EARTH AIR TUNNEL COOLING SYSTEM

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Low Energy Cooling System

Conventional design

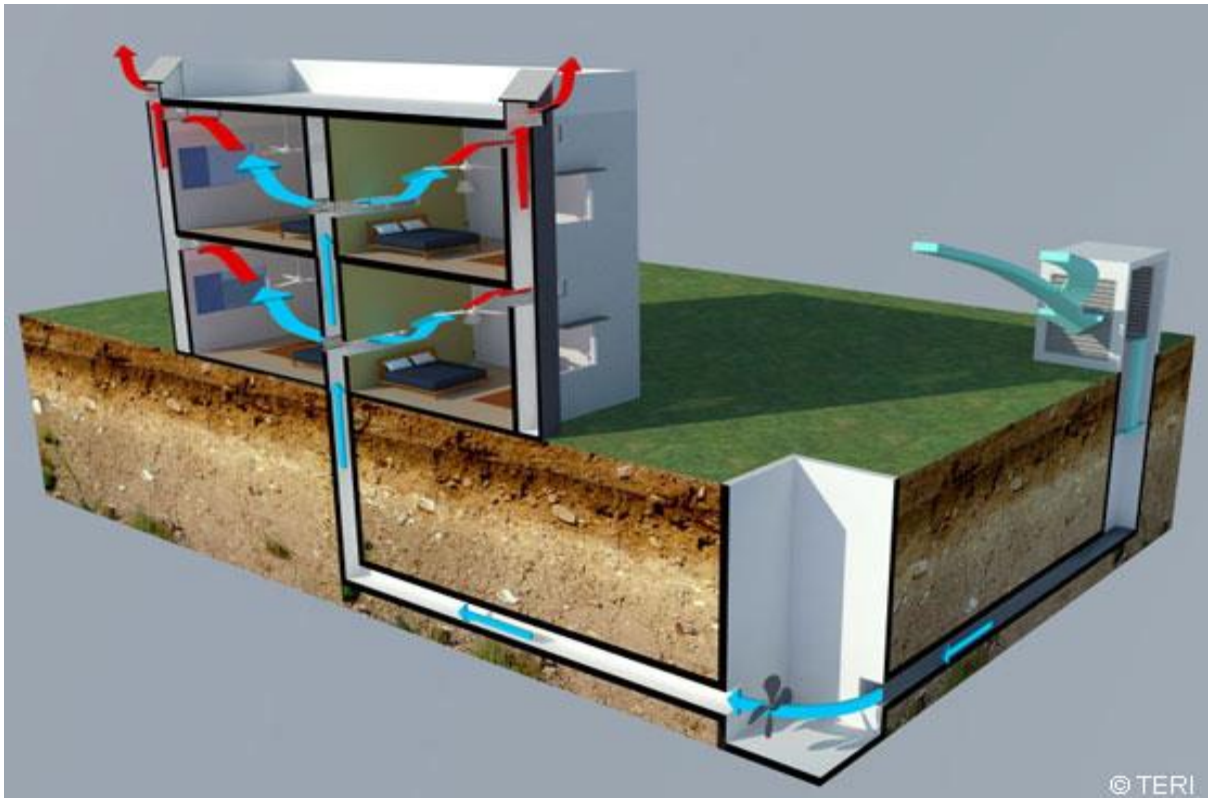
- **Site: TERI university campus, New Delhi**
- **32 rooms hostel**
- **Total air conditioning load: 35 TR**
- **System COP:2.34**

Low Energy Cooling System

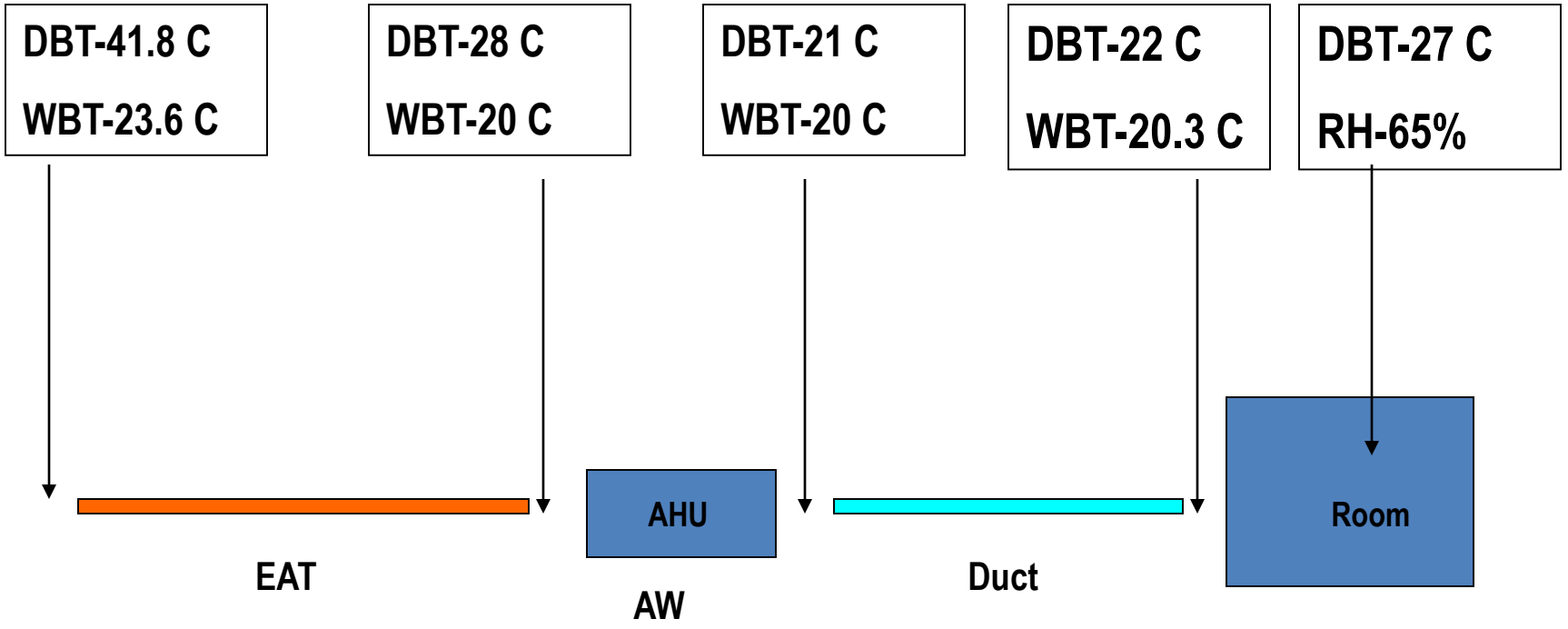
Earth air tunnel along with air washer & DX coil

- **Adaptive thermal comfort: 26~28 ^{0} C /60~70 %**
- **Inside design condition: 27 ^{0} C/65%**
- **Total RSH: 39909 W**
- **Temperature rise: 5 ^{0} C**
- **Total air quantity required: 6000 lps**

EAT Cooling System at TERI University



EAT thermal performance in summer



Conditions of air Entering & Leaving EAT

- Soil Thermo-physical properties selected:
  - Soil thermal conductivity = 2.0 W/m.K
    - Soil density = 2000 kg/m^3
    - Soil specific heat = 2000 J/kg.K

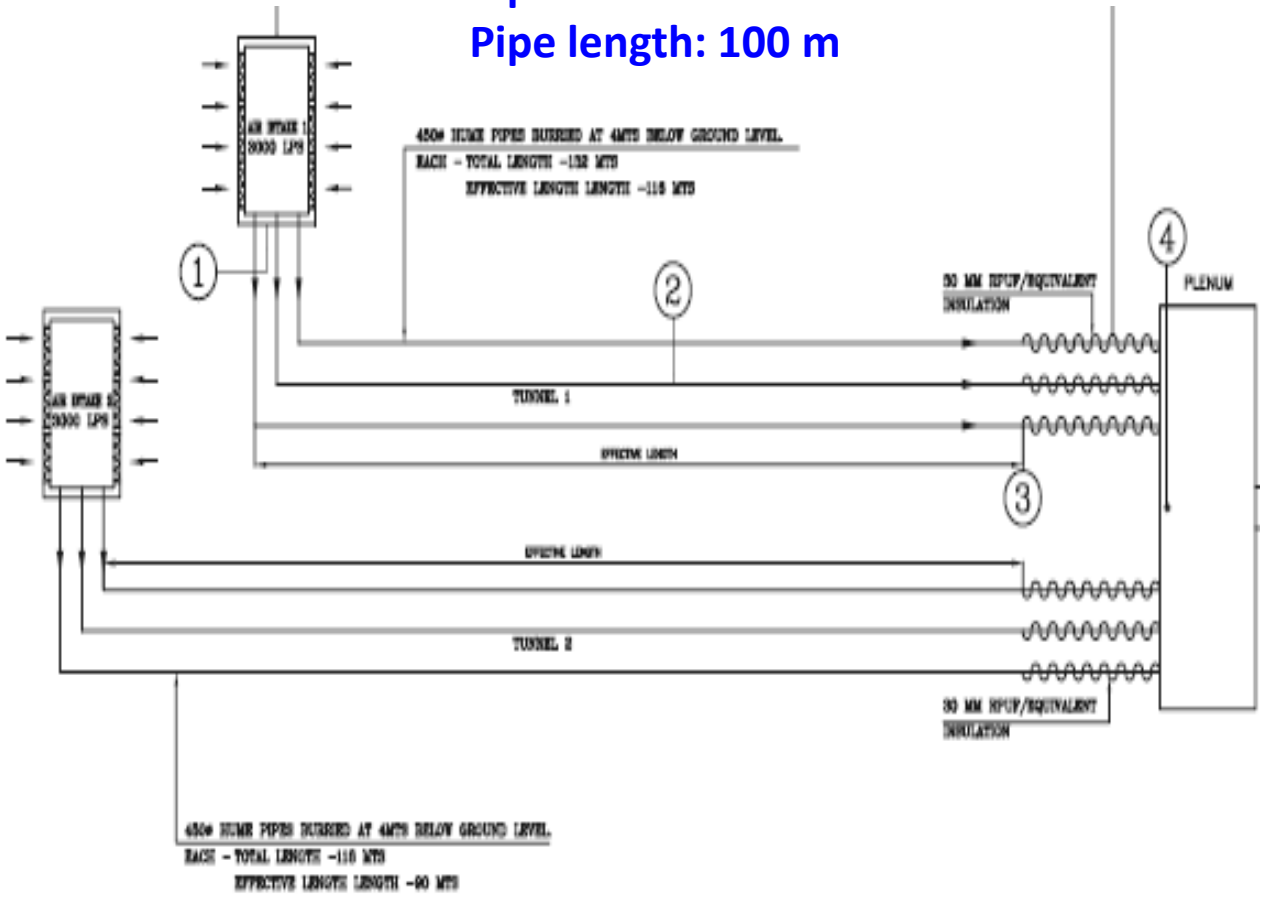
EAT System Design

Earth Air Tunnel

2 Tunnel each having 3 pipes

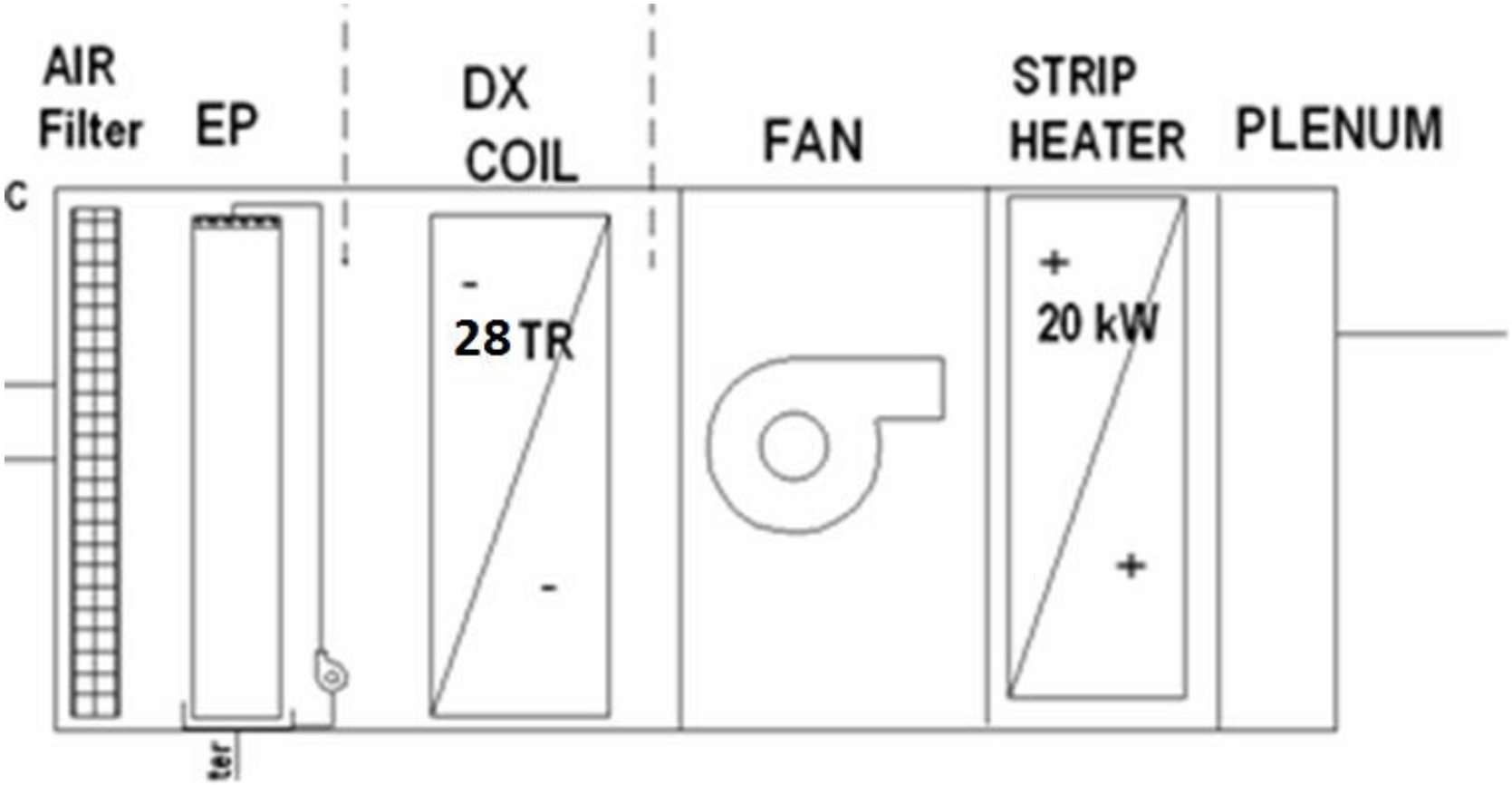
Pipe diameter: 450 mm

Pipe length: 100 m

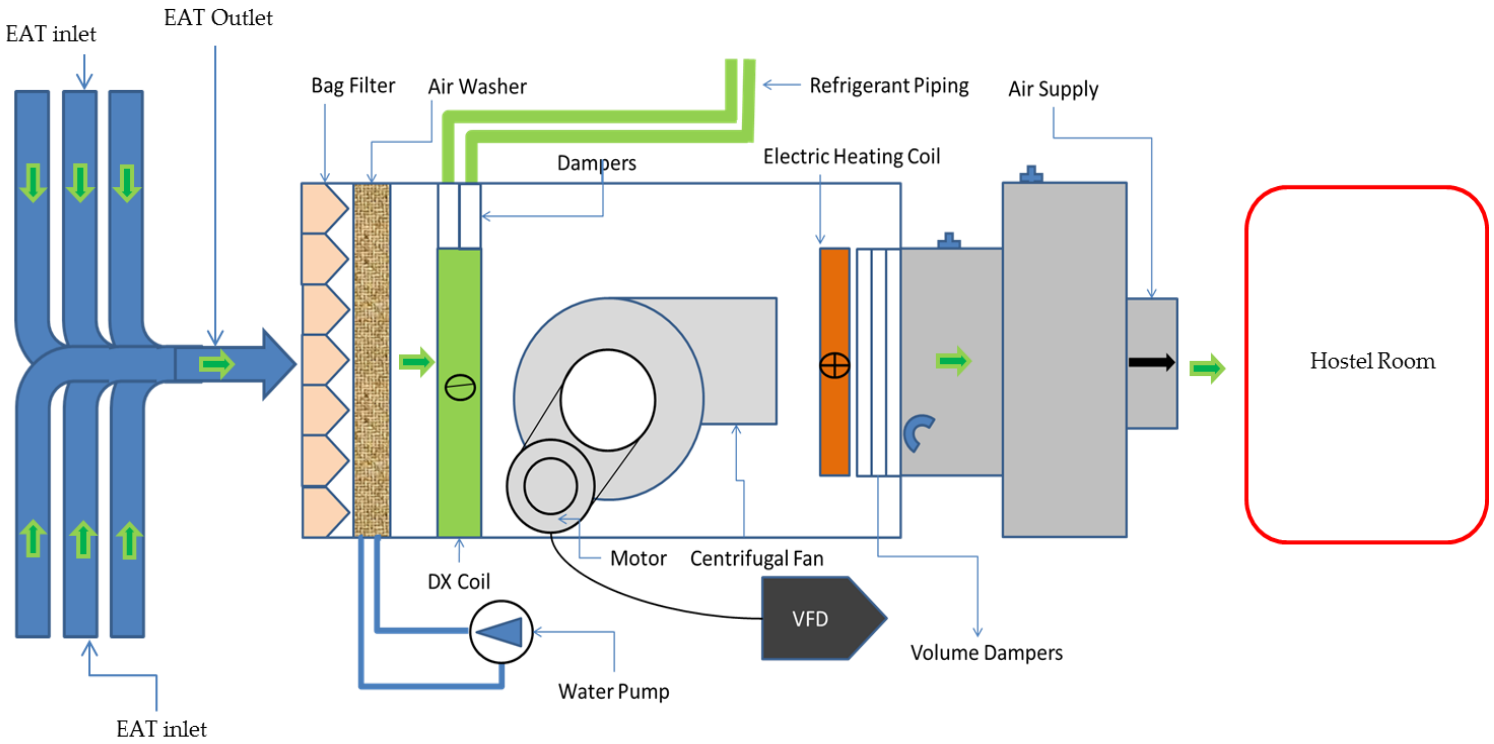


AHU System

Air Handling Unit



EAT Cooling System



Earth Air Tunnel Sizing

Pipe diameter selection

Case-1

- Diameter of pipe : 0.45 M
- Flow through pipe : 1000 lps
- Pipe velocity : 6.25 m/s
- Flow through pipe : 750 lps
- Pipe velocity : 4.7 m/s

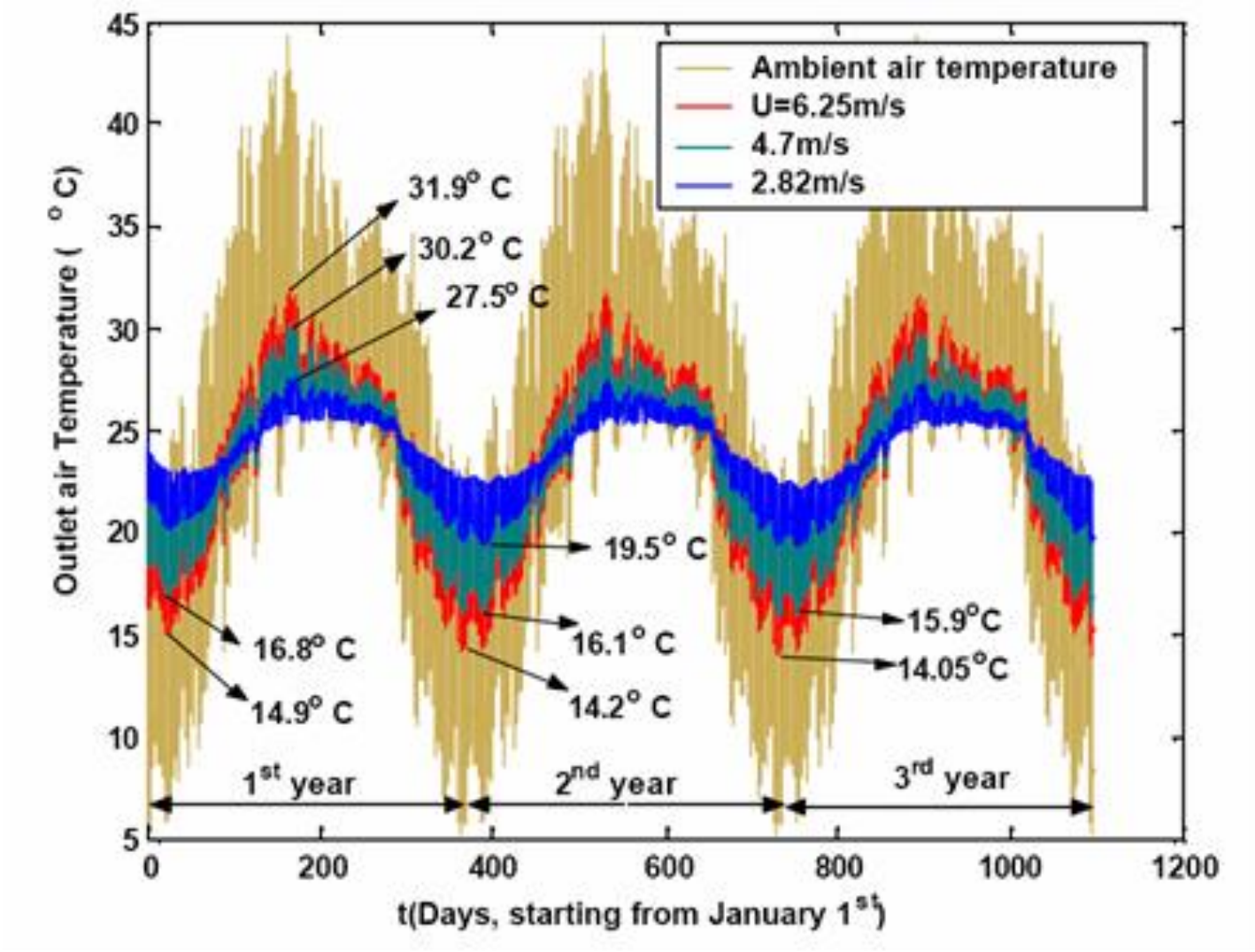
Case-2

- Diameter of pipe : 0.6 M
- Flow through pipe : 1000 lps
- Pipe velocity : 3.57 m/s
- Flow through pipe : 750 lps
- Pipe velocity : 2.7 m/s

Pipe length selection

- L/D : 150~200

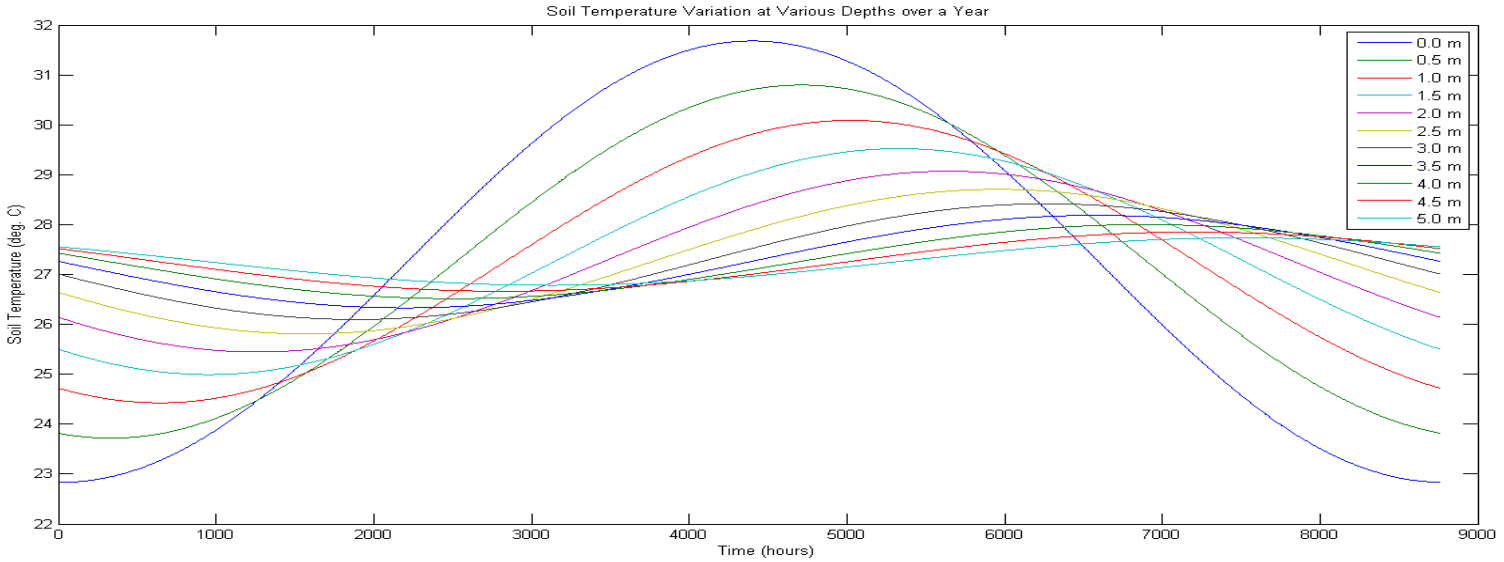
Earth Air Tunnel Simulation Results



EAT: Application of use of Geothermal Energy

- EAT is a technique in which air to soil heat exchange occurs to produce cooling in summer and pre-heating in winter.

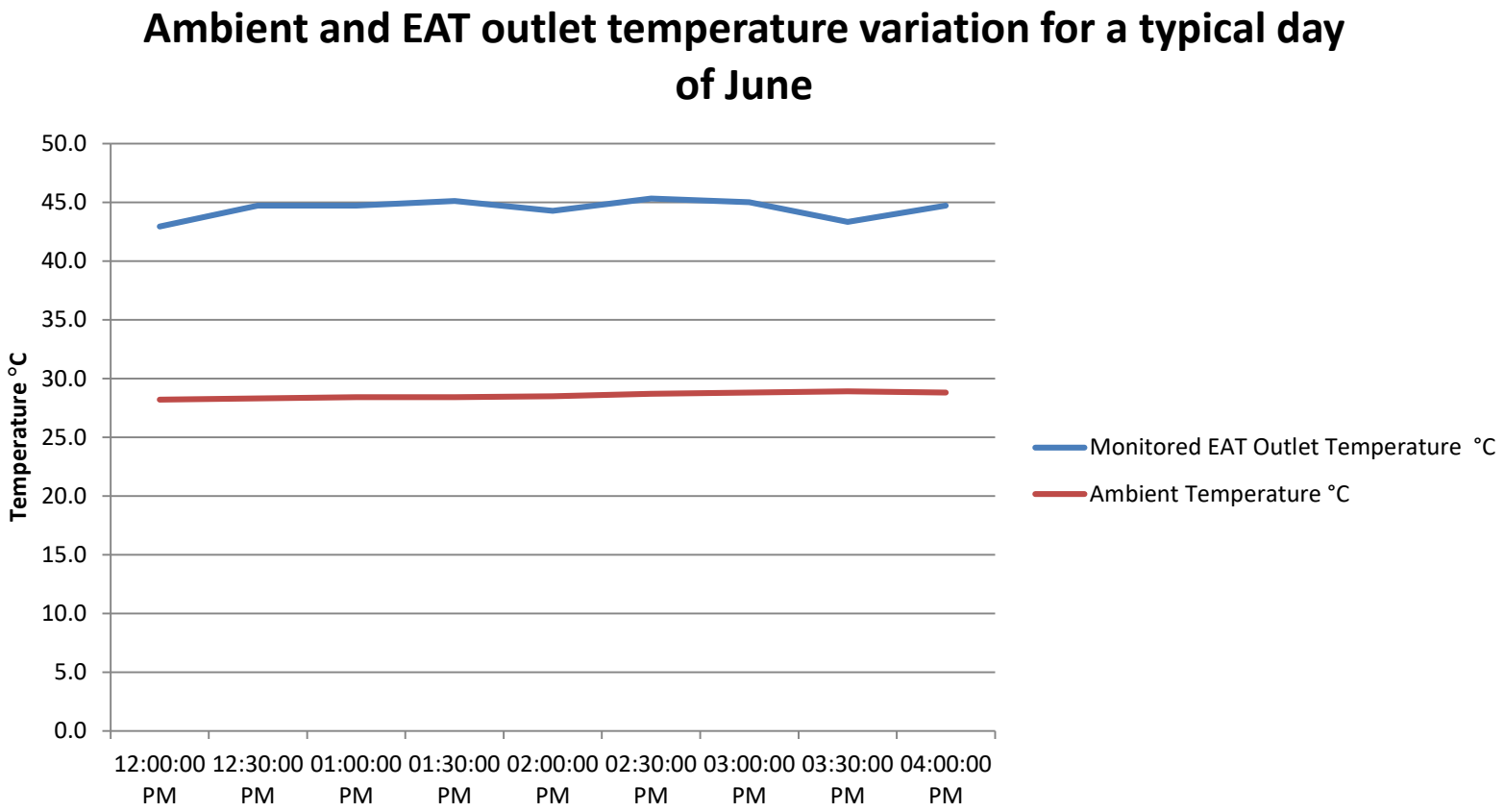
- Two properties of underground soil:
  - Dampening of temperature fluctuations with depth.
  - Phase lag between soil and ambient temperatures.



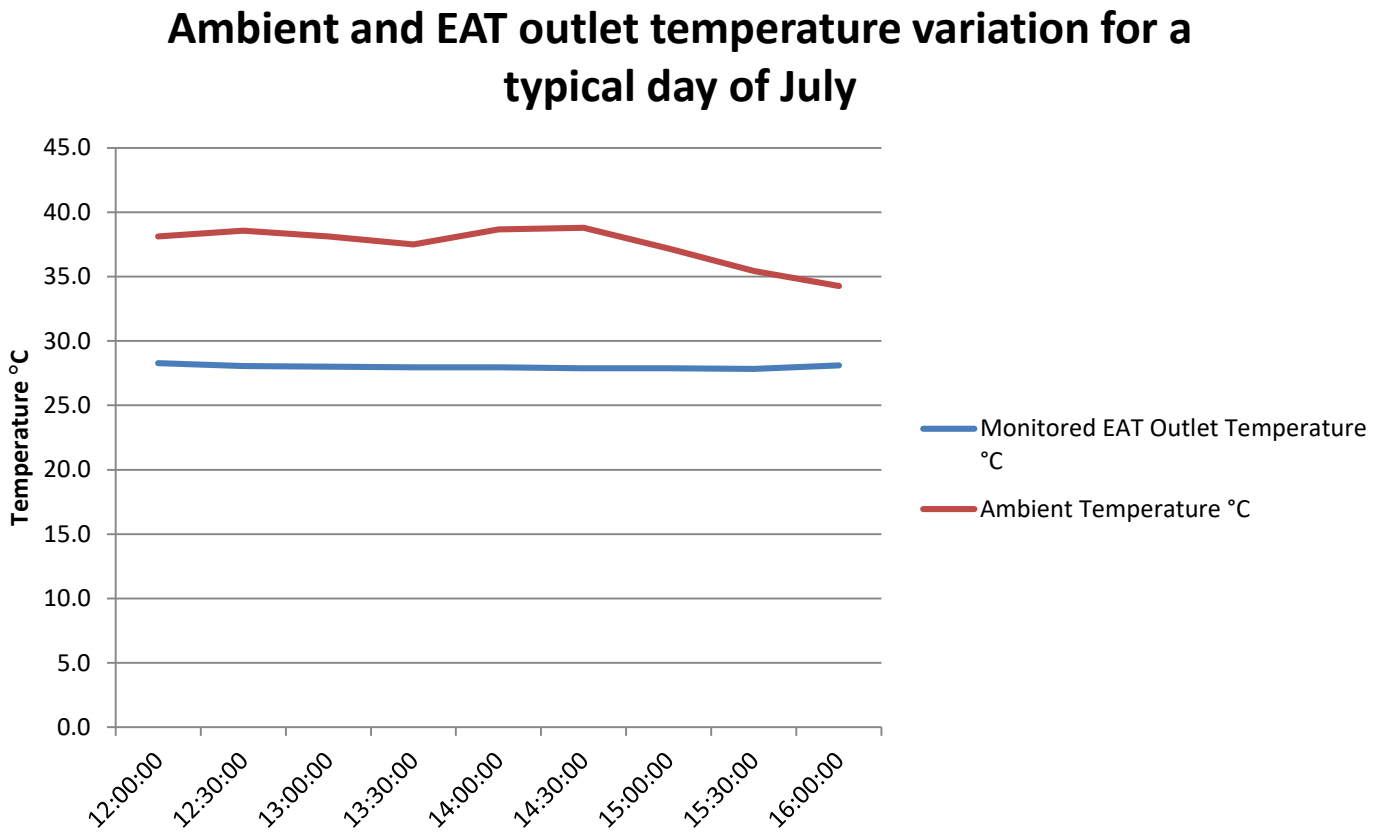
Performance Parameters

- Thermal conductivity of soil
- Pipe Diameter
- Length of tunnel
- Air velocity in pipes

Earth air tunnel outlet air temp in June



Earth air tunnel outlet air temp variation in July (Monsoon)



Thank You!!