Energy efficiency in housing and small buildings: heating, ventilating and air-conditioning and service water heating

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Presentations on energy efficiency requirements for housing and small buildings incorporated into Part 9 of the National Building Code of Canada 2010, 2013-03

NRC Canadian Codes Centre

Energy Efficiency in Housing and Small Buildings

Heating, Ventilating and Air-Conditioning and Service Water Heating

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Introduction

- Presentation is part of a series of four
- Model code developed by Canadian Commission on Building and Fire Codes
- National Building Code of Canada 2010 (NBC) must be adopted by provincial/territorial authorities to become law

Outline

- Heating, Ventilating and Air-conditioning (HVAC) requirements
  - Subsection structure
  - Equipment efficiency
  - Ducts and pipes
  - Heat recovery from air over interior pools
- Service Water Heating requirements
  - Subsection structure
  - Equipment efficiency
  - Pipe insulation
  - Controls
- Solar

HVAC – subsection structure

- 9.36.3. HVAC Requirements
  - 9.36.3.1. Scope and Application
  - 9.36.3.2. Equipment and Ducts
  - 9.36.3.3. Air Intake and Outlet Dampers
  - 9.36.3.4. Piping for Heating and Cooling Systems
  - 9.36.3.5. Equipment for Heating and Air-conditioning Systems
  - 9.36.3.6. Temperature Controls
  - 9.36.3.7. Humidification
  - 9.36.3.8. Heat Recovery from Dehumidification in Spaces with an Indoor Swimming Pool or Tub
  - 9.36.3.9. Heat Recovery from Ventilation Systems
  - 9.36.3.10. Equipment Efficiency
  - 9.36.3.11. Solar Thermal Systems

HVAC – equipment efficiency

- List of equipment developed based on:
  - Model National Energy Code of Canada for Houses 1997
  - National Energy Code of Canada for Buildings 2011
  - Additional equipment (identified in committee meetings)
- Performance based on validation requirements, market analysis and industry practice
- Minimum equipment efficiencies
  - Standards and performance referenced for other technology
  - Requirements for air-conditioners, where installed
- *Energy Efficiency Regulations* absolute floor for performance

HVAC – equipment efficiency

- 9.36.3.10. Equipment Efficiency Table

Table 9.36.3.10.
HVAC Equipment Performance Requirements
Forming Part of Sentences 9.36.3.9.(2) and 9.36.3.10.(1)

Air-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated			
Component or Equipment	Heating or Cooling Capacity, kW	Standard	Minimum Performance[1]
Split system	≤ 19	CAN/CSA-C656	SEER = 14.5 EER = 11.5 HSPF = 7.1 (region 5 in standard)
Single-package system	≤ 19	CAN/CSA-C656 (including General Instruction No. 2)	SEER = 14 EER = 11 HSPF = 7.0 (region 5 in standard)
All systems	> 19	CAN/CSA-C746	See Level 2 in standard
Water-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated			
Component or Equipment	Heating or Cooling Capacity, kW	Standard	Minimum Performance[1]
Ground-source and water-source heat pumps open loop closed loop	< 40	CAN/CSA-C13256-1	 $COP_c \geq 4.75$, $COP_h \geq 3.6$ $COP_c \geq 3.93$, $COP_h \geq 3.1$
Water-to-water heat pumps			

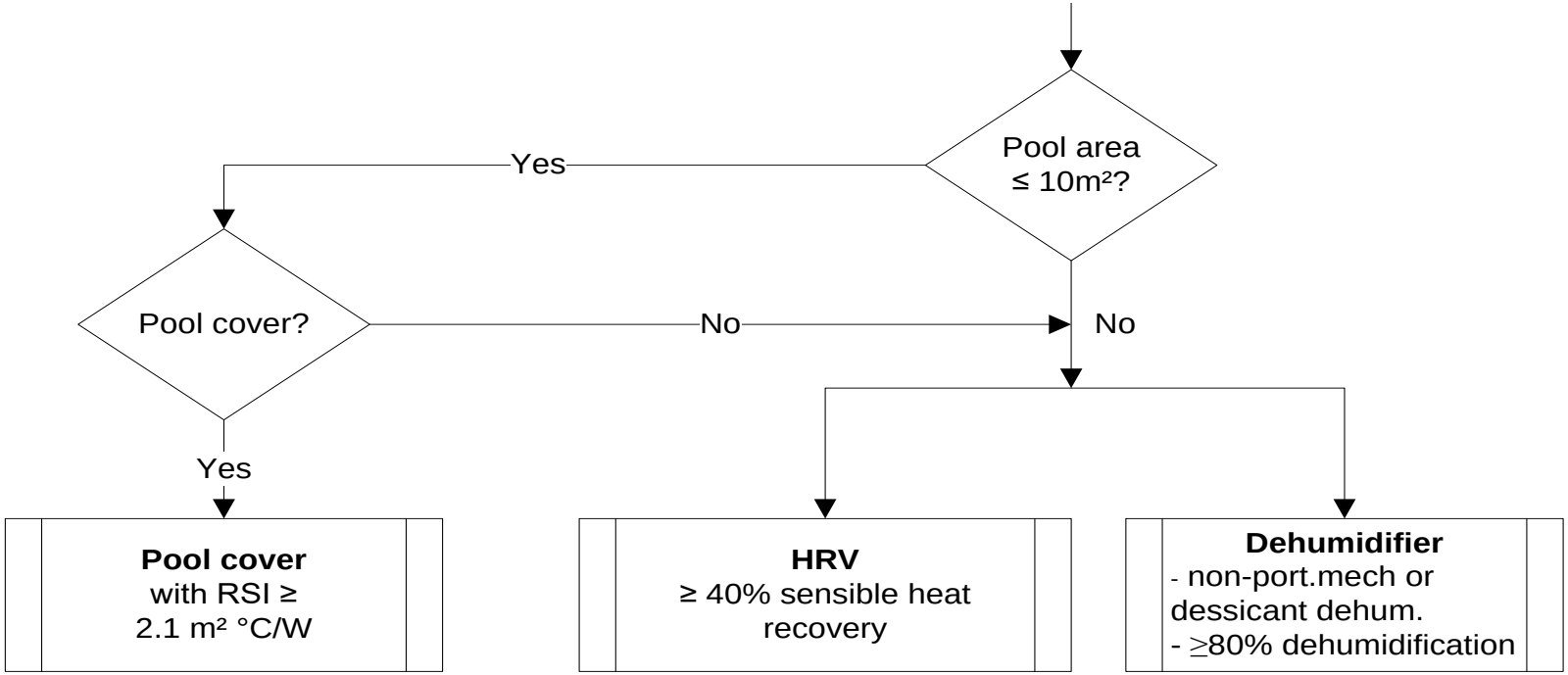
HVAC – ducts and pipes

- Prescriptive HVAC requirements
  - Proper sizing of system and ducts with Sections 9.32 and 9.33
  - Outside ducts and piping insulated to above-grade wall RSI value
  - Heat recovery ventilators (HRV) not required, but
    - Where installed, minimum sensible heat recovery efficiency required
      - 60% in mild locations (when tested at 0°C)
      - 55% in cold locations (when tested at 0°C and -25°C)
  - Dampers required (some exemptions), thermostats
  - Controls to prevent simultaneous heating and cooling
    - Specific heat pump controls for supplementary heating
  - Piping installed as per Section 9.33.8.

HVAC – ducts and pipes

- Duct insulation solution
  - Addresses construction types having low profiles
    - Insulated duct installed under floor over shallow foundation
    - Due to transportation limitations
  - Increase side insulation to compensate for bottom insulation
  - Performance expected to be close to equal

HVAC – heat recovery from air over interior pools



HVAC – gas and propane fireplaces/stoves

- Performance requirements currently not listed
- Testing standard being updated
- Applies to decorative appliances
- Code lists prescriptive requirements
  - Direct-vented
  - No standing pilot lights
- To be revisited when standard available

Service water heating – subsection structure

- 9.36.4. Service Water Heating Systems
  - 9.36.4.1. Scope and Application
  - 9.36.4.2. Equipment Efficiency
  - 9.36.4.3. Solar Domestic Hot Water Systems
  - 9.36.4.4. Piping
  - 9.36.4.5. Controls
  - 9.36.4.6. Indoor Swimming Pool Equipment Controls

Service water heating – equipment efficiency

- Minimum equipment efficiencies
  - Electric, gas, oil
  - Tankless/storage tank type
  - Pool heaters included
  - Combo systems (water and heating)
- Storage tanks need to be insulated

Service water heating – pipe insulation and controls

- Insulate outlet and inlet piping within two meters of storage or heating vessel
- Pipe insulation for
  - Piping located outside or in unconditioned spaces
  - Recirculation piping: 12 mm diameter insulation
- Controls for
  - Storage tank temperature
  - Pool heater shut down

Solar thermal technology

- Applies to HVAC and service water heating
  - Solar space heating technology
  - Solar water heating technology
- Requirement (separate Article)
  - Conform to manufacturer's design and installation procedures, or
  - Installation according to National Plumbing Code of Canada 2010
    - Exception: all storage tanks must be installed in conditioned space
- Related standards not listed under equipment efficiency

Questions?

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Thank you