# WORLD’s EVOLUTION THROUGH ENGINEERING

## Ancient Era

- (Invention of Wheels, Lever, Pulley, **Great wall of China & The Great pyramid of Giza)**

## Middle ages

- (Hagia Sophia **(Roman empire)**
- (Wind power machine, steam powered machine, Spinning wheel & Astronomical clock **(Islamic Golden age)**
- Steam Engine lead to Industrial revolution **(European Renaissance)**

## Modern Era

- (Mechanical, Electrical, Electronics, Aerospace, chemical & Computer engineering)

**GLOBAL MARKET**
$ 17.6 TRILLION

**PAKISTANI MARKET**
PKR 2.6 TRILLION

# Marvels of Modern Era Engineering

# WORLD’S TALLEST BUILDING
## Burj Khalifa

- World’s Tallest Skyscraper – (163 floors & 828 meters)
- Record-Breaking Elevators – (Speeds up to 36 km/h)
- Sustainability Focus – (Water recycling )
- Night time Spectacle – (Features mesmerizing LED light)
- Massive Investment – ($1.5 billion USD)

# Electrical Engineering

## Role in Burj Khalifa

- Power distribution
- Elevators
- Lighting

## Practical Work

- Design and maintain electrical wiring and lighting systems
- Ensure uninterrupted power supply
- Monitor elevator and backup power systems

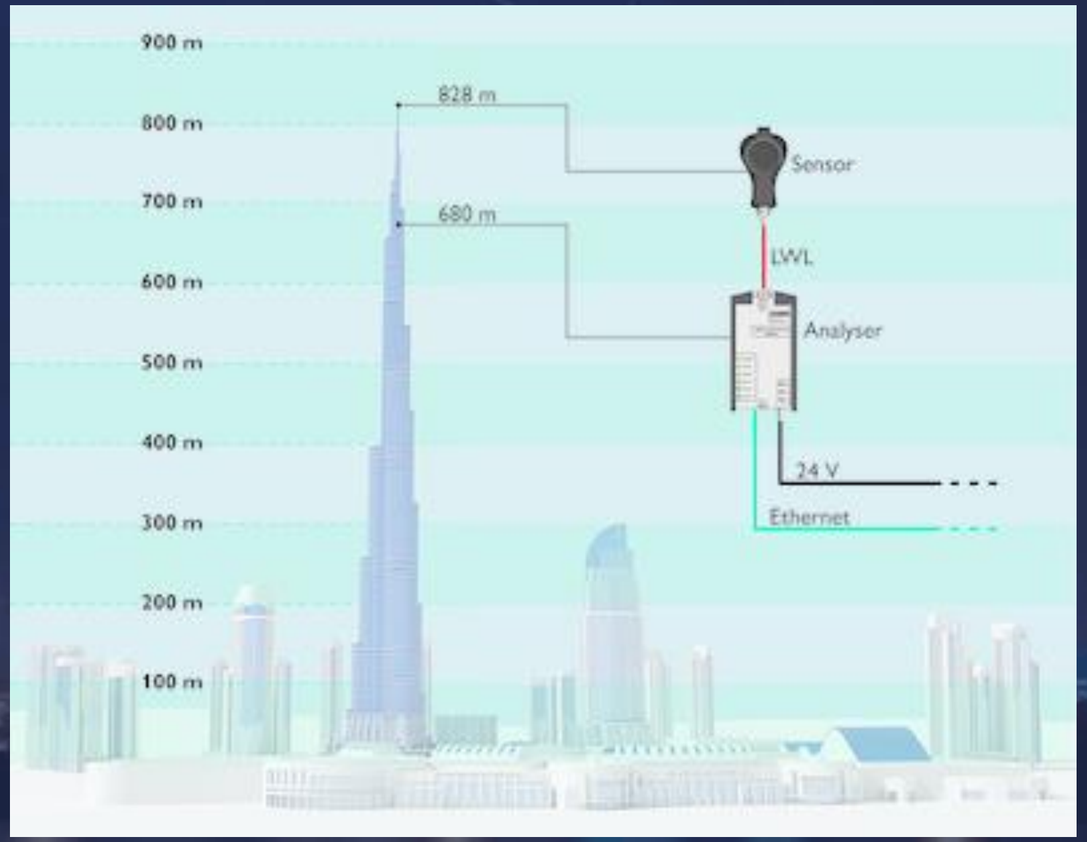
**Areas of Interest**
- Power Systems
- Circuit Design
- Safety Codes

**Aptitude**
- Resilience and Patience
- Interest in Physics & Maths
- Curiosity for Technology

**Starting Salary**
- Pakistan: 75k–150k PKR
- UAE: 6k–12k AED
- USA: $60k–80k

# Integrated Faraday Cage & Lightning Protection

Handles 200 kA lightning strikes safely to ground



# Civil Engineering

## Role in Burj Khalifa

- Foundations
- Superstructure

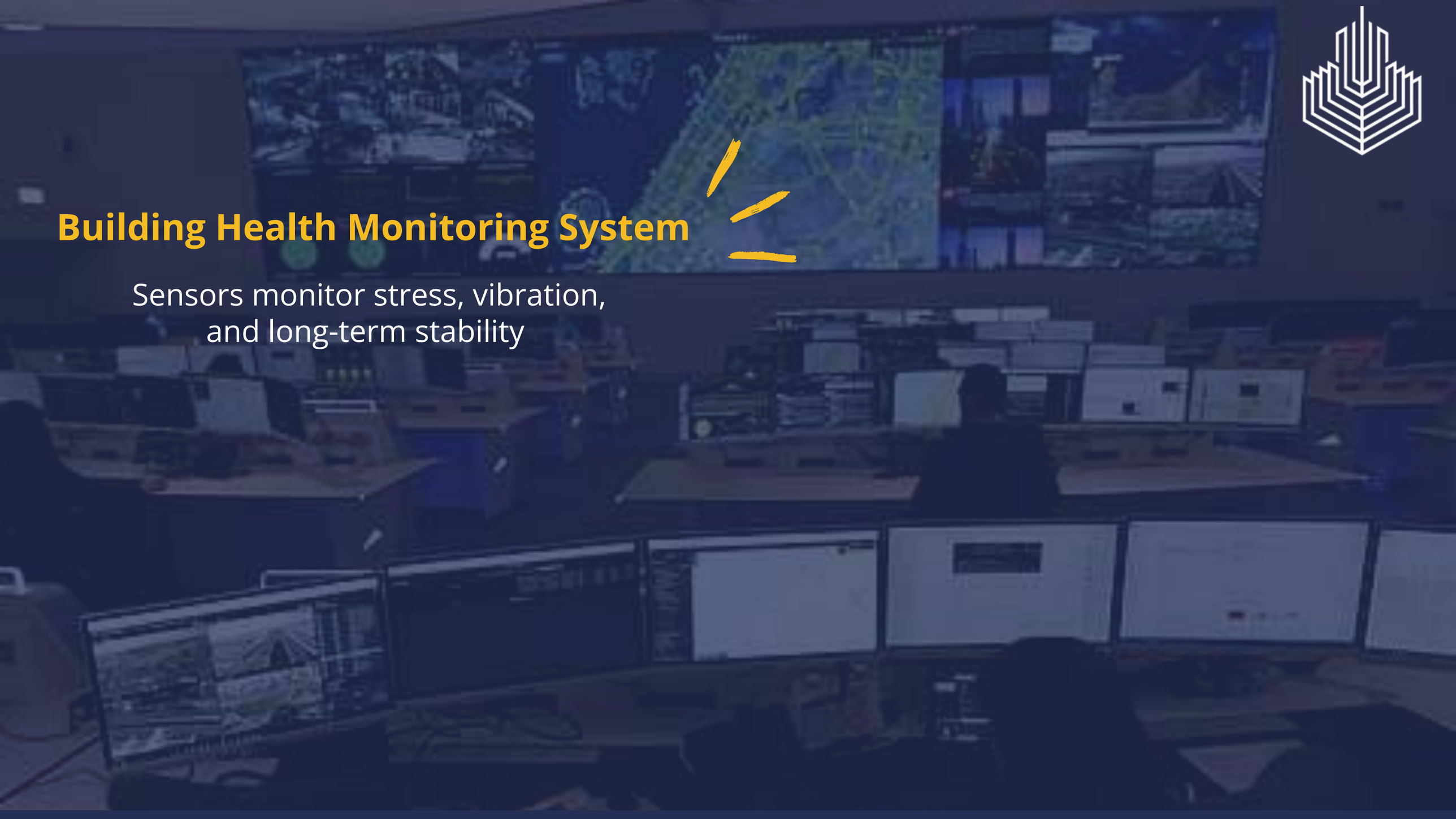
## Practical Work

- Prepare structural plans and supervise construction
- Manage on-site teams and quality control
- Ensure stability of foundations and skyscraper structure

**Areas of Interest**
- RCC/Steel Design
- Project Management

**Aptitude**
- Visualization Skills
- Adaptability
- Structural Design

**Starting Salary**
- Pakistan: 70k–140k PKR
- UAE: 5k–11k AED
- USA: $58k–78k



# Building Health Monitoring System

Sensors monitor stress, vibration,
and long-term stability

# Mechanical Engineering

## Role in Burj Khalifa

- **HVAC systems**
- **Firefighting** (Design, Installation & Maintainence)

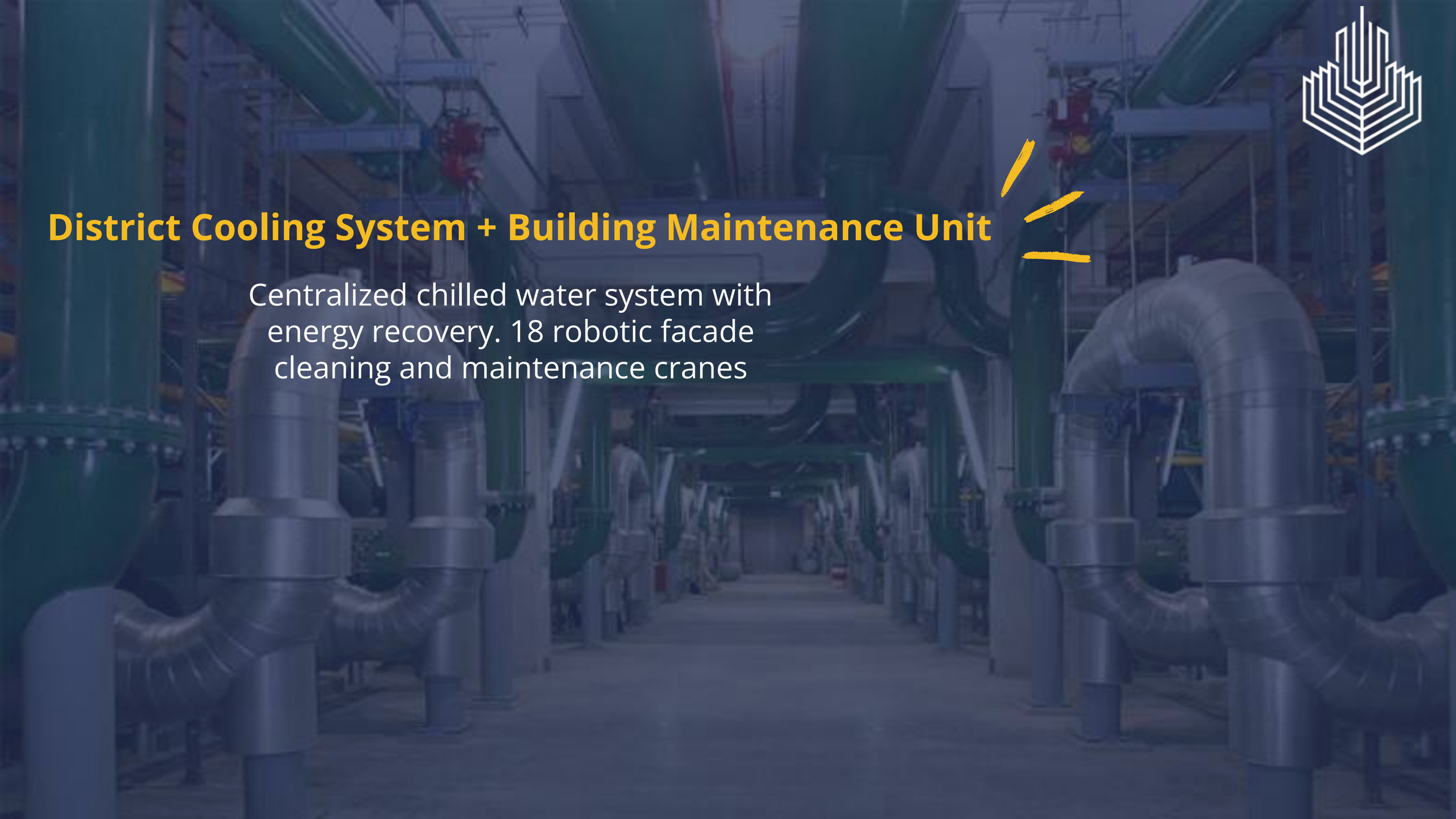
## Practical Work

- Install and maintain HVAC (heating, cooling) systems
- Design plumbing and water systems
- Implement fire protection and safety systems

**Areas of Interest**
- Mechanics & Dynamics
- Robotics & Automation
- Hydraulics

**Aptitude**
- Mechanical Design
- Innovation
- Motion & Machinery

**Starting Salary**
- Pakistan: 75k–145k PKR
- UAE: 6k–12k AED
- USA: $62k–82k



## District Cooling System + Building Maintenance Unit

Centralized chilled water system with energy recovery. 18 robotic facade cleaning and maintenance cranes

# Architectural Engineering

## Role in Burj Khalifa

- Tower design
- Aesthetics

## Practical Work

- Create architectural designs and 3D models
- Plan interior and exterior spaces
- Collaborate with engineers for structural feasibility

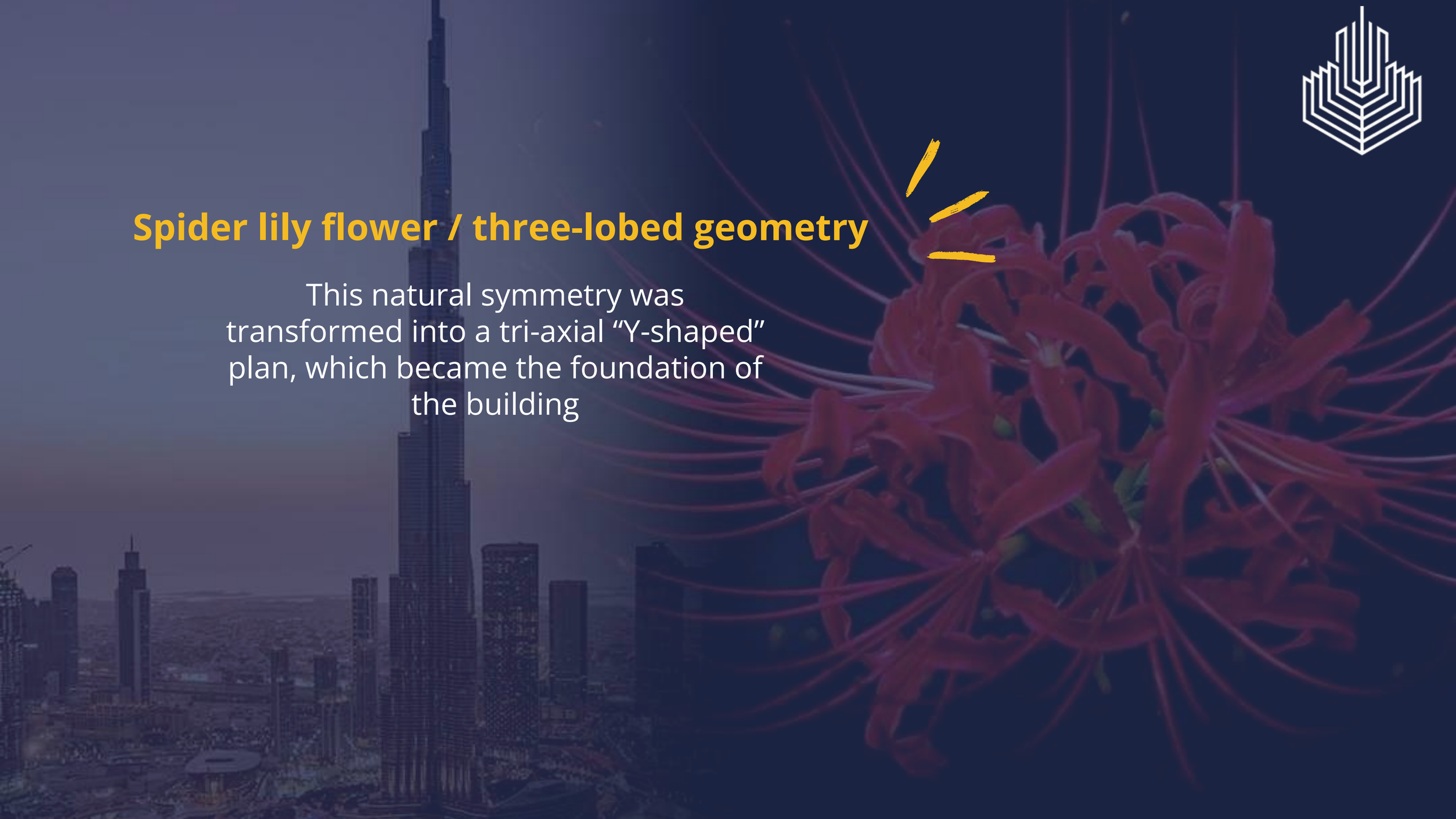
**Areas of Interest**
- Design
- Urban Planning
- 3D Modeling

**Aptitude**
- Strong imagination & creativity
- Interest in art & design
- Good sense of aesthetics

**Starting Salary**
- Pakistan: 80k–145k PKR
- UAE: 6k–12k AED
- USA: $62k–82k

## Spider lily flower / three-lobed geometry

This natural symmetry was transformed into a tri-axial “Y-shaped” plan, which became the foundation of the building



# Software Engineering

## Role in Burj Khalifa

- **Building automation**
- **Smart systems**

## Practical Work

- Develop software for automation of elevators, lighting and security systems
- Integrate building management systems
- Troubleshoot and maintain digital systems

**Areas of Interest**
- Programming
- Databases
- AI/ML

**Aptitude**
- Patience and persistence
- Strong mathematical reasoning
- Interest in technology

**Starting Salary**
- Pakistan: 70k–180k PKR
- UAE: 7k–15k AED
- USA: $70k–95k

# Advanced Building Management System

Network management & system integration for elevators, building health and safety, fire systems, security monitoring systems

# Industrial Engineering

## Role in Burj Khalifa

- Workflow
- Operations efficiency

## Practical Work

- Plan project workflow and operational efficiency
- Coordinate logistics of materials and labor
- Optimize processes to reduce delays and costs

**Areas of Interest**
- Lean Manufacturing
- Process Optimization

**Aptitude**
- Curiosity about industry work
- Organizational skills
- Attention to efficiency

**Starting Salary**
- Pakistan: 85k–130k PKR
- UAE: 6k–11k AED
- USA: $60k–82k

## Lean Construction

They used Lean Construction to minimize waste in material delivery, concrete pouring schedules, and tower crane logistics

# Environmental Engineering

## Role in Burj Khalifa

- Sustainable design
- Waste management

## Practical Work

- Design water treatment and recycling systems
- Monitor environmental compliance
- Implement eco-friendly building practices

**Areas of Interest**
- Environmental Protection
- Global Sustainability
- Renewable Energy

**Aptitude**
- Problem-solving mindset
- Concern for sustainability
- Strong observation skills

**Starting Salary**
- Pakistan: 80k–120k PKR
- UAE: 5k–10k AED
- USA: $55k–75k

## Grey water recycling system

Condensation collection system condenses 15 million gallons of water and recycles in irrigation

# Materials Engineering

## Role in Burj Khalifa

- High-strength concrete
- Glass & Steel

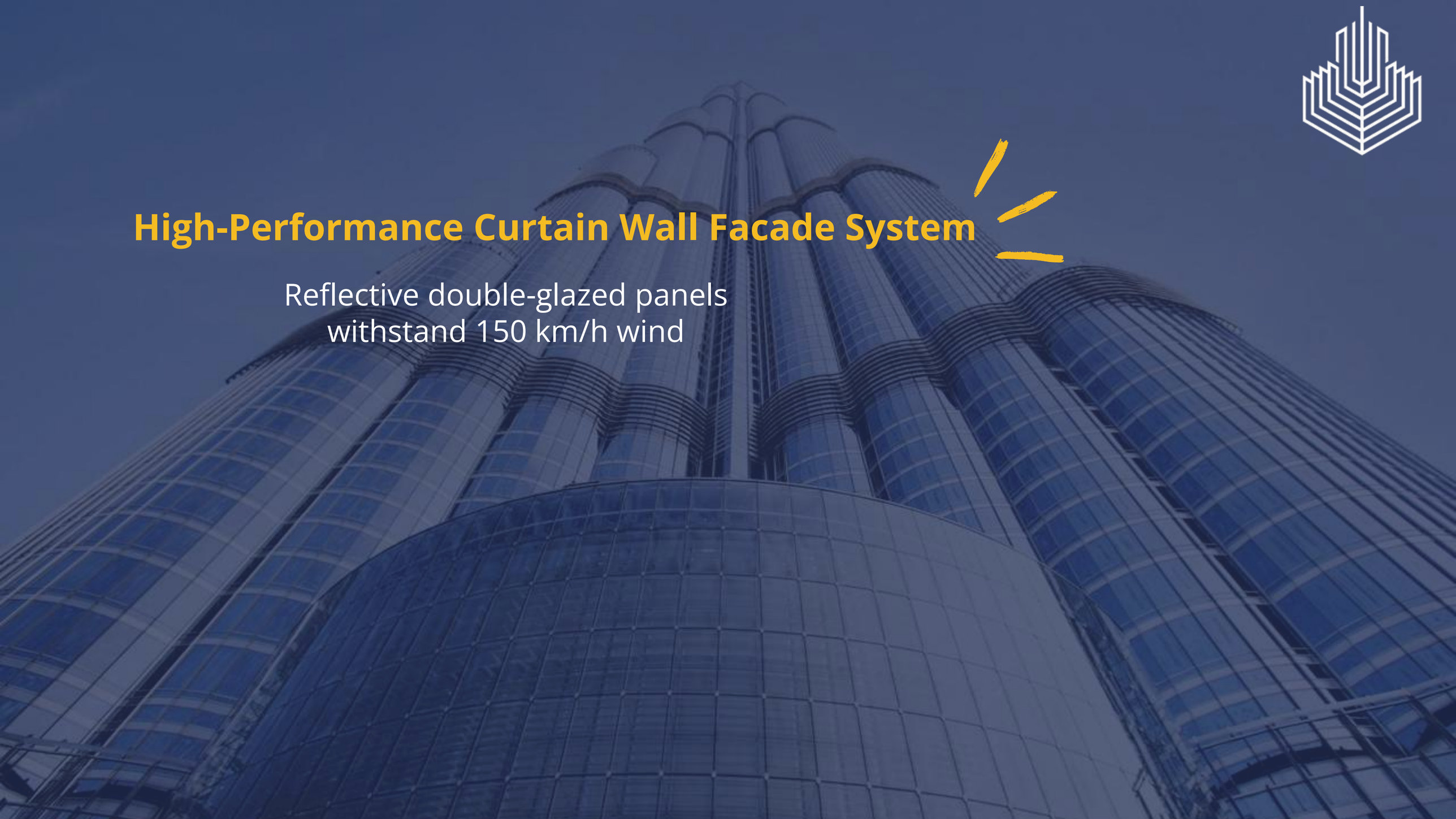
## Practical Work

- Select materials for strength and durability
- Test and analyze construction materials
- Ensure quality standards are met

**Areas of Interest**
- Metallurgy
- Polymers
- Advanced Materials

**Aptitude**
- Creative thinking
- Curiosity about raw material
- Attention to Detail

**Starting Salary**
- Pakistan: 75k–125k PKR
- UAE: 5k–10k AED
- USA: $58k–80k



# High-Performance Curtain Wall Facade System

Reflective double-glazed panels
withstand 150 km/h wind

# Petroleum Engineering

## Role in Burj Khalifa

- Fuel systems
- Energy planning

## Practical Work

- Plan energy supply and fuel management
- Optimize energy consumption for large buildings
- Monitor generators and backup energy systems

**Areas of Interest**
- Drilling
- Reservoir
- Exploration

**Aptitude**
- Interest in earth and geology
- Creativity and innovation
- Environmental consciousness

**Starting Salary**
- Pakistan: 70k–180k PKR
- UAE: 7k–14k AED
- USA: $65k–90k

## natural gas and petroleum-based power plants

The Burj Khalifa’s continuous electricity demand is indirectly powered by natural gas and petroleum-based power plants maintained by petroleum engineering professionals

# Mechatronics Engineering

## Role in Burj Khalifa

- Elevators
- Automated systems

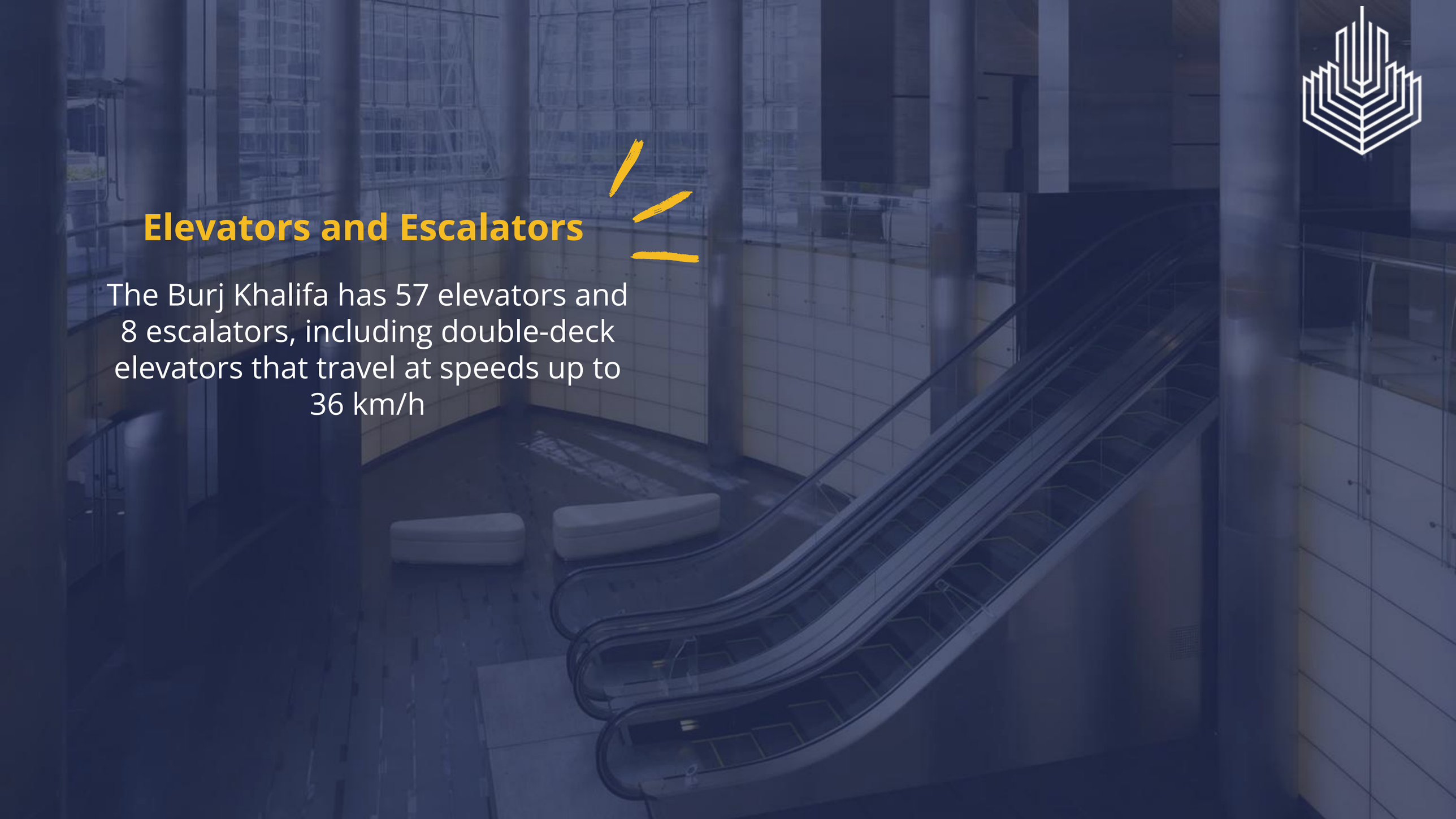
## Practical Work

- Design and maintain automated systems
- Program robotic controls for elevators and equipment
- Program robotic controls for elevators and equipment

**Areas of Interest**
- Robotics
- Control Systems
- Sensors

**Aptitude**
- Mechanophile
- Tech-Enthusiast
- Practical mindset

**Starting Salary**
- Pakistan: 80k–145k PKR
- UAE: 6k–12k AED
- USA: $62k–82k



## Elevators and Escalators

The Burj Khalifa has 57 elevators and 8 escalators, including double-deck elevators that travel at speeds up to 36 km/h

# Structural Engineering

## Role in Burj Khalifa

- Core structure
- Stability

## Practical Work

- Analyze and design building structure
- Ensure seismic safety and stability
- Supervise construction of steel and concrete framework

**Areas of Interest**
- Structural Analysis
- Sustainable structure
- Design & Innovation

**Aptitude**
- Safety conscious
- Attention to detail
- Interest in design & construction

**Starting Salary**
- Pakistan: 70k–140k PKR
- UAE: 5k–11k AED
- USA: $58k–78k

## Buttressed Core System

The system consists of a central hexagonal reinforced concrete core supported by three wings (buttresses) arranged in a Y-shape

# Biomedical Engineering

## Role in Burj Khalifa

- Medical
- Safety systems

## Practical Work

- Maintain medical and emergency equipment
- Monitor health and safety systems
- Collaborate with safety engineers on protocols

**Areas of Interest**
- Medical devices
- Bioinformatics
- Diagnostics

**Aptitude**
- Health sustainability
- Interest in research
- Teamwork and collaboration

**Starting Salary**
- Pakistan: 85k–140k PKR
- UAE: 6k–12k AED
- USA: $60k–85k

## Robotic Surgery Systems

Biomedical engineers designed and developed robotic arms that replicate the surgeon’s hand movements with extreme precision

# CONCLUSION

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