USING FACILITY GUIDELINES TO BOOST EFFICIENCY OF PROJECTS & EQUIPMENT REPLACEMENTS

ARTICLE

It's *your building* – it is OK to ask questions and be picky.

Steering the ship with a guideline specification

Guideline specifications are used in many facilities to embed preferences into new construction and renovation work. For example a hospital might want to stock parts for two or three toilets instead of twenty. This doesn't change the design but does help streamline operations. The same concept is suggested here: to streamline operating *cost* (the utility bill), influencing certain features in equipment selection, installation, controls etc. can be a very wise investment in time and money, by 'building in' efficiency. You might be surprised how a few choices can make a nice improvement even in a basic replacement project. Replacement time is also a good time to improve some nagging inefficiency issue rather than 20 more years of it. Examples are given to get you started.

Add value by tweaking the project

It may be convenient to replace with like kind, and use whatever is readily in stock, but then again, a couple of key features might be worth a short delay to get it right. It is always more cost effective to build something right or purchase it right the first time than alter it after the fact, and that includes efficiency considerations. Energy codes do some of this inherently but there are other things you can do as an informed consumer to create energy savings.

In all projects there are budget discussions and choices. Sometimes efficiency is exchanged for some extra square footage, or other hard choices. It is good practice to understand the impacts of the choices so there are no surprises.

Examples

- Forward-looking voluntary code compliance with upcoming but not yet adopted versions of the energy code. **Going beyond minimally compliant designs** will build in efficiency and hedge against utility

costs. These can include and fan power budgets, fan efficiency criteria, part load fan capacity control, and optimization controls.

- Note: 'Better than code requires' equipment is often a rebate candidate. Be sure to ask us!

- Choices that fit the '**use less to begin with**' theme. These scales down the entire energy use volume. Examples:
  - Low flow plumbing fixtures that use less water and can allow smaller water heater.
  - Light colored ceiling/wall/floors that allow less lighting power from reflection recovery.
  - Generous duct sizes that allow smaller fans from less friction.
  - Exterior shading that allow smaller cooling units by reducing the solar gain in a few design-hours.
  - Adding insulation or double pane windows to allow a smaller boiler by reducing heat loss.

- Choices that fit the '**load following**' theme vs. *steady energy use*. In general, a goal of building system energy use that is only used when needed, such as:
  - Controls that allow daily scheduling to match building use patterns.
  - Variable flow fans vs constant flow.
  - Rooftop units with 2-speed fans and matching 2-stage capacity are a wonderful improvement for annual energy use.
  - Variable speed compressors vs. mechanical throttling, especially when there are a lot of low load hours of operation.
  - Automatic occupancy switches so energy is applied only when people are there.
  - Demand-controlled ventilation vs max ventilation all the time.
  - Zoning and controls so one small area or one person on a Saturday doesn't invoke large central equipment that would otherwise be off.
  - For regular package rooftop units, include additional thermostat wires so any unoccupied operation keeps the outside air damper closed if unoccupied. Scenario is unit starting at night or over the weekend when it is cold, adding load from heating the ventilation air with no people in the building.

- Where possible, try to **correct inherent inefficiencies** that may exist, as part of the project.
  - Go below the roof and beyond the mechanical room to and consider the terminal equipment and controls as well as the central unit being replaced… they are a system.
  - Modify legacy HVAC systems known to be high energy users from heat/cool fighting, such as constant volume reheat and multizone, instead of just a new roof unit that locks-in another 20 years of poor energy performance.
  - Separation so an area needing humidification gets it without humidifying the whole building.

  - Zoning and control so one area or tenant with unique operating hours can have HVAC comfort for just that area and not the whole building.
  - Repair or replace 'grooved pipe fittings' and don't use them on new heating systems. The gaskets inevitably leak and end up as the reason to never reset boiler water temperature or to never turn off the boiler. Tail wagging the dog.
  - Add a small dedicated cooling unit if one area has hot equipment and creates HVAC operating efficiency loss by always being asked to cool this area, even in winter. Tail wagging the dog.

- Choices that fit the '**more efficient equipment'** theme. Notice the other items are listed first. Examples:
  - Higher efficiency heating and cooling central equipment. Energy codes will automatically require the new equipment to be more efficient than the old one, but there will be 'extra efficient' options to consider.
  - Verify sizing is still correct for that heating/cooling unit, air compressor, pump. Sometimes usage of an area has changed over time and the existing thing about to be replaced is actually oversized. 'Right sizing' keeps equipment with a variable load in its efficient sweet spot longer and save money if buying a smaller unit.
  - Equipment that has part load efficiency values as good or better than full load – this can be had with multiple stages, variable speed motors, modular units (multiple small ones instead of one big one).
  - Select VAV cooling equipment with variable speed fans and capacity control that does not use 'hot gas bypass'
  - Cooling towers with enclosed 'centrifugal fans' that can use much smaller motors with propeller fans, sometimes reducing motor Hp by half.
  - Cooling towers specified for energy savings, such as this pearl: *Max 7F approach from local design wet bulb temperature and max fan power budget of 0.05 kW per ton of cooling.*
  - Window and door frames with 'thermal break' feature to eliminate thermal bridging from standard solid aluminum window frames and steel doors.
  - If a dock door is damaged and being replaced, include insulation with the new door.
  - Direct venting of gas burning appliance (takes combustion air from outdoors instead of from the room).
  - High efficiency fan wheels instead of standard forward-curved squirrel cage type. This can reduce fan energy 10-15%.
  - Higher efficiency lighting.

- **Automatic control features** that are oh-so-useful when specified up front:

  - Equipment that comes with control provisions that are compatible with existing energy management system. Applies to rooftop units, chillers, boilers, VFDs, more.
  - Demand-limiting capability with large electric loads, as an enabler for demand response and managing demand charges.
  - No heat/cool overlap in HVAC, with controls that actively prevent it.
  - When moving to LED lighting, new fixtures are readily available with automatic control features like easy dimming, occupancy sensing, light harvesting; these amplify the savings of the LED technology.

- **Sub metering** as enablers for energy management:
  - Separate buildings on a campus for benchmarking oversight by-building.
  - Separate leased areas in a shared building, to allocate cost fairly and attract tenants.
  - Unique areas in manufacturing to identify embedded cost.

- **Natural gas** for heating:
  - Choose natural gas heating over electric heating where there is an option.
  - For new facilities, make sure natural gas available to areas where heating will be needed. Try to avoid electric resistance for basic heating since it is much more expensive to operate.

- **Electrical** considerations that are part of new equipment:
  - Equipment that comes with on-board power factor correction, to >95% - to reduce power factor charges.
  - Phase loss and surge protection, so you get the full life out of the efficient equipment.

- Ample service access and **maintenance provisions** to sustain efficiency:
  - Service doors (easy to open, invites service).
  - HVAC cabinet access doors on both sides of coils (easy to clean each year).
  - Good filters that fit tightly in the channels and snug at the ends (keeps coils clean).
  - Keep shrubs, turf, and debris well away from any air-cooled equipment. Give this equipment a place to breathe so it takes in cool air and has no obstructions at the outlet.

…and dozens of other preferential items related to energy, just like preferences are asserted for other things in a facility from paint to light bulbs. None of these are exotic or gold-plated but will curb the energy appetite of the building during its life.