Sanitary Appliances

Sanitary fittings.

The types are: 1. Washbasin 2. Sinks 3. Bath Tub 4. Flushing Cisterns 5. Water-Closet 6. Urinals.

1. Washbasin:

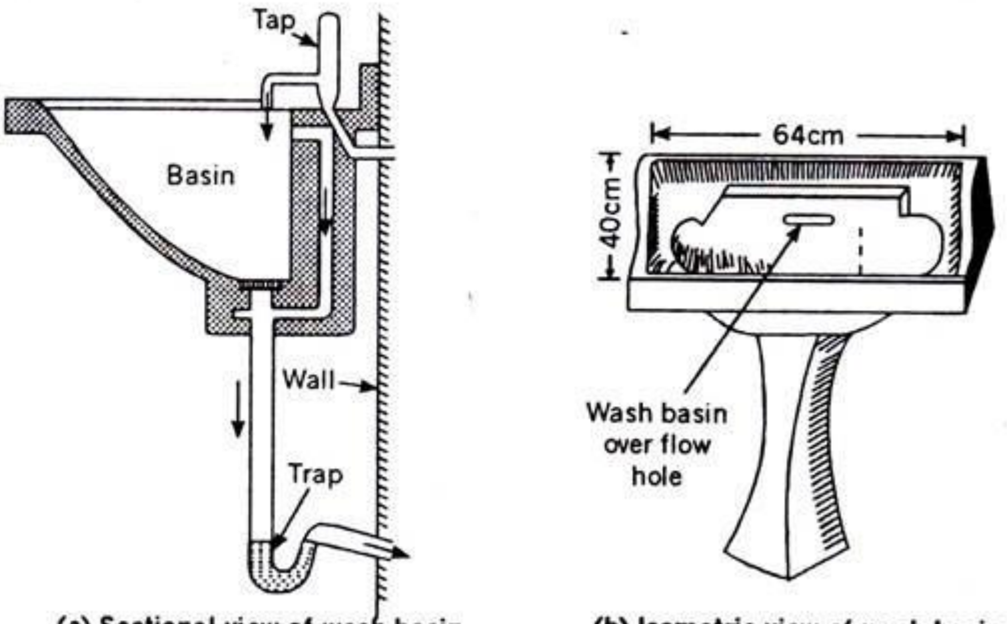
The wash basins are available in various patterns and sizes in the market.

There are mostly two patterns:

(a) Flat back for mounting on walls,

(b) Angle back for fixing at the junction of two walls.

Flat back basins are provided with double or single tap holes. All the wash basins should be of one piece construction and should have slotted overflow hole. All the internal angles are designed so as to facilitate cleaning. The wash basins are provided with a circular waste hole in the bottom as shows in Fig. The basins are provided with an integral soap holder recess which drains into the bowl.



(a) Sectional view of wash basin. (b) Isometric view of wash basin.

Fig. 25.1. Wash basin.

Wash basins are made of fire-clay, stoneware, earthenware or vitreous china. But nowadays steel, aluminium and plastic wash basins are also available in the market which are very popular. In plain the basins may have rectangular, square, circular, oblong, circular quadrant etc. shape depending on the choice. Again these may be supported on the brackets fixed on the wall or supported on the pedestals.

For holding water in the bowl these are provided with tapering rubber plugs, which can be fitted in the outlet. This plug is fixed to a chain secured by a stay.

The usual size of wash basins are:

Pattern	*Size*
Flat back	630×450 *mm* 550×400 *mm*
Angle back	600×480 *mm* 400×400 *mm*

2. Sinks:

These are rectangular shallow receptacles suitable for kitchens or laboratory. Fig. 25.2 shows a kitchen sink which is mostly used. It is of one piece construction, provided with or without rim.

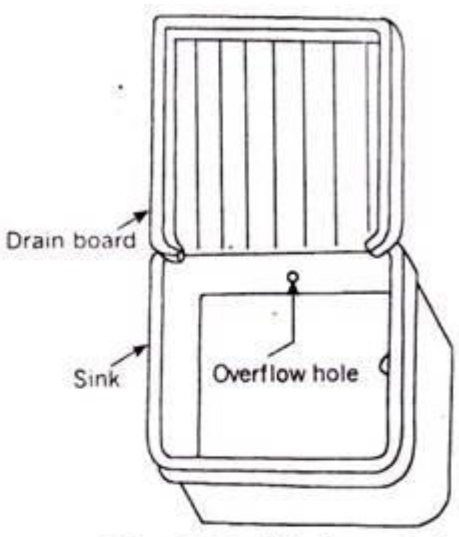


Fig. 25.2. Kitchen sink.

The floor of the sink is given a slope towards the waste outlet. The sinks are provided with circular waste hole. All the kitchen sinks are provided with a draining board which is fixed on the right of the user. Weir type overflow slots are also provided in some sinks.

The usual dimensions of the sinks are:

The sinks are made of glazed earthenware or stoneware. The height of the top of the sink from the floor should be 90 cm.

3. Bath Tub:

Bath tubs may be made of various materials, such as enamelled iron, plastic, cast iron, porcelain enamelled, marble or fire clay etc. For high class residential buildings marble, plastic or enamelled iron or fibre glass baths are used. For public places glazed fire-clay or porcelain enamelled cast iron baths are used.

Vitreous enamelled pressed steel baths are also available in the market. Previously copper baths were used but nowadays they have become obsolete. In future aluminium alloy and fibre glass bath are coming which will replace old baths.

The bath may be parallel or taper, the latter type being more popular. It is provided with one outlet of 4 to 8 cm and one inlet pipe for filling it. In some cases two taps are provided one for hot and another for cold water supply. The bath should also be provided with one over-flow pipe to take excessive water. The waste pipe of bath is provided with a trap, to prevent the foul gases from entering in the bath room.

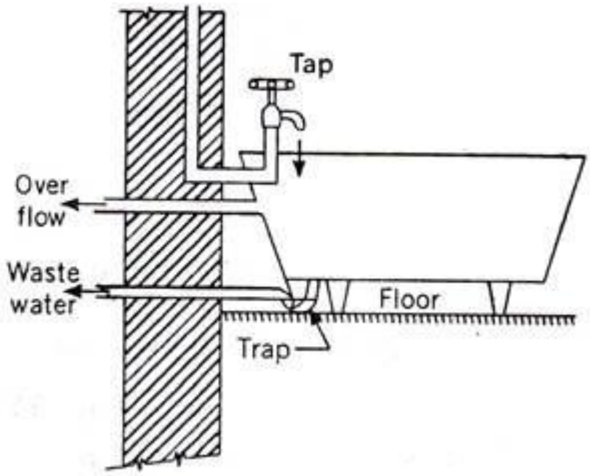


Fig. 25.3. Section through a bath.

The usual dimensions of bath are: length 1.7 to 1.85 m width 70 to 75 cm, depth near waste pipe side 43 to 45 cm, overall height with feet 58 to 60 cm.

4. Flushing Cisterns:

These are used for flushing water closets and urinals after use. There are several varieties of flushing cisterns. High-level cisterns are intended to operate with a minimum height of 125 cm between the top of the pan and the underside of the cistern.

Low-level cisterns are intended to operate at a height not more than 30 cm between the top of the pan and the underside of the cistern. Cistern may be of cast iron, glazed earthenware, glazed vitreous ware or pressed steel or any other impervious material. Now a days plastic cisterns are also available in the market.

Following two types of cisterns are most common now a days:

(i) Bell type without valve.

(ii) Flat bottom type fitted with valve.

Fig. 25.4 shows the bells type flushing cistern. The bell is kept over the outlet pipe, the inlet end of which is slightly above the water level. When the chain is pulled the bell is lifted causing the water to spill over the outlet pipe and starting the siphonic action due to which the whole water rushes towards the outlet and flushes the W.C.

Due to shortage in the water supply, there was urgent demand to reduce the quantity of water consumption. All the flushing cisterns available and existing in the building fitting, discharge their full quantity of water even for small purposes or even when small quantity of water will sufficient for that purpose.

C.B.R.I. Roorkee has developed dual flushing cistern, which allows fractional or full discharge of cistern at a time. All the existing cisterns can be converted into dual flushing cisterns by making arrangements to cut the vacuum seal at the fixed water level. To obtain the fractional discharge the chain is pulled and left, but for obtaining full discharge the chain is pulled and kept in position till full capacity is discharged.

For converting the existing cisterns to dual flushing cisterns, 6 mm dia., rubber tube is fixed in the bell of the cistern at the fixed height. The other end of the rubber tube is connected to a plastic pipe with a stop-cock at the end to control the entry of air. The cistern will give full discharge with the stop cock and fractional discharge with the stop cock open.

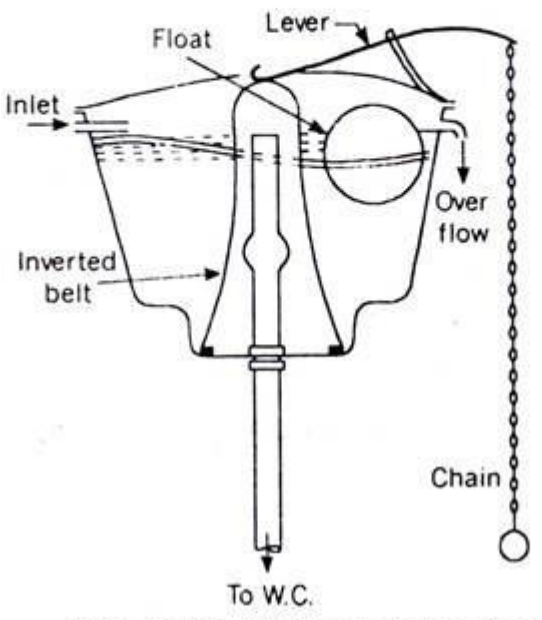


Fig. 25.4. Flushing cisterns (bell type).

C.B.R.I. has also developed an automatic flushing cistern for the urinals. This cistern has eliminated the use of copper fittings which are presently provided with the public urinals cisterns. The new developed fittings consist of a U-tube made of plastic pipe.

When the water level in the cistern reaches the level of the bend, the syphonic action takes place and the water present in the cistern rushes, to the urinals. This new automatic flushing cistern can be cheaply manufactured and easily fixed in the position. Table 25.1 gives the Flushing Storage Capacities.

Note:

1. If the premises is situated at a place higher than the road level in front of the premises, storage at ground level should be provided on the same lines on floor 2.

2. The above storage may be permitted to be installed provided that the total domestic storage calculated on the above basis is not less than the storage calculated on the number of down take fittings according to the scales given below:

(a) Down take taps – 70 Hires each

(b) Showers – 135 litres each

(c) Bath tubs – 200 litres each

Fig. 25.5. illustrates the flat bottom type flushing cistern provided with valve. When the chain is pulled, it lifts the disc which also suddenly lifts the water above it and starts the siphonic action. The valve allows the water to rush in the outlet pipe.

The flushing cisterns are provided with inlet pipe, over-flow pipe and automatic closing float ball valve.

5. Water-Closet:

This is a sanitary appliance to receive the human excreta directly and is connected to the soil pipe by means of a trap.

The water closets are classified as follows:

(A) Squatting type or Indian type:

(i) Long pan pattern (length 450,580,680 mm)

(ii) Orissa pattern (length 580,630,680 mm)

(iii) Rural pattern (length 425 mm)

(B) Wash-down, Pedestral or European type:

Fig. 25.6 shows the section through an Indian type water closet.

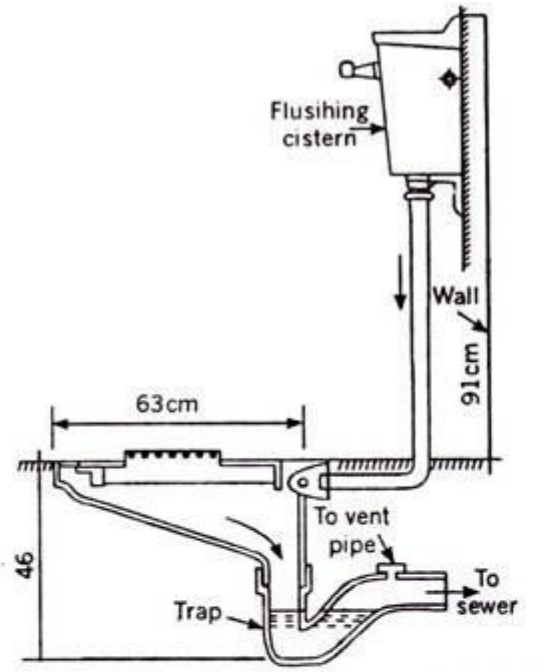


Fig. 25.6. Indian Type Water Closet.

This is manufactured in two different pieces:

(a) Squatting pan, and

(b) Trap.

The pan is provided with an integral flushing rim of suitable type. The inside of the bottom of the pan should have sufficient slope towards the outlet for quick disposal during flushing.

These are made of vitreous chain clay. The inner portion is glazed to make it easy in cleaning. The pan is connected to the flushing cistern by means of flushing pipe. The top of the trap is connected to the anti-siphon or vent pipe.

Fig. 25.7 shows the pictorial view of an Indian type water closet.

the section through a wash-down type water closet which is most commonly used in high class buildings. It is provided with a wide flushing rim and 5 cm trap. It is one piece construction in which the pan and trap are not separate. It is provided with an inlet or supply horn for connecting to the flushing pipe.

It may be provided with P and S trap as desired. These types of water closets require less space than squatting pattern type and can be flushed by low level cistern. Nowadays siphonic water closets are very popular. Fig. 25.9 shows the isometric view of such a water closet.

6. Urinals:

Urinals can be made in any of the following patterns and sizes:

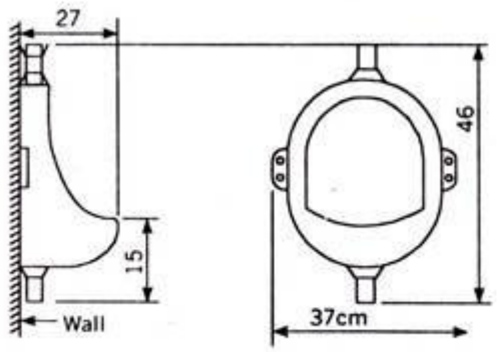


Fig. 25.10. Bowl type urinal.

Bowl type urinals are of one piece construction. Each urinal is provided with two fixing holes on the side for fixing it on the wall. At the bottom an outlet horn is provided for connecting it to the trap. The inside surface is regular and smooth for ensuring efficient flushing.

The bottom of the urinal is provided with sufficient slope from the front towards the outlet for efficient drainage of the urinal. Bowl type urinals are also provided with flushing rim which is connected by flushing pipe to the flushing cistern. Fig. 25.10 illustrates a bowl type urinal.

Fig. 25.11 shows the isometric view of two type urinals placed in position.

The slab and stall type urinals are manufactured either as a urinal or as a range of two or more and are used in public places such as cinema houses, restaurants, railway stations, offices, etc. The squatting plate urinals are mostly used in ladies lavatories and are on piece construction.

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Traps are an important component of a plumbing system. They prevent ingress of foul air, insects and vermin from the sewers into the building and resist the spread of disease. Traps are constructed, so that they retain a body of water which acts as a water seal.

Floor trap is also called as Nahni Trap (Nahni in hindi means washing / bathing place). Nahni Trap is provided to prevent the foul gasses entering into the building by providing the water seal. Minimum 50 mm depth of water seal should be provided. Whether waste water is flowing or not, floor trap prevents the foul gases (bad smells) to enter in to the building.

To collect wastewater from the bathroom, wash area, wash basin, kitchen sinks etc., floor trap or Nahni trap is provided into the floor. Floor traps are available in PVC, UPVC and CI; they are without vent pipe but removable grating is provided at the top of Traps.

Floor traps or Nahni traps (Nahni means washing place) come in a variety of shapes, sizes and outlet conditions. Many do not have a water seal at all, and have a non-uniform and rough bore. Nahni traps are a source of major leakages due to their poor design, casting and poor quality. It is prevented by using only deep seal P traps with multi-inlet fitting/traps with connections from wash basins and other fitting to provide a positive joint.

Traps installed in the areas not in normal use may lose their water seal due to evaporation. Provision must be made to renew the seal by adding water periodically and this can be done by connecting a waste appliance to the trap (e.g. a wash basin, etc). Replenishment is also achieved by installing a sophisticated water supply valve with a back-flow prevention device that is connected to the trap. Care has to be taken to prevent installation of traps that are exposed to freezing conditions.

The length of floor trap is 310 mm, with minimum 80 mm diameter at the inlet end, 30 mm diameter near outlet end and 73 mm diameter outside the outlet of floor trap. And 95 mm grating size provided at the top of floor trap with 8 mm diameter holes.

Heat System

Heat is one of the prime necessities of life, as essential as food, clothing, and shelter. You can have a very good shelter, but you still need heat to be comfortable in it. By studying this chapter, you will start to gain knowledge of what you will be required to know to become a proficient Utilitiesman in the operation of a heating plant.

Objectives

When you have completed this chapter, you will be able to do the following:

1. Identify the principles of heating.
2. Identify the different types of combustible fuels.
3. Describe warm-air heating equipment.
4. Describe the different types of warm-air heating systems.
5. Describe the purpose and operation of low-temperature hot water systems.
6. Describe the different types of low-temperature hot water distribution systems.
7. Describe the different types of high-temperature hot water systems.

Heat Transfer

The transfer of heat is the next problem to consider after the heat has been produced. It must be moved to the space where it is to be used. Heat naturally flows from a warmer to a cooler substance; consequently, there must be a temperature difference before heat can flow. Naturally, the greater the temperature difference, the faster the heat flow. When placed together, two objects that have different temperatures tend to equalize their temperature. Heat travels in heating systems from one place to another by three different methods. All three of these methods are used in most heating systems.

1. Conduction

Conduction is the flow of heat from one part of a substance to another part of the same substance, or from one substance to another when they are in direct contact.

When one end of a stove poker is held in a flame, the other end will soon be too hot to hold. This indicates that the heat is being conducted, or transferred, from one end of the poker to the other end. Such a transfer of heat is called conduction. Conduction is used to transfer heat through the walls of a stove, furnace, or radiator so that the warmth can be used for heating. Some materials do not conduct heat as well as others. For example, if a piece of wood had been used instead of the poker, the end of the wood away from the fire would have remained cool. Those materials that offer considerable resistance to heat flow are referred to as insulators or poor conductors

2 Convection

Convection is the transfer of heat by means of mediums, such as water, air, and steam. When air is heated, it expands, becomes lighter in weight, and rises. The cooler air, which is heavier, then flows in to replace the warm air. Thus a convection current is set up. Water, when heated, acts in the same way as air. The water next to the heating surface becomes warmer, lighter, and rises. This action allows the cooler water to flow in next to the heating surface and become heated. Convection is a very important factor in a heating system. It is this force, developed by heating the medium, which circulates that medium to the space to be heated.

.**3 Radiation**

Radiation is the transfer of heat through space. When a hand is held in front of a stove, it is quickly warmed by means of radiation. In this same manner, the earth receives its heat from the sun.Radiated heat is transferred by heat waves, similar to radio waves. Heat waves do not

warm the air through which they pass, but they must be absorbed by some substance to produce heat. For example, when you stand in the shade of a tree, you feel cool because the leaves and limbs are absorbing the heat waves before they reach you.

When heat waves strike an object, some are reflected, some may pass through, and the object absorbs the rest. Polished metals are the best reflectors known; therefore, they are poor absorbers of heat. A poor absorber is also a good radiator. Rough metal

absorbs heat more readily than a highly polished metal, and it also loses heat faster by radiation.

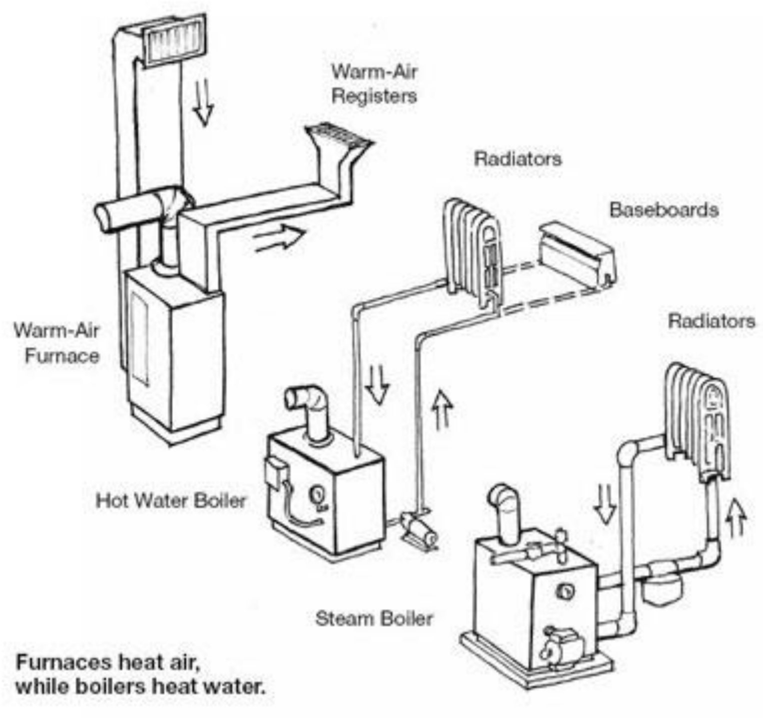
The color of a substance also affects its absorbing power. A black surface absorbs heat faster than a white one. That is why light-colored clothes are cooler in summer than are dark-colored clothes.

Central Heat

Furnaces

The majority of North American households depend on a central furnace to provide heat. A furnace works by blowing heated air through ducts that deliver the warm air to rooms throughout the house via air registers or grills. This type of heating system is called a ducted warm-air or forced warm-air distribution system. It can be powered by electricity, natural gas, or fuel oil.

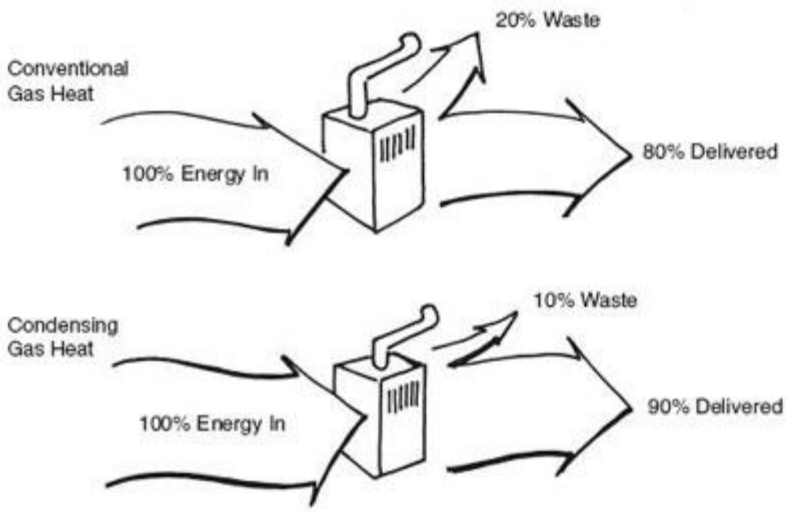
Inside a gas- or oil-fired furnace, the fuel is mixed with air and burned. The flames heat a metal heat exchanger where the heat is transferred to air. Air is pushed through the heat exchanger by the “air handler’s” furnace fan and then forced through the ductwork downstream of the heat exchanger. At the furnace, combustion products are vented out of the building through a flue pipe. Older “atmospheric” furnaces vented directly to the atmosphere, and wasted about 30% of the fuel energy just to keep the exhaust hot enough to safely rise through the chimney. Current minimum-efficiency furnaces reduce this waste substantially by using an “inducer” fan to pull the exhaust gases through the heat exchanger and induce draft in the chimney. “Condensing” furnaces are designed to reclaim much of this escaping heat by cooling exhaust gases well below 140°F, where water vapor in the exhaust condenses into water. This is the primary feature of a high-efficiency furnace (or boiler). These typically vent through a sidewall with a plastic pipe.



Furnaces heat air, while boilers heat water.

New furnace standards are currently under development by the U.S. Department of Energy, and are due to be finalized in the spring of 2016. The current furnace standards have not been updated since 1987.

Heating system controls regulate when the various components of the heating system turn on and off. The most important control from your standpoint is the thermostat, which turns the system — or at least the distribution system — on and off to keep you comfortable. A typical forced air system will have a single thermostat. But, there are other internal controls in a heating system, such as "high limit" switches that are part of an invisible but critical set of safety controls.



The best gas furnaces and boilers today have efficiencies over 90%

The efficiency of a fossil-fuel furnace or boiler is a measure of the amount of useful heat produced per unit of input energy (fuel). Combustion efficiency is the simplest measure; it is just the system's efficiency while it is running. Combustion efficiency is like the miles per gallon your car gets cruising along at 55 miles per hour on the highway.

In the U.S., furnace efficiency is regulated by minimum AFUE (Annual Fuel Utilization Efficiency). AFUE estimates seasonal efficiency, averaging peak and part-load situations. AFUE accounts for start-up, cool-down, and other operating losses that occur in real operating conditions, and includes an estimate of electricity used by the air handler, inducer fan, and controls. AFUE is like your car mileage between fill-ups, including both highway driving and stop-and-go traffic. The higher the AFUE, the more efficient the furnace or boiler.

solar water heater.

A solar water heater is a device that captures sunlight to heat water. It can be an economical way to generate hot water for your family (for shower and bath).

A solar heater not only enables substantial energy savings as solar power is free in contrast to natural gas or fuel oil. Moreover, it is a way to produce hot water for sanitary use throughout the year without emitting any CO_2.

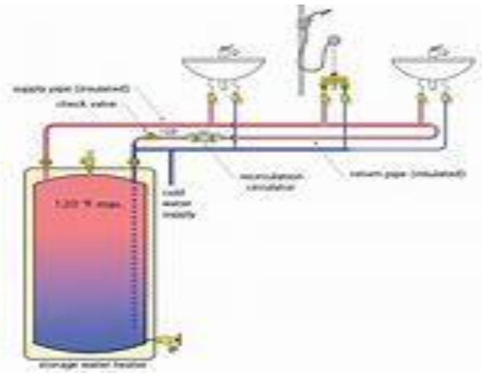
1m² of roof = 100m³ of natural gas/year

In our latitudes, the sun shining on 1m² of roof replaces 100 l of heating oil or 100 m³ of natural gas (approximately 1 000 kWh) a year. Generally speaking, it is possible to heat **50 to 70 %** of the **water used** in the kitchen and the bathroom in this way. However, a back-up heating system is required for times when there is insufficient luminosity.

Supplying a washing machine or dishwasher with this hot water also **cuts out the electricity used by these appliances** to heat the water and shortens the washing cycles, as long as certain **precautionary measures** are taken.

Domestic hot water system

The domestic hot water system (DHW) is used to provide hot water for the kitchen and bathroom sinks, tubs and other appliances. The same boiler can provide both water systems as long as both water systems do not mix


supply pipe (insulated)
check valve
recirculation circulator
return pipe (insulated)
cold water supply
storage water heater

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