

The U.S. Department of Energy's (DOE) Federal Energy Management Program (FEMP) facilitates the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

PURCHASING SPECIFICATIONS
FOR ENERGY-EFFICIENT PRODUCTS

Water-Cooled Ice Machines

Legal Authorities

Federal agencies are required by the National Energy Conservation Policy Act (P.L. 95-619), Executive Order 13423, Executive Order 13514, and Federal Acquisition Regulations (FAR) Subpart 23.2 and 53.223 to specify and buy ENERGY STAR® qualified products or, in categories not included in the ENERGY STAR program, FEMP designated products, which are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirements for Federal Purchases			
Type	Ice Harvest Rate (pounds per 24 hours)	Energy Use ^a (per 100 pounds)	Potable Water Use ^b (per 100 pounds)
Self Contained Unit	199 or less	6.6 kWh or less	25 gallons or less
Self Contained Unit	200 or more	6.5 kWh or less	25 gallons or less
Ice Making Head	300 or less	5.3 kWh or less	25 gallons or less
Ice Making Head	301 to 400	4.8 kWh or less	25 gallons or less
Ice Making Head	401 to 500	4.3 kWh or less	25 gallons or less
Ice Making Head	501 to 750	4.1 kWh or less	25 gallons or less
Ice Making Head	751 to 1435	3.5 kWh or less	25 gallons or less
Ice Making Head	1,436 or more	3.4 kWh or less	25 gallons or less

a) Measured in accordance with ARI Standard 810-2003: Performance Rating of Automatic Commercial Ice Makers.

b) Measured in accordance with ARI Standard 810-2003. Does not include condenser water use.

Buying Energy-Efficient Water-Cooled Ice Machines

Several types of water-cooled ice machines exist, but only self contained unit (SCU) and ice making head (IMH) models are addressed by this *Specification*. SCU models have an ice making mechanism and storage bin integrated into the same cabinet or housing. SCU models are common in smaller ice machines, those making 500 pounds or less in 24 hours. IMH models do not contain storage bins, but are generally designed to fit on top of a variety of bin sizes. These are the most common type of ice machine and range in size from about 250 to 4,000 pounds of ice per 24-hours.

This *Specification* applies to water-cooled ice machines that generate cube ice at 60 grams (two ounces) or lighter. It does not apply to commercial ice machines that make flake or nugget ice, or to those with remote condensing units. When buying water-cooled ice machines, specify or select models that meet the *Performance Requirements* shown above. Federal supply sources for ice machines include the U.S. General Services Administration (GSA) and Defense Logistics Agency (DLA). GSA offers ice machines through its Multiple Awards Schedules program and online shopping network, GSA *Advantage!* DLA sells them online through DLA EMall.

Water-cooled ice machines should only be used when they can be connected to a cooling tower that operates year round. Federal agencies should not use single-pass or once-through cooling, a practice where potable water is used to remove waste heat from the condenser and then disposed of down the drain. Federal water efficiency best management practices (BMP) advocate against this practice. BMP #9, *Single-Pass Cooling Equipment*, recommends that ice machines and other equipment using single-pass cooling be modified to recirculate water or be eliminated altogether. BMP #9 is available at femp.energy.gov/program/waterefficiency_bmp9.html.

In situations where connecting to a cooling tower is not possible, install an air-cooled ice machine instead. See the FEMP Purchasing Specification for Air-Cooled Ice Machines at femp.energy.gov/pdfs/pseep_icemachines.pdf, which includes information about the ENERGY STAR program for these units.

These requirements apply to all forms of procurements, including guide and project specifications; construction, renovation, repair, energy service, operation and maintenance (O&M) contracts; lease agreements; and solicitations for offers. Energy performance requirements should be included in all evaluations of solicitation responses. Buyers shall insert the standard clause from FAR section 52.223-15 into contracts and solicitations that deliver, acquire, furnish, or specify energy-consuming products for use in Federal facilities. Agencies can claim an exception to these requirements through a written finding that no ENERGY STAR qualified or FEMP designated product is life cycle cost-effective for a specific application.

For More Information:

FEMP

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 1000 Independence Avenue, SW
 Washington, DC 20585-0121
 202-586-5772
www.femp.energy.gov

FEMP Product Procurement

www.femp.energy.gov/procurement

Lawrence Berkeley National Laboratory

202-488-2250
www.lbl.gov

ENERGY STAR

800-372-7827
www.energystar.gov

Air Conditioning, Heating, and Refrigeration Institute (AHRI)

703-524-8800
www.ahrinet.org

Federal Supply Sources

U.S. General Services Administration

816-926-6760
www.gsa.gov
www.gsaadvantage.gov

Defense Logistics Agency

www.dla.mil/
www.dod-email.dla.mil

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Buyer Tips

Performance data shows SCU model ice machines tend to be less efficient than IMH models. When purchasing large SCU ice machines (greater than 250 pounds per day), consider a small IMH model instead as it may be possible to further reduce energy consumption.

User Tips

Proper maintenance of water-cooled ice machines is important, especially of the solenoid valve that controls the flow of water through the condenser. When a solenoid fails in the open position, water flows through the condenser regardless of whether it is operating or not. This unnecessarily increases the load on the cooling tower.

Hard water leaves mineral deposits or scale on the evaporator plate and other components of the ice making mechanism. Commercial ice machines typically include a self-cleaning function that periodically rinses scale off these components. In most cases, the owner or service technician can adjust the frequency of the cleaning function to accommodate differences in water quality (i.e., ice machines in areas with very hard water must be cleaned more frequently). It is common to find water-cooled ice machines with self-cleaning set to maximum regardless of water quality. It is necessary to check and adjust the setting to match the water quality in your area.

Cost Effectiveness Example			
Performance	Base Model	Required	Best Available
Energy Use Rate	5.3 kWh/100 lbs	4.5 kWh/100 lbs	4.2 kWh/100 lbs
Annual Energy Use ^a	5,962 kWh	5,062 kWh	4,725 kWh
Water Use Rate	30 gallons/100 lbs	25 gallons/100 lbs	23 gallons/100 lbs
Annual Water Use ^b	33,750 gallons	28,125 gallons	25,875 gallons
Annual Utility Cost	\$690	\$580	\$540
Lifetime Utility Cost	\$4,150	\$3,510	\$3,265
Lifetime Utility Cost Savings	—	\$640	\$885

a) Does not include cooling tower energy use.
 b) Does not include cooling tower water use.

Cost Effectiveness Assumptions

In the example above, *Annual Energy Use* and *Annual Water Use* are based on *ARI Standard 810-2003* for a water-cooled, IMH-type model with an ice harvest rate of 450 pounds per 24 hours. This ice machine operates 250 days per year making an average of 450 pounds per day. The performance of the *Base Model* meets the Federal appliance standard for this product type while the performance of the *Required* ice maker meets this *Specification*. Performance data for the *Best Available* model was obtained from the Air Conditioning, Heating, and Refrigeration Institute (AHRI) Directory (ahridirectory.org). The assumed rate for electricity (\$0.09 per kWh) and water and sewer (\$4.50 per 1,000 gallons) is the average at Federal facilities throughout the U.S. *Lifetime Utility Cost* is the sum of the discounted values of annual energy and water costs with an assumed ice machine life of seven years.

Using the Cost Effectiveness Example

In the example above, the *Required* water-cooled ice machine is cost effective if its purchase price is no more than \$640 above the *Base Model*. The *Best Available* unit is cost effective if its purchase price is no more than \$885 above the *Base Model*. The savings will be greater in facilities that operate 365 days per year, such as military bases and hospitals.

What if My Energy Price is Different?

A cost calculator for ice machines is available on the FEMP Web site at femp.energy.gov/technologies/eep_ice_makers_calc.html. Input the variables (i.e., machine type, hours of operation, rate for electricity, etc.) to match conditions at your facility and then click on “Calculate.” The Output Section will display results that more accurately reflect your energy cost.