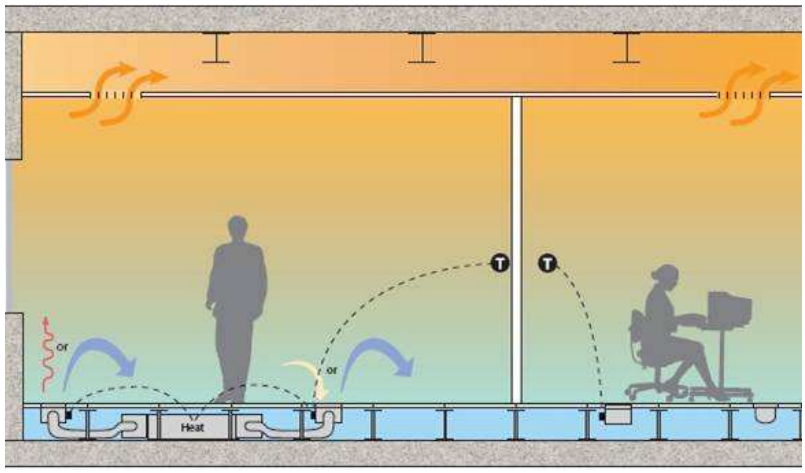
2. Displacement ventilation:

Displacement ventilation (DV) is a means of providing cool supply air directly to the occupants. The cooled air, supplied near the floor at a very low velocity, falls towards the floor due to gravity and spreads across the room until it comes into contact with heat sources. The cool supply air slowly rises as it picks up heat from occupants and equipment. The warm, stale air rises towards the ceiling where it is exhausted from the space. This vertical airflow pattern near each occupant often referred to as a thermal plume, makes it less likely that germs spread. The air distribution system provides far effective ventilation, since the fresh supply of air is delivered directly to each occupant.

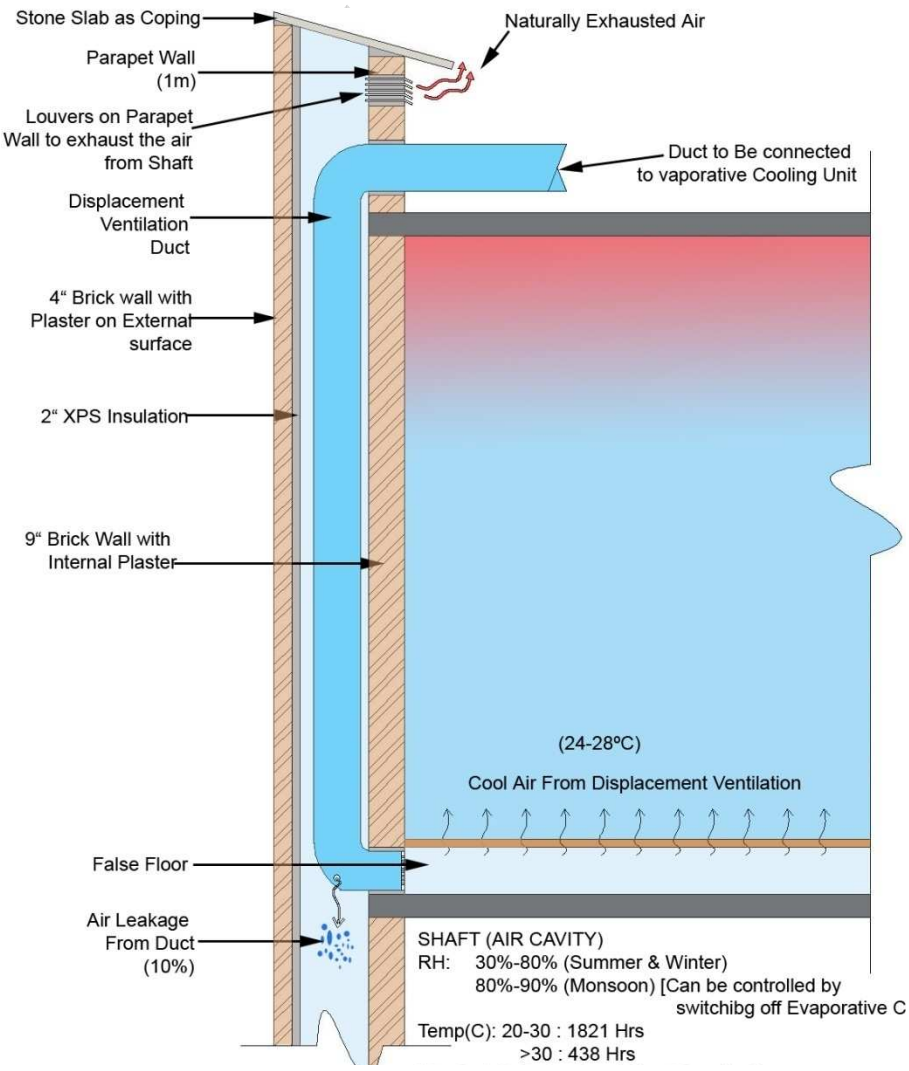


2.1

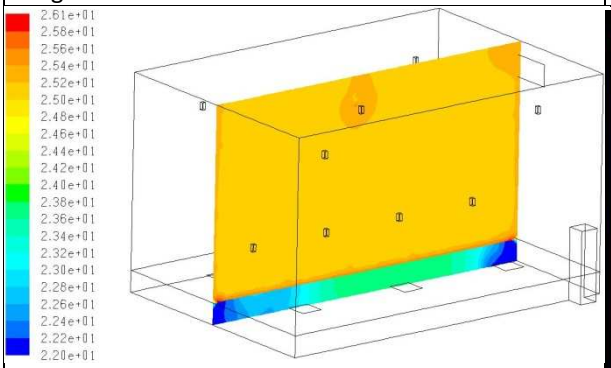
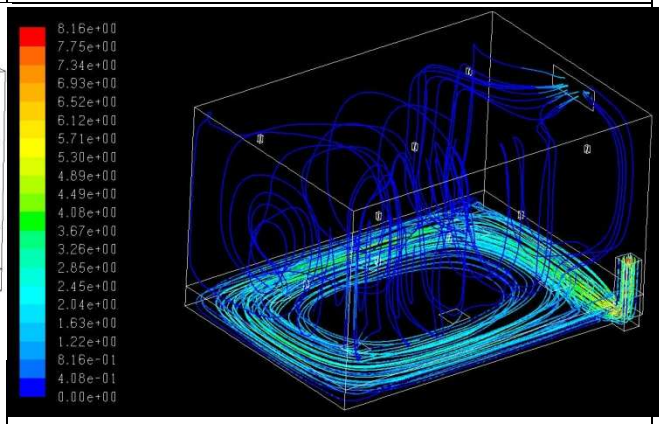
A. Displacement ventilation with Two stage evaporative cooling (McD BERL's recent project)

Displacement ventilation with two stage evaporative cooling is the new concept of cooling the space in hot and dry climate. Air supplied from the duct is made to pass through the floor (Under floor air distribution) and the raised stale air is exhausted naturally through windows (Ventilators at ceiling level).

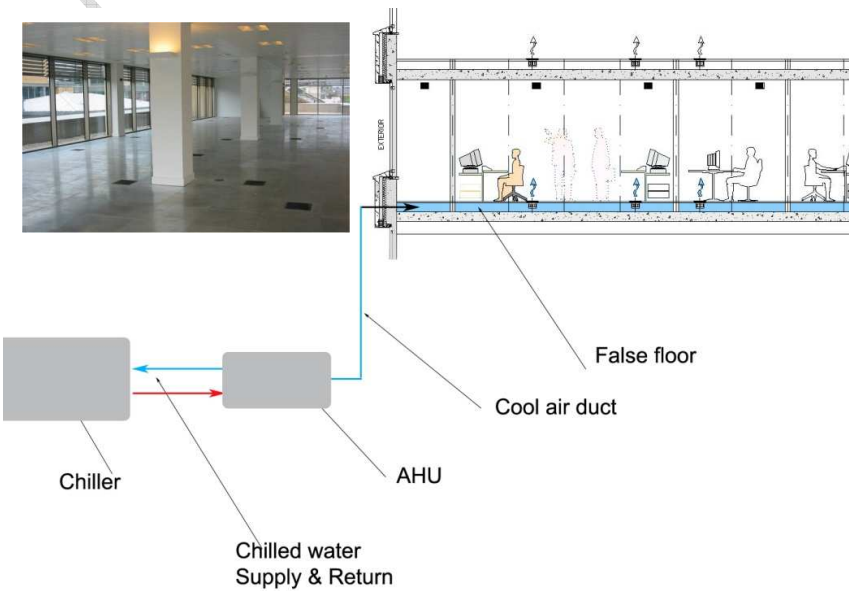
It is possible to attain 26 ^{0}C with this system in summer (At actual test conditions). Only 30% of electrical energy is required compared to the conventional water cooled chilling system. Other great advantage of this system is that it maintains 100% fresh air providing good indoor air quality.



CFD (Computation fluid Dynamics) modeling shows that it is possible to achieve 24 ^{0}C at 1.2 mts level.

1. CFD Analysis showing temperature at different heights	2. CFD Analysis showing stale air exit **2. A.1**
	
3. Test centre of Displacement ventilation(Right) with two stage evaporative cooling **2. A.2**	

B. Displacement ventilation with Chiller and AHU

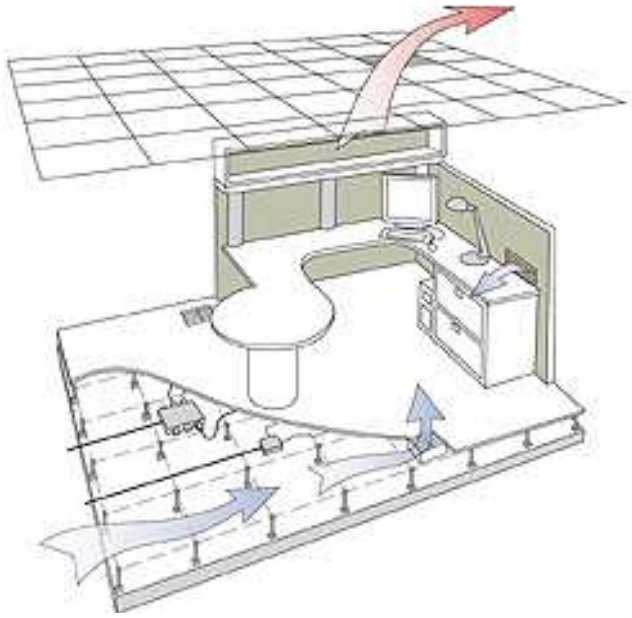


This system is similar to conventional air conditioning system except that the cool air is supplied from beneath the floor. The supplied air temperature at the floor grille will be 18 ^{0}C compared to the conventional ceiling grille of 14 deg C. This improves the COP (Coefficient of performance) the chiller and reduces the operating cost. Due to 2.5 ^{0}C temperature gradient maintained across floor height, there is a reduction of air condition load by 15%. Overall 30% energy reduction can be achieved with this system.

2. B.1

C. Task cooling displacement ventilation system

Air will be supplied by Partition-based diffusers, mounted in the partitions immediately adjacent to the desk. Air is delivered through passageways that are integrated into the partition design to controllable supply grills (jet-type) that can be located just above desk level or just below the top of the panel. The AHU (Air handling unit) feed air to the supply plenum (below floor, fitted with spring loaded motorized fire dampers). This space is shared by data and task electrical lines. The return plenum on the ceiling likewise shares space with fire fighting systems and general lighting. The intermediate slab ensures fire discontinuity between floors and the light under deck insulation keeps the plenums thermally apart.



2. C.1

Desktop units and task air conditioning for micro-environmental (personalized environmental) control have great potential because of the smaller controlled environment and therefore lower energy use. Air conditioning integration with furniture shall be important in the future.

The air conditioning outlet is 'plugged' into the system furniture that forms a part of the building. Using occupancy sensors, the air-conditioning thus can be thought of as a dynamically responding pressurized system that only releases as much cooling as required according to the desks where the work is going on. The spaces are only cooled till human height (about 6') and with a relatively high inlet air temperature of 18-19 ºC. In this system, eco-friendly, efficient, fresh, locally targeted air-conditioning forms a bubble around the person seated.