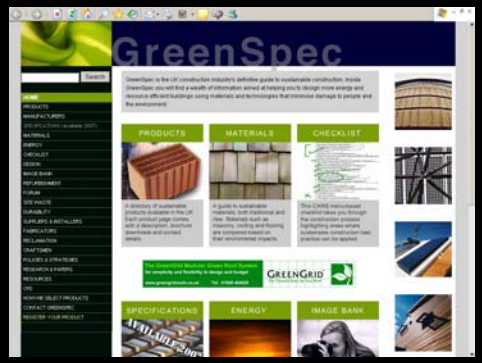

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Air movement in & about buildings

Q&As

© NGS GreenSpec 2007 CPD in 10 parts

GreenSpec CPD Seminar Series

- Educational Objective:
  - Comprehensive introduction to subject: from wind to air-conditioning and a lot more in between
  - emphasis on environmentally sustainable solutions
  - design primer: addressing principles and solutions
  - technically rich: materials, construction, services & testing
  - Related GreenSpec CPD Seminars indicated
  - Questions and answers for each subtopic in file 10
- Audience:
  - Architecture Students Part 1 Year 2
  - CPD update for all levels of experience & knowledge
- Delivery:
  - 3 to 4 hours depending upon audience participation
  - Reading 1 hour
  - 26 subject breaks to enable subdivision

Air Movement in Buildings: Questions & Answers for 9 lessons

- Principles of Element Design
- Climate Change
- Wind
- Wind Tunnel Testing
- Wind Turbines
- Natural Ventilation
- Moisture Vapour & Condensation
- Thermal Insulation
- Breathing Construction
- Airtightness
- Wind & Airtightness Testing
- Building Elements
- Passive Ventilation
- Active Ventilation
- Stack Effect
- Atrium
- Solar Orientation & Solar Gain
- Conservatories
- Thermal mass
- Conduction, Convection, Radiation
- Solar Shading
- Thermal mass, Passive and active cooling
- Fluid dynamics
- Mechanical Ventilation
- Air-Conditioning
- Questions and Answers

Test Yourself Part 1

- When would Performance Drawings be appropriate?
- How will climate change affect the elements that affect buildings?
- What things can be dome to future proof buildings against climate change?

How did you do? Part 1

- In Design and Build or when the specialist subcontractor has to complete the design
- We can expect to see more extreme wind and weather patterns in the future
- Use of multi-fuel boilers and avoidance of need for heating and cooling

Test Yourself Part 2

- How can wind be exploited in buildings
- How can wind turbulence be avoided around tower block bases
- What are the pitfalls of wind turbines attached to buildings
- When and where are vertical axis wind turbines the better choice

How did you do? Part 2

- Opening up the building for passive ventilation, cross flows to refresh the air and remove moisture
- Podium, Shelf, Skirts around the base above pedestrians
- Being too close the building inside the turbulence bubble, efficiency drops off
- In urban area, disturbed air, wind coming from all direction

Test Yourself Part 3

- Name some advantages of layered construction related to ventilation
- What is Venturi Principle?
- What are we trying to remove that relates to Sick Building Syndrome?

How did you do? Part 3

- Clear ventilation zone, uncomplicated eaves detail
- A narrowing in a flue which speeds up the air flow to resist air being blown back down
- Off-gassing from synthetic materials finishes and cleaning fluids

Test Yourself Part 4

- Where can you use Hydrophobic insulation?
- Where can Hygroscopic insulation be used?
- How does Hygroscopic insulation work when in damp conditions?

How did you do? Part 4

- Hydrophobic in dry wall construction and even in external cavity walls
- Hygroscopic in breathing walls
- Hygroscopic insulation absorbs moisture into the fibre leaving the airspace to insulate

Test Yourself Part 5

- How much heat is lost through air leakage?
- At what stage should air testing be carried out?
- How is a house air tested?
- What happens when architects interfere with manufacturer's standard details?

How did you do? Part 5

- 50%
- External envelope substantialy complete, no finishes
- Seal up opening, connect fan suck out air and smoke wand identify leaks
- Often acoustic, fire and airtightness performance integrity compromised

Test Yourself Part 6

- What are the necessary parts of Stack effect?
- Stack effect has been exploited for many centuries name an early example
- How can stack effect be used today

How did you do? Part 6

- A vertical space or duct with heat or heat source at bottom, exit for air at top and entry for air at bottom
- Iron age fort roundhouse
- To remove hot air from buildings by permitting cool air in to replace hot stale air which rises through high level vents

Test Yourself Part 7

- What are the ideal characteristics for thermal mass?
- How does Hockerton exploit Thermal mass?
- How is Mile End different from Hockerton?

How did you do Part 7

- High density, large surface area, exposed to passive heat gains from sun
- Traps sun in conservatory, heats up floor and back wall then warms up house interior
- Mile end stores the heat in the ground below and behind the building, insulation absent in floors is set beyond the building and soil

Test Yourself Part 8

- When would a building be purged of heat?
- How can atrium help to cool buildings?
- What can go wrong with atrium cooling effect?

How did you do? Part 8

- Overnight in summer to remove heat using cool night air
- Air from floors can be drawn from the floors to the atrium using stack effect
- Air from lowest floors can block the air from upper floors or short circuit into the upper floors

Test Yourself Part 9

- Why is mechanical ventilation better than Air-conditioning?
- What opportunities are there for having mixed mode Mechanical ventilation and air-conditioning in the same building?
- How is mechanical ventilation best introduced?
- How does heat recovery work in mechanical ventilation?

How did you do? Part 9

- Far less energy needed to push air than to heat, cool and humidify it
- Ventilation most of the time and air conditioning during performances ore when exhibits warrant it.
- Cool air in at low level to displace hot air rising
- Steal the heat from stale air outgoing to heat the fresh air incoming

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