ENVIRONMENTAL BUILDING SYSTEMS

Environmental building systems definition:

Something built with a roof and walls, which has a combination of parts or form a whole unit that responds to external conditions or surroundings.

Subject aims:

The subject covers key elements of building services and sustainability. The subject includes solar passive design, heating and cooling, vertical transportation, and related comfort issues of indoor air quality, lighting and acoustics.

It also includes services for buildings such as hospitals, auditoria, schools or factories with emphasis on fire safety, electrical, telecommunications systems, and building management.

It also covers strategies and technologies to improve systems efficiency, displacement ventilation, evaporative cooling, and radiant cooling systems, active solar heating, and cooling systems, post occupancy evaluation, façade systems, solar technologies, hybrid (mixed mode) systems, as well as environmental rating tools for comparing building performance.

CONTENTS

AUSTRALIAN STANDARDS

DRAWING

- AS1100:401 Technical drawing conventions – engineering survey and engineering survey design drawing
- AS1100.301 – 1986 Drafting

WATER

- AS/NZS 1432 2004 Copper tubes for plumbing, gas fitting and drainage applications
- AS/NZS 3500.1:2003 Plumbing and drainage water services
- AS/NZS 3500.2.2003 Plumbing and drainage sanitary plumbing and drainage
- AS/NZS 3500. 2..1 1996 National plumbing and drainage sanitary plumbing and drainage – performance requirements
- AS/NZS 3500.3 Pluming and drainage, stormwater drainage
- AS/NZS National plumbing and drainage, domestic installations

AUSTRALIAN STANDARD LIFE CODES (AS 1735 LIFTS, ESCALATORS AND MOVING WALKS GENERAL REQUIREMENTS)

- AS 1735.1 - General requirements
- AS 1735.2 - Passenger and goods lifts – Electric
- AS 1735.3 - Part 4: Passenger and goods lifts – Electrohydraulic
- AS 1735.4 - Part 5: Service lifts – power operated
- AS 1735.5 - Escalators and moving walks
- AS 1735.6 - N/A
- AS 1735.7- Stairway lifts
- AS 1735.8 - Inclined lifts
- AS 1735.9 - Special purpose industrial lifts
- AS 1735.10 - Tests
- AS 1735.11 - Fire rated landing doors
- AS 1735.12 - Facilities for persons with disabilities
- AS 1735.13 - Lifts for persons with limited mobility – manual powered
- AS 1735.14 - Low-rise platforms for passengers
- AS 1735.15 - Low-rise passenger lifts – non automatically controlled
- AS 1735.16 - Lifts for people with limited mobility – restricted use – automatically controlled
- AS 1735.17 - Lifts for people with limited mobility – restricted use – water drive
- AS/NZS 1735.18 Passenger lifts - Part 18 Passenger lifts for private residence – automatically controlled

- British Standards lift codes
    - BS EN81-2 for its acceptance in Australia as an alternative to AS 1735.3

LIMITS OF SLOPE FOR RAMPS, STAIRS AND LADDERS

- AS 1657- 1992: Fixed platforms, walkways, stairways and ladders.

- Evaporation
- Earth coupling
- Reflection of radiation

RULES OF THUMB

- Living areas to the north
- Shading, north horizontal, vertical east and west
- Insulation
    - Walls R1.5
    - Ceiling R3.5
    - Consider the edge of the slab R1.0
- Thermal mass should only be used if it is heated by the sun/other renewable forms and it is cooled by opening windows
- Cross ventilation generally only works 5 times the height of the room

MATERIALS

MATERIAL CONSIDERATIONS:

- Durability
- Low maintenance
- Life cycle environmental impact
- Life cycle cost effectiveness
- Role in improving thermal performance
- Reuse or recycling potential
- Local availability
- Skills needed to construct the system
- Embodied energy throughout lifecycle of material (the upstream stage (materials extraction and manufacture), the in-use or operational stage and the downstream stage (disposal or reuse))
- Embodied energy: The total energy consumed by all of the processes associated with the production of a building. From the mining and processing of natural resources to manufacturing, transport and product delivery.

ENVIRONMENTALLY FRIENDLY MATERIALS

- Investigate ecological impacts
- Abundant materials are generally more sustainable
- Try and find sustainably harvested materials
- Rapidly renewable materials such as bamboo, are a good choice
- Embodied energy is generally directly proportional to its carbon footprint
- Other resources such as water are used in the materials
- Material lifecycle
- Recycled material:
    - Helps the environment by reducing newly extracted materials
    - Use 90% less energy when they are recycled
    - E.g. Aluminium
- Some materials have negative health impacts
- A product won't be sustainable if its physical properties are sustainable for its use

TANK TYPES

- Smaller tanks are often prefabricated however larger tanks are built on site
- Tank types:
    - Round, above water tanks
        - Cheapest type per litre of volume
    - Slimline tanks
        - Usually need a properly formed concrete slab for support, depending on their height to width ratio
    - Storage tanks
        - Very slim modular slimline tanks that lock together to fit into tight spaces
        - Generally, most expensive tank type
    - Underground tanks
        - Save on space
        - Usually have a greater catchment potential than above ground tanks
        - Cost a similar amount to slimline tanks (excluding installation)
    - Bladders
        - Sealed flexible tanks that are suitable for subfloor spaces
        - Good for renovations where space is limited
        - Save on outdoor space and cost a similar amount to slimline tanks
        - Need as little as 600mm clearance
    - Header tank
        - Household systems can incorporate a small header tank located at a higher elevation, perhaps at roof height
        - Low powered pumped is used to transfer water from the mains to the header tank
        - Can be much more efficient than mains pressure pump systems
        - Household water supply pipes need to be sized to suit the low-pressure supply
    - Gravity feed
        - Reliable, silent way to supply rainwater without external power
        - If the rainwater collection area and tank are more than 15m higher than the house, gravity pressure can be sufficient for all domestic uses
    - Waffle pod concrete slab (good thermal mass)
- Pump systems
    - Pressure pumps
    - Pump controllers
    - Mains switch over devices
- Filters
    - Ensure filter housing is accessible
    - Shut off valves are installed so the water won't drain out the pipework
    - Pleated sediment filters must be changed annually if they are part of a drinking water supply
    - Ceramic filters need to be removed for cleaning when the flow rate becomes too low
    - Filters reduce pressure and flow and must be sized correctly and allow for the pressure drop in the pump selection
- System maintenance
    - Monthly:
        - Tank inlet screens
        - Tank outlet screens
        - Lead shedding rain heads
        - First flush diverter
    - Annually
        - Check roofs and gutters and remove debris
        - Check filters annually and replace if necessary