to high-efficiency storage water heaters. Electric instantaneous water heaters are more efficient than electric storage water heaters, and point-of-use versions will minimize piping losses. However, their impact on building peak electric demand can be significant and should be taken into account during design.

WH5   *Location* (Climate Zones: all)

The water heater should be located close to the hot water fixtures to avoid the use of a hot water return loop or the use of heat tracing on the hot water supply piping. Where electric resistance heaters are used, point-of-use water heaters should be considered when there is a low number of fixtures or where they can eliminate the need for a recirculating loop.

WH6   *Pipe Insulation* (Climate Zones: all)

All SWH piping should be installed in accordance with accepted industry standards. Insulation levels should be in accordance with the recommendation levels in Chapter 3, and the insulation should be protected from damage. Include a vapor retardant on the outside of the insulation.

Reference   *ASHRAE Handbook—HVAC Applications*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

BONUS SAVINGS

Plug Loads

Building owners and other users of this Guide can benefit from additional energy savings by outfitting retail stores with efficient appliances, office equipment, and other devices plugged into electric outlets. These "plug loads" can account for 4% to 40% of a retail building's annual energy requirements and energy expense.[1] In addition to their own energy requirements, plug loads also are a source of internal heat gains that increase air-conditioning energy use. There is a large variation of these loads depending on the retail operation and the need for retail displays, communications equipment, computing requirements, product movement, and cleaning requirements.

Retail displays may have specialized task lighting, ventilation fans for cooling, and refrigerated end-caps (cases that sell soda and other refrigerated items), just to name a few. Most retail operations have small computer networks that may include inventory systems and point-of-sale devices. In many retail operations, Internet terminals provide customers the ability to order products online. Retail stores also have offices for managers and staff; these spaces include devices such as fax machines, calculators, and copiers. Employee break rooms are often equipped with refrigerators, microwave ovens, and coffee makers. Many retail stores have vending machines that may or may not be publicly accessible. Cleaning equipment, such as waxers and buffers, can be directly connected or recharged. Telephone switches, fire and security alarm systems, and energy management systems all contribute to the building loads. Design teams should identify special loads in retail spaces (examples might include lighting displays in hardware stores and fish tanks in pet stores) and try to reduce these loads as appropriate. The team should take inventory in an existing similar facility to fully understand the loads and determine possible points for energy savings.

The recommendations presented in Table 5-2 for purchase and operation of plug load equipment are an integral part of this Guide, but the energy savings from the plug load recommendations are expected to be in addition to the target 30% savings.

1. Data available at www.eia.doe.gov/emeu/cbecs/cbec-eu4.pdf.

Table 5-2. Recommendations for Efficient Plug Load Equipment

Equipment/Appliance Type	Purchase Recommendation	Operating Recommendation
Desktop computer	ENERGY STAR® only	Implement sleep mode software
Electronic cash registers and point-of-sale devices	Purchase with flat-screens with sleep modes	Many of these items are only used during peak times and excess equipment should be turned off
Laptop computer—use where practical instead of desktops to minimize energy use	ENERGY STAR® only	Implement sleep mode software
Computer monitors (may include point-of-sale monitors)	ENERGY STAR® flat-screen monitors only	Implement sleep mode software
Printer	ENERGY STAR® only	Implement sleep mode software
Copy machine	ENERGY STAR® only	Implement sleep mode software
Fax machine	ENERGY STAR® only	Implement sleep mode software
Water cooler	ENERGY STAR® only	N/A
Refrigerator	ENERGY STAR® only	N/A
Vending machines	ENERGY STAR® only	Delamp display lighting

PL1 Purchase Energy-Efficient Equipment (Climate Zones: all)

Many of the plug load items in retail stores can be specified to be energy efficient. ENERGY STAR® labels are applicable for computer equipment, office equipment, and vending machines. Refrigerators for break rooms should also be ENERGY STAR® rated. To further reduce energy use, make sure that the ENERGY STAR® sleep modes are enabled on computer and copier equipment. The use of such equipment in most retail operations is limited and short delays to sleep mode are appropriate.

PL2 Use Time Clocks to Disable Plug Loads (Climate Zones: all)

Time clocks can be used to effectively disable loads when these loads are not needed. Display lighting end-cap displays can be de-energized when the store is closed. This may provide a narrower window than the occupied hours of the store because of stocking times. It may be possible to use common electrical circuits on central time clocks or the energy management system. This technique can also be used to turn off vending machines, coffee makers, point-of-sale devices, calculators, credit card dialers, and other miscellaneous loads when the building is not occupied. Care must be exercised not to turn on all the loads when the HVAC and lighting are energized to avoid a peak demand on start-up.

PL3 Use Motion-Based Plug Strips (Climate Zones: all)

Plug strips with motion sensors can be deployed in break rooms and offices to turn off plug loads such as vending machines, computer monitors, calculators, and other equipment that plugs in (usually identified with power packs or cubes). Motion sensor circuits can also be used for end-cap displays and lit displays. In some cases it is more dramatic to have items "turn on" as customers approach to gain attention.