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Centralization for domestic hot water and heating: a winning solution

The centralization of domestic hot water in multi-tenant buildings has proven its technical and economic worth for several years now. While few buildings had recourse to this solution in the past, today, the newest buildings have chosen this option. However, the situation is quite different when it comes to heating.

Gaz Métro became interested in this subject and recently decided to make its observations known more widely in order to help the market choose more efficient solutions that have several advantages – the centralization of heating and domestic hot water.

Three solutions to centralizing everything!

With regard to centralized solutions, there are three major options for designing a centralized domestic hot water and heating system:

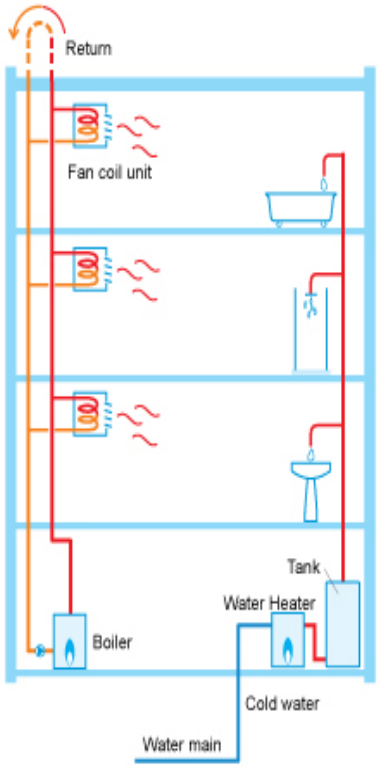


Figure 1A
Typical system –
two separate systems

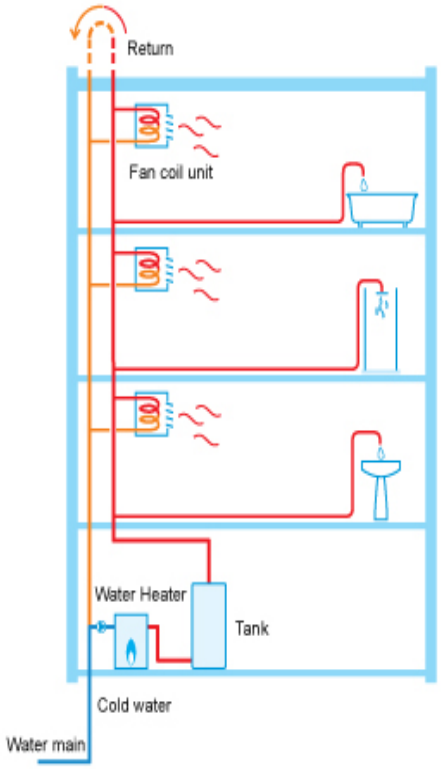


Figure 1B
Open combo system
with water heater

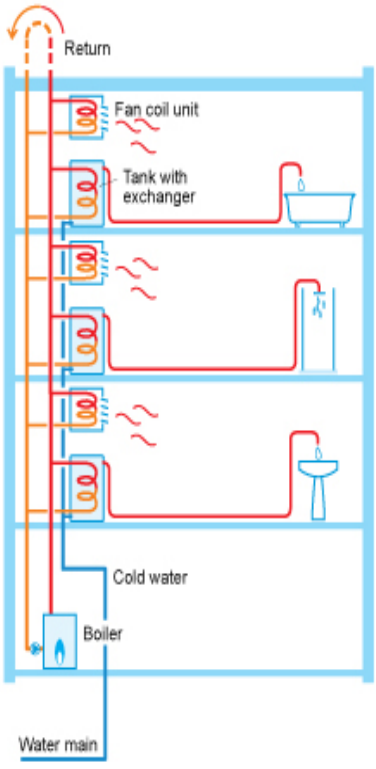


Figure 1C
Closed combo system
with boiler

No matter which centralized solution is considered, heat is always produced outside the units; the mechanical room may be centralized on the roof and therefore does not take living space away from the occupants.

The first option might be described as a typical solution to centralizing heating and domestic hot water (DHW). In Figure 1A, the boiler and water heater are located in a mechanical room in the building's basement. Each appliance supplies a dedicated water system. This solution is already known and proven by designers and contractors.

The significant difference betwen the typical solution and the two other centralized solutions is that the heating needs can be combined and covered by just one system – called a combo system. There are two kinds of combo installations:

- a solution with a water heater,
- a solution with a boiler.

In the combo solution with a water heater (Figure 1B), the DHW passes through a fan coil in each apartment before reaching the various outlets (shower, bath, tap, etc.) used by the unit's occupant. What is important in this solution, from a sanitary point of view, is to choose systems that are compatible with this usage of hot water (see section on Codes below). Note that the water heater chosen in this solution may be linked to a storage tank to optimize the quantity of DHW available in the building to meet the needs of the occupants.

In the last solution (Figure 1C above), the heating and DHW needs are met by a boiler. In this solution, the water produced by the boiler is not useable directly by the building occupants as in the previous solution. This means that two heat exchangers, i.e., a fan coil for heating and a water-water exchanger, are needed to produce the DHW.

Centralization: Many advantages and opportunities of pairing with other uses

These centralized solutions offer many advantages compared with decentralized solutions. First of all, they help reduce the number of systems to be installed in a building to produce heating and DHW and thus reduce the number of systems to be replaced and maintained. In fact, in a decentralized solution with, for example, two water heaters in the apartments, many insurers require that the water heaters be changed every 10 years in order to prevent water damage in the units. With a centralized solution, this is not an issue. Also, having a centralized solution means that maintenance professionals can easily access the systems and quickly check that the generator or generators are operating correctly without disturbing the occupants. A regular verification of the installation helps increase the useful life of the chosen system(s).

The trend today is to reduce a unit's living space. In short, apartments are smaller and smaller and each square foot is precious. An attractive feature to offer future occupants of a unit is the possibility of using all their living space thanks to the centralized mechanical systems. Along with this trend, the units are better and better insulated and consume less and less energy. Now, the higher the consumption of natural gas in the building, the lower the cost of the natural gas. It is therefore in the interests of everyone to opt for a centralized solution to reduce the operating costs of the units.

Lastly, choosing condensing water heaters and/or boilers can help in the design a very efficient installation, minimizing the energy bills of the units. Also, there are at least two interesting pairing solutions: with the fresh air needed to ventilate the units, and with the minimalist ducts concept to comfortably diffuse the warm air through the unit's various rooms (see Informa-tech, Volume 28, No. 2, September 2014).

Some precautions to take into account with open combo systems

The Codes in effect cover the design of such systems. Without limiting them, here are some factors to be taken into account when designing this type of installation:

- the materials for the water systems and components must be designed for drinking water;
- the double-usage water heater must also be designed to operate in this type of application.

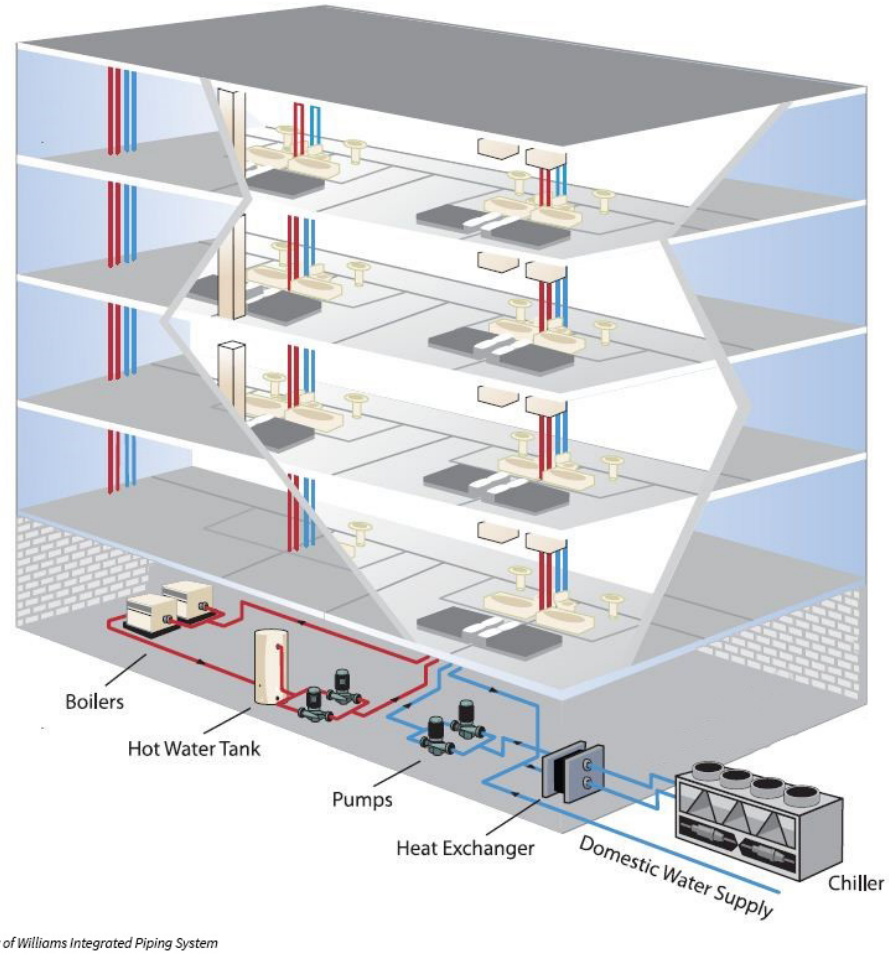
Also, a minimum temperature of 131°F must be maintained in the distribution pipes, as required by the plumbing code. And, in an open loop mode, water circulation in the fan coil units must be assured for fixed time periods at predetermined intervals.

Centralized air-conditioning from a cold water system: An innovation from all points of view

Choosing a centralized solution for heating and DHW is a small step forward from a solution where only the hot water is

centralized. Why not take a step even farther by daring to opt for centralized air-conditioning from the domestic cold water system already planned for the building? Brought to the attention of Gaz Métro some months ago by various market players when promoting the centralized combo concept, this idea is one of the many innovative solutions offered on the Québec market.

In concrete terms, this type of solution breaks down as follows: for heating, the same principle of the open combo system described above is chosen, i.e., water heater with tank and supply to the units by the domestic hot water system (hot air system and various outlet points). For air-conditioning, the domestic cold water system already in the building is used to supply the same fan coil unit as is used for heating. Linked to a central chiller that maintains the cold water system at the correct temperature, comfort is thus assured in the apartments. Figure 2 as well illustrates this concept.



Courtesy of Williams Integrated Piping System

Figure 2: *Centralization of hot water, heating and air conditioning via the domestic cold water system*

In order to optimize energy consumption even more, energy can also be recovered from the chilling system and integrated in the production of domestic hot water and heating.

In conclusion, what has to be kept in mind is that the needs of users are in constant evolution. Architects, as well as mechanical designers, must together show imagination to meet them every day, and Gaz Métro contributes to tackling these subjects by sharing its conviction that centralized solutions present significant technical-economic advantages, adapted to the needs of promoters, builders, and unit occupants.

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[1] A common energy bill instead of a bill per unit.

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