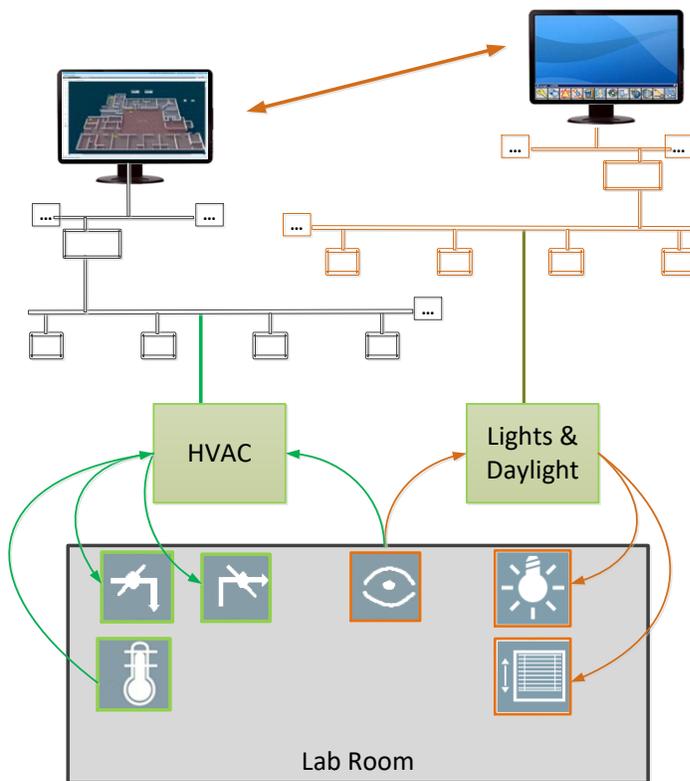


Integrate Lighting, Daylighting and HVAC Control in the Laboratory Room

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Trends in Building Automation combine to make this the right time to combine control of HVAC, lighting and daylighting in a unified Room Automation system. Lighting equipment and lighting controls evolved separately and in different time frames from heating, cooling and ventilating equipment. Today, energy efficiency standards have pushed lighting controls to grow into a separate set of networked, intelligent controls. Today, many up-to-date buildings have two parallel automation systems, as illustrated in Diagram 1.

Diagram 1: Separate Automation Systems



Caption: Separate Automation Systems. Credit: Siemens Building Technologies.

History has put us in this situation that doesn't exactly make sense, but we don't have to stay there. Forward thinkers in the design community ask, "Why do you call it Building Automation if it can't control the lights?" and "Why do I have to specify two separate automation systems?: Today we have the option to design the laboratory with one automation system that handles the complete set of room infrastructure. The second diagram shows a simpler and more functional system.

Broadly speaking, we have three reasons to integrate lighting with HVAC control.

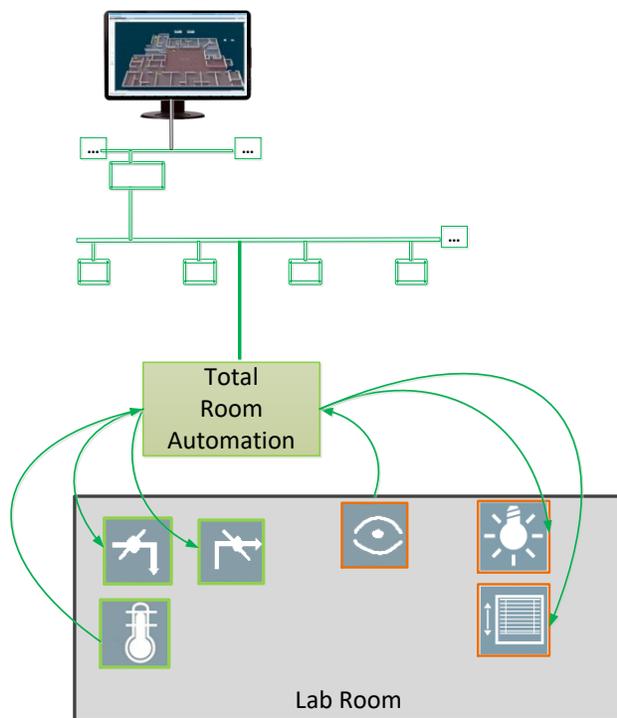
Operating Efficiency

Functionally, the biggest reason to connect lighting and HVAC is to share occupancy data. Much of the energy used in laboratory buildings is spent to serve occupants. If they aren't there, we can reduce the light levels; we can relax the temperature setpoints; we have less need for ventilation. This "comprehensive setback" strategy saves significant energy in many laboratories.

The most basic approach is to share the occupancy sensor between the lighting controls and HVAC system. (Diagram 1) It is practical and effective. It's working well in many laboratories today. But it's also limited. If the systems are only connected by the occupancy sensor, then they can't share schedules and building operators have to access them separately.

If we unify automation at the room controller (Diagram 2) we get common schedules, and common access for operators in a simpler system. Further, a single room automation system creates new possibilities for functional integration. Electric lights and daylight have strong thermal impact on a room. In a unified system we can consider the heating and cooling loads when adjusting light levels and sources.

Diagram 2: Total Room Automation System



Caption: Total Room Automation System. Credit: Siemens Building Technologies.

A complete room automation system enables other advances in control for research facilities:

- coordinated response to peak energy demands: adjusting light levels, shading and temperature setpoints.
- include fume hood lights in the nightly sweep

- complex environmental requirements for housing research animals

Construction Efficiency

The two diagrams suggest that the unified room automation system costs less to install than separate systems for lights and HVAC. Estimates from actual projects are bearing that out. One room automation system costs less than separate HVAC and lighting systems. The difference is as much as 35% of the total automation cost.

Better Experience for Occupants

No building can be considered efficient if it doesn't work well for the occupants. The LEED rating system encourages giving occupants control over their environment. This also gives occupants control over energy usage. Lab users might not know the energy implications of their actions. The "room unit" is the unified interface panel that lets users adjust temperature, ventilation and lighting. A new application for energy conservation communicates to the occupants in the simplest terms. If his actions lead to higher energy use, the "Green Leaf" turns red. If he touches the button, the system undoes his inefficient actions and restores the conserving setpoints.

This simple paradigm works at the room unit, and at the fume hood operator's panel. In the very simplest terms, we inform and empower the lab worker to participate in sustainability.