9. Roof pond cooling system / Roof sprinklers

The roof absorbs the highest amount of solar radiation during summer. On a hot summer day the surface temperature of the roof could reach up to 80 °C. The roof also has the largest exposure to the sky dome and hence can be used effectively for night sky radiation.

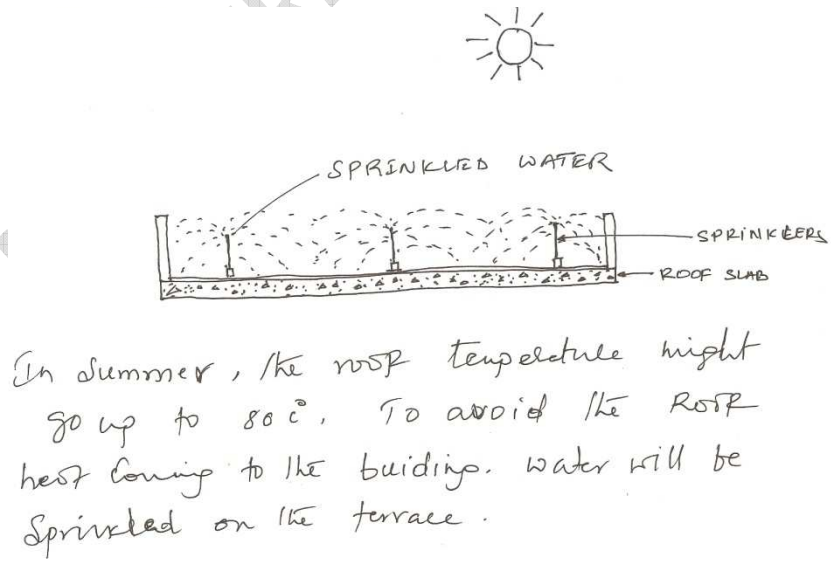
Roof pond cooling system

To stop the roof getting heated up and to cool the occupant space using radiation (radiant cooling) throughout the daytime **Roof pond** system can be adopted. This is very simple system, where roof slab has to be water proofed enough that the water should not leak. On the water proofed roof, water is stored and sliding deck (Metal insulated deck) to be installed. In the night time roof pond to be exposed (early morning 2 AM to 5AM) to the night sky to cool the water (Water temperature can reach as low as 16 °C for Bangalore kind of climate on clear sky day). Daytime, insulated metal deck to slide over to cover the roof pond. Insulated metal deck shades the roof pond and stops the water from evaporating. The cooled water radiates coolth to the space and acts like radiant cooling system. This kind of system can be easily adapted to residences and works very well in moderate, hot and dry climate.

9.1

Roof sprinkler

The roof gets hot in summer, to cool the roof and the occupant space; **Roof sprinkler** system can be adapted. This system works very well in hot and dry climate and also in moderate climate. Roof sprinklers system adapts evaporative cooling technique to cool the roof slab (Adiabatic process). A passive ventilation system with roof sprinklers can achieve comfort temperature in summer hot and dry climate and also in moderate climate.



9.2

A. Combination of Night sky cooling and Roof sprinkler

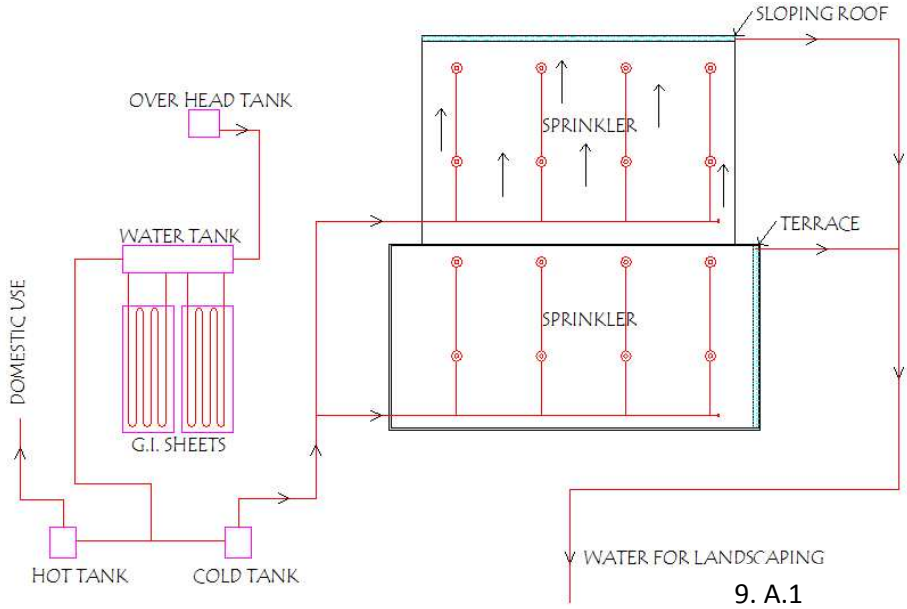
Night sky radiation is based on heat lost through long wave radiation from a body towards another body of lower temperature, which plays the role of a heat sink. In case of a building, the cooled body is the building and heat sink is the sky, since the sky temperature is lower than the temperatures of most objects on the earth. Similarly, if we expose the water on the terrace, it gets cooled because the temperature of the night sky is much less than the temperature of the water.

The proposed system performs two tasks,

1. In daytime, the system produces hot water, and it can be used for domestic application.
2. In night time, using night sky radiation the system produces cold water and it is stored in a thermally insulated tank. This cold water is then utilized by a sprinkler system during the day.

The roof decking system consists of galvanised iron sheets (G.I), which will be painted black and its bottom will be thermally insulated with polyurethane insulation. Copper pipes containing water will be placed on top of the sheet, which is exposed to sunlight.

This system protects the roof slab from the direct sun. The flowing water inside the copper tube absorbs the heat from the sun and becomes hot. This hot water in the daytime will be collected in a hot water tank and used for domestic hot water requirements. During the night, the system takes advantage of the night sky radiation and will generate cold water. This cold water assembled during the night will be collected in a separate cold water tank. The water is then used to cool the roof surface during peak hours (the hottest time of the day!) with the help of the sprinkler system.



9. A.1

Sprinkler

Cool water that is collected by using the system of 'night sky radiation' is pumped up to a sprinkler system on the terrace. The cold water coming through the sprinkler is exposed to the hot surface of the terrace where it will evaporate and in turn cool the surface. The coolth from the terrace is then transferred to the floor below so as to decrease the heat gain of the internal space. The cooled slab then acts as a radiant surface, which provides comfort temperatures to the habitable spaces.