



# BUILDING SERVICES III

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"Architecture is not just about space-making; it's about environment-making."

# What Are Building Services?

## The Systems that Bring a Building to Life

**Building Services** are the engineered systems and technologies installed in buildings to provide a safe, comfortable, functional, and productive environment for the occupants. They are the dynamic, performance-oriented counterpart to the static, structural shell.

**Why they matter:** A building without services is just a shelter. With services, it becomes a modern, usable space.

**"Invisible Architecture"** – They are typically concealed but are fundamental to the user's experience.

# Categories and Examples of Building Services

Category	Purpose	Key Examples
<b>Environmental Control</b>	Provide occupant comfort	<b>HVAC</b> (Heating, Ventilation, Air Conditioning), <b>Lighting</b> (Natural & Artificial)
<b>Public Health</b>	Ensure hygiene and sanitation	<b>Water Supply, Drainage &amp; Sewage, Gas Supply</b>
<b>Safety &amp; Protection</b>	Protect life and property	<b>Fire Detection &amp; Alarm, Sprinklers, Emergency Lighting, Security Systems</b>
<b>Transportation</b>	Enable movement within building	<b>Lifts (Elevators), Escalators, Moving Walkways</b>
<b>Communication</b>	Facilitate information flow	<b>ICT (Data Cabling), Telephony, Public Address (PA) Systems</b>

# The Concept of "Invisible Architecture"

- ▶ Noticed by Absence, Not Presence.
- ▶ Services are "invisible" because we only actively notice them when they **fail** or are **absent**.
  - ▶ **Thermal Failure:** A glass-walled building with no effective shading or cooling becomes a **greenhouse**—uninhabitable despite its beauty.
  - ▶ **Acoustic Failure:** A restaurant with hard surfaces everywhere becomes unbearably **noisy**—killing conversation and comfort.
  - ▶ **Visual Failure:** A museum with glare on the artwork **ruins the viewing experience**.
- ▶ **Conclusion:** The success of the architectural design is dependent on the silent, correct operation of its services.



# Architect vs. Engineer: The Critical Division of Labor.

Aspect	The Architect (The Integrator)	The Engineer (The Designer)
Primary Focus	Space, Form, and Coordination	System Performance and Calculation
Key Tasks	<ul style="list-style-type: none"><li>- Allocates space (shafts, plant rooms).</li><li>- Ensures aesthetic integration.</li><li>- Coordinates between all disciplines.</li><li>- Oversees site installation.</li></ul>	<ul style="list-style-type: none"><li>- Calculates heating/cooling loads.</li><li>- Sizes ducts, pipes, cables.</li><li>- Selects technical equipment (pumps, fans, boilers).</li><li>- Ensures code compliance.</li></ul>
Analogy	The <b>Film Director</b> (orchestrates the whole production)	The <b>Specialist Cinematographer</b> (masters the technical details of lighting)
Exam Answer	"The architect <b>reserves the space</b> and <b>coordinates</b> the integration."	"The engineer <b>sizes the systems</b> and <b>selects the equipment.</b> "

# The Four Pillars of Indoor Comfort.

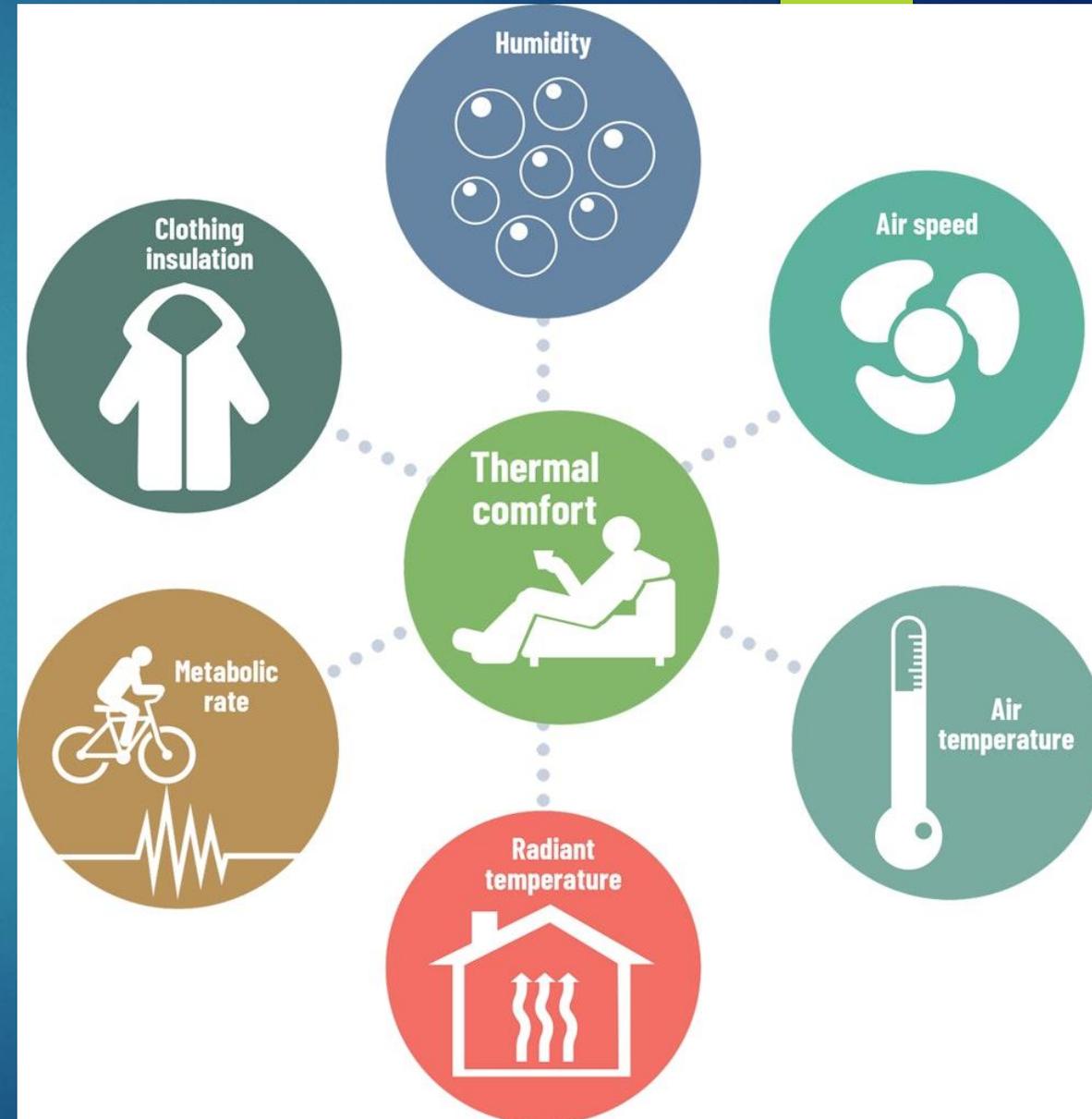
The Fundamental Human Needs in a Built Environment

1. Thermal Comfort
2. Visual Comfort
3. Acoustic Comfort
4. Indoor Air Quality (IAQ)



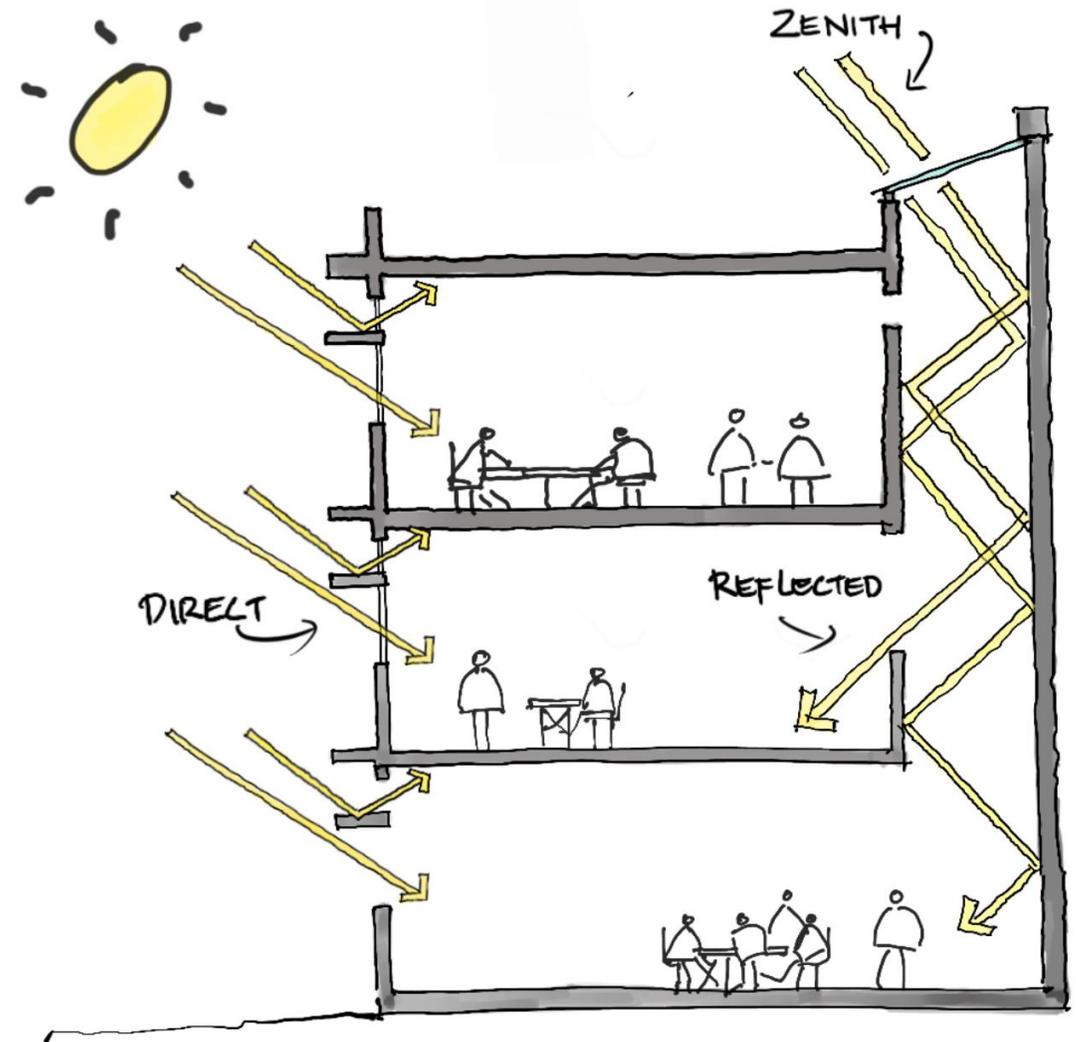
# 1. Thermal Comfort

- ▶ **What it is:** The state of mind that expresses satisfaction with the thermal environment (not too hot, not too cold).
- ▶ **Provided by: HVAC Systems,** insulation, shading.
- ▶ **Exam Note:** Factors include air temperature, radiant temperature, humidity, and air speed.



## 2. Visual Comfort

- ▶ **What it is:** The state of mind that expresses satisfaction with the visual environment (enough light, no glare).
- ▶ **Provided by: Windows (daylighting) + Artificial Lighting Systems.**
- ▶ **Exam Note:** A key goal is balancing natural and artificial light to avoid glare on screens.



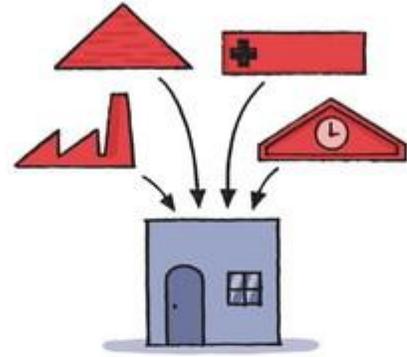
# 3. Acoustic Comfort

- ▶ **What it is:** A building's ability to provide an environment with appropriate sound levels and minimal disturbance.
- ▶ **Provided by:** Sound insulation, absorption materials, acoustic zoning.
- ▶ **Exam Note:** Critical in spaces like lecture halls, libraries, and offices.

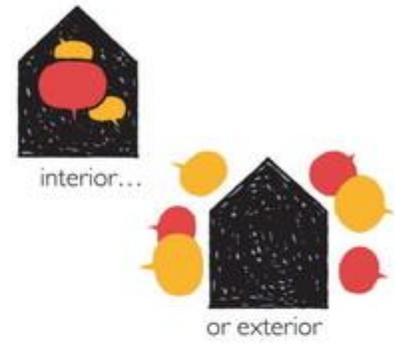
## Designing for acoustic comfort

To design acoustically comfortable buildings, it is important to take into account the needs of the occupants, as well as a variety of external and architectural factors:

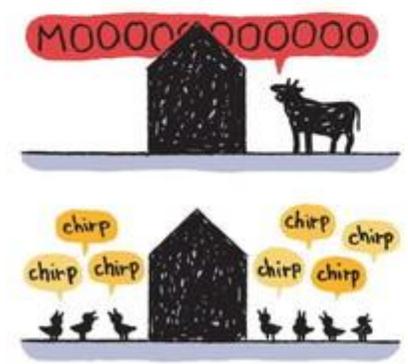
The activities to be performed,



the types of noise to be managed,



the spectrum of noise to be managed,



the construction system and materials...



However, sound is difficult to predict. Computer simulations are very useful but cannot replace on-site testing and the experience of an acoustic engineer.



# 4. Indoor Air Quality (IAQ)

- ▶ **What it is:** The nature of air inside the building that affects occupant health and comfort.
- ▶ **Provided by: Ventilation Systems** (bringing in fresh air, filtering out pollutants).
- ▶ **Exam Note:** Poor IAQ leads to "Sick Building Syndrome" (headaches, fatigue).

## BENEFITS OF GOOD INDOOR AIR QUALITY



BETTER BREATHING



MOISTURE CONTROL



FEWER ALLERGENS



LOWER ENERGY COSTS



BETTER SLEEP

# Safety Systems: The Non-Negotiables

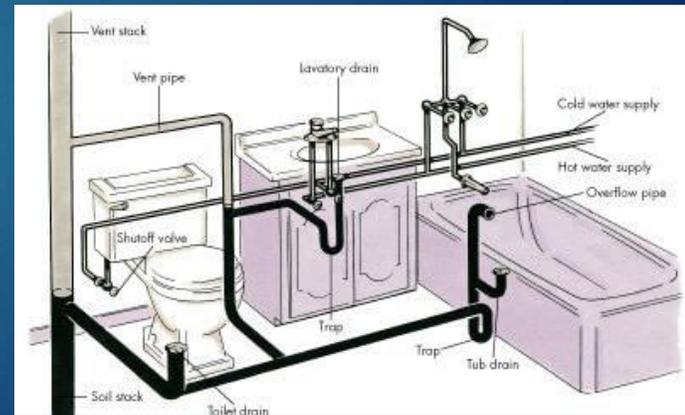
## Protecting Lives and Property

### ► Fire Safety Systems:

- **Active: Sprinklers**, fire alarms, smoke detectors, emergency lights.
- **Passive:** Fire-rated walls/doors, compartmentation, escape stair design (*Note: Passive is often the architect's direct responsibility*).

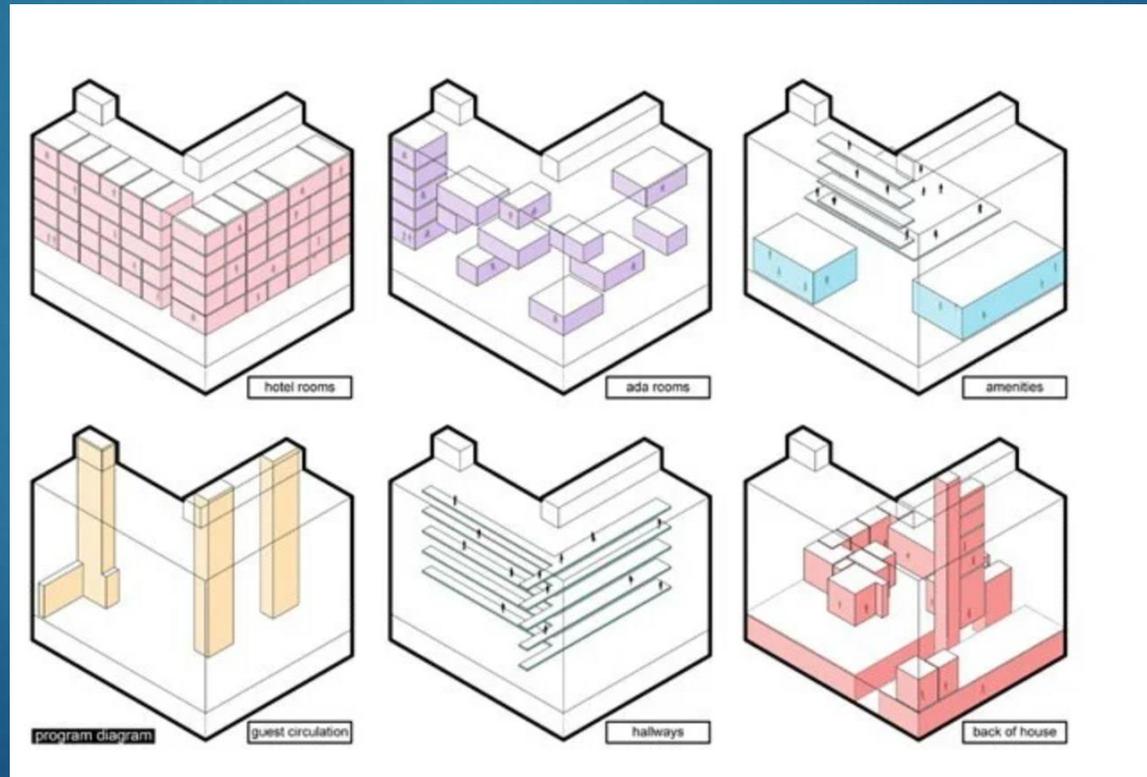
### ► Sanitation Systems:

- **Potable Water:** Safe, clean water for drinking and washing.
- **Drainage:** Safe and hygienic removal of wastewater to prevent disease.



# Spatial Planning for Services – The Architect's Main Task

If You Don't Design the Space, It Will Be a Problem



# The Four Key Spatial Elements to Design:

## 1. Vertical Shafts / Risers:

- ▶ **Purpose:** Continuous vertical channels for ducts, pipes, and cables.
- ▶ **Design Tip:** Group them in a central "**service core**" for efficiency.

## 2. Horizontal Voids:

- ▶ **False Ceiling (Suspended Ceiling):** The primary void for air conditioning ducts, light fixtures, sprinkler heads, and speakers.
- ▶ **Raised Floor:** Creates a void for power and data cabling to be distributed flexibly (common in offices).



# The Four Key Spatial Elements to Design:

## 3. Plant Rooms:

- ▶ **Purpose:** House large, noisy equipment (boilers, chillers, pumps, generators).
- ▶ **Location:** Basements, roof tops, or dedicated service floors. They require **large access doors** for maintenance and replacement.

## 4. Access for Maintenance:

- ▶ **Principle:** Every valve, filter, and motor must be accessible. Design **access panels** and clear routes.



# The Design Process: Integrated vs. Traditional

- ▶ **The Traditional (Failed) Approach:**

Architect → Structural Engineer → Services Engineer.

- ▶ **Problem:** The architect designs the form first. Engineers are asked to "fit" systems in later. This leads to **clashes** (e.g., duct vs. beam), **low ceilings**, and **compromised design**.

- ▶ **The Integrated (Correct) Approach:**

- ▶ **Solution:** All disciplines work together from the **conceptual design stage**. Problems are solved early using tools like **BIM (Building Information Modelling)** for clash detection.
- ▶ **Result:** A building where structure and services are elegantly and efficiently integrated.



# Why It All Matters: Sustainability and Efficiency

- ▶ **The Statistic:** Buildings consume **~40% of global energy** and contribute to **~30% of global greenhouse gas emissions**. The majority of this is from **operational energy** (heating, cooling, lighting).
- ▶ **The Architect's Influence:** Your design choices directly impact this:
  - ▶ **Building Form & Orientation:** Affects solar heat gain and need for cooling.
  - ▶ **Window Placement:** Affects daylighting (reduces lighting energy) and ventilation.
  - ▶ **Space for Efficient Systems:** Allowing room for larger ducts, better insulation, and efficient equipment.

**Conclusion:** Good service integration is no longer just about comfort—it is an **ethical and environmental imperative**.

# Summary & Conclusion

## ▶ The Three Key Takeaways:

- ▶ **Services are Fundamental:** They are not an add-on but a core component of modern architecture that enables comfort, safety, and function.
- ▶ **Architect as Integrator:** Your role is spatial planning, coordination, and ensuring aesthetic integration, not technical calculation.
- ▶ **Design Early and Collaborate:** Integrate service considerations from the very first sketch to avoid costly and ugly problems later.

"Mastering the integration of the 'invisible architecture' is what will separate your designs as truly professional, functional, and sustainable."



# Thank You!

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