

## REQUIREMENTS FOR COMBINATION HEATING SYSTEMS

### SUBJECT: DUAL PURPOSE WATER (*POTABLE*) HEATER (COMBO UNIT)

Safety Services and the Plumbing and Gas Technical Council, in order to inform the plumbing and gas industry of the requirements associated with the sale and installation of Dual Purpose **Water Heaters**, have jointly developed this bulletin.

The CSA gas **water heater** standards indicate that **water heaters** are **certified** for use with either **potable** water only or **potable** water and space heating. They cannot be used for space heating alone. Therefore, Suppliers and Installers are reminded that combination **Water Heaters** shall be **certified** and marked "Suitable for Water (**Potable**) Heating and Space Heating" and can be utilized for either:

- (a) conventional water (**potable**) heating only; or
- (b) a combination water (**potable**) heating and space heating application.

The certification and installation of these units require that:

- (a) all piping and components connected to the **water heater** for space heating applications shall be suitable for use with **potable** water;
- (b) toxic chemicals, such as used for boiler treatment, shall not be introduced into the **potable** water used for space heating;
- (c) a **water heater** which will be used to supply **potable** water shall not be connected to any heating system or component(s) previously used with a non-**potable** water heating appliance, and;
- (d) when the system requires water for space heating at temperatures higher than required for other uses, a means such as a mixing valve, listed to **CSA-B125.3 Plumbing Fittings Standard**, shall be installed to temper the **potable** water for those uses in order to reduce scald hazard potential.

All combination heating systems must be installed in accordance with the attached guidelines and **no** modification shall be made to the temperature and pressure relief valve(s), gas controls, or other operating components of a **certified** Dual Purpose **Water Heater**.

The installer shall be responsible for ensuring that the **water heater** is installed in accordance with the applicable codes and standards to serve both the **potable** hot water application(s) and space heating application(s) for which it is intended. Consult your local authority having jurisdiction for the applicable Building Code requirements with respect to hydronic heating systems, including radiant floor systems.

## COMBINATION POTABLE WATER / SPACE HEATING GUIDELINES

These systems consist of a **Certified** Combination storage type or a **certified** instantaneous **potable water heater** used in conjunction with a fan coil heating system, baseboard system, and/or a radiant slab heating system, and intended for space heating applications of not more than 75,000 Btu/h.

### 1 Definition:

**Certified** – (with respect to any appliance, accessory, component, equipment, or manufacturer’s installation instructions) means investigated and identified by a designated testing organization as conforming to recognized standards, requirements, or accepted test reports.

**Combination Heating System** - means an integrated installation that supplies hot water to both the **potable** hot water system and space heating system of a building. The integrated installation must serve multiple plumbing fixtures that will utilize hot water during normal daily usage.

**Potable** – means safe for human consumption.

**Water Heater** – means a vessel in which water is heated and is withdrawn for use external to the vessel, including all controls and devices necessary to prevent water temperature from exceeding 99°C (210°F).

### 2 Compliance:

- 2.1 Personnel performing installation, operation, and maintenance work shall be properly trained in a manner acceptable to the Building, Fire, Plumbing and Gas Administrators, and all work shall be done in a skilful, thorough manner.
- 2.2 All solders, brazing materials, fluxes and any chemicals introduced to a **Combination Heating System** shall be approved for use with **potable** water.
- 2.3 All components in the **Combination Heating System** or on the **potable** water side of a heat exchanger shall have a design pressure of not less than 1035 kPa (150 psi) and shall be able to withstand a continuous water temperature of 71°C (160°F) and a short-term exposure of 99°C (210°F).
- 2.4 Where the static pressure may exceed 550 kPa (80 psi), a pressure-reducing valve shall be installed that conforms to CSA Standard B356 on the water distribution system in accordance with the National Plumbing Code of Canada.

- 2.5 Where a hot water supply is required in a building, the hot water tank shall be set to provide an adequate supply of service water with a temperature range from 45°C (113°F) to 60°C (140°F).
- 2.6 The velocity of the water through the **Combination Heating System** must not exceed 1200 mm (4 feet) per second for temperatures up to 60°C (140°F), 900 mm (3 feet) per second for temperatures exceeding 60°C (140°F).
- 2.7 The total length of supply and return piping from a **Combination Heating System** to the **terminal heating unit** shall not exceed 15 m (50 feet). A heat exchanger that is used to separate the **potable** water from the heating fluid is an example of a terminal heating unit.
- 2.8 The total length of a **Combination Heating System** utilizing radiant piping shall not exceed 15 m (50 feet).
- 2.9 A means shall be provided to automatically prevent stagnation by cycling the **Combination Heating System** at least once every **24 hrs**.
- 2.10 To reduce the probability of contamination of the **potable** water system all piping and components shall be thoroughly flushed and cleaned before the **Combination Heating System** is put into operation.
- 2.11 The installers shall instruct the user in the safe and correct operation of all appliances or equipment that they install.
- 2.12 The installers shall ensure that the manufacturer's instructions supplied with the **Combination Heating System** are left attached to the equipment.

### 3 Design & Installation Considerations

The space heating portions of the **Combination Heating System** shall be designed and installed in a manner similar to a conventional hydronic heating system, since the design and installation principles are equivalent.

- 3.1 When a **Combination Heating System** is installed the space-heating portion of the system shall be sized and installed to comply with the Alberta Building Code.
- 3.2 A **Combination Heating System** shall meet the requirements of the CSA-B214 Installation Code for Hydronic Heating Systems.
- 3.3 Multiple **Certified** combination storage type (Combo Unit) water heaters may be used where the total space heating load is not more than 75,000 Btu/h and shall be installed in accordance with the manufacturer's instructions.
- 3.4 A **Combination Heating System** with a bottom feed shall be installed or equipped with an anti-siphonage device listed to CSA B-64. This is to provide low water protection in the event of a leak in any portion of the circulating system that is located below the heater.

#### **4 Selected Reference Publications:**

##### **ABC**

- Alberta Building Code 2006

##### **ASHRAE –**

- Handbook of Fundamentals, Residential/Nonresidential Cooling and Heating Load Calculations.
- Handbook of HVAC Applications, Service water Heating
- Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
- Standard 90.2, Energy-Efficiency Design of Low-rise Residential Buildings

##### **CSA**

- **B149.1** Natural Gas and Propane Installation Code
- **B-214** Installation Code for Hydronic Heating Systems

##### **NRC**

- National Plumbing Code of Canada 2005

##### **Standata**

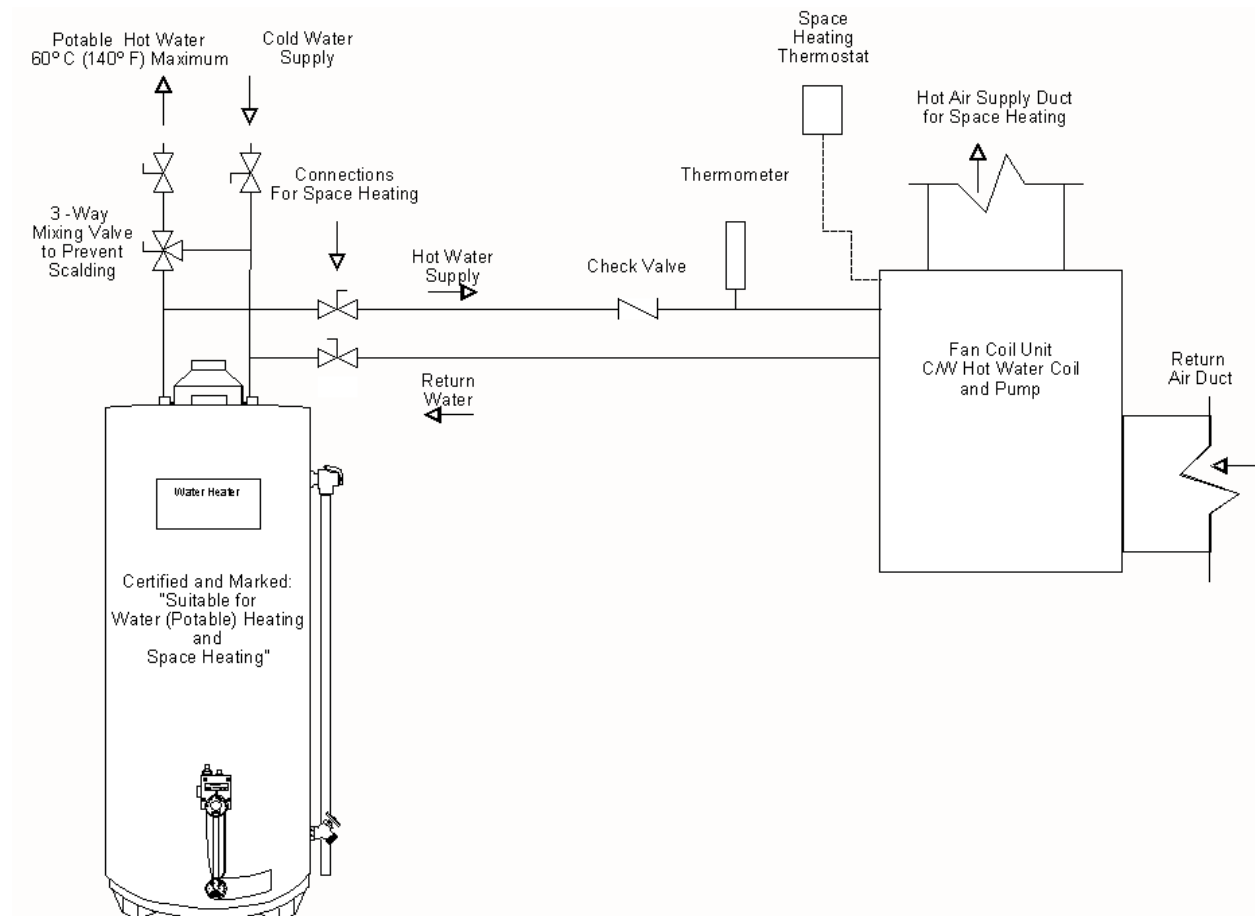
- Building Directors Interpretation **06-BCI-012** Hydronic Heating Systems
- Plumbing Safety Information Bulletin **P-08-01-NPC** Single Wall Heat Exchangers

#### **5 Abbreviations:**

- ASHRAE -** American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- CHC -** Canadian Hydronics Council
- CSA -** Canadian Standards Association International
- NRC -** National Research Council of Canada

## Appendix A -Typical Drawings

**Figure A.1 - Combination (Combo) Fan Coil Heating System with Storage Type *Water Heater***

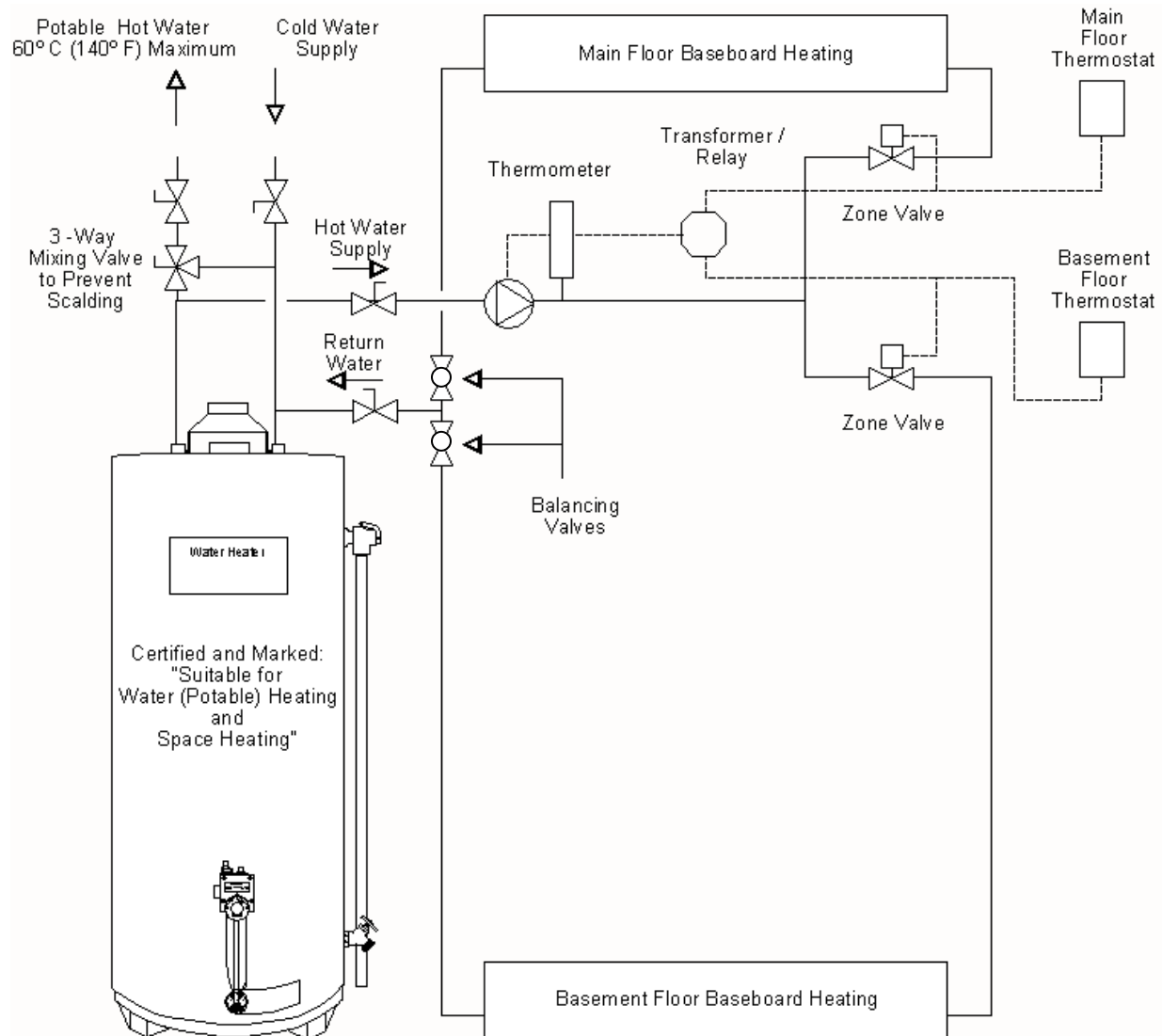


### Notes:

1. All equipment, components and piping to be approved for **potable** water.
2. Hydronic space heating systems must have input from a qualified designer (See **Building Standata 06-BCI-012**)

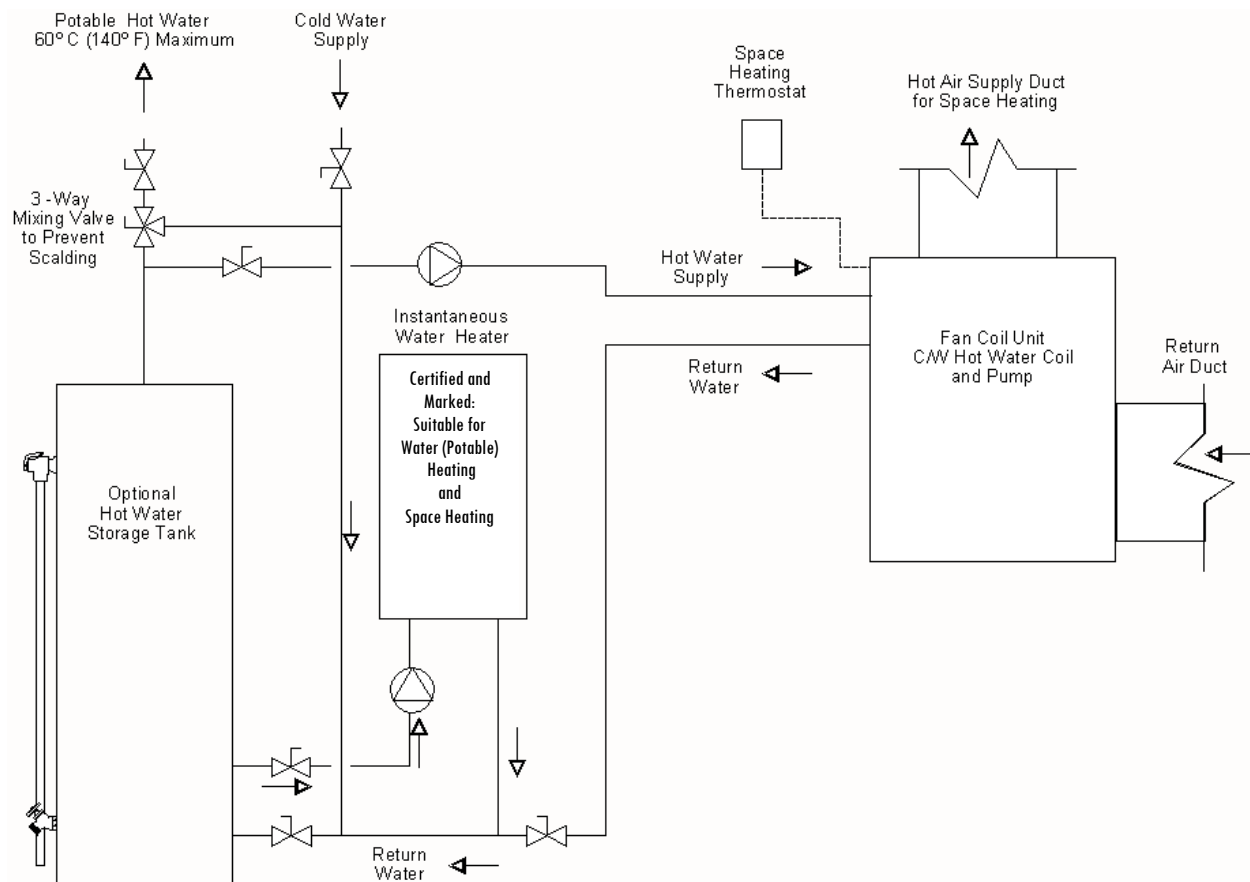
**NOTE:** This typical drawing is of a general nature and does not necessarily include the allowances that must be taken into account in each specific installation.

**Figure A.2 -** Combination (Combo) *Water Heater* with Hydronic Baseboard Single or Multiple Zone System



**NOTE:** This typical drawing is of a general nature and does not necessarily include the allowances that must be taken into account in each specific installation.

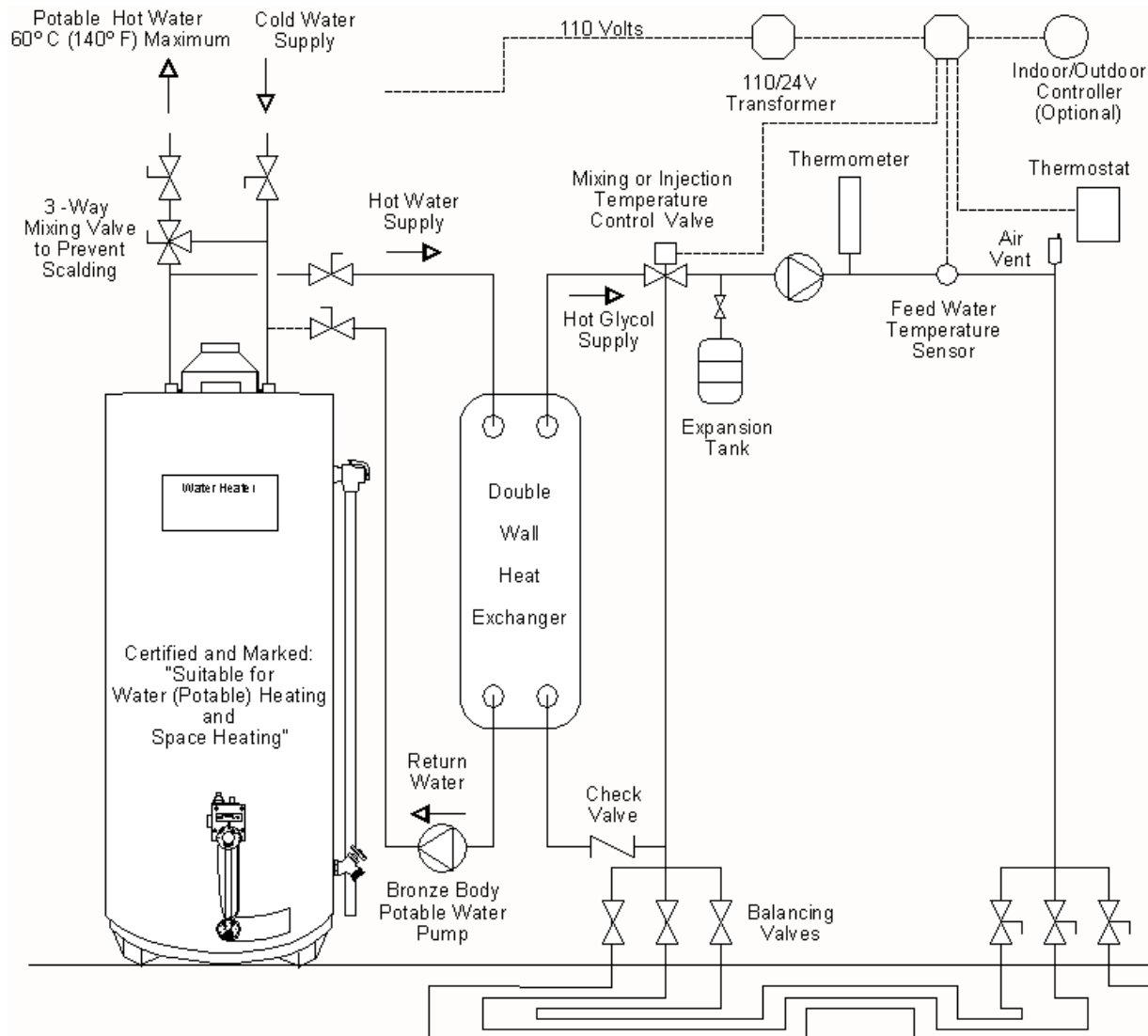
**Figure A.3 - Combination (Combo) Fan Coil Heating System with Instantaneous Type Water Heater**



1. Instantaneous hot **water heaters** and components shall be installed in accordance with the manufacturer's **certified** installation instructions.
2. Hydronic space heating systems must have input from a qualified designer (See **Building Standata 06-BCI-012**)

**NOTE:** This typical drawing is of a general nature and does not necessarily include the allowances that must be taken into account in each specific installation.

**Figure A.4** - Combination (Combo) **Water Heater** with an in floor heating system shall be equipped with a heat exchanger to separate the potable water from the heat transfer fluid.

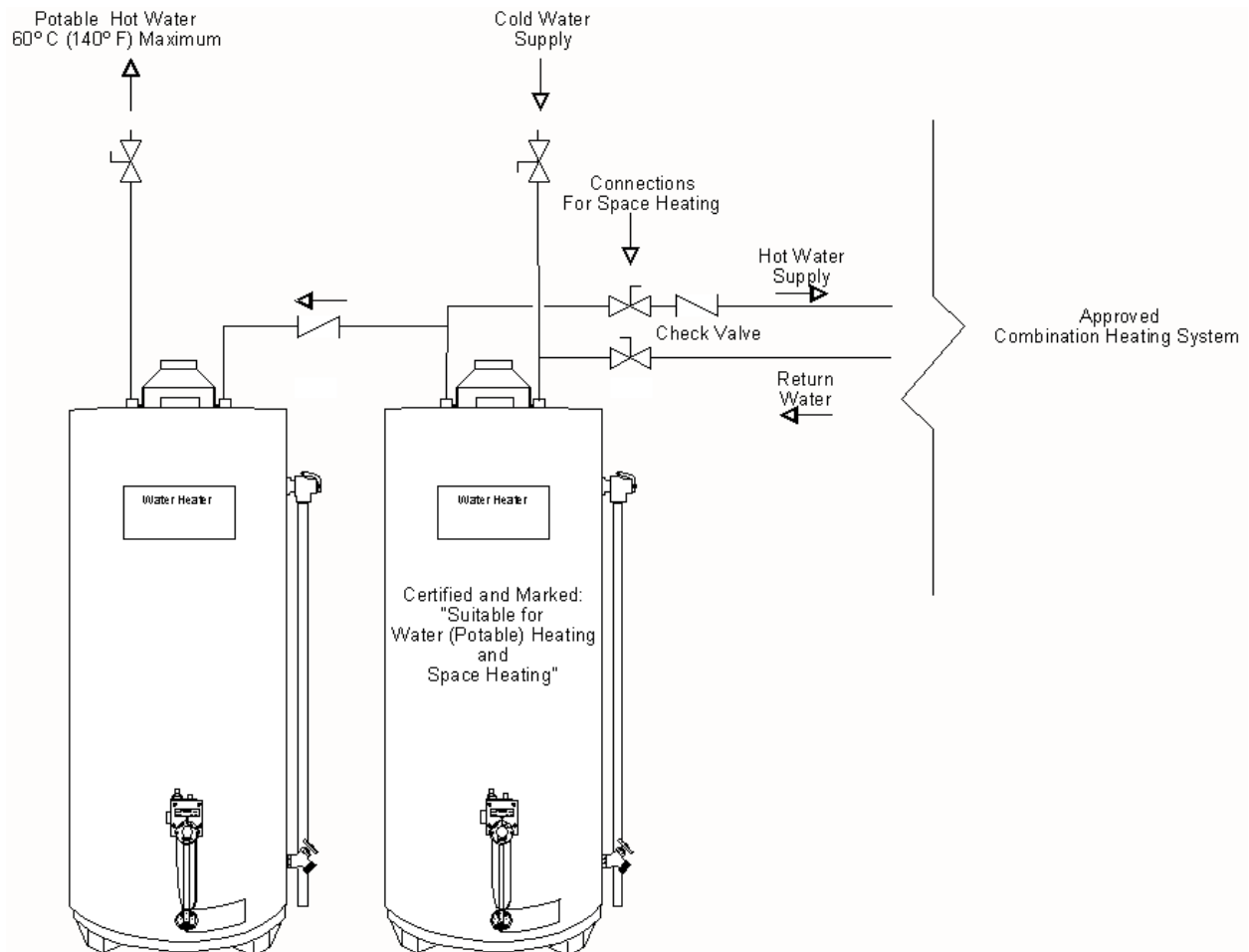


1. **Toxic** Heat transfer fluids must be separated from the potable water using atmospherically vented double wall heat exchangers or equivalent protection.
2. Single wall heat exchangers may be installed when the heat transfer fluid is **Non-toxic** and the installation shall comply with **Standata P-08-01-NPC**.
3. Radiant floor heating systems must have input from a qualified designer.  
(See **Building Standata 06-BCI-012**)

**NOTE:** This typical drawing is of a general nature and does not necessarily include the allowances that must be taken into account in each specific installation.

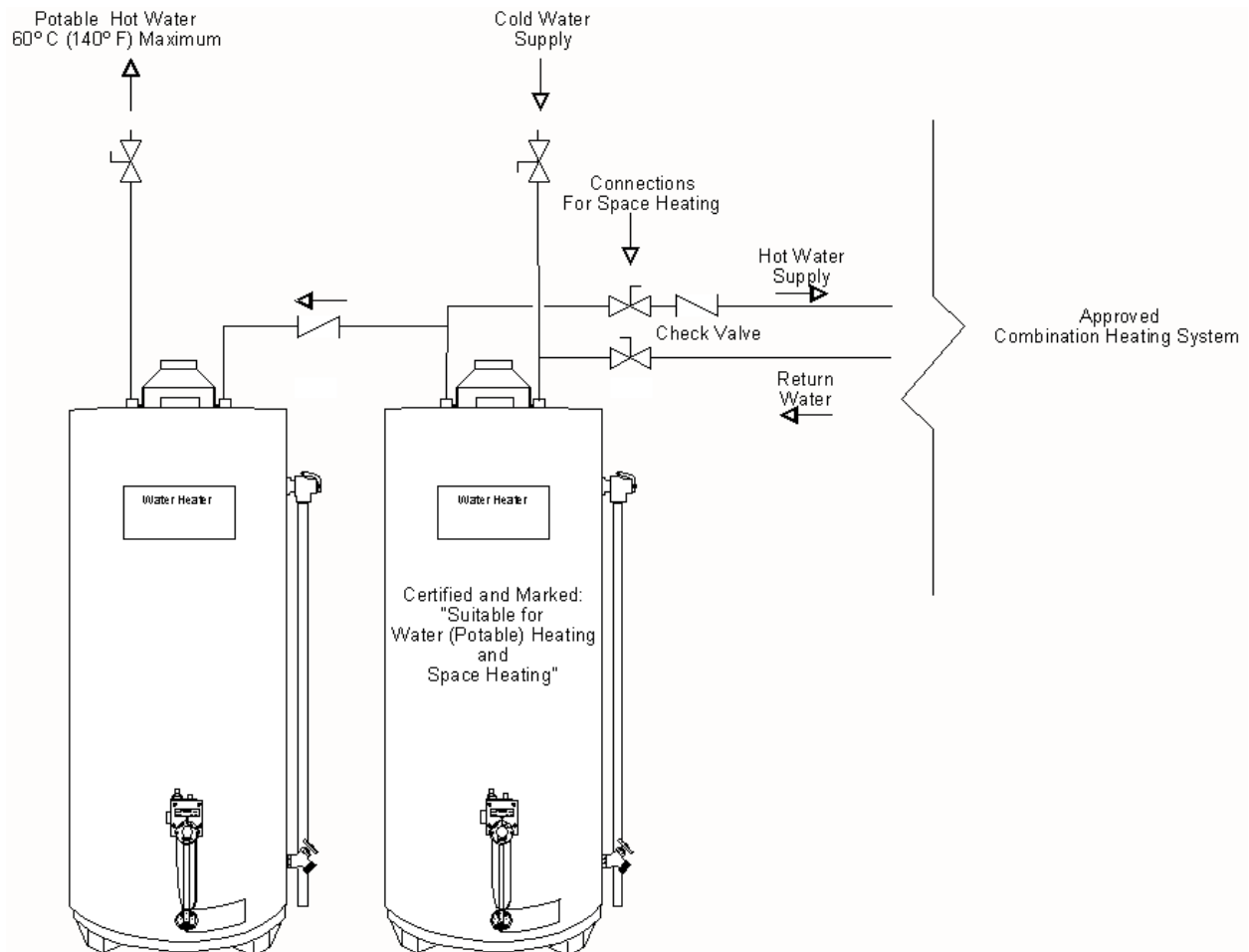


**Figure A.5 - Combination (Combo) *Water Heater* in series with a **Non – Combination Water Heater** supplying Heat to an Approved Combination Heating System**



**NOTE:** This typical drawing is of a general nature and does not necessarily include the allowances that must be taken into account in each specific installation.

**Figure A.6 - Multiple Certified Combination Water Heater supplying Heat to an Approved Combination Heating System**



**Note:** Design and Installation Considerations under item 3.3

**NOTE:** This typical drawing is of a general nature and does not necessarily include the allowances that must be taken into account in each specific installation.

## Appendix B - Background on Combination (combo) Heating Systems:

These systems were introduced in early 1990's, by the heating industry, to provide supplementary space heat in areas with poor circulation and for small heating applications as an alternative to a primary heating system.

The trend to build more energy efficient housing, in the late 1980's, resulted in a significant decrease in the space heating load. The combination heating systems gave the designers additional flexibility in the design of space heating and water heating in the R2000 dwellings. With a single gas-fired appliance being utilized for both space heating and **potable** hot water the gas installation was simplified.

### Applicable Codes:

#### 1. National Plumbing Code of Canada (NPC) 2005

The NPC covers the materials, piping, allowable pressures, water temperature and protection from contamination relating to the application of combination heating systems.

- All piping, fittings, heat exchangers, baseboards and circulating pumps must be made of approved materials and suitable for use with **potable** water.
- Operation of a water system at pressures above 550 kPa (80 psi) will accelerate deterioration of the system and could create a health risk due to splashing and potential scalding.
- If the space heating water system requires water with a temperature in excess of 60°C (140°F), a mixing valve or other means shall be installed in the **potable** hot water supply to temper the water to reduce scald hazard potential.
- Do not introduce toxic chemicals such as those used for boiler treatment. **Potable** water systems must be protected from all sources of contamination to reduce the probability of creating an unsafe **potable** water supply.

#### 2. Alberta Building Code (ABC) 2006 (CSA B214 by reference)

The ABC will cover the systems designed to provide the primary means of space heating for a structure as part of a combination heating system.

- Calculating the heat loss of the structure.
- Sizing of the air handler/baseboard/radiant slab based on water temperature.
- Sizing of the **water heater** that will meet the requirements for the space heating application and the domestic hot water system.

#### 3. Natural Gas and Propane Installation Code CAN/CSA-B149.1

The B149.1 covers the gas supply piping or tubing system, installation of the gas-fired **water heaters**, venting, and combustion air supply.

- The appliance, accessory, component, equipment, or material used in an installation shall be of a type and rating approved for the specific purpose for which it is employed.
- The **water heaters** shall be **certified** and marked "Suitable for Water (**Potable**) Heating and Space Heating"
- Isolating or rendering inoperative a safety shut-off, safety limit control or relief valve shall be prohibited.