Table of Contents

The majority of the content below covers the topics for the PA, PPD, and PDD exams. However, the content of these three exams goes beyond what is covered in these lectures. I will continue to add more content to cover all the technical subjects eventually.

1.2 - Material Behavior Under Load

1.2A - Material Deformation

Deformation & Hooke's Law
Stress & Strain
Elasticity & Plasticity
Stress/Strain Diagram

1.2B - Mechanical Properties of Materials

Modulus of Elasticity
Ductility & Brittleness
Tension & Compression
Shear & Bending

1.2C - Shear & Moment Diagrams

Sample Questions (Shear & Moment Diagrams)

1.3 Structural Systems & Earthquake Design

1.3A - Structural Systems

Shear Wall, Moment Frame, and Braced Frame
Tributary Area

1.3B - Earthquake Design

Earthquakes
Inertial Forces and Acceleration
Period & Resonance
Damping
Ductility, Stiffness & Strength
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Re-Entrant Corners
Structural Irregularities
Soft & Weak Story

1.3C - Earthquake Design (Continued)

Impacts of Earthquakes on Site Assessment
Non-Structural Design Elements Under Seismic Loads

1.4 - Overturning Moment

Overturning Moment
Safety Factor

1.5 - Wind Loads

Basics of Wind
Wind Loads on Buildings

Sliding, Uplifting & Overturning
Designing for Wind

2.0 Environment & Sustainability

2.1A - Sustainability

What is Sustainability
Sustainable Design Objectives
Global Warming & Greenhouse Effect
Renewable Energy Sources
Geothermal Energy Systems
Wind Turbines

2.1B - The Basics

The Basics
Embodied Energy
Heat, Sensible Heat, Latent Heat
Heat Flow
Thermal Resistance
R-Value, K-Value, U-Value, C-Value
Thermal Comfort
Psychometric Chart

2.2A - Climate Strategies

Climate
Microclimate
Climate Regions of the US
General Design Strategies for Cold & Hot Climates

2.2B-Pt.1 - Sun

Altitude /Azimuth Angles
Latitude
Reading Sun-Path Diagrams

2.2B-Pt.2 - Daylighting

Daylighting Strategies
Thermal Properties of Windows
Surface Films and Low-E Coating
Window Design Strategies for Better Daylighting

2.2C - Passive Heating Systems

- Direct Gain
- Indirect Gain (Trombe Wall)
- Isolated Gain (Sun Space)
- Thermosiphoning

2.3 - Shading

2.4 - Passive Cooling

- How Does Air Flow?
- Natural Ventilation
- Stack Effects, Bernoulli Effect, Venturi Tube)
- High-Mass Cooling (Roof Ponds)
- Night Flushing
- Evaporative Cooling

3.0 Mechanical Systems

3.1 - 3.1- HVAC Basics

- Active Climate Control
- How to Select the HVAC System
- Thermal Zoning
- HVAC System Components
- Boilers
- Furnaces
- Refrigeration Cycle
- Heat Pumps

3.2 - Distribution Mediums

Air Delivery

- Fans
- Air Handling Units
- Designing Ductwork

Water Delivery

- Pumps, Pipes
- Water Delivery Devices

Indoor Air Quality

- Dedicated Outdoor Air System (DOAS)
- Heat Recovery Ventilators (HRVs)
- Energy Recovery Ventilators (ERV)

3.3 - **Small Building Scenarios**

- Small Buildings / Large Buildings
- Local Systems / Central Systems
- Small Building HVAC System Scenarios

3.4 - **Large Building Scenarios**

- Large Buildings HVAC System Scenarios

3.5 - **Bonus Quiz**

- Mechanical Systems Bonus Quiz

4.0 Site Analysis

4.1 - **Zoning Regulations**

- Zoning
- FAR / Setback /Building Footprint/ Total Buildable Area Calculations
- Easement / Right of Way
- Variance
- Planned Urban Development

4.2 - **Site Analysis**

- Site Analysis & Design (Analyzing the Site and Placement of Buildings)

5.0 Water & Plumbing

5.1 - **Water & Site**

- The Water Cycle
- Rainwater Harvesting
- Stormwater Management Strategies

1. Infiltration and Absorption-Based Strategies
   - Permeable Pavements or Ground Covers.
   - Rain Gardens (Bioretention Basins)
   - Bioswales
   - Vegetated Swales
   - Green Roofs
   - Infiltration Trenches & Infiltration Basins
   - Filter Strip
   - Sand Filters

2. Retention and Detention-Based Strategies
   - Retention Basins (Ponds)
   - Detention Basins (Ponds)
   - Constructed Wetlands

5.2-Water in Buildings - Pt-I

- Water Supply
  - Public Water Supply
  - Private Water Supply and Water Wells (Dug, Drilled, Driven…Wells Compared)
- Water Distribution
  - Upfeed & Downfeed Water Distribution
- Pipes & Controls
  - Plastic Pipe Types
  - Galvanized Steel Pipes
  - Valve Types

5.2-Water in Buildings -Pt-II

- Plumbing Fixtures
  - Toilet Types
  - Toilet Bowl and Flush Types
  - Compost Toilets
- Hot Water
  - Water Heater Types
  - Solar Water Heating

5.3 - Drainage

- Sanitary Drainage
  - Components of the DWV Systems (Vent Stack vs. Stack Vent)
  - Traps & Siphonage
  - Grease Traps
- Waste Piping
  - Pipe Materials
  - Pipe Connections
  -

6.0 Electrical Systems

6.1 - The Fundamentals

- The Basics (Voltage, Current, Resistance...)
- AC vs DC, single-phase vs three-phase
- Service entrance
- Distribution Hierarchy