for omitted systems such as exterior lighting. The performance model report shall be authenticated by a registered professional of record.

Pre-occupancy submissions

The NECB 2017 Checklist for any chosen compliance path shall be submitted in conjunction with a request for final building inspection for occupancy. The updated checklist will capture the change in energy performance due to any changes in the construction phase of the project. This is in addition to requirements for NBC(AE) 9.36 documentation, though C-schedules that may be required may pertain to both NBC(AE) and NECB.

If overall professional involvement is **NOT** required for the project per NBC(AE), provide a Letter of Assurance

of Compliance signed by both constructor and owner assuring that PRESCRIPTIVE PATH and/or Trade-Off Path - Building Envelope requirements have been met. For Trade-Off Path - Lighting , HVAC, or Service Water Heating OR PERFORMANCE PATH, provide applicable C-Schedule(s) of Assurance from the registered professional(s) responsible for the design.

If overall professional involvement is required for the project per NBC(AE), the required C-Schedules of Assurance shall pertain to both NBC(AE) and NECB compliance.

For **PERFORMANCE PATH** submissions, the following documents are required with all permit applications:

- Updated NECB 2017 Checklist with the Part 8 Section complete
- Performance Model Energy Consumption Report capturing all changes during the construction phase

Core and shell buildings and tenant improvement guidelines

Core and shell buildings are buildings which are constructed with a complete building envelope, basic lighting, and basic HVAC equipment with the intent to develop the shell space to suit individual tenants at a later date. During the improvement the tenant will add additional electrical and mechanical equipment to suit their needs. The core and shell applicant may not know the scope of the tenant improvement when applying for a building permit.

The following guidelines apply to core and shell projects pursuing the performance path for compliance.

Core and Shell Applicant Guidelines

Where insufficient information is known about the base building or future tenant improvement components, the prescriptive requirements should be modeled in both the proposed and reference energy models. This ensures that the tenant is not bound by the assumptions in the energy model report, and can complete the tenant improvement using the prescriptive values.

An example is modeling interior lighting. Lighting installed in the base building is typically much less than what is required for the tenant improvement. If the base building lighting is entered in the proposed model, but the prescriptive value is entered in the reference model, then the tenant cannot install more lighting without a new energy model as it will decrease the proposed building energy savings relative to the reference building. An updated energy model is then required to verify compliance with the NECB.

The intent is to model the building so that the tenant can follow the prescriptive requirements and avoid updating the energy model for each tenant improvement. Additional equipment installed during the tenant improvement should not decrease the relative energy savings of the proposed building over the reference building.

Tenant Improvement Applicant Guidelines

Tenants are required to comply with the assumptions in the base building energy model report or the prescriptive requirements of NECB 2017 for components not yet constructed, whichever is more stringent. The tenant must submit the Part 4, 5, and/or 6 Prescriptive Details sheets from the NECB 2017 checklist with their permit application including, but not limited to, the following:

- The thermal performance of the building envelope was not altered as a result of the tenant improvement. This includes altering the amount of envelope openings, or altering wall, roof, floor slab, glazing, and door assemblies. Pipes, ducts, equipment with through-the-wall venting, packaged terminal air conditioners or heat pumps which penetrate the building envelope need not be taken into account per NECB:B:3.1.1.7.(2).
- Installed lighting power does not exceed the values assumed in the base building energy modeling report
- Lighting controls meet or exceed the level of performance assumed in the base building energy modeling report
- New HVAC equipment meets or exceeds the performance level of the NECB prescriptive requirements
- New service hot water heating equipment meets or exceeds the performance level of the NECB prescriptive requirements
- Any other components installed as part of the tenant improvement do not decrease the relative energy savings of the proposed building over the reference building.