Natural Resources Canada
EnerGuide Rating System—Version 15
Foundation Level Exam Competency Profile, November 2015

NOTES:

The categories, competencies and learning objectives listed below will be tested during the exam, except those identified with an asterisk (*).

The categories, competencies and learning objectives listed below apply to houses, houses with secondary suites and buildings containing only dwelling units and common spaces that are not greater than three storeys in building height, are not greater than 600 m2 (6,458 sq. ft.) in building area and are on permanent foundations or are permanently moored float homes. For more information on eligible housing types under the EnerGuide Rating System, refer to the most current version of the EnerGuide Rating System Standard—Version 15.

Category / Competency / Learning Objective	
1. Communication & Computer Skills*	
1.1 Demonstrate knowledge of how to maintain courteous and professional relations with clients (e.g., dependability, timeliness, clear and polite communication).*	
1.1.1	Identify ways to convey a professional and reliable approach to customers' needs and enquiries.*
1.1.2	Identify ways to apply effective listening skills to respond appropriately to customer requests.*
1.1.3	Recognize the principles of effective written communication.*
1.1.4	Identify ways to apply effective verbal communication skills.*
1.1.5	Apply spelling and grammar rules to written communication.*
1.2 Use email, word processing and spreadsheet software effectively (e.g. Microsoft Word, Microsoft Excel, Microsoft Outlook).*	
1.2.1	Develop effective documents using word processing software.*
1.2.2	Perform data entry using spreadsheet software.*
1.2.3	Describe how to generate customized emails (with attachments) that can be sent to a list of contacts.*
2. Numeracy	
2.1 Perform geometric and arithmetic calculations accurately	
2.1.1	Apply rounding rules on a given set of examples.
2.1.2	Calculate areas.
2.1.3	Calculate volumes.
2.1.4	Calculate perimeters.
2.1.5	Calculate circumferences.
2.1.6	Calculate angles/slopes
2.1.7	Perform basic algebraic operations
2.2 Execute unit conversions between metric and imperial.	
2.2.1	Convert measurements from metric units to imperial units.
2.2.2	Convert measurements from imperial units to metric units.
3. Construction and Renovation of Low-Rise Housing	
3.1 Describe typical Canadian architectural house typology	
3.1.1	Identify common types of existing and new homes in Canada.
3.1.2	Recognize different types of house construction methods for existing and new homes.
3.1.3	Identify typical Canadian building materials used for homes.
3.1.4	Determine the impact of building codes on the energy efficiency of housing.
3.1.5	Interpret applicable data on building material properties and performance.
3.1.6	Identify structural and non-structural components of existing construction.
3.2 Describe the building design process and construction techniques using appropriate construction terms and definitions.	
3.2.1	Describe the key stages in designing and constructing a house.
3.2.2	Describe the basic components of light wood frame construction.
3.2.3	Distinguish between nominal and effective thermal resistance.
3.2.4	Describe building methods and materials used in foundation, floor, wall and roof assemblies for existing and new homes.
3.2.5	Describe advanced framing and double stud wall construction.
3.2.6	Describe cast-in-place concrete foundations.
3.2.7	Describe techniques to ensure the continuity of the air barrier around service penetrations (plumbing, electrical, mechanical) through the building envelope.
3.2.8	Describe differences between foundation damp proofing and water proofing.
3.2.9	Describe foundation drainage systems.
3.2.10	Describe alternative building systems, products and claddings.
3.2.11	Describe engineered wood products.
3.2.12	Describe insulated concrete forms (ICFs).
3.2.13	Describe structural insulated panels (SIPs).
3.2.14	Describe masonry cavity walls.
3.2.15	Describe exterior insulation and finish systems (EIFS).

3.2.16	Describe preserved wood foundations (PWF).
3.2.17	Provide examples of building problems associated with poor design.
3.2.18	Provide examples of building problems associated with poor construction methods.
3.3	**Describe renovation techniques using appropriate construction terms and definitions.**
3.3.1	List potential house-as-a-system implications when assessing renovation options.
3.3.2	Describe the advantages and disadvantages of adding insulation to the exterior versus the interior of the building envelope.
3.3.3	Identify the sub-trades involved in energy efficiency renovations.
3.4	**Recognize highly efficient design principles for new construction and renovation.**
3.4.1	Describe how integrated design can lead to optimal building performance.
3.4.2	Describe a highly efficient building envelope.
3.4.3	Describe highly efficient mechanical systems, including how they can be integrated.
3.4.4	Describe alternatives to conventional central or window-type air conditioning.
3.4.5	List opportunities for reducing hot water use and hot water delivery time delays through efficient plumbing design and fixtures.
3.4.6	List opportunities for reducing total water consumption.
3.4.7	List options for reducing lighting loads.
3.4.8	Describe opportunities to reduce electrical loads.
3.4.9	Describe renewable energy options for housing.
3.4.10	Describe ways that photovoltaic systems can be integrated into the structure of the building.
3.4.11	Describe construction and renovation practices and materials to control air leakage.
3.5	**Interpret plans.**
3.5.1	Interpret house construction drawings.
3.5.2	Interpret common architectural symbols and abbreviations.
4. Safety Considerations	
4.1	**Describe safety considerations when accessing home construction or renovation sites.**
4.1.1	Describe ladder safety protocol.
4.1.2	Describe construction site safety protocols.
4.1.3	List safety equipment.
4.1.4	Identify electrical shock and electrical fire hazards.
5. Building Envelope (New and Existing Homes)	
5.1	**Describe building envelope barrier systems (air barrier, vapour barrier, moisture barrier, weather/wind barrier, thermal barrier).**
5.1.1	Describe the function of each of the barrier systems in the building envelope.
5.1.2	Identify typical building materials that form each type of barrier system.
5.1.3	List and identify the types of insulation materials and their applications.
5.1.4	State the RSI(R)-value of some typical insulation materials.
5.1.5	Describe the function of gaskets and list some desirable characteristics of gaskets.
5.1.6	Provide examples of caulking and sealant materials.
5.1.7	Compare advantages and disadvantages of various air barrier systems (e.g. sealed polyethylene approach (SPA), airtight drywall approach (ADA), exterior insulation approach (EIA) and house wrap approach (HWA).
5.1.8	Identify the appropriate location of various barrier systems within the building envelope.
5.1.9	Compare building code requirements for air barriers and vapour barriers.
5.1.10	Describe the implications of barrier system failure and identify remedial actions.
5.1.11	Describe the advantages and disadvantages of different insulation materials and their air/vapour barrier properties.
5.2	**Describe windows, skylights and doors.**
5.2.1	Describe the types of window, skylight and door systems.
5.2.2	Describe the components of window, skylight and door systems.
5.2.3	Describe window, skylight and door installation methods, including the preparation of rough openings, careful detailing, flashing and air sealing.
5.2.4	Describe the factors that affect the energy efficiency of windows, skylights and doors.
5.2.5	Distinguish between edge-of-glass and centre-of-glass conductivity.
5.2.6	Indicate where to locate applicable performance data for windows/doors/skylights.
5.2.7	Describe U-factor.
5.2.8	Describe solar heat gain coefficient.
5.2.9	Describe glazing.
5.2.10	Describe Heat MirrorTM film.
5.2.11	Describe low-e coating.
5.2.12	Describe gas fill and types.
5.2.13	Describe low-conductivity frames.
5.2.14	Describe insulated spacers.
5.2.15	Describe Energy Rating.
5.2.16	Describe visible transmittance.
5.2.17	Describe ENERGY STAR ratings and performance for windows and doors.
6. Heating, Ventilation and Air Conditioning (New and Existing Homes)	
6.1	**Recognize and define common terminology.**

6.1.1	Describe heating degree days.
6.1.2	Describe the outdoor design temperature.
6.1.3	Describe heating load.
6.1.4	Describe cooling load.
6.1.5	Distinguish between a unit of energy and a unit of power.
6.1.6	Interpret the terminology used to measure the energy efficiency of various types of mechanical systems.
6.2	**Describe mechanical heating, cooling and ventilation systems.**
6.2.1	List the different types of energy sources used by mechanical systems.
6.2.2	Describe heat loss/gain principles to determine design heating and cooling loads.
6.2.3	Describe the combustion process for natural gas, propane and heating oil.
6.2.4	Describe condensing technology for space and water heating and its limitations.
6.3	**Describe the operation of heating systems.**
6.3.1	Identify the various types of space heating equipment and range of efficiencies.
6.3.2	Identify the various types of domestic hot water heating equipment and range of efficiencies.
6.3.3	Describe the purpose of space heating equipment.
6.3.4	Describe the purpose of domestic hot water heating equipment.
6.3.5	Describe the operating principles of space heating equipment.
6.3.6	Describe the operating principles of domestic hot water heating equipment.
6.3.7	Identify drain-water heat recovery systems.
6.3.8	Describe the combustion requirements of heating systems.
6.3.9	Describe how water heater-based combination systems operate.
6.3.10	Describe how boiler-based combination systems operate.
6.3.11	Describe how integrated mechanical systems operate.
6.3.12	Describe types of combustion air supply and exhaust.
6.3.13	Identify the types of venting systems.
6.3.14	Describe the purpose and operating principles of venting systems.
6.3.15	Describe natural, induced and forced draft and its purpose.
6.3.16	Identify different types of space heating distribution systems.
6.4	**Describe the operation of ventilation systems.**
6.4.1	Describe different types of ventilation equipment and their advantages and limitations.
6.4.2	Describe different types of ventilation distribution systems and their advantages and limitations.
6.4.3	Describe natural ventilation.
6.4.4	Describe mechanical ventilation.
6.4.5	Describe the importance of ventilation in a building.
6.4.6	Describe balanced ventilation with and without heat recovery.
6.4.7	Describe the reasons for making a building airtight and having controlled, mechanical ventilation.
6.4.8	Identify typical locations of natural infiltration.
6.5	**Describe the operation of cooling systems.**
6.5.1	List the types of cooling systems.
6.5.2	Describe the operating principles of cooling systems.
6.5.3	Identify different types of space cooling distribution systems.
6.5.4	Describe the role of dehumidification for cooling comfort, efficiency and building envelope protection.
6.6	**Describe district energy systems.**
6.6.1	Describe district energy systems for heating, cooling and domestic water heating.
6.6.2	Indicate the typical end-use of district energy systems.
6.7	**Describe renewable energy systems and their properties.**
6.7.1	Describe the fundamental principles in passive solar design.
6.7.2	Describe solar heat gain.
6.7.3	Summarize how to implement passive solar design.
6.7.4	Summarize ways to encourage natural ventilation into passive solar design.
6.7.5	Describe the general principles of active solar space heating.
6.7.6	Describe the general principles of active solar domestic water heating.
6.7.7	Describe the general principles of solar photovoltaic energy.
6.7.8	Describe the general principles wind and micro-hydro energy.
6.7.9	Interpret applicable data on the energy performance of renewable energy systems.
7.	**Building Science Principles and the House-as-a-System Concept**
7.1	**Identify the elements that make up a building and recognize their interdependence (house-as-a-system concept).**
7.1.1	Identify and describe the key components of a building.
7.1.2	Describe the building envelope.
7.1.3	Describe basic components of the building envelope.
7.1.4	Describe the factors that determine thermal comfort.
7.1.5	Describe the principles behind the house-as-a-system concept.
7.1.6	Describe how occupant behaviour (lifestyle and operation) impact the house-as-a-system.
7.1.7	Describe the effect of mechanical systems on heat, air and moisture movement in the building.

7.2 Describe the physical processes that occur within a building.	
Heat Flow	
7.2.1	Describe comfort as it applies to an indoor environment for people.
7.2.2	Describe specific heat, sensible heat and latent heat.
7.2.3	State the necessary conditions for heat flow to occur.
7.2.4	Describe the relationship between R-value and U-factor.
7.2.5	Describe convection and provide typical examples in a house.
7.2.6	Describe conduction and provide typical examples in a house.
7.2.7	Describe radiation and provide typical examples in a house.
7.2.8	Describe condensation.
7.2.9	Describe evaporation.
7.2.10	List the three main factors of the environment that affect the rate of body heat loss.
7.2.11	Describe energy and its relationship to heat.
7.2.12	Describe typical internal heat gain sources.
7.2.13	Describe how heat flow through the building envelope affects thermal comfort and energy consumption.
7.2.14	Determine the temperature gradient across a building envelope assembly.
7.2.15	List the major sources of heat loss in a building.
7.2.16	Describe building practices and materials to control heat flow.
7.2.17	Describe thermal bridging and provide an example.
7.2.18	Describe how to determine the thermal resistance of building materials.
7.2.19	Describe the procedure to determine the thermal resistance values of assemblies.
7.2.20	Describe data required to evaluate heat flow through the building envelope and calculate the conductive heat loss in a given example.
7.2.21	Determine the difference between nominal insulation value and effective insulation value for a stud wall.
Air Flow	
7.2.22	List the criteria necessary for airflow to occur.
7.2.23	Describe airflow mechanisms.
7.2.24	Describe the factors that affect airflow.
7.2.25	Describe stack effect and the neutral pressure plane.
7.2.26	Describe wind-, ventilation-, mechanical- and reverse stack-effect.
7.2.27	Describe air stratification and its implications.
7.2.28	Summarize how air leakage affects thermal comfort, indoor air quality and energy consumption.
Moisture Flow	
7.2.29	Indicate sources of moisture (existing or potential).
7.2.30	Describe moisture flow mechanisms.
7.2.31	Describe dew point.
7.2.32	Differentiate between capillary action and osmosis.
7.2.33	Describe relative humidity.
7.2.34	Describe absolute humidity.
7.2.35	Describe the relationship between temperature and condensation.
7.2.36	List the ways that water can enter basements and crawl spaces.
7.2.37	Describe moisture control strategies.
7.2.38	List the benefits of controlling moisture.
7.2.39	Describe how moisture flow within the building envelope can affect the structural integrity of the assembly.
7.2.40	Describe how moisture flow within the building envelope can affect the indoor air quality.
7.2.41	List the causes of extremely low humidity levels and their implications.
7.2.42	Describe how to determine the permeability of building materials.
7.2.43	Compare airflow to vapour diffusion in terms of moisture movement.
7.3 Describe the diagnostic indicators of indoor air pollutants.	
7.3.1	Describe different types of indoor pollutants and their potential impact on the health of occupants.
7.3.2	Identify potential sources of indoor air pollutants.
7.3.3	Describe methods to minimize indoor air quality problems.
7.3.4	Describe combustion spillage and its implications.
7.3.5	List and identify the signs of combustion spillage.
7.3.6	Identify factors that cause combustion spillage.
7.3.7	Describe methods to reduce or prevent combustion spillage.
7.3.8	Describe carbon monoxide poisoning hazard and use of fire/smoke/CO_2 alarms.
7.3.9	Describe the health hazards of asbestos.
7.3.10	Provide some examples of materials that contain asbestos.
7.3.11	List the causes of mould.
7.3.12	Describe the concerns of mould.
7.3.13	List the sources of radon.
7.3.14	Describe the concerns of radon
7.3.15	List the causes of excessive moisture.
7.3.16	Describe the concerns of excessive moisture.