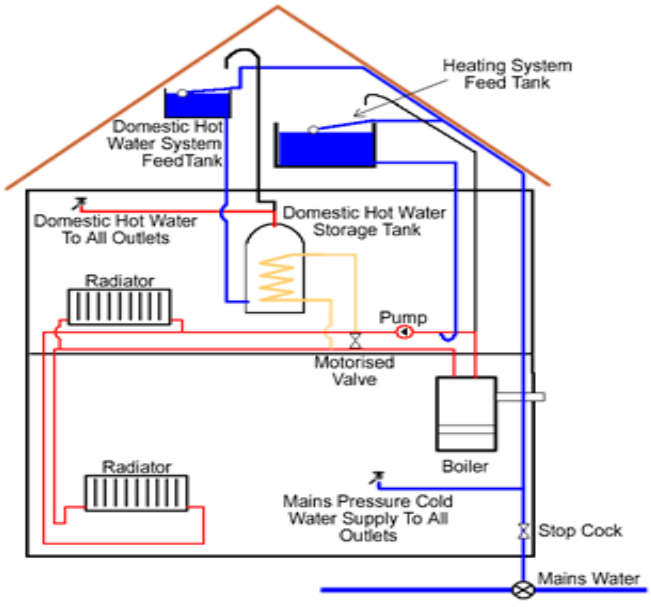
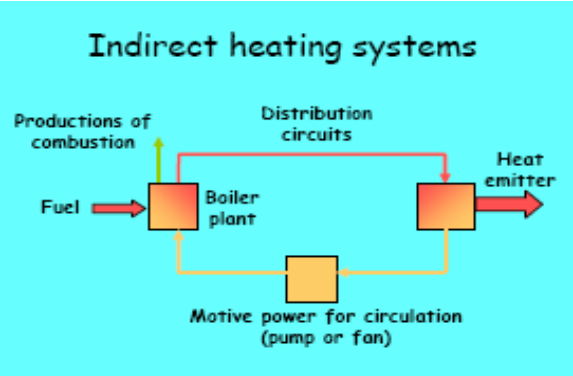
The property, which I inhabit, is an end of terraced two storey property situated in Belfast. There is an open plan kitchen and living room on the ground floor and three bedrooms and a bathroom on the first floor. Below is a simple sketch of the layout of my house:

This second sketch identifies clearly where the heat producing appliances, heat emitters, cold water storage, hot water storage and cold and hot water outlets are in the property in more detail:



Task 1

Firstly I will discuss the heating system that is in use in my student house. My home is heated through oiled fired central heating system. The main components of this are the oil tank and boiler, which are both located in the yard at the back of my student house. Oil fired central heating is a form of indirect heating. Indirect heating is where the energy purchased is consumed at some point outside the space to be heated and then transferred to equipment in that space for liberation. Below is a sketch illustrating how an indirect heating system operates:



The medium used to transmit the thermal energy may be either liquid (water) or a vapour (steam) or a gas (air) and each may be used over a wide range of temperatures and pressures. In my home the medium used to transmit the thermal energy is liquid, as in my house a water based heating system is in operation. A water central heating system consists of basically the boiler, the radiators and the interconnecting piping. The boiler is powered from the oil in the tank and heats the water. In the boiler the fuel must be atomised if the process of combustion is to be efficient, as combustion is the way in which the boiler heats. Then a pump circulates the water through the pipework and radiators. The radiators are the emitters of heat in my household and release heat by radiation and convection. Below are pictures of the main components of my heating system:

Oil Tank

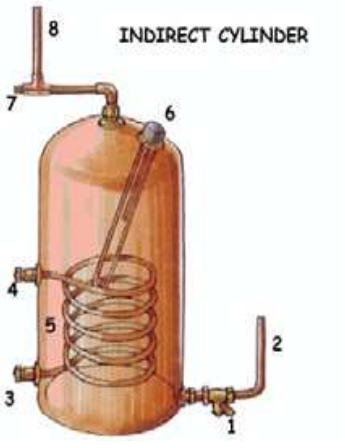
Boiler **Radiator**

Water based systems operate at atmospheric pressure and the maximum temperature will be limited by the boiling point of water and even perhaps by the surface temperature of emitters. The pipe work for water based systems may be arranged as either a one pipe or two piped system. In my dwelling a two pipe system is used. The two pipe system, which is shown above is more efficient than the single pipe loop. The heated water from the boiler is fed to one side of every radiator (the feed pipe) while the other end of each radiator is connected to a separate common return pipe. This means that the temperature of the water entering each radiator is more or less the same so each radiator should heat the local environment by the same amount. Below is a diagram showing a two pipe system and how it would work in my house:

Task 2

I will now look at the hot water system in my house. Hot water must be capable of meeting the demands of the user i.e. how much they require and at what time of the day it is needed.

In my student house the hot water cylinder is stored in a cupboard in bedroom two, which is situated beside the bathroom. Below is a typical example of a hot water cylinder showing all its various components.



1. Drain cock
2. Incoming cold feed
3. Return to boiler
4. Hot feed from boiler
5. Heating coil
6. Immersion
7. Hot feed to taps
8. Vent to cold water tank

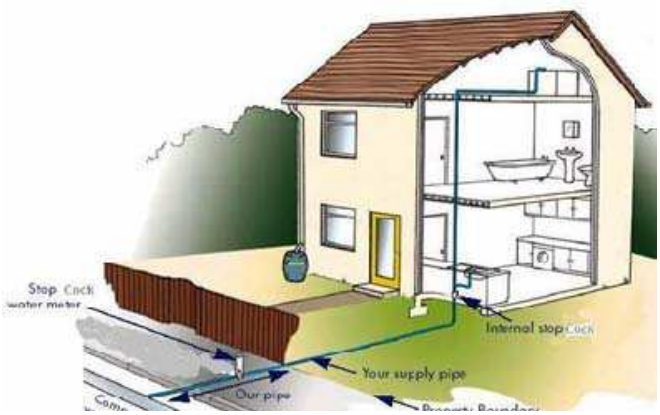
In my house we use a central water heating system and it is an indirect method. We have an indirect water cylinder which is made from copper. The water is fed from the cold water storage tank to the hot water cylinder. And in the tank this is where the water is heated. A copper coiled pipe, which forms part of the central heating circuit, is joined to the cylinder and indirectly heats the water. Using this method the build up of scale is less likely which is a huge advantage as it prolongs the life of the cylinder. However when the central heating is switched off hot water can still be available through the use of an immersion heater. The immersion heater is wired to the mains electrical supply. It is thermostatically controlled. The temperature of the water in the cylinder must be controlled in accordance with building regulations. Below is a photograph illustrating the immersion heater, which is used in my student accommodation:

Now the hot water is ready and available to be utilised at the various hot water outlets in our house i.e. the kitchen and bathroom taps. Below shows one of the hot water out lets in my house:

This is a typical example of a stop valve, which is used in my house. It is one of the main components of the hot water supply and would be situated beside the main water outlets i.e. under the kitchen sink. They are very useful, as if there are any problems with the water outlets in your house then these can be used to switch the water supply off at the source immediately.

Task 3

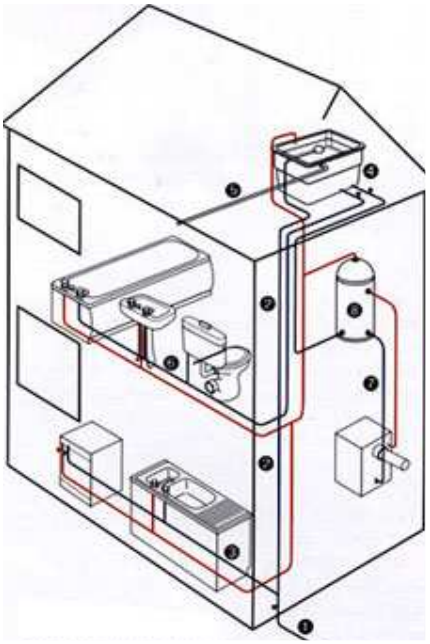
Now I will go on to discuss the cold water supply in my house. Cold water supply either comes from the public water supply or a persons own private well. I get my water supply from the water mains under the road which is a connection from the local authority. It is connected through a service pipe to my house. Below shows a diagram of how the water flows from the mains to my house.



There are many uses for cold water in my household. They are; drinking, domestic hot water supply, household appliances, sanitary appliances and filling the heating system.

There are two types of cold water systems that can be used; direct and indirect. In my home an indirect system is in place. My home uses an indirect system as only the kitchen sink is fed from the rising main, all my other cold water outlets are fed indirectly using gravity from a head tank (cistern) which is situated in my attic. The advantages using this method are less likely hood of contaminated water getting into the mains supply and because of the reduced water pressure there is less chance of noisy pipes. Also there is a good reserve of water and less chance of back siphonage. However the disadvantages are that only the kitchen sink is suitable for drinking water and due to using the head tank for both hot and cold water storage this tank usually has to be a lot bigger. Also the storage system can become quite dirty as it is stored up

in my attic. Below is a typical example of how the cold water system operates in my house:



1. Service pipe from Water Company.
2. Rising main.
3. Drinking water form rising main.
4. Cold water storage tank.
5. Overflow pipe.
6. Cold feed pipe to bathroom.
7. Cold feed pipe to boiler.
8. Hot water cylinder.

On the left there is a picture of my cold water storage tank. This should be covered, well insulated and uniformly supported up in my roof space.

Along with the cistern the float valve is another main component of my cold water system. The float valve controls the water system. A plastic ball floats in the water. As it rises, it lifts the arm which closes the valve and stops water entering. Float valves are situated in both my cold water tank and also the cistern in my bathroom.

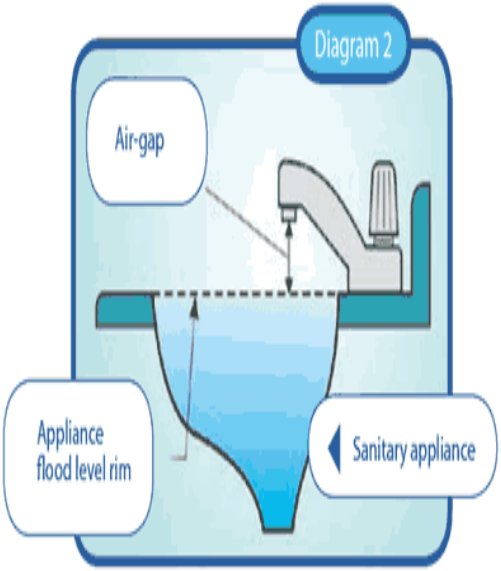
Backflow can occur in any cold water system. Backflow is the backflow of contaminated water into our main drinking water supply. Two mechanisms in which these can occur are; back pressure and back siphonage.

Back pressure occurs in our drinking supply when pressure is exerted on moving water by obstructions or tight bends along my water pipes, against its direction of

flow. In my water system back pressure does occur at various outlets and at the boiler when there is reversed water pressure.

Back siphonage occurs when the water supply pressure drops in our cold water system; it is a result of liquids at a lower level drawing water from a higher level. Back siphonage is a plumbing term applied to clean water pipes that connect directly into a reservoir without an air gap. In our cold water system, as our water is delivered to other outlets and areas of the plumbing system at a lower level, the siphon effect will tend to siphon water back out of the reservoir. This may result in contamination of our water pipes.

An air gap, as it relates to the plumbing trade, is the unobstructed vertical space between the water outlet and the flood level of a fixture. A simple example of an air gap in my house is the space between my water outlet (taps) and the sink rim. Water can easily flow from the taps into the sink, but there is no way that water can flow from the sink into the taps without modifying the system. This arrangement will prevent any contaminants in the sink from flowing into the potable water system by siphonage and is the least expensive form of backflow prevention. To the right is a typical example of an air gap:



An Atmospheric Vacuum Breaker (AVB) is a backflow prevention device used in plumbing to prevent backflow of non-drinking liquids into my drinking water system. It is usually constructed of brass and resembles a 90 degree elbow with a hood on its top to allow air to enter the water system if a siphon attempts to form. On the left is a photograph of a typical Atmospheric Vacuum Breaker.

A check valve is a mechanical valve that normally allows fluid to flow through it in only one direction. Check valves are two-port valves, meaning they have two

openings in the body, one for fluid to enter and the other for fluid to leave. There are various types of check valves used in a wide variety of applications. They are available in a wide range of sizes and costs many check valves are very small and cheap. Check valves work automatically and most are not controlled by a person or any external control; accordingly, most do not have any valve handle or stem. The bodies of most check valves are made of plastic or metal. In my student house there is a check valve situated at the boiler.

Illustrated on the left is a photograph of a check valve similar to the one that is situated at the boiler in my student house.

A double check valve is a backflow prevention device designed to protect my household's water supply from contamination. It consists of two check valves assembled in series usually with a ball valve or gate valve installed at each end for isolation and testing. Often, test cocks (very small ball valves) are in place to attach test equipment for evaluating whether the double check assembly is still functional.

Improvements

I am very happy with the heating and water systems in my student house, as it meets my needs and I never have any technical problems with it. However being a student I feel it would be more efficient for me to have gas installed to heat my house. This is because it can be cheaper to oil and there is no storage required or handling. Whereas with using oil most of my back yard is taken up, as an oil tank is required for storage. Also with using oil I have to wait on it being delivered whereas if I utilized gas I would not be required to wait on it being delivered to my door.

I also am happy with the hot and cold water systems in my house, as yet again I have no problems with it and there is always hot and cold water readily available for use. I would not feel the need to make any improvement on these systems that are already in place, as with my house being student accommodation it is not a long term dwelling and is more than satisfactory for short term use.

However if my housing was a more permanent dwelling I would consider using more energy and economically friendly systems such as solar panels for heating my house and also geothermal energy for hot water. As although these may be expensive to install in the long run the advantages will more than out weigh the high installation costs, as in the long term it would work out cheaper for me to run these systems and also would benefit the environment around me.

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