

CANADIAN INSTITUTE OF PLUMBING & HEATING
L'INSTITUT CANADIEN DE PLOMBERIE ET DE CHAUFFAGE

A National Voice With Regional Roots | Une histoire régionale, une voix nationale

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C-Memo: C.089.11

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Chief Plumbing Inspector
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SUBJECT: Double-Wall Heat Exchangers

Dear James and Brian:

On behalf of the members of CIPH, we would like to thank you for your thorough responses to our inquiries regarding requirements for double-wall heat exchangers.

The Institute shares your commitment to public safety and protection of the domestic water supply, but we do have many concerns with the rationale, supporting information and the serious impacts this particular enforcement drive will have on the marketplace. We believe that this broad-based initiative adversely affects both solar water heating and hydronic heating systems, and will create a detrimental shift away from energy-efficient and renewable technologies for heating of homes and their hot-water supply.

We request that without any recorded health or system failures, your rules for double-wall heat exchangers should be suspended in hydronic heating systems and reviewed for solar water heating systems. The attached submission contains our detailed reasoning and references to support our requests.

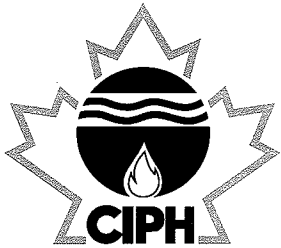
One of the unintended consequences of these requirements will be a diminishment of the leadership role that the Province of British Columbia currently enjoys in adopting green technologies for the reduction of greenhouse gases and we are certain that you do not want this to happen.

The City of Vancouver and the Capital Region District are the only known jurisdictions in Canada requiring double-wall heat exchangers on every solar and hydronic heating installation. This is an uneven application of accepted Canadian Codes and Standards that unfairly penalizes industries and consumers that are striving to help Canada meet national goals of greenhouse gas reductions by increasing their heating energy requirements by as much as 25%.

CIPH Recommendations

Adoption of a uniform national standard is important and if this is a critical safety issue for BC, then it should be for all Canadians. These heat transfer technologies have been in use for more than 25 years and the Institute contends that if double-wall heat exchangers were identified as a necessary

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design factor, they would be universally adopted across Canada and international jurisdictions where such heating systems are much more common. In fact, such a requirement was removed from the National Plumbing Code of Canada in 1995.

We believe that your primary objective of public safety can be fully supported and maintained without additional requirements beyond the provisions of existing codes and standards. British Columbia is now conducting analysis for the 2012 B.C. Building Code and CIPH recommends that:

- All Authorities Having Jurisdiction immediately cease application of enforcement orders directed at SDHW that are incorrectly applied to hydronic heating installations;
- B.C. Building and Safety Standards Branch create the most up-to-date codes by including reference to the latest versions of relevant standards in the 2012 editions of B.C. Building and Plumbing Codes including the updated standards of F379-09, F383-08 and B214-07;
- All AHJ's and the Province agree to adopt a uniform approach to heat exchangers based on the 2012 B.C. Building and Plumbing Codes which will allow single-wall heat exchangers under specified conditions and suspend application of additional bylaws and enforcement orders; and
- Any AHJ that has specific concerns about codes and standards be directed to follow the nationally-approved protocol for addressing objectives in model national codes rather than create their own regulations.

Furthermore, we urge all affected parties to create a forum as soon as possible for to discuss concerns from industry, inspection officials and municipal, provincial and federal regulators with a goal to creating a uniform requirement for this issue.

CIPH has a long history of working with all levels of government to create harmonized, uniform codes and standards within the established regulatory processes. We are here to help and we ask you to please advise how we can best collaborate to find a practical and workable solution to this issue and any other industry-related concerns.

Yours truly
Canadian Institute of Plumbing & Heating

Ken Tomihiro
Program Manager

KT/tg

Attachments: Detailed Response to Stated Concerns
Referenced Sources

c.c. Bob Thompson, Building and Safety Standards Branch
Jeff Vasey, Executive Director, Building and Safety Standards Branch
Andrew Pape-Salmon, Director, Energy Efficiency Branch
David Pope, Chief Plumbing Inspector, City of Vancouver
CIPH BC Region Board Members
Canadian Hydronics Council
CIPH Boiler Manufacturer Members

CIPH Detailed Response to Concerns of James Nyhus, Plumbing Officials Association of British Columbia and Brian Husband, Chief Plumbing Inspector, City of Victoria

Comments received are *'quoted in italics'*.

1. *'There is no definition or way to determine the toxicity in the code so any reference to the Gosselin scale or the Hodge & Sterner scale would not have any relevance to the application of the building code.'*

Your concerns over the definition of toxicity are shared by many industry personnel, including those who participate on the Technical Committees for CSA B64.10 and CSA B214. Both committees have recently adopted wording to clearly determine degree of toxicity of heat-transfer fluid additives based on the Hodge & Sterner scale. (3) This has passed ballot of the B64.10 TC, is currently at ballot for B214 TC and will be considered by the F379 TC.

Once referenced in Building and Plumbing Codes, these updated standards will provide a way for authorities to clearly determine conformance to the prescribed water quality standards as defined in B.C. Regulation 200/2003 Drinking Water Protection Regulation. (14)

Toxicity is not any issue whenever the heat-transfer fluid is water drawn directly from a potable water system.

2. *'A solar domestic hot water system is defined in B64.10-01 as a severe hazard in table B-1'*

The hazard rating of SDHW systems has been modified in the latest draft version of B64.10 with variances in hazard rating according to the degree of toxicity and type of heat exchanger installed. (3) As a result, many applications of solar hot water systems are now listed as minor to moderate hazards.

3. *'Single-walled heat exchangers do not offer anywhere near the protection that is required in protecting the potable water systems from the severe hazard posed by the SDHW system'*

There is no data that verifies additional protection offered by the installation of a double-wall heat exchanger. Specific conditions for installation of single-wall heat exchangers are provided in several Canadian standards including B64.10, B214 and F379.

4. *'Most jurisdictions may go by their Cross-Connection control Bylaws.... Where there would be an issue is when boiler treatments, additives or anti-freeze is added to the hydronic system.'*

We agree that all jurisdictions should strictly enforce their cross-connection bylaws whenever toxic additives are introduced into the heat-transfer fluid. However, degree of toxicity must be properly assessed and revised working in B64.10 and B214 are designed to provide the necessary clear guidance to inspectors. (3)(4)

CIPH Recommendation

Recognition and adoption of the updated standards CSA B64.10 by the B.C. Building Code will satisfy the intent of clauses 7.6.2.1 (1) – (3) Connection of Systems.

5. *'Double-Walled Heat Exchangers with leak detection are a requirement in other codes for SDHW, notably the Uniform Plumbing Code and codes in Germany'*.

Canadian standards CSA F379 Packaged Solar Domestic Hot Water Systems, B214 Installation Code for Hydronic Heating Systems and CSA B64.10. Selection and Installation of Backflow

Preventers all prescribe conditions for installation of both single-wall and double-wall heat exchangers. The Uniform Plumbing Code is not a document referenced in Canada.

Our research has not found any existing codes in Germany or other nations that have requirements for installation of only double-wall heat exchangers for these types of uses, but single-wall heat exchangers are acceptable for systems under the European Solar Keymark, in the USA under SRCC OG-300 and in Canada under CSA F379.

CIPH Recommendation

The Canadian regulatory framework should be respected for application of codes and standards for Canadian jurisdictions. Jurisdictions with specific concerns may follow the nationally-approved protocol for addressing changes in model national codes and submit any research documents such as foreign standards to substantiate their request for change to Canadian codes and standards.

6. *'The City of Vancouver has published a bulletin (2011-001-BU/PL) requiring double-wall heat exchangers in all SDHW installations and sets out standards to which they must conform.'*

Section 14 of Vancouver Waterworks Bylaw 4848, consolidated to November 30, 2010 does not contain any heat exchanger requirement.(5)

The modification of a packaged system that is certified to CSA F379.1-88 could invalidate the certification even if the modification is to replace a single-wall heat exchanger with one that is double-wall per the requirement of the bulletin. To our knowledge, there are no packaged systems available that are currently certified to F379.1-88 with a double-wall heat exchanger, therefore no package systems could be installed in the City of Vancouver should this bulletin be fully enforced.

CIPH Recommendation

The City of Vancouver should be urged to recall Information Bulletin 2011-001-BU/PL.

7. *'The only protection for the potable water system in the building, when dealing with heat exchangers, is a double-wall heat exchanger with a leak path'*

CIPH cannot find any reports of single-wall heat exchanger failures that have led to injury or death except where safety mechanisms were deliberately bypassed. Typical single-wall heat exchangers that contact potable water include drinking fountains that provide chilled water, refrigerator ice makers and food processing chillers in the dairy and juice industries. These all use high pressure refrigerants on the non-potable water side of the system.

All heat exchangers continue to benefit from advances in technology and a materials standard exists in the form of IAPMO PS 92-2008 Material and Property Standard for Heat Exchangers.(8)

8. *'The scope of CAN/CSA-F379.1-88 deals with packaged solar domestic hot water systems... To my knowledge, there are no systems currently listed to the standard...one of the problems being the requirement...which restricts the working pressure...to a maximum of 103 kPa.'*

CSA F379.1-88 is out of date and CSA F379-09 has been published. In CSA F379-09, references to maximum operating pressure have been eliminated and more comprehensive safeguards defined to deal with backflow concerns.

CIPH Recommendation

CSA F379-09 has been published and code references should be updated accordingly.

9. *'The referenced document (for SDHW systems) in the 2006 B.C. Building Code is CSA F383-87.'*

CIPH Recommendation

CSA F383-08 has been published and code references should be updated accordingly.

10. *'Article 7.2.10.13 (of BCBC) relate to backflow caused by siphonage or back pressure.'*

Requirements to protect potable water systems due to backflow are specifically addressed in CSA B64.10. (3)

11. *'CRD Bylaw no. 3516 was brought out in 2008 and covers all aspects of cross connection control..... Section 23.2 is being revised'*

Current wording of the bylaw specifically states conditions for the installation of single-wall heater exchangers. (15) Other changes to the bylaw have not been implemented and are not enforceable at this time.

12. *'The B.C. Water and Waste Water Association Cross Connection Control Committee recommends that a heat exchanger connected to a potable water system shall be an approved double-wall heat exchanger with visible leak detection. It is the position of this committee that the use of a heat exchanger other than double-walled with visible leak path/detection presents an unacceptable risk to human health'*

We believe that use of inflammatory language is irresponsible when BCWWA has not validated their statement with facts to substantiate the claim. Single-wall heat exchangers are the norm in millions of installations around the world, but CIPH cannot find any reports of heat exchanger failures that have led to injury or death with the exception of improper installations where safety mechanisms were deliberately bypassed.

CIPH Recommendation

The BCWWA should be asked to provide verifiable evidence to substantiate their recommendations for the mandatory installation of double-wall heat exchangers and until such information is made available, their recommendation should be retracted.

13. *'Efficiency of double-wall heat exchangers has increased to within 15% of single-wall in some cases.'*

The B.C. Ministry of Energy and Mines is implementing programs such as LiveSmartBC under the Energy Efficient Buildings Strategy to aggressively pursue reductions in the carbon footprint through energy efficiency upgrades. Most typical double-wall exchangers lose up to 25% of efficiency. An unnecessary increase in energy requirements due to the installation of double-wall heat exchangers runs counter to the positive work of the B.C. Energy & Mines and other agencies around the world which are trying to reduce energy requirements.

On one hand, Canadian manufacturers of heat sources such as boilers and hot water heaters are being mandated to find incremental gains of 2-5% in efficiency at great expense to both them and the consumer. The unwarranted installation of a double-wall heat exchanger will require higher boiler temperatures or more solar panels and heavily penalizes the consumer who will find themselves with large increases in their energy bills or installation costs for renewable technologies. Inefficient systems will not provide expected payback and they will eventually abandon these programs and revert to more conventional heating systems.

14. *'Additives to solar hot water systems, such as food-grade glycerin, become potentially toxic once they reach the boiling point.'*

Most additives for heating systems are non-toxic. The B64.10 Technical Committee has made changes that will enable a rapid and clear determination of any potential harm. For example you have mentioned glycerin and even though it is not used in heating systems, one can immediately determine that it has an LD rating of 12600 which is not toxic according to the Hodge & Sterner scale. A typical heat-transfer fluid using propylene glycol is rated as food-grade and therefore is considered to be non-toxic per the MSDS.(14)

CIPH Recommendation

The work of the B64.10 TC should be respected and adopted for the determination of toxicity of any additives to heat-transfer fluids in heating systems to prevent decisions made with incorrect information.

15. *'Human error or lack of knowledge can result in petroleum-based antifreeze being introduced into the system.'*

No protective measure can completely account for human error. Installations of complex systems of solar and hydronic heating systems are generally performed by industry professionals with experience, knowledge and training, but all such systems still require inspection and part of the responsibility of those inspectors is to evaluate all of the installed components, including the heat transfer fluid which can be rapidly assessed by the MSDS information.

16. *'Double-wall heat exchangers eliminate the need for costly testable backflow devices and annual testing costs.'*

Per CSA B64.10, the installation of RP type backflow preventers is NOT always required under specified conditions, regardless of heat exchanger construction.

17. *'The B.C. Building and Safety Policy Branch released Bulletin B09-02 on July 28, 2009....to clarify the 2006 Building Code regulations pertaining to backflow prevention for SDHW systems.'*

This bulletin states, 'The CSA F379.1-88 standard allows the use of both single and double-wall heat exchangers'. (2)(9) Also refer to points 8, 9 and 10 regarding updated standards.

18. *'The lack of clear direction of codes, standards and bylaws leaves municipalities open to a liability than many are not willing to accept. Ultimately, the B.C. Building Code needs to be amended to clearly indicate that single-wall heat exchangers are permitted without additional and often ineffective backflow protection, or a Provincial regulation has to be introduced mandating the acceptance of single-wall heat exchangers.'*

CIPH agrees with this statement and suggests that the B.C. Building and Safety Standards Branch adopt this recommendation as soon as possible. We recommend that you lead the way and provide guidance to others by adopting this as the rule in your own jurisdictions. B.C. BSSB is currently analyzing potential code updates for 2012 and will provide stakeholders the opportunity to submit comments and we expect that your jurisdiction will help to provide direction on the issue of heat exchangers.

CIPH Recommendation

A forum of regulators, inspectors, industry and standards organizations should be convened as soon as possible to deal with this issue. The mutual goal will be to ensure that the 2012 edition of the B.C. Building Code and future editions of the National Building and Plumbing codes reflect most up-to-date standards available.

19. *Rejection of Single-wall Heat Exchangers on Hydronic Heating Installations*

Almost all of the currently stated concerns on double-wall heat exchangers relate to their installation in SDHW systems. However, it would appear that installations of hydronic heating systems are also being rejected based on regulations that do not apply to them.

All hydronic heating system installations have their own CSA Standard which is CSA B214-07 Installation Code for Hydronic Heating Systems. Installation requirements for both single and double-wall heat exchangers are clearly defined in this code. Here are some other key points regarding hydronic heating installations:

- CSA B214-07 is a referenced document in National Building Code 2010 Parts 6 and 9. This provides regulatory agencies with a uniform guideline for inspecting hydronic heating installations (11)(12);
- Combination water heaters that are used for hydronic systems are certified to the appropriate CSA standards including CSA B140.12, ANSI Z21.10.1/CSA 4.1 or ANSI Z21.10.3/CSA 4.3 and these combo water heaters use single-wall heat exchangers;
- Province of Alberta issued a Standata in June 2005 for use of single-wall heat exchangers in hydronic heating systems. (7);
- Hydronic systems employ the use of expansion tanks to minimize system pressures due to thermal expansion and help prevent backflow. They also typically operate at pressures below 103 kPa and must employ the use of a pressure-relief valve to help prevent backflow.

CIPH Recommendation

Any heat exchanger requirements for SDHW systems should not be applied to hydronic heating systems.

Reference Sources

1. City of Vancouver, Waterworks Bylaw 4848, Consolidated to November 30, 2010
2. B.C. Building and Safety Branch, Bulletin B09-02, July 28, 2009
3. CSA B64.10-10, Draft approved by ballot January, 2011
4. CSA B214-10, Draft currently at ballot
5. City of Vancouver, Licenses & Inspections Bulletin 2011-001-BU/PL, January 18, 2011
6. CIPH, Advocacy Link, October 13, 2009 (Code Requirements for SDHW)
7. Province of Alberta, Standata, June 2005 (Single-Wall Heat Exchangers for Indirect Hot Water Tanks)
8. International Association of Plumbing and Mechanical Officials, PS 92-2008, Material and Property Standard for Heat Exchangers
9. CSA F379.1-88 – Excerpt with Section 7.4 Heat Exchangers
10. British Columbia, Building and Safety Standards Branch, Information Bulletin B11-01, March 20, 2011
11. National Building Code 2010, Part 6 (Excerpt with reference to CAN/CSA-B214 as 'Good Engineering Practice')
12. National Building Code 2010, Part 9 (Excerpt with reference to 9.33.4.2-Installation of Hydronic Heating Systems)
13. British Columbia, Drinking Water Protection Regulation 200/2003
14. MSDS for Glycerin and MSDS Sheet for Propylene Glycol Heat Transfer Fluid
15. Capital Region District, Bylaw 3516, Section 23

All Referenced Sources Available Upon Request