Zhengzhou Hengling New Energy - Solution

Smart Courtyard Solution

Zhengzhou Hengling New Energy Technology Co., Ltd.

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1. REQUIREMENT ANALYSIS & INVESTIGATION

1.1 Project Background

Courtyards serve as transitional spaces between buildings and outdoor environments, requiring lighting solutions that: - Create welcoming entrance atmosphere for residential and commercial properties - Provide security and deterrence against intruders - Enhance architectural features and property value - Operate reliably with minimal intervention - Integrate with building management systems

1.2 Client Requirements

- **Welcome Ambiance**: Warm, inviting lighting for entrances
- **Security**: Motion-activated brightening for perimeter protection
- **Energy Efficiency**: Solar-powered with grid backup option
- **Architectural Integration**: Fixtures complement building design
- **Durability**: Vandal-resistant, weatherproof construction
- **Smart Integration**: BMS, access control, CCTV integration

1.3 Site Parameters

- Courtyard types: residential, hotel, office building, apartment complex
- Size range: 50m² (residential) to 5,000m² (commercial)
- Features: building facades, entrances, walkways, parking, landscaping
- Operating hours: 24/7 security lighting, evening ambiance lighting
- Integration points: access control, CCTV, intercom systems

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2. SOLUTION DESIGN

2.1 Integrated System Architecture

Multi-Layer Courtyard Lighting System: - **Entrance Layer**: Welcome lighting for main doors and gateways - **Facade Layer**: Architectural lighting for building features - **Pathway Layer**: Safe navigation through courtyard spaces - **Security Layer**: Perimeter and high-risk area illumination - **Control Layer**: Centralized intelligent management system

2.2 Core Technologies

- **Human Presence Detection**: mmWave radar for accurate detection
- **Adaptive Brightness**: AI-based adjustment based on activity
- **Video Analytics Integration**: Lighting response to CCTV events
- **Access Control Sync**: Welcome lighting triggered by authorized entry
- **Energy Harvesting**: Solar + vibration energy harvesting options

2.3 Fixture Specifications

Location	Fixture Type	Power Range	Mount Height
Main Entrance	Pendant / Chandelier	20W-60W	2.5m-4m
Building Facade	Wall Washer / Spotlight	10W-50W	3m-10m
Walkways	Bollard / Post Top	5W-20W	0.8m-3m
Perimeter	Floodlight / Wall Pack	30W-100W	2m-6m
Features	In-ground / Accent Light	3W-15W	Ground level

2.4 Control Features

- Time-based scheduling with astronomical clock
- Motion detection with adjustable sensitivity
- Integration with access control systems
- CCTV camera event-triggered lighting
- Remote monitoring and control via cloud platform
- Energy consumption analytics and reporting
- Fault detection and automated maintenance alerts

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3. PRODUCT CUSTOMIZATION

3.1 Architectural Customization

- Fixture style matching building architecture (modern, traditional, classic)
- Color matching to building facade materials
- Custom mounting solutions for unique building features
- Branding integration for commercial properties
- Concealed wiring for clean aesthetic appearance

3.2 Functional Customization

- Custom detection zones and sensitivity levels
- Integration with specific BMS platforms
- Visitor welcome lighting scenarios
- Emergency lighting integration
- Holiday and special event lighting presets

- Multi-tenant access control for apartment complexes

3.3 Energy Configuration

- Solar-grid hybrid systems for reliability
- Battery backup for power outage situations
- Energy metering for tenant billing (commercial)
- Demand response capability for smart grids
- Load balancing for multi-tenant properties

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4. PROJECT IMPLEMENTATION

4.1 Project Timeline

Phase	Duration	Activities
Site Survey	1-2 days	Building assessment, integration points, power mapping
System Design	1 week	Photometric plans, integration schematics, BOM
Manufacturing	2-3 weeks	Custom production, integration testing
Installation	1-2 weeks	Fixture mounting, wiring, system integration
Commissioning	2-3 days	System calibration, BMS integration, training
Total	5-7 weeks	End-to-end turnkey solution

4.2 Installation Standards

- **Building Integration**: Coordination with construction schedule
- **Wiring Standards**: Compliance with electrical codes, proper grounding
- **Waterproofing**: All exterior connections properly sealed
- **Aesthetic Considerations**: Cable concealment, fixture alignment
- **Safety**: Fall protection, lockout/tagout procedures

4.3 Compliance Standards

- IEC 60598-1 luminaire safety
- IEC 62386 DALI communication
- EN 12464-1 outdoor lighting
- ISO 27001 cybersecurity for connected systems
- Local building and electrical codes

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5. SYSTEM COMMISSIONING & TESTING

5.1 Integration Testing

- BMS communication protocol verification
- Access control system trigger testing
- CCTV event response validation
- Third-party system API integration
- Multi-user access and permission testing

5.2 Performance Testing

- Motion detection range and accuracy verification
- Response time testing (<500ms)
- Energy consumption baseline measurement
- 72-hour continuous operation test
- Failover and backup system testing

5.3 Acceptance Criteria

- 100% system integration success rate
- Energy savings verification (60%+ target)
- All functional requirements verified
- Security response time within specifications
- Complete documentation and training delivered

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6. PROJECT DELIVERY

6.1 Deliverables Package

- Complete lighting hardware installation
- Central control system with user licenses
- BMS and security system integration
- Mobile and web access for management
- Comprehensive documentation package

6.2 Documentation

- As-built drawings and wiring schematics
- System configuration and network settings
- Operation and maintenance manuals
- Integration API documentation
- Spare parts list and recommended inventory
- Warranty and service agreement documentation

6.3 Training Program

- **Facility Managers**: System administration, reporting, troubleshooting
- **Security Staff**: Emergency operation, alarm response procedures
- **Maintenance Teams**: Component replacement, calibration procedures

- **IT Staff**: Network configuration, cybersecurity best practices
- **Training Format**: Classroom + hands-on + documentation

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7. OPERATION & MAINTENANCE

7.1 Preventive Maintenance

Frequency	Activities
Weekly	System health check, alert review
Monthly	Visual inspection, fixture cleaning
Quarterly	Connection tightening, battery testing
Semi-annually	Sensor recalibration, firmware updates
Annually	Full system audit, photometric testing

7.2 Predictive Maintenance

- LED lifespan prediction based on usage
- Battery health monitoring and replacement alerts
- Communication performance degradation alerts
- Automated work order generation
- Maintenance cost tracking and optimization

7.3 Security & Reliability

- 24/7 system health monitoring
- Redundant communication paths
- Battery backup for critical areas
- Cybersecurity updates and patches
- Emergency response protocol activation

7.4 Performance KPIs

- System uptime reliability (target: 99.9%+)
- Energy cost reduction percentage (target: 65%+)
- Mean Time To Repair (target: <8 hours)
- Security incident response time (target: <1 second)
- Tenant/resident satisfaction score (target: 4.6/5)
