Building Energy Systems & Thermal Comfort

Dr. Md. Zahurul Haq, *Ph.D., CEA, FBSME, FIEB*

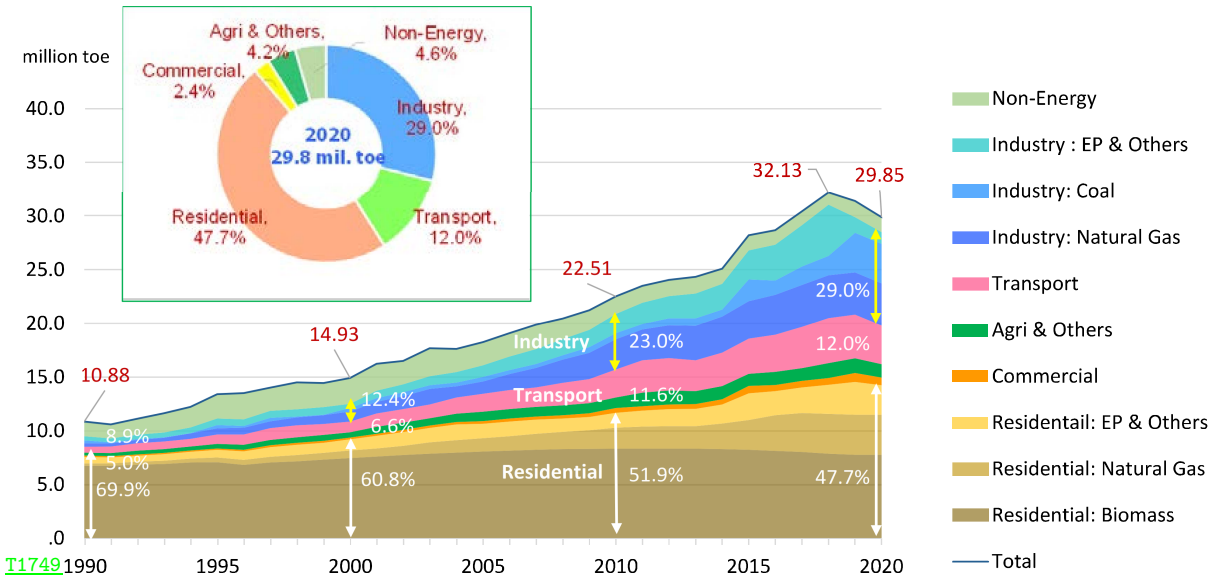
Professor
Department of Mechanical Engineering
Bangladesh University of Engineering & Technology (BUET)
Dhaka-1000, Bangladesh

http://zahurul.buet.ac.bd/

Training on
Energy Efficiency and Conservation
conducted by
Bangladesh Power Management Institute (BPMI)

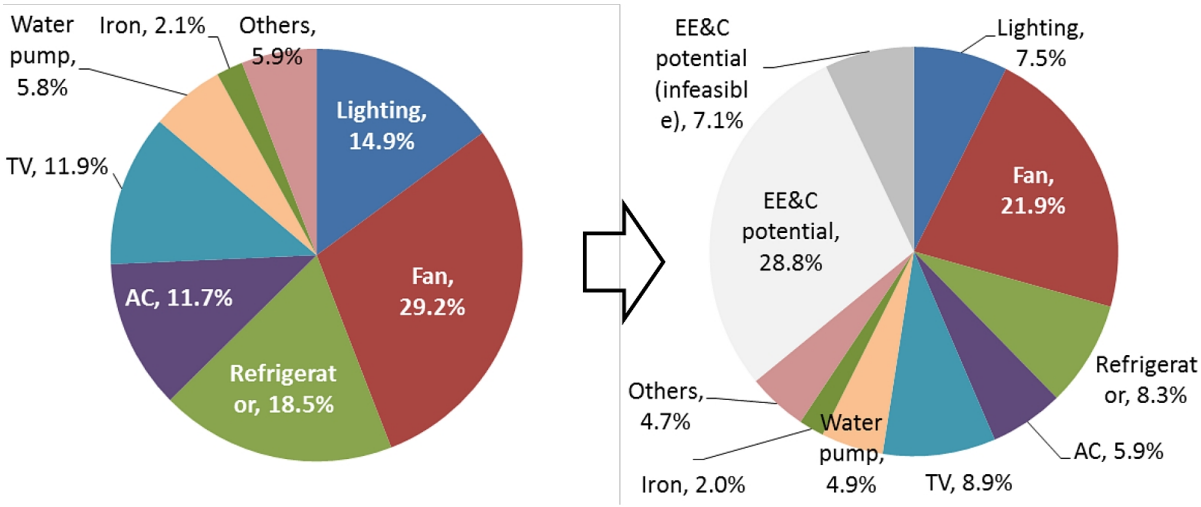
Overview

Bangladesh Sector-wise Energy Consumption



T1749

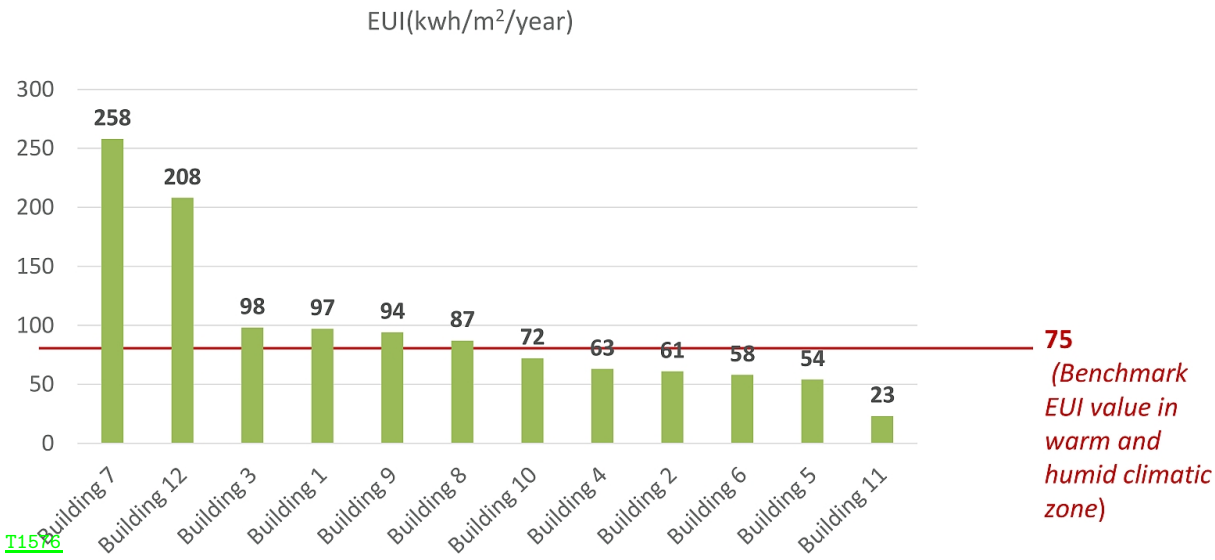
Bangladesh: EE&C Potential of Home Appliances



T1726 A: Present Electricity Consumption B: EE Case Electricity Consumption

EE potential in Residential Sector is estimated 28.8%.

Public Building Energy Use Intensity (EUI) analysis



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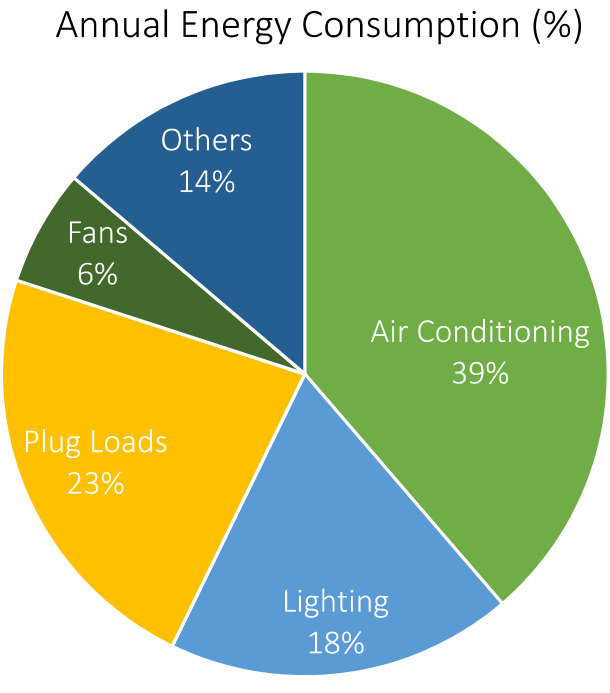
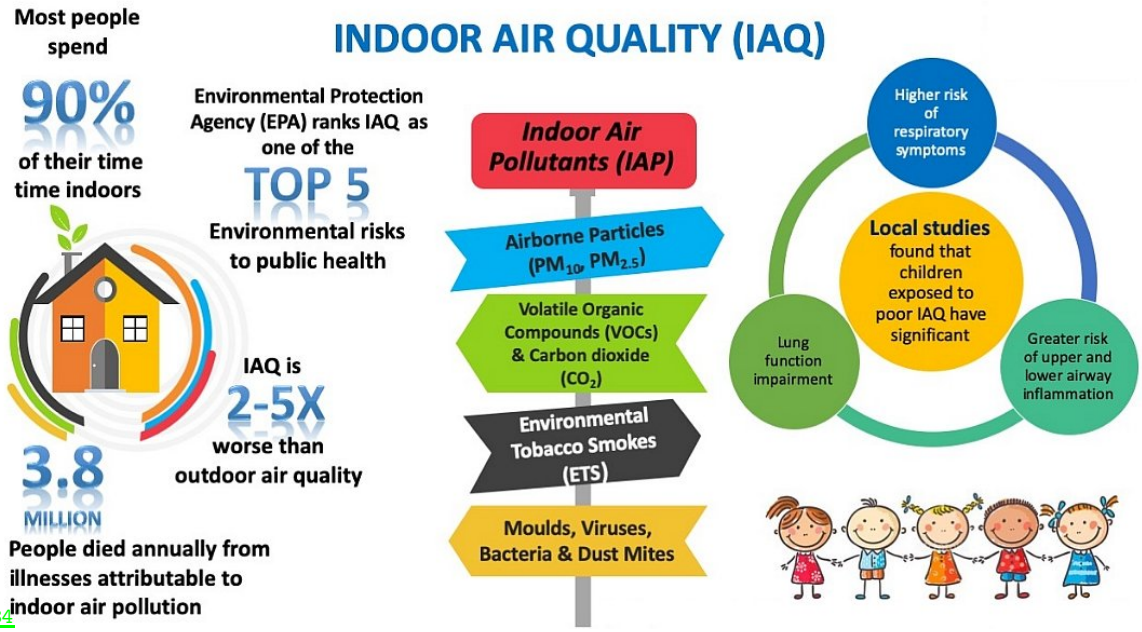
75-85 kWh/m²/yr is for one ★, and 45 kWh/m²/yr for five ★ building in India.

End Use Application (%) in 12 Buildings



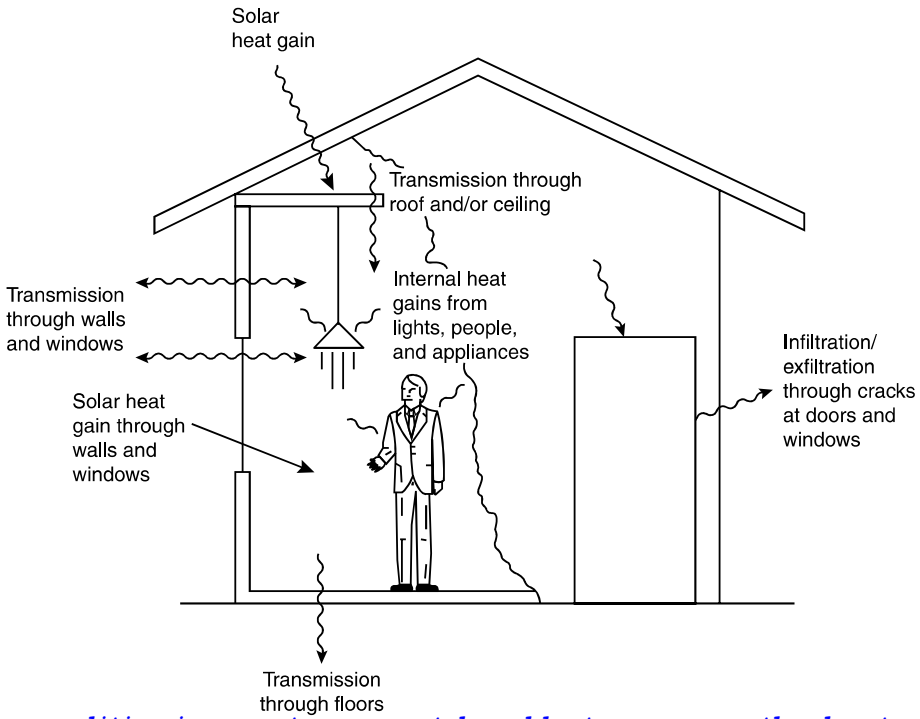
T1729

INDOOR AIR QUALITY



T1384

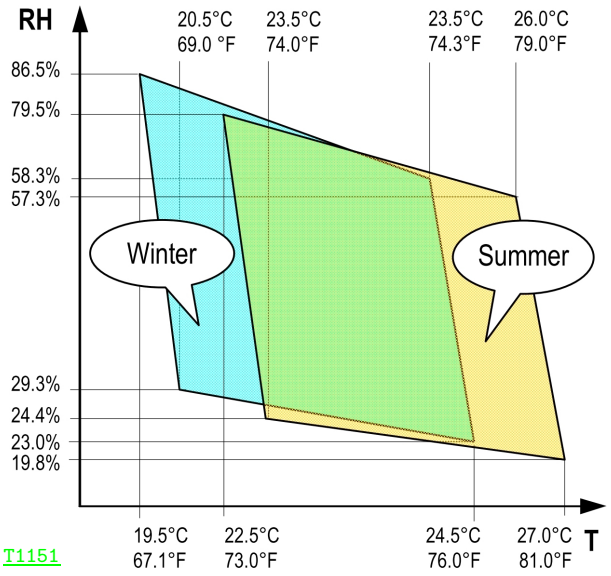
Heat Transfer to/from Building Space



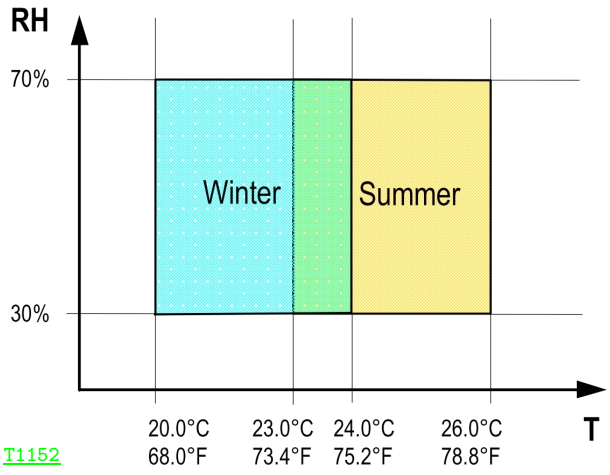
T1385

Air-conditioning system must be able to remove the heat gain

Thermal Comfort



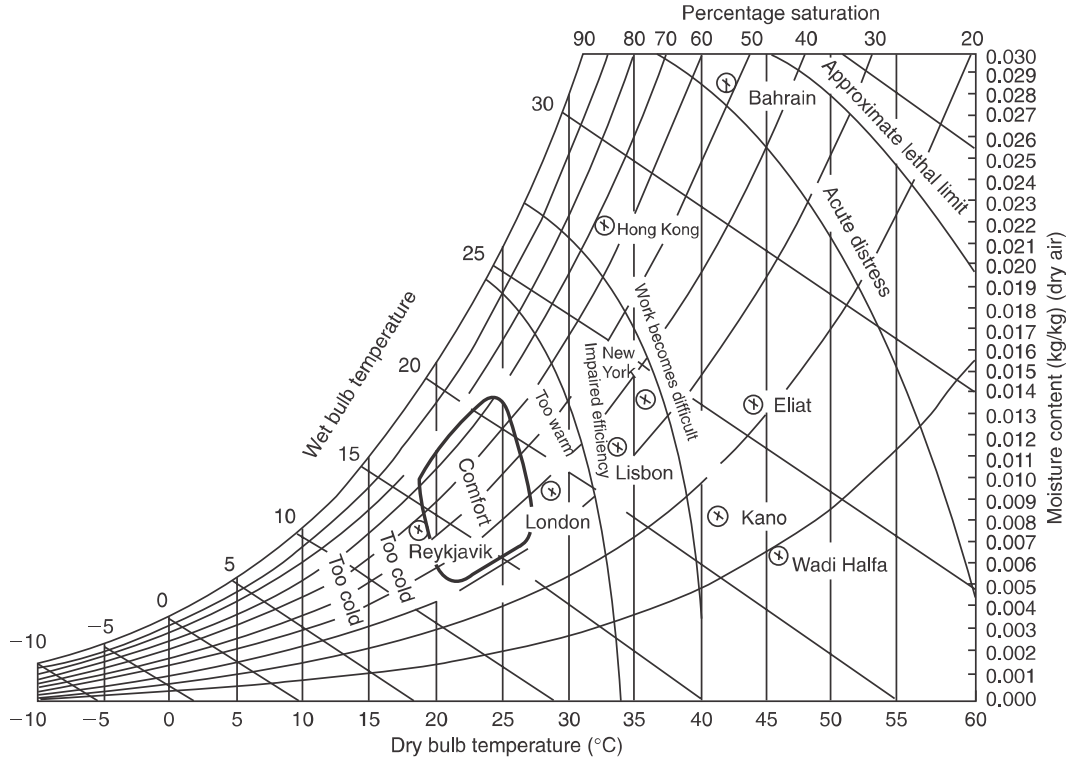
T1151



T1152

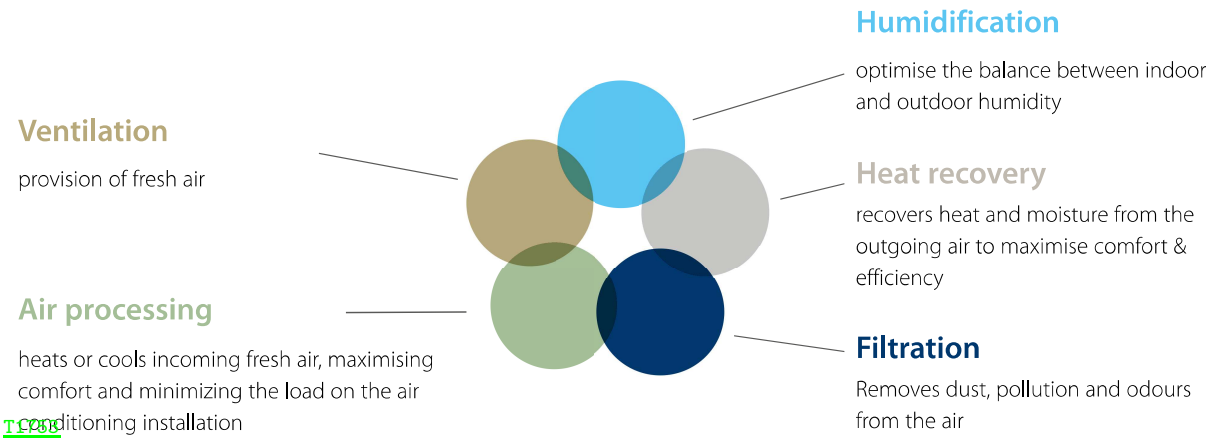
Thermal comfort is defined as that condition of mind which expresses satisfaction with the thermal environment.

Typical Climate Conditions



T1153

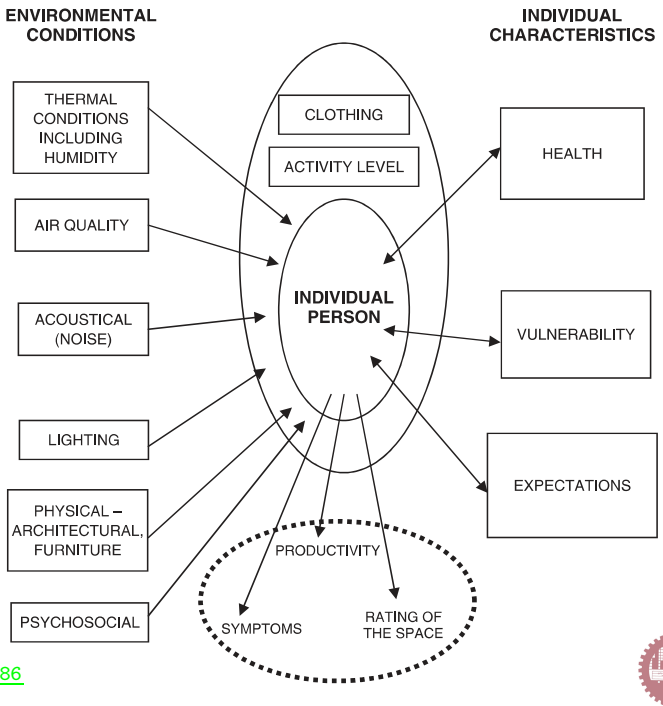
Comfort Air-Conditioning



T1385

Factors Influencing Thermal Comfort

1. Activity level
2. Clothing
3. Expectation
4. Air temperature
5. Radiant temperature
6. Humidity
7. Air speed



T1386

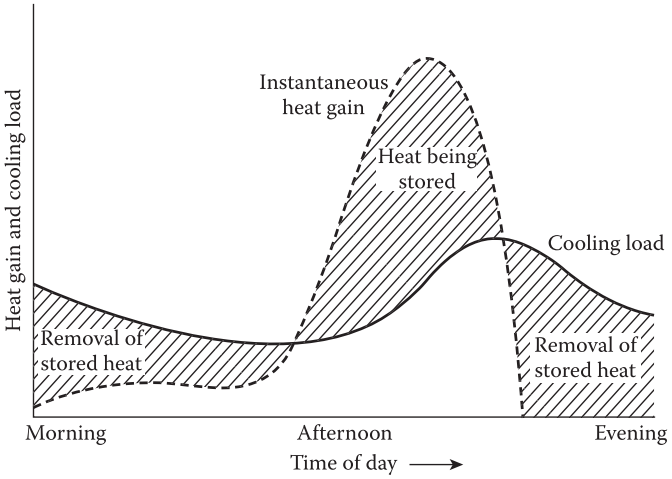
Ventilation: Outdoor Air Requirements

- to meet metabolic requirements of occupants
- to dilute the indoor air contaminants, odors and pollutants to maintain an acceptable air quality.
- to support any combustion process or replace the amount of exhaust air required in laboratories, manufacturing processes or rest rooms.
- to provide make-up of amount of ex-filtrated air required when positive pressure is to be maintained at the conditioned space.

Outdoor Air as per ASHRAE 62-1992

Application	L/s per person
Dining/conference room, office spaces, lounges	10
Retail stores, transport waiting rooms, class rooms	7
Hospital patient rooms, residences	15
Smoking lounges	30

Heat Gain & Cooling Load



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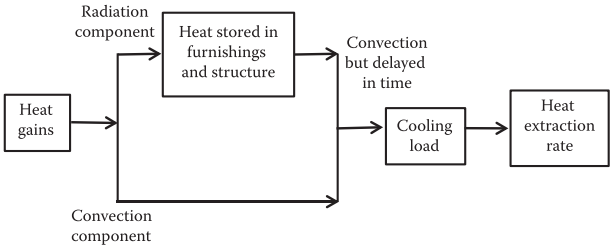
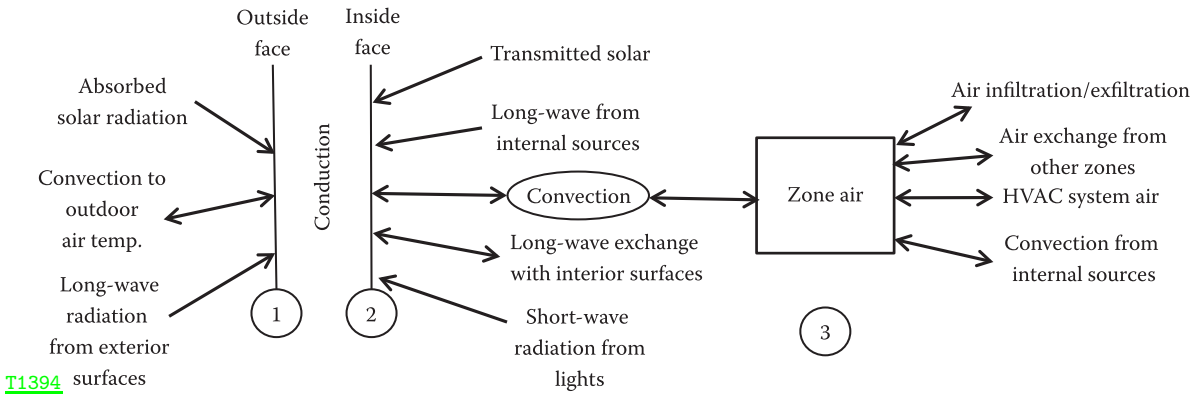


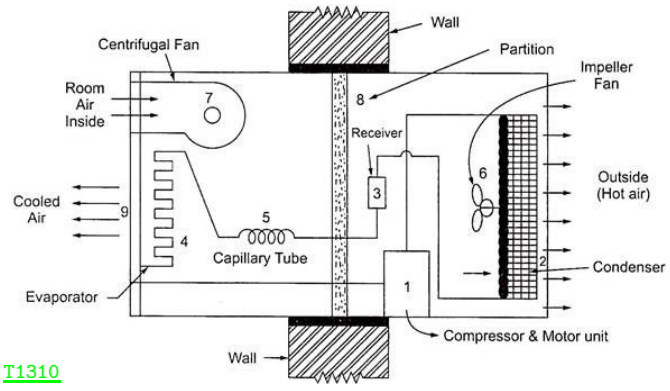
T1392

Cooling Load Components



T1394

Window Air-Conditioner



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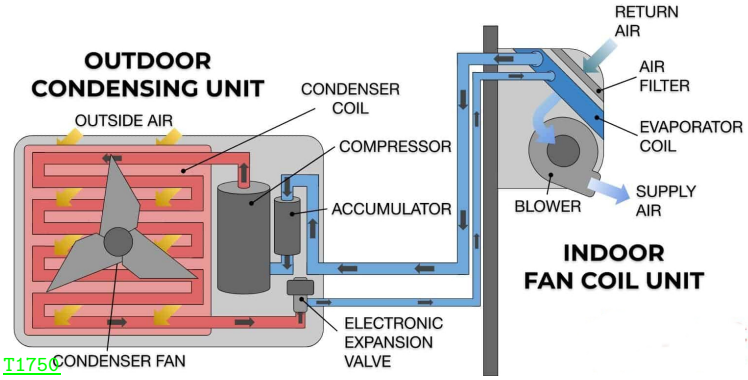
Split System



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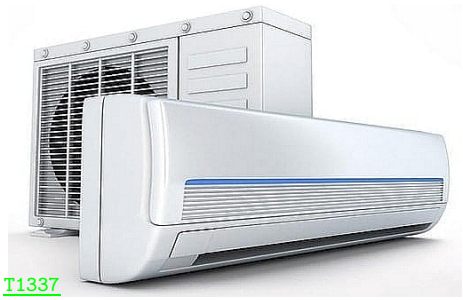
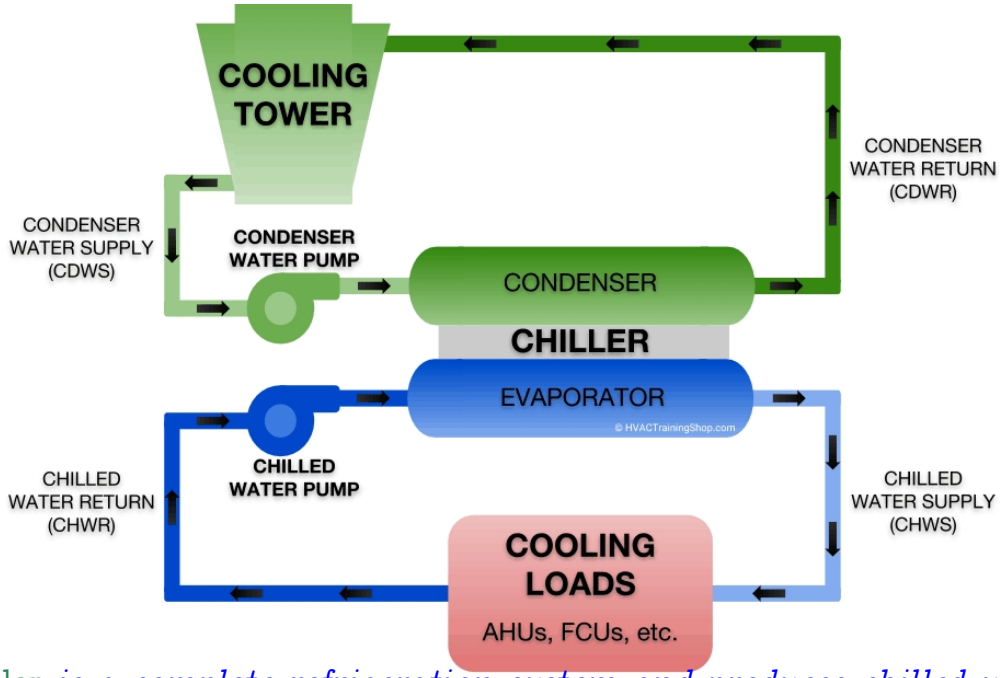


T1337

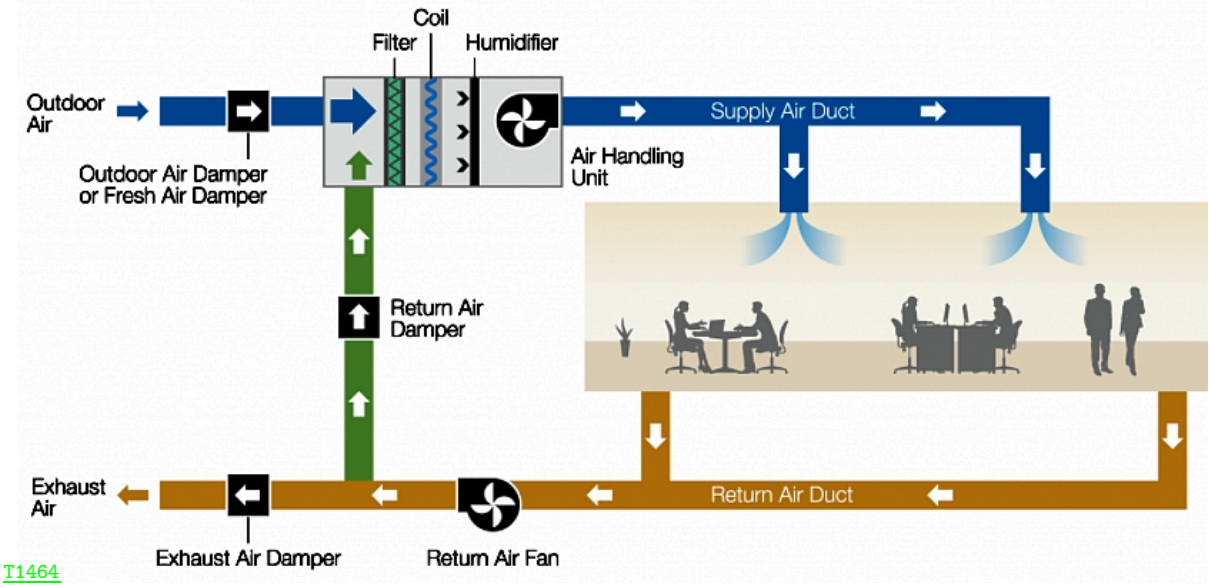
Compressor/condenser part of the refrigeration system separate from the evaporator coil and connected by the refrigerant lines to the air system, which includes the evaporator.

Central Air-conditioning System



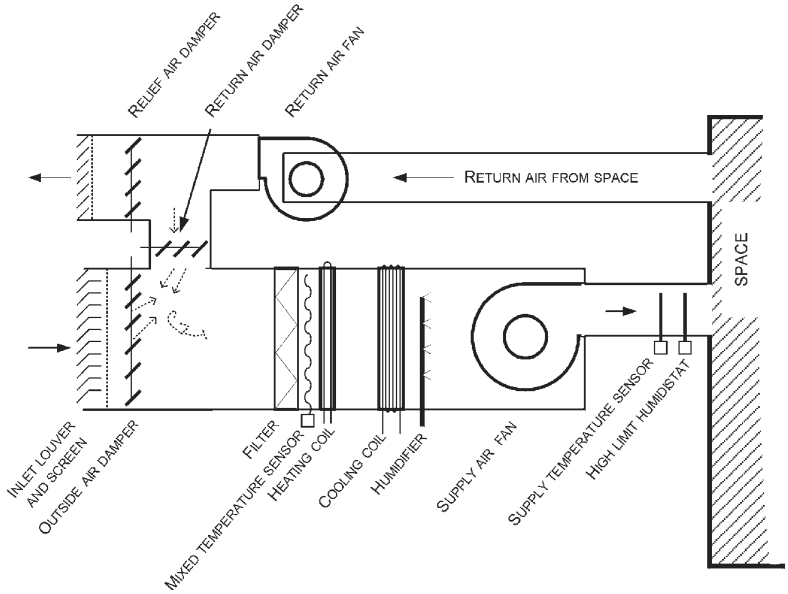
T1465

Chiller *is a complete refrigeration system and produces chilled water (6-10°C) for FCU and AHU.*



T1464

Air Handling Unit (AHU)



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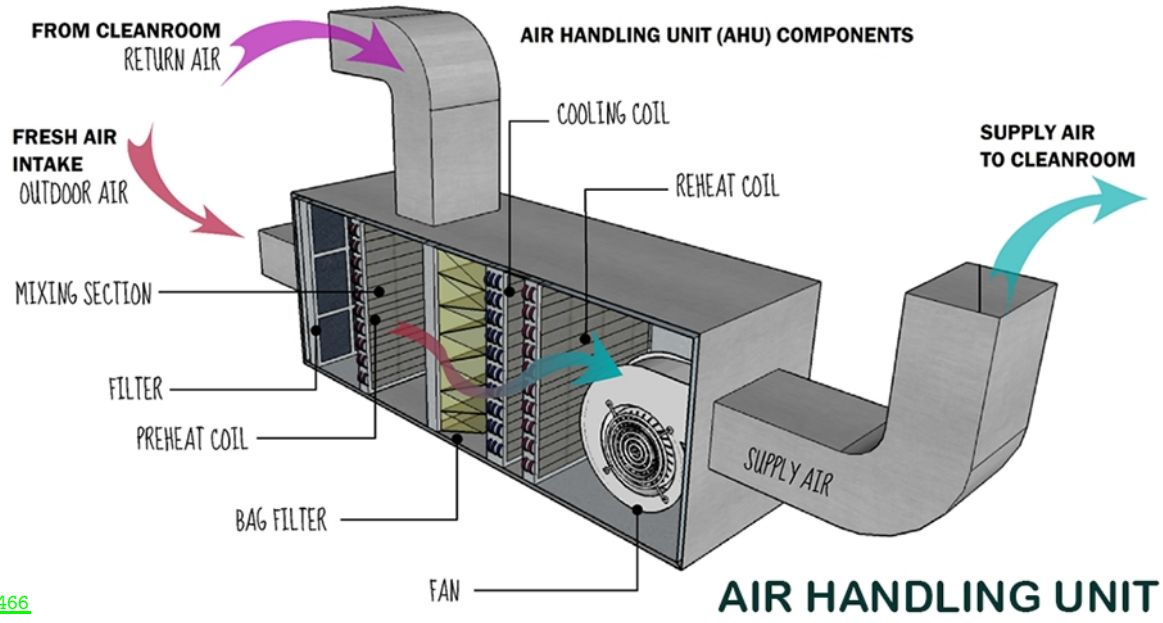
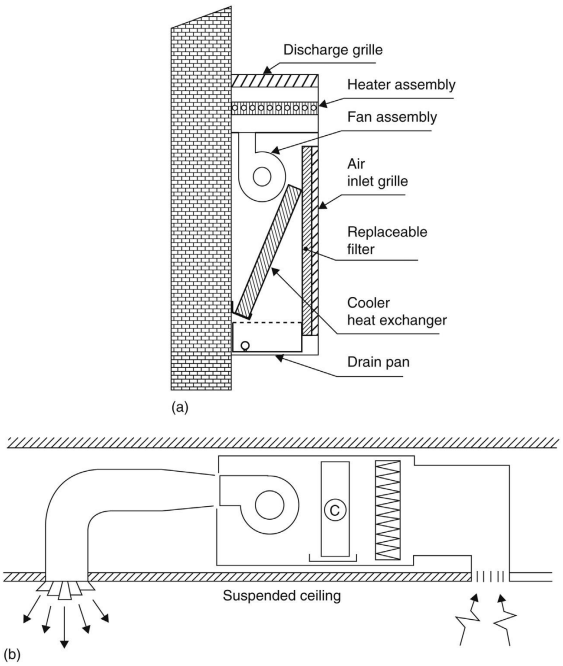
The functions of the air-handler are to draw in outside air and return air, mix them, condition the mixed air, blow the air into the space and exhaust any excess air to outside.



T1466

AHU prepares clean air at a required temperature and humidity.

Fan Coil Unit (FCU)

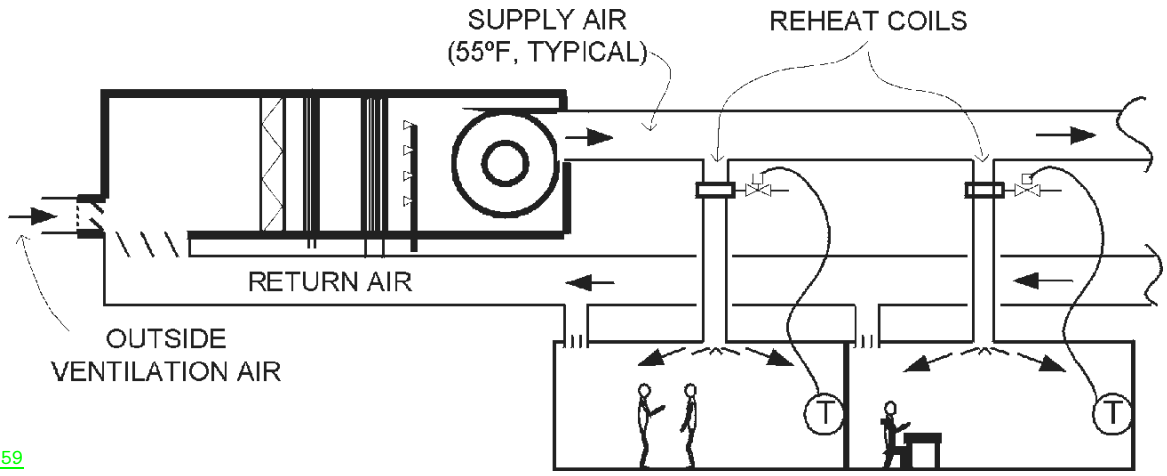


T1308 ***Fan coil units.*** (a) Wall mounted, (b) ceiling mounted.

T1339

FCU: Fan Coil Units, FCU receives air from room and cools it using

All-Air System with Reheat



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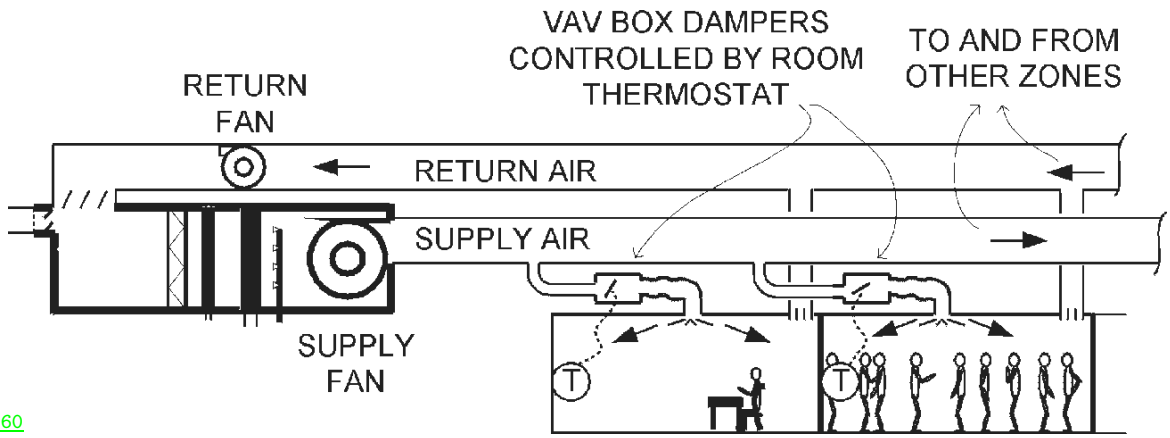
Reheat is the simplest system, known for both its reliability and the down side, its high energy wastage.

All-Air System with Variable Air Volume (VAV)



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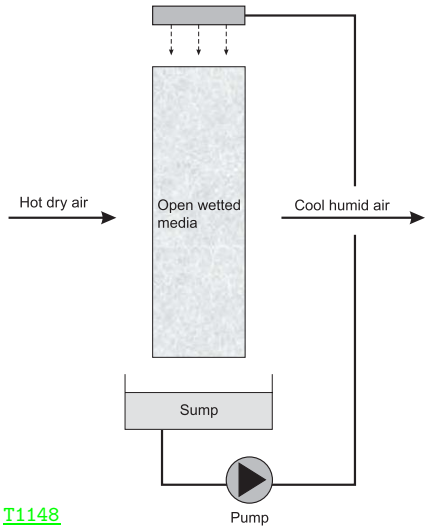
More energy efficient than reheat, VAV is a very flexible system with many virtues. When there is a low load, however, it does offer challenges for maintaining adequate ventilation air and good room air distribution.

Evaporative Cooling



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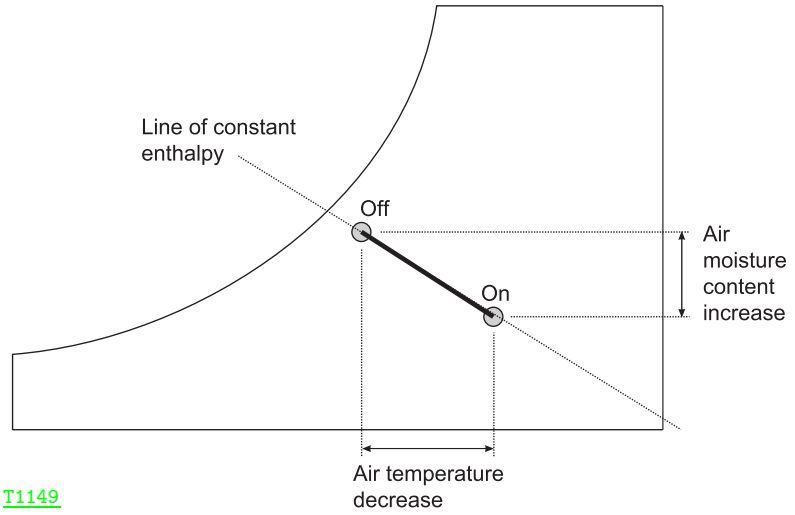

T1149

Thanks a Lot