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HYDRONIC HEATING SYSTEMS

PURPOSE

This interpretation clarifies the design requirements of hydronic heating systems, so that an acceptable level of performance may be maintained for all installations.

DISCUSSION

Sentence 9.33.4.1.(1) of the National Building Code-2019 Alberta Edition (NBC(AE)) specifies that heating and air-conditioning systems must be designed and installed according to “good practice.” While there are publications by industry and standards development organizations that are recognized by authorities having jurisdiction for use as “good practice,” safety codes officers have asked for guidance regarding the process for verifying that a hydronic heating system has been designed and installed according to the documents for “good practice” referenced in Sentence 9.33.4.1.(1).

For buildings that fall within the scope of Division C, Sentences 2.4.2.1.(4) and (5), full professional involvement is required on the project and, in the specific case of hydronic heating systems for these buildings, a registered engineering professional is usually retained to do the design and construction review.

However, buildings that fall outside the scope of Division C, Sentences 2.4.2.1.(4) and (5) are not required to have professionals involved in the design and construction process, unless the safety codes officer is of the opinion that some or all aspects of the building design are complex enough to warrant professional involvement. For these buildings, safety codes officers can use this interpretation as a guide to evaluating the design and installation of hydronic heating systems that have been submitted for a building permit.

CODE REFERENCES

Article 9.33.4.1. states:

9.33.4.1. Design of Heating and Air-conditioning Systems

- 1) Heating and air-conditioning systems, including ducting, and mechanical heating and refrigeration equipment, shall be designed, constructed and installed to conform with good practice such as that described in
 - a) the ASHRAE Handbooks and Standards,

Unless stated otherwise, all Code references in this STANDATA are to Division B of the National Building Code-2019 Alberta Edition

Issue of this STANDATA is authorized by
the Provincial Building and Plumbing Administrators

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The logo for the province of Alberta, featuring the word "Alberta" in a stylized, cursive font with a small blue square at the end of the word.

- b) the HRAI Digest,
 - c) the CHC Handbook on Hydronic Heating Systems,
 - d) the Hydronics Institute Manuals,
 - e) the SMACNA Manuals, and
 - f) CSA B214, "Installation Code for Hydronic Heating Systems."
- (See also Subsection 9.32.3. for the design of systems that also provide ventilation.)

Division C, Sentences 2.4.2.1.(4) and (5) states:

2.4.2. Professional Involvement

2.4.2.1. General

4) Plans and specifications must be imprinted with the seals or stamps of either a *registered architectural professional*, or one or more *registered engineering professionals* qualified to engage in the appropriate combination of those branches of engineering that are applicable to *building* design and construction for a *building* that is

- a) 3 storeys or less in *building height* and classified as a *residential occupancy*, containing at least 5 but not more than 20 *dwelling units* in a single site,
- b) classified as an *industrial occupancy* and the *occupant load* is 28 m² per person or greater, or
- c) classified for more than one *occupancy* group, if
 - i) the *major occupancy* of the *building* is industrial,
 - ii) the *occupant load* is 28 m² per person or greater, and
 - iii) any *occupancy* other than the *major occupancy* does not exceed 400 m² in *building area*.

5) For *buildings* other than those described in Sentences (3) and (4), the *building* plans and specifications must be imprinted with seals and stamps of both

- a) a *registered architectural professional* in the case of architectural design, and
- b) one or more *registered engineering professionals* qualified to engage in the appropriate combination of those branches of engineering that are applicable to *building* design and construction in the case of engineering design.

APPLICATION

This interpretation applies to any hydronic heating system intended to provide heat to the interior of the building. This would include systems that are designed as the primary heat source in the building, as well as any secondary heat sources (i.e. a house heated with a forced-air furnace that has hydronic heating at the perimeter of a walk-out basement). Examples of hydronic heating systems would include but not limited to:

- Poured-floor radiant tubing
- "Staple-up" radiant tubing
- Convective-plate in-floor tubing
- Radiators
- Baseboard heaters
- Fan-coil units

This interpretation does not apply to systems that are not intended to provide heat to the interior of the building, such as exterior snowmelt systems or pool heaters.

INTERPRETATION

Proper verification of compliance with Sentence 9.33.4.1.(1) for hydronic heating systems in buildings that are not within the scope of Division C, Sentences 2.4.2.1.(4) and (5) can be obtained by following these procedures:

DESIGN REQUIREMENTS

Hydronic heating systems shall be:

1. Submitted as a pre-engineered package for review by the authority having jurisdiction. Pre-engineered packages shall consist of the basic generic system specifications and installation details prepared by a registered engineering professional together with additional system design data and floor plans specific to the project. The additional system design must be completed by
 - a. A registered engineering professional licensed to practice in the province of Alberta; or
 - b. An individual who holds one of the following qualifications:
 - i. A Certified Hydronics Designer, as certified by the Canadian Hydronics Council, a council within the Canadian Institute for Plumbing and Heating; or
 - ii. A Residential Hydronics Design Technician, as certified by the Heating, Refrigeration and Air Conditioning Institute of Canada.
2. Submitted as a custom design by
 - a. a registered engineering professional licensed to practice in the province of Alberta; or
 - b. an individual who holds one of the following qualifications:
 - i. A Certified Hydronics Designer, as certified by the Canadian Hydronics Council; or
 - ii. A Residential Hydronics Design Technician, as certified by the Heating, Refrigeration and Air Conditioning Institute of Canada.

SUBMISSION REQUIREMENTS

For all hydronic heating system designs, the plans and specifications submitted shall include but not limited to the following information:

1. The schematic arrangement of the system and the equipment specifications including, but not limited to, boilers, pumps, expansion tanks, zone controls, mixing valves and other system components such as supplementary baseboard and/or fan-coil units, water heater, etc. connecting to the system.
2. Mechanical room layout, venting and combustion air provisions for all fuel-fired appliances.
3. Piping specifications, spacing, sizes, maximum loop lengths, and pipe support details. Floor plans showing a general layout of the piping loops required for each room or space and the location of the main headers, if applicable.
4. Locations, sizes and specifications for all heat terminal units, such as baseboard heaters, radiators, fan-coil units, etc., if applicable.
5. Cross sections through typical floor assemblies to show piping loop locations and the type of insulation to be provided.
6. System operating parameters including supply and return water temperatures, design flow rates and heat output coefficient of individual piping loops.
7. Room by room heat loss calculations.
8. Heat Exchangers.
9. Toxic Heat transfer fluids must be separated from the potable water using atmospherically vented double wall heat exchangers or equivalent protection.
10. Single wall heat exchangers may be installed when the heat transfer fluid is Non-toxic and the installation shall comply with [STANDATA P-08-01-NPC](#).

VENTILATION REQUIREMENTS

The NBC(AE) stipulates that adequate ventilation must be provided for all rooms and spaces in any building. Such provisions shall be properly identified, in detail, on the system design drawings submitted for review.

Sections 6.2. and 9.32. of the NBC(AE) apply to the design requirements for ventilation systems in various applications.

This INTERPRETATION is applicable throughout the province of Alberta.