lighting control in schools k-12

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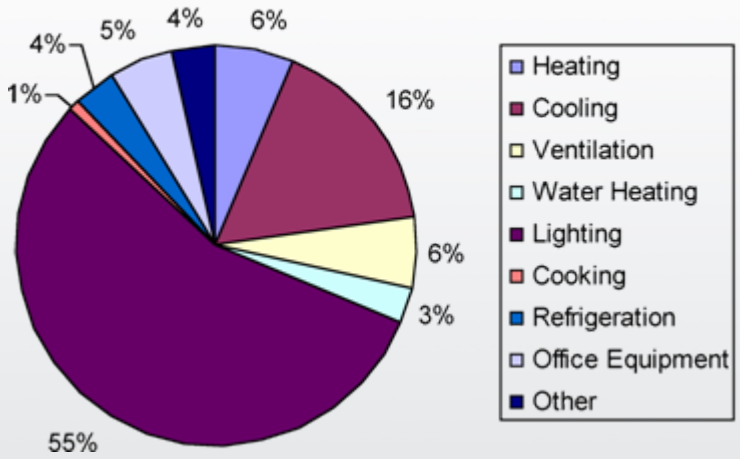
- Rising energy costs and operational costs
  - Lighting accounts for 35-50% of a school's electrical energy consumption
  - Over the past years energy costs have risen 10%
  - From 2000 to 2001 energy expenditures increased more than 20% per student

Electricity Consumption in Education Buildings



- The Current Landscape in K-12 Education
  - Client and Designer concerns
  - Code requirements
  - Rising energy costs and operational costs
  - Student performance
  - Increasing technology in the classroom
  - Sustainable design

history of school design

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- Pre WW II design
  - Organic materials
  - Daylighting
  - Little insulation
  - No indoor environmental controls
  - Simplistic design

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- Post WW II design
  - Non-organic materials
  - Artificial lighting
  - Heavy insulation
  - Total environmental control
  - Specialized design

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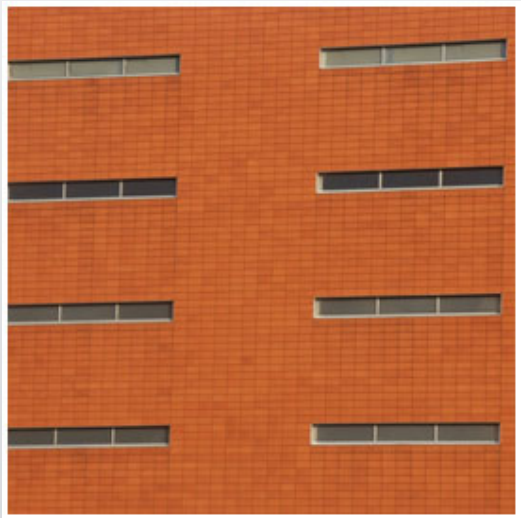
- Post Oil Crisis
  - Compact design
  - Windowless
  - Primary goal of energy efficiency



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- Today
  - Non-organic materials and sustainable materials
  - Return to incorporating daylight
  - Environmental control systems
  - Specialized design
  - Community center

current factors in school design

- Student Performance
  - Many environmental factors impact student performance
    - Indoor air quality and ventilation
    - Temperature and humidity
    - Lighting

- Daylight and Student Performance
  - Heschong Mahone Group 1999 Study on Daylighting and Student Performance
    - Conducted in three school districts across three states with different daylighting practices
    - Students performed 20% better in math and 26% better in reading when in classrooms with daylight

- Light Levels
  - Light levels affect the performance of the student
    - Handwritten tasks 50 fc
    - Chalk/white boards 85 fc
    - Keyboards 30 fc
    - Monitors 3 fc
    - Reading printed material 50 fc

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- General Spaces
  - Lighting Control:
    - Automatic Control
    - Architectural Highlights
    - Life Safety/Security

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- Specialized Spaces
  - Lighting Control:
    - Automatic Control
    - Manual Control
    - Daylight Control
    - Ambience
    - Architectural Highlights
    - Life Safety/Security

- Specialized Spaces: Multi-Purpose Space
  - The multi-purpose space is the most flexible area in the building:
    - Cafetorium
    - Gymnasium
    - Auditorium
  - In addition to normal use:
    - Theatrical performance
    - Concerts
    - Presentations
    - Student assemblies

- Specialized Spaces: Classrooms
  - The classroom serve as:
    - Student learning environment
    - Teacher work environment
    - After school activities space
    - Community meeting space

- Classroom-
  Manual Control
  - Lights can be turned on or off or dimmed using manual wall controls

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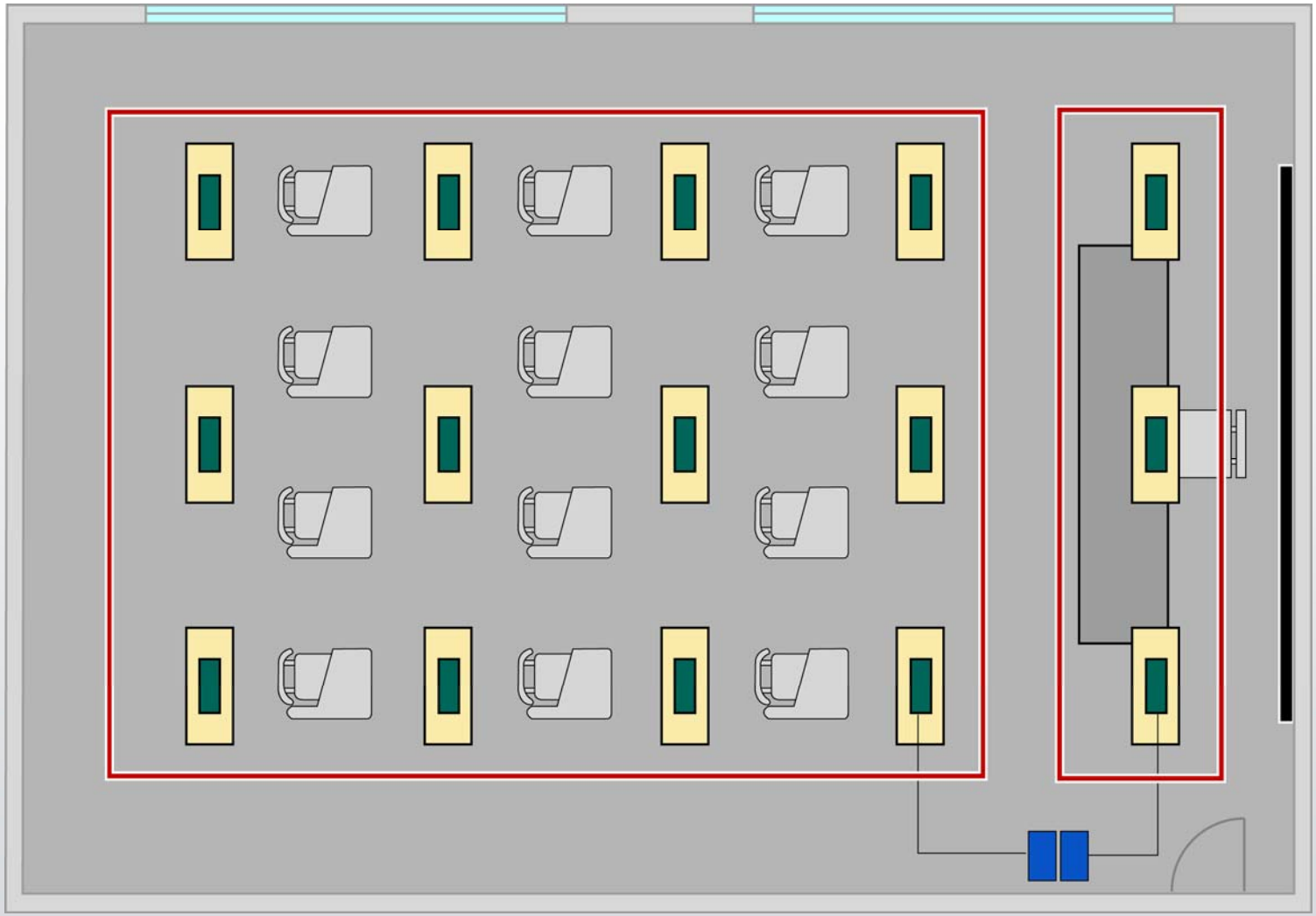

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- Classroom-
  Occupant sensor control
  - All lights turn on and off automatically

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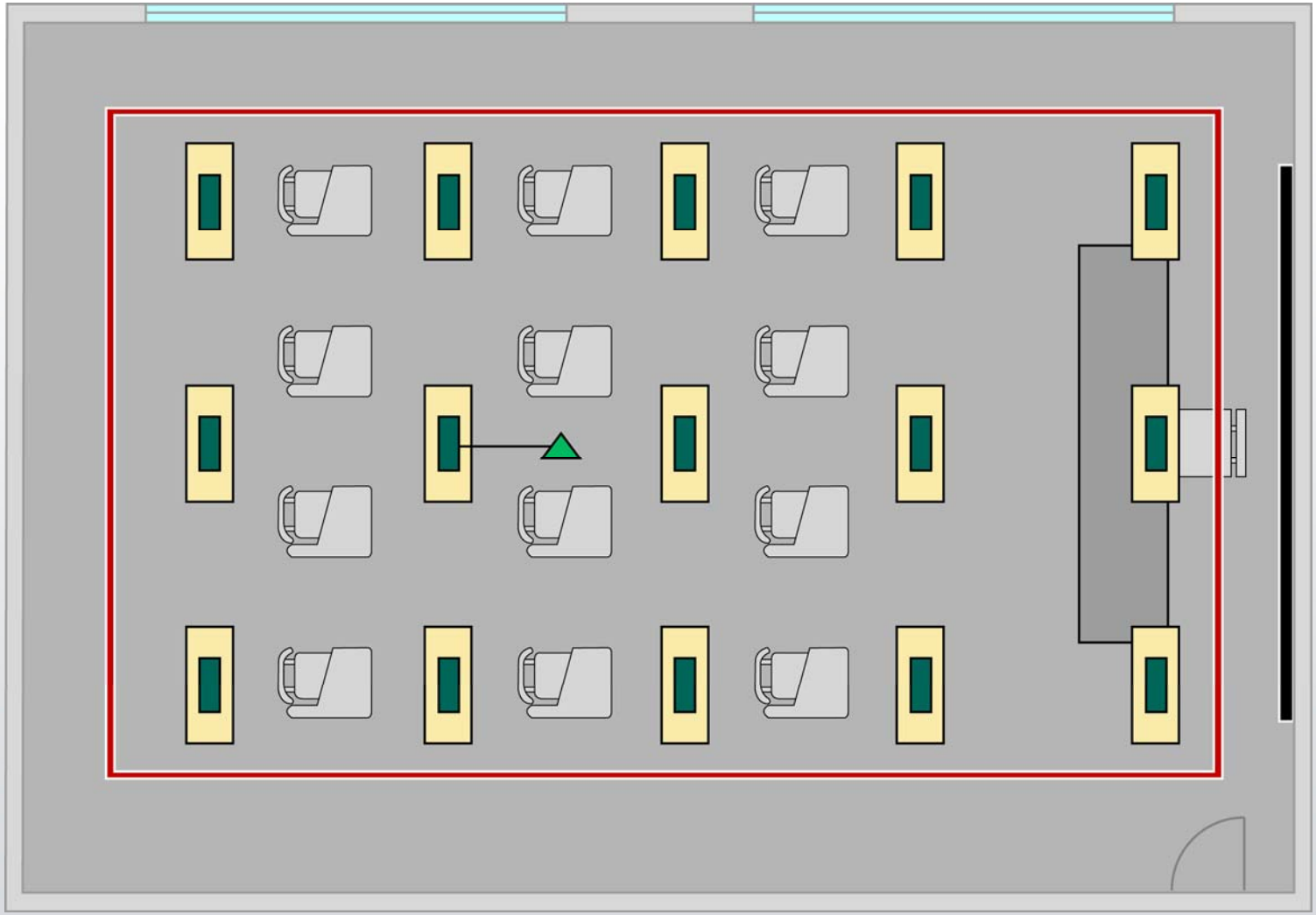

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- Classroom-
  Photo sensor control
  - Lights closest to windows dim as daylight contributes to room lighting

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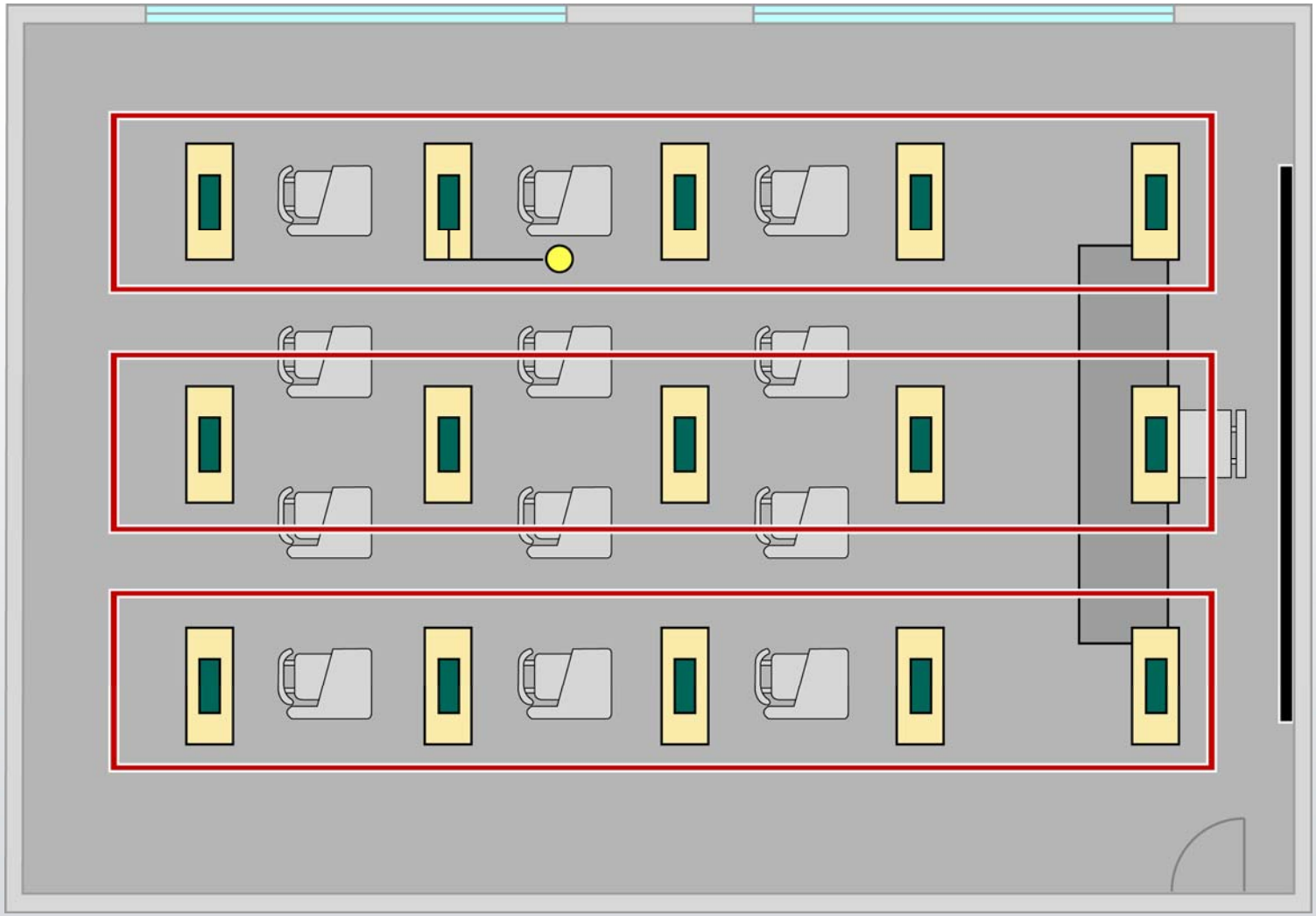

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- Classroom-
  combined control techniques
  - Blend of automatic and manual control optimizes lighting
  - Provides the right light for the task
  - Maximizing energy savings

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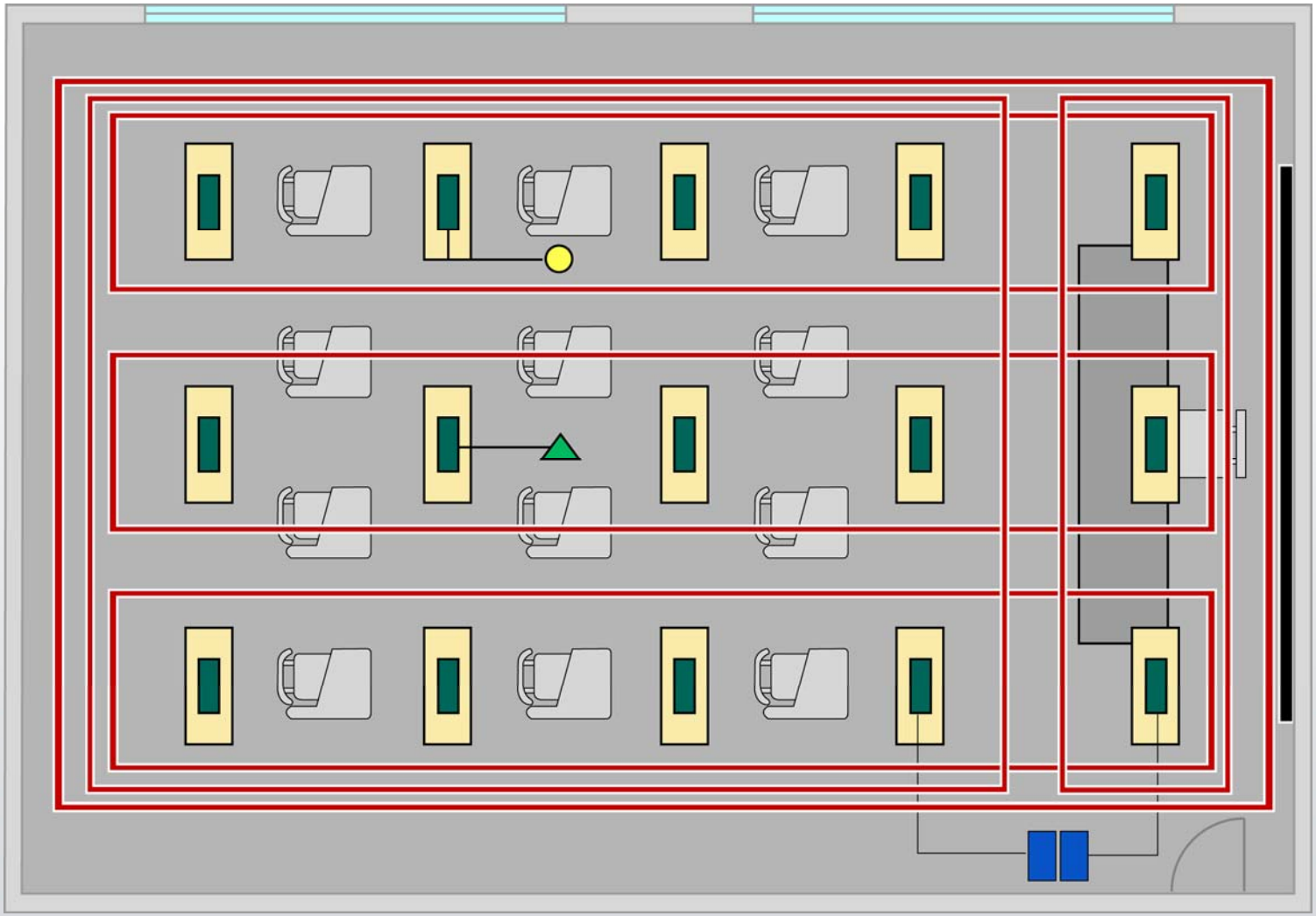

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Space	Local Wallbox Control	Window Shades	Time Clock	Occupancy Control	Vacancy Control	Daylight Control	Zone Control	Scene Control	Personal Control	Theatrical Control Interface	
Administrative											
Open Office	X	X	X	X		X			X		
Private Office	X	X			X	X			X		
Classroom											
Interior	X			X	X		X	X			
Perimeter	X	X		X	X	X	X	X			
Exterior Lighting											
Parking			X			X					
Stadium							X	X			
Athletic Fields			X			X	X				
Site Lighting			X			X					
Multi-Purpose											
Auditorium	X	X	X				X	X		X	
Cafeteria		X	X			X					
Cafetorium	X	X	X			X	X	X		X	
Gymnasium			X			X					
Public Spaces											
Corridor	X		X								
Lobby	X	X	X			X					
Restroom				X							
Commons	X	X	X				X	X			

- Conclusion
  - Schools have a wide variety of spaces
  - There are many control strategies to choose from
  - Employing the right strategy for the space can save energy, reduce costs and improve performance
  - Integrate these strategies to meet your client’s needs

thank you for your time

Any Questions?