Description	N/A	✓	Notes
1. Identify specific performance objectives.			
2. Evaluate existing systems. Are they due for replacement?			
3. Evaluate current ventilation for new building use.			
4. Define load on HVAC for new building use:			
a. Envelope (windows, walls, roof, etc. – include thermal bridging effects), interior gains (lighting, plug loads) and ventilation;			
b. Consider any changes in space and layout and their subsequent impact on HVAC system zoning;			
c. If relevant to future HVAC operation, measure current loads to determine sizing and design parameters.			
5. Complete energy simulations assessing whole building design performance. (Use an energy simulation model for all following evaluations of energy efficiency measures.)			
6. Consider thermal storage options using mechanical systems.			
7. Develop preliminary design for ventilation, heating, and cooling delivery systems.			
a. Evaluate current system's ability to meet loads efficiently:			
i. If HVAC requires more capacity, evaluate relative costs and benefits of envelope upgrades and measures to reduce loads or to increase HVAC capacity;			
ii. If current system is constant air volume (CAV) system (dual or single duct), consider conversion to variable air volume (VAV), evaluate impact on ventilation;			
iii. If current system is single-zone rooftops, evaluate high performance rooftops for additional capacity.			

Description	N/A	✓	Notes
b. If completely new HVAC system, evaluate different systems for energy efficiency, indoor environmental quality (IEQ), and integration with building. Consider:			
i. 100% fresh air systems with distributed heating and cooling (e.g., heat pumps, local heating/cooling coils, radiant heating/cooling) offer excellent energy saving opportunities, excellent ventilation and indoor air quality (IAQ), low noise and minimal HVAC service space requirements;			
ii. VAV systems offer good energy saving opportunities, average ventilation effectiveness (careful design required). Always include air side economizer;			
iii. CAV systems can, in some circumstances (system primarily serves internal spaces with year-round constant cooling requirements), be energy efficient, offer good ventilation, simpler design and controls. Always include air side economizer. *[Note: these descriptions should also be a part of evaluation of current HVAC system.]*			
c. If single-zone rooftops, replace poorly performing units:			
i. If additional/replacement units required, evaluate high efficiency (CEE Tier 2) units. At minimum include heat recovery, free cooling economizer, and modulating/condensing burners.			
8. Develop preliminary ventilation, heating and cooling control systems:			
a. Ensure opportunities for free cooling are maximized;			
b. Schedule turn off of equipment when not needed;			
c. Minimize simultaneous heating and cooling operation;			
d. Use outdoor-reset strategies to increase part load efficiencies, and match system output to current weather conditions.			
9. Develop preliminary design for heating central plant:			

Description	N/A	✓	Notes
a. If retaining existing boiler, consider burner replacement to increase efficiency (variable output burners can increase part load efficiency);			
b. If replacing boiler, evaluate condensing boilers. This requires low temperature return water, using larger heat delivery devices (e.g., fan coils, larger baseboard radiators, larger radiant panels, or in-floor heating). If cost constrained, evaluate multiple boilers with only the lead boiler being condensing;			
c. If replacing boiler, specify, at a minimum, a high-efficiency or near-condensing boiler;			
d. Specify new boiler(s) to address part load efficiency operation:			
i. Use multiple boilers;			
ii. Staged or variable output boilers.			
e. Use higher temperature drop heat distribution devices to reduce return water temperature (see comment above on condensing) to lower pumping power and increase efficiency of all boilers;			
f. Evaluate variable speed drive (VSD) hot water loop pump:			
i. In conjunction with VSD, evaluate 2-way valves at coils, radiators, etc., to decrease return water temperature during part load operation.			
10. Develop preliminary design for cooling central plant:			
a. Evaluate existing system refrigerant. (CFCs, phased out by Montreal Protocol, should be retrofitted to HFCs (best) or HCFCs systems.) If major retrofit required to accomplish this, evaluate in conjunction with high efficiency retrofit options;			
b. If replacing chiller, generally air cooled is more cost effective (using life cycle) below 200 tons, water cooled above 200 tons;			
c. Always include/retrofit cooling tower economizer for free cooling with new or existing water-cooled chiller;			

Description	N/A	✓	Notes
d. Include variable speed fan drive on cooling tower for new water-cooled chiller; for existing, evaluate retrofitting same;			
e. Specify new chiller to address part load efficiency operation:			
i. Use multiple chillers;			
ii. Stages or variable output chillers;			
f. For new chillers evaluate zero ozone depletion options (Montreal Protocol began phase-out of HCFC in 2005, more HFC options are available every day);			
g. For new chillers evaluate high efficiency options;			
h. Evaluate low energy cooling options (natural ventilation/ cooling, evaporative cooling).			
11. Heat recovery:			
a. Exhaust air heat recovery almost always cost effective and can be single largest energy saving measure;			
b. Evaluate potential for heat recovery off chiller condenser.			
12. Summarize HVAC issues for Comfort and Productivity Performance Plan.			
13. Prepare the Design Development Report.			
14. Review: Does the design of this system complement or compromise any other system?			