Submit a comment

Proposed Change 1825

Code Reference(s):	**NBC20 Div.B 10.9.36. (first printing)**
Subject:	Alteration of Existing Buildings
Title:	Alteration of Service Water Heating Systems
Description:	This proposed change introduces requirements for service water heating systems subjected to alteration.
Related Proposed Change(s):	PCF 1827, PCF 1828, PCF 2032, PCF 2033, PCF 2051

This change could potentially affect the following topic areas:

- [ ] Division A
- [ ] Division C
- [ ] Building operations
- [x] Small Buildings
- [ ] Fire Protection
- [ ] Accessibility
- [ ] Building Envelope
- [ ] Heating, Ventilating and Air Conditioning
- [x] Division B
- [x] Design and Construction
- [x] Housing
- [ ] Large Buildings
- [ ] Occupant safety in use
- [ ] Structural Requirements
- [x] Energy Efficiency
- [x] Plumbing
- [ ] Construction and Demolition Sites

General information

See the summary for subject Alteration of Existing Buildings.

Problem

See the "Problem" section of the summary for the subject Alteration of Existing Buildings.

The energy performance requirements for the service water heating systems described in Subsection 9.36.4. of Division B of the National Building Code of Canada (NBC) already apply to the alteration of existing buildings. However, the enforcement of the application of these requirements depends on the interpretation of the relative importance, by the authority having jurisdiction, of achieving the environment objective of the Code when balanced against the cost of implementation.

Indiscriminately applying the energy performance requirements for service water heating systems to all voluntary alterations could result in alterations that go far beyond their original scope.

If voluntary alterations include upgrades to existing service water heating systems, not upgrading these systems to reasonable performance levels of energy efficiency might waste an opportunity for future energy benefits and cost savings through reduced energy bills and reduced construction costs.

Justification

The voluntary alteration of a service water heating system in an existing building represents an opportunity to upgrade the energy performance of the system.

To address the alteration of existing buildings, a guiding principle of the development of provisions is that the provisions should be reasonable, pragmatic and avoid placing an undue burden on building owners. Providing exemptions for cases of maintenance, repair or replacement with similar parts or components allows the flexible continued use of existing functional equipment by extending its service life and deferring system replacement costs.

This proposed change attempts to minimize the misinterpretation of requirements for the application of exemptions for maintenance or repair and ensures that alterations are not required to go far beyond the scope of the original alteration, causing an undue burden.

PROPOSED CHANGE

[10.9.36.] -- Energy Efficiency

[10.9.36.1.] --- Service Water Heating Systems
(See Note A-10.9.36.1.)

[1] --) Except for maintenance and repair, replacement service water heating equipment shall conform to the performance requirements stated in Article 9.36.4.2.

[2] --) Where piping forming part of a service water heating system is replaced or exposed, the exposed portion of the piping shall be insulated in accordance with Article 9.36.4.4.

[3] --) Where service water heating systems with storage tanks are replaced, the installation of automatic temperature controls shall conform to applicable provincial or territorial regulations or, in the absence of such regulations, to Sentence 9.36.4.5.(1).

Note A-10.9.36.1. Abandoned Inlets.

If the replacement of the HVAC or service water heating system or its components results in an abandoned inlet opening in a chimney or vent, the opening should be closed by an approved method to make the chimney or vent safe (see Clause 2.6.1.4.(3)(b) of Division B of the NFC). Consideration should also be given to removing and sealing a dedicated make-up air vent if the provision of make-up air is no longer required for the replacement service water heating system or component or for any other equipment identified in Article 9.32.3.8.

Impact analysis

No cost increase is associated with the replacement of equipment since any new service water heating equipment on the market meets the minimum Code requirements. Costs associated with pipe and thermal insulation forming part of the service water heating system (SWHS) is expected to be minimal. However, an assessment of costs is provided below for general information.

Average Cost of SWHS Equipment by Energy Source and Capacity

The average cost of SWHS equipment per energy source is provided based on a market price survey conducted on widely available models for different heating capacities. According to the National Resources Canada guide [1], each Canadian uses an average of 75 L of hot water per day. As such, between 75 L and 150 L for storage-based SWHS equipment is expected to meet the average hot service water demand. For tankless heaters, a hot service water capacity of 20 L/min to 40 L/min is sufficient to meet the demand.

The average cost of these heaters is between $1 000 and $3 000, based on the market survey conducted in Central Ontario for guidance purposes. The average cost of domestic water heaters by capacity is summarized in the Tables 1 to 3. The most common capacities of service water heating equipment available in Canada were converted to metric units (L) from U.S. gallons using soft conversion (see explanatory Note A-2.2.7.6. of Division C of the NBC).

Table 1. Average Cost of Gas- and Oil-fired Storage-type Service Water Heaters

Capacity, L	**Average Cost, $**	
	Gas-fired	**Oil-fired**
≥ 115 and < 150	1 400	–(1)
150	–	1 850
190	1 765	1 870
230	2 215	2 790
≥ 230 and < 265	–	4 875
> 265	4 050	–

Note to Table 1:
(1) A dash appears where pricing data was not applicable or available for the energy source at the specified capacity.

Table 2. Average Cost of Electric Tankless Service Water Heaters

Capacity, L/min	**Average Cost, $**
	Electric (Tankless)
0–15	550
20–40	1 160

Table 3. Average Cost of Electric Storage-type Service Water Heaters

Capacity, L	**Average Cost, $**
	Electric (Storage)
75	1 280
150	1 010
190	1 905
230	1 135
> 230	2 320

Average Cost of Thermal Insulation and Pipe by Size

Typical pipe size used for SWHS in residential buildings is less than 25 mm. The required length of pipe connected to SWHS equipment, which is directly affected and required to be replaced, is expected to be less than 1.8 m according to general installation practices. Thermal insulation can be newly applied to meet the requirements of Article 9.36.4.4. of Division B of the NBC. The required length of thermal insulation is identical to that of the pipe connected to SWHS equipment, which is directly affected and required to be replaced. Overall material costs including both pipe and pipe insulation is between about $10 and $40.

Table 4. Average Costs of Piping

Material	Size (for a 1.8 m length)	Average Cost, $
Pipe (e.g., PEX, Copper, CPVC)	Up to 25 mm pipe size	~3–30
Thermal insulation	Up to 25 mm pipe size and up to 25 mm thickness	~5–10

Total Cost of Replacement SWHS

The estimated total cost of a replacement SWHS is between $1 000 and $3 000, if the installation is conducted by the building owner, and between $1 400 and $3 600, if conducted by professionals. Note that when installation of the SWHS is conducted by professionals, costs associated with materials such as pipe and thermal insulation for pipe are included in the cost of installation.

Assessment of Benefits

The benefits are measurable due to the direct energy savings associated with using higher energy-efficiency SHWS equipment. The energy savings that result from applying a small section of thermal insulation to pipe is considered as negligible for this particular installation.

According to the National Resources Canada guide [1], Canadians use an average of 75 L of hot water daily and the average Canadian household uses 225 L daily for washing dishes and clothing, cleaning and showering or bathing. Water heaters account for 17.2% of the energy used by the average Canadian house. This statistic makes water heaters the second highest energy consumer in the house after heating.

According to the ENERGY STAR guide [2], replacing lower efficiency SWHS equipment with an ENERGY STAR certified super-efficient electric water heater and can save a household of four or more approximately $470 per year on electric bills. This could represent the base case scenario.

Applying thermal insulation to piping connected to SWHS equipment may minimize thermal transfer from the piping to the surrounding environment and reduce consumption of energy for service water heating.

References

[1] National Resources Canada. Water heaters. https://natural-resources.canada.ca/energy-efficiency/products/water-heaters/13735.
[2] ENERGY STAR. Super-Efficient Water Heater. https://www.energystar.gov/products/energy_star_home_upgrade/super_efficient_water_heater.

Enforcement implications

It is expected that a consistent set of provisions that apply to the alteration of existing buildings would help reduce the administrative and enforcement work of assessing the degree to which any particular requirement could be relaxed without affecting the level of performance of the building with respect to the Code objectives.

The proposed change would aid enforcement by identifying the work necessary to improve energy performance in the unaltered portion of the building.

Who is affected

Designers, engineers, architects, building officials, manufacturers, suppliers and energy advisors.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

[10.9.36.1.] -- ([1] --) no attributions

[10.9.36.1.] -- ([2] --) no attributions

[10.9.36.1.] -- ([3] --) no attributions