EVDS 629 Environmental Control Systems - Learning Objectives

Note: This list summarizes the content to be covered in the course and on which the final exam will be based.

Abilities

- carry out approximate sizing of mechanical systems sufficient for development of conceptual and schematic designs (Stein and Reynolds 223-228, 392, class)
- basic heat loss and heat gain calculations (Stein and Reynolds 120-124, 126-127)
- plot processes on the psycrometric chart (Stein and Reynolds 132-133)

Knowledge

- thermal performance of glazing
  - shading coefficient, solar heat gain factor (Stein and Reynolds124-125)
  - solar heat gain coefficient (class)
  - concept of spectral transmittance (Stein and Reynolds 310, class)
  - angular dependence of transmission (class)
- factors affecting thermal comfort (Stein and Reynolds 34-44)
- the purpose and uses of the psychrometric chart (plotting processes & zones of human comfort) (Stein and Reynolds 39-44)
- meaning of dry bulb temperature, wet bulb temperature, relative humidity, dew point, enthalpy, latent and sensible heat gain (Stein and Reynolds 39, 47, 129)
- heat gain and heat loss (Stein and Reynolds 115-128)
  - conductive heat transfer
    - mechanisms by which it occurs
    - formula for calculating it & the significance of the terms in the formula
    - meaning of R-value, U-value
  - infiltration
    - forces causing infiltration (stack effect, wind pressure)
    - formula for calculating heat exchange due to infiltration & the significance of the terms in the formula
  - internal heat gains
    - significance and magnitude of gains from people, lights, equipment
    - difference between sensible and latent heat gain
- stages in treating and circulating air in the air-conditioning process (Stein and Reynolds 385, 400, class)
- basic typical schematics of the conditioning and circulation of air through different building types (high-rise, low-rise, large footprint low-rise, ground-related residential) (class)
- the role and usual location of primary thermal control system components for smaller buildings (**main fans, filters, coils, chillers, cooling towers & boilersHRV, heat pump**) (Stein and Reynolds 341-378, class)
  - compartmentalized versus centralized systems
- types of air-conditioning systems for large buildings; their advantages and disadvantages (Stein and Reynolds 383-389, 429-444) class)
- air and water systems (Stein and Reynolds 444-452)
- the role and usual location of primary thermal control system components for larger buildings (main fans, filters, coils, chillers, cooling towers & boilers) (Stein and Reynolds as above, class)

Awareness

- spatial and visual issues in the design of systems for thermal and air quality control (Stein and Reynolds 283-300, class)

- the historical evolution of environmental control technology and its relationship to stylistic development (in general terms) (class)
- approaches of recognized designers to systems design (class)
- passive versus active environmental control (e.g., control through envelope design in relation to control through powered systems) (Stein and Reynolds 301-330, class)
- central equipment for large buildings (Stein and Reynolds 401-429, class)
- the role and location of other primary mechanical system components (domestic hot water boiler, water storage for fire fighting, smoke and fire control systems) (class)
- concept and examples of passive and active equivalencies for fire safety systems (class)
- approach to analysis of building code requirements (minor emphasis) (class)
- basic organization and issues in mechanical transport and plumbing systems (class)
- basic issues with respect to wind, people, and buildings (class)