

Program Design Guidance

Hot Food Holding Cabinets

Hot food holding cabinets (HFHCs) are used to keep recently cooked food hot, ensuring food safety, temperature, and freshness are maintained until customers are served the prepared food. They are used in all types of foodservice establishments, but are most frequently and heavily relied upon in establishments that cook large volumes of food in a central location for subsequent distribution to remote serving locations, such as schools, hospitals, prisons, and banqueting and catering operations.

This document covers the following topics for HFHCs:

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Equipment Description

HFHCs are defined by CEE and ENERGY STAR[®] as appliances designed to hold hot food at a specified temperature, which has been cooked using a separate appliance. Dual function equipment, such as cook-and-hold¹ models, is outside the scope of the CEE and ENERGY STAR specifications and is not addressed in this document.

HFHCs come in a variety of styles and sizes to suit the needs of different end users. These include stationary units, which are designed to stay in one place, and mobile units, which are designed to transport prepared food throughout a facility or to other locations. HFHCs are available as reach-ins, with a single door at the front and tray slides; roll-ins, with a single door at the front through which a rolling rack can pass and rest inside the cabinet; or pass-thrus, with two doors at the front and back, allowing food or racks to be loaded into the unit from one side and removed from the other side. Sizes range from units designed for caterers to carry to off-site events or to fit under counters, usually accommodating about five 2.5" deep trays and measuring as little as 24" tall and 18" wide, to units with multiple sections, which can accommodate multiple rolling racks and measure over 80" tall and 100" wide.

¹ Cook-and-hold cabinets are designed to first cook a product slowly and then hold it at serving temperatures. The cooking temperatures are generally higher than holding temperatures.



Figure 1. Examples of HFHC types and sizes.

The foodservice equipment market often refers to HFHCs by their size category: full-size, three-quarter size, half-size, or undercounter. These sizes are not exact, and some units do not fall clearly into any of these categories. In addition, these sizes refer only to the height of the unit and do not take into account the width or depth. As a guideline, full-size cabinets measure around 75” tall, three-quarter size cabinets measure around 62” tall, half-size cabinets measure around 44” tall, and undercounter cabinets measure around 33” tall.

To overcome the ambiguous nature of these size categories, CEE and ENERGY STAR energy efficiency specifications are based on the internal volume of the cabinet, which is a more precise measurement of size and how it relates to energy consumption. It is important to note, however, that manufacturer cut sheets are not consistent in offering information on volume or the market created categories described above (full, three-quarters, half, or undercounter). This lack of clear, easily available information in the market can be a challenge for prescriptive efficiency programs to address given differences in cost and savings potential for different size units.

CEE and ENERGY STAR have begun to address this lack of clear information through the creation and maintenance of qualified products lists. These lists include data on the volume of the tested products. However, because test data is required only for the smallest unit in a product family to qualify the entire product family, exact volume and energy consumption data is not provided for all qualified units. See the “Specification and Test Methods” section below for more information on, limitations of, and links to the qualified products lists. Cabinet volume can also be calculated from its internal dimensions, which are provided on all manufacturer cut sheets.

Programs have addressed the lack of clear sizing information in a number of different ways when designing programs, including averaging savings and costs, setting minimum size requirements,

and breaking out size categories according to volume or market definitions and requiring that program applications include the necessary information to verify the size category.

Product Performance Metrics

There are a number of performance indicators that end users consider when choosing a HFHC, which include:

- Interior finish (aluminum vs. stainless steel; grade of material)
- Exterior finish (aluminum, stainless steel, plastic/burn-free panels)
- Quality of construction (quality of parts, such as heating elements, doors, hinges, gaskets, etc.)
- Insulation (insulated vs. noninsulated)
- Functionality (dry heat only, moist heat capability)
- Thermometer type (analog, digital)
- Controls (solid state/electronic, HACCP reporting capabilities, etc.)
- Warranty

Product Use and Lifetimes

HFHC use and life vary widely among commercial kitchen facilities. The [ENERGY STAR Savings Calculator](#) assumes that HFHCs are used for 15 hours a day. Some facilities, however, may leave their HFHCs on idle 24 hours per day even when there is no food in the equipment, whereas other facilities may only use their HFHCs a few hours a day. A typical HFHC is expected to last about 12 years, though again, this number can vary based on the level of use and maintenance practices. This document assumes that HFHCs are used 15 hours per day and have a product life of 12 years for all savings calculations.

Specifications and Test Methods

CEE and ENERGY STAR have both developed efficiency specifications for HFHCs. The ENERGY STAR specification offers one efficiency level while the CEE specification offers a Tier 1 that is equivalent to ENERGY STAR and a Tier 2 which requires 50% less energy consumption than Tier 1. The CEE Tier 1 or ENERGY STAR energy consumption limit is 40 watts per cubic foot and the CEE Tier 2 limit is 20 watts per cubic foot.² In some areas of the country, particularly in the West, the ENERGY STAR levels have been adopted as code. Links to the current CEE and ENERGY STAR specifications and qualified products lists are below.

- CEE HFHC Specification and Qualified Products List
<http://www.cee1.org/com/com-kit/com-kit-equip.php3>
- ENERGY STAR Specification and Qualified Products List
http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc
- American Society for Testing and Materials (ASTM) Test Method F2140-01(2007) Standard Test Method for Performance of Hot Food Holding Cabinets
<http://www.astm.org/Standards/F2140.htm>

² Based on ASTM Standard F2140-01, Test Method for the Performance of Hot Food Holding Cabinets.

It is important to note that for this product category, HFHCs are qualified as a family. That is, manufacturers may test the smallest unit within a product family and qualify the entire family provided the design and insulation specifications for the product family are identical to that of the smallest unit. This is allowed by CEE and ENERGY STAR because the smallest size unit in a product family is always the least energy efficient based on the ratio of surface area to internal volume; therefore, it is safe to assume that if the smallest HFHC in a family qualifies for the ENERGY STAR or CEE Tier, larger units will also qualify.

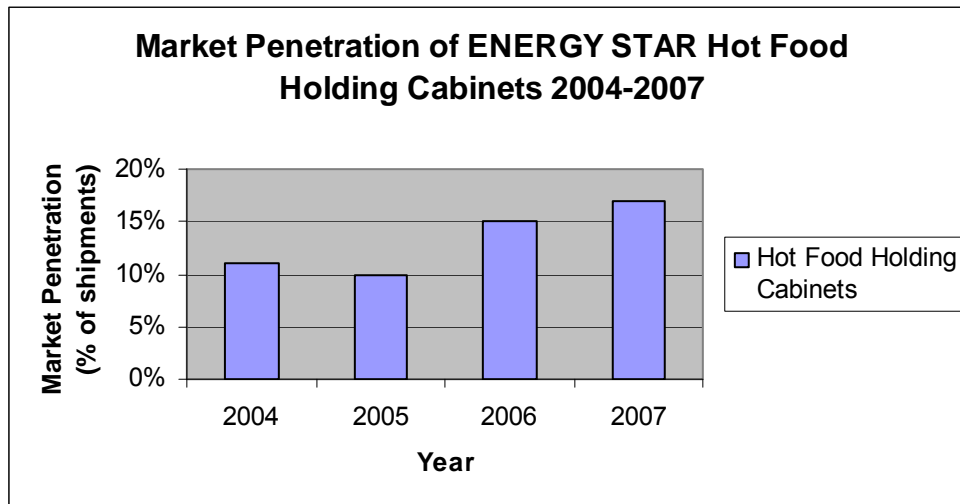
Product Availability

According to the [North American Food Equipment Manufacturer’s directory](#), as of September 2008 there were 23 HFHC manufacturers. Sixteen manufacturers made HFHCs that met the CEE Tier 1 or ENERGY STAR efficiency criteria and 12 manufacturers made HFHCs that met the CEE Tier 2 criteria. Qualifying Tier 1 manufacturers were:

- [Alto-Shaam](#)
- [Bevles](#)
- [Cambro](#)
- [Carter-Hoffmann](#)
- [Cres Cor](#)
- [FWE](#)
- [Hatco](#)
- [Henny Penny](#)
- [Hot Food Boxes](#)
- [InterMetro](#)
- [McCall](#)
- [Nor-Lake](#)
- [Royalton](#)
- [Traulsen](#)
- [CVap](#)
- [Wittco](#)
- [Vulcan-Hart.](#)

Market penetration of ENERGY STAR qualified HFHCs was 17% as of 2007. See Figure 1 below for market penetration of ENERGY STAR qualified HFHCs from 2004 through 2007.

Figure 1 - Market penetration of ENERGY STAR HFHCs 2004 - 2007.



Incremental Cost³

According to data compiled in November 2008, both CEE Tier 1 and CEE Tier 2 HFHC list prices range from \$1,095 to \$27,051 depending on model size and features. Typical end user pricing is about 50% of the list price. The median list price is \$7,872 for CEE Tier 1 qualified models and \$9,234 for CEE Tier 2 qualified models.

The relationship between size (volume) and list price for CEE Tier 1 or ENERGY STAR HFHCs is demonstrated visually in Figure 2 below. It is clear from these graphs that HFHC list price is highly correlated volume. The same relationship exists for nonqualifying and CEE Tier 2 products.

Figure 2. Relationship between list price and volume for CEE Tier 1 or ENERGY STAR qualified HFHCs.

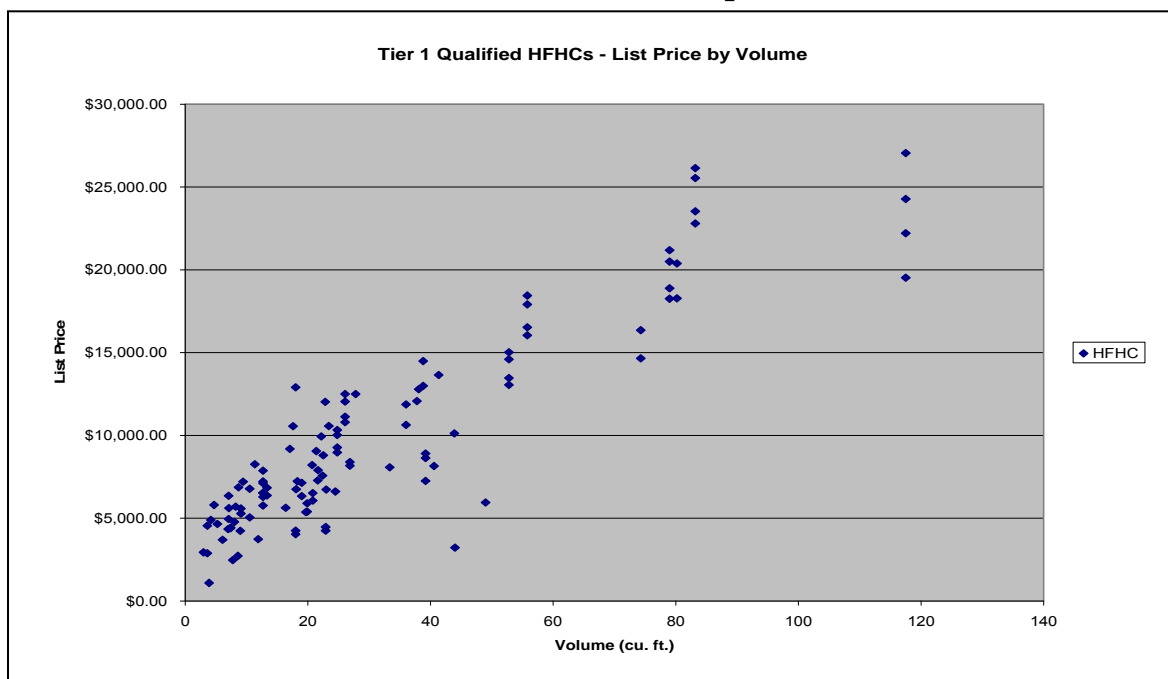


Table 1 below shows the average list price and price differential for different volume categories of CEE Tier 1 and CEE Tier 2 qualified HFHCs. The size categories were determined by looking for natural breaks in volume. Smaller HFHCs did not exhibit any natural breaks, so 5 cubic foot intervals were used to provide a high level of detail.

³ All list price information is based on an analysis of CEE Tier 1 and 2 qualified HFHCs listed in AutoQuotes on November 3, 2008. Only the tested products in a product family were included in this analysis.

Table 1. HFHC average list price and price differential by volume.

Size Category (Cubic Feet)	Average List Price CEE Tier 1	Average List Price CEE Tier 2	Average List Price Differential Between CEE Tier 1 and 2	Average List Price/Cu. Ft. CEE Tier 1	Average List Price/Cu. Ft. CEE Tier 2	Average List Price/Cu. Ft. Differential Between CEE Tier 1 and 2
<5	\$ 3,697	\$ 2,309	(\$1,388)	\$ 956	\$ 689	(\$266)
5≤x<10	\$ 4,902	\$ 4,825	(\$77)	\$ 637	\$ 611	(\$26)
10≤x<15	\$ 6,490	\$ 6,692	\$201	\$ 530	\$ 546	\$16
15≤x<20	\$ 6,978	\$ 7,494	\$516	\$ 383	\$ 411	\$28
20≤x<30	\$ 8,853	\$ 9,228	\$374	\$ 370	\$ 385	\$15
30≤x<45	\$ 10,208	\$ 10,745	\$537	\$ 264	\$ 279	\$15
45≤x<60	\$ 14,559	\$ 14,559	\$0	\$ 269	\$ 269	\$0
60≤x<100	\$ 20,543	\$ 20,543	\$0	\$ 256	\$ 256	\$0
100≤x	\$ 23,265	\$ 23,265	\$0	\$ 198	\$ 198	\$0

Energy Savings

HFHCs designed with energy efficiency in mind can save significant electricity. Some design attributes that can realize these savings include: improved insulation, digital temperature and humidity controls, auto-door closers, magnetic gaskets, and doors that can be used without losing heat from the entire cabinet (i.e. Dutch Doors).

Table 2 below depicts the energy consumption of standard (baseline) HFHCs, CEE Tier 1 or ENERGY STAR HFHCs, and CEE Tier 2 HFHCs by volume category. A standard HFHC is assumed to consume 70 watts per cubic foot. CEE Tier 1 or ENERGY STAR HFHCs consume a maximum of 40 watts per cubic foot (a 43% savings over the baseline), and CEE Tier 2 HFHCs consume a maximum of 20 watts per cubic foot (a 50% savings over the CEE Tier 1 or ENERGY STAR levels). These calculations were made using the Pacific Gas and Electric Food Service Technology Center (FSTC) [Life Cycle Cost Calculator](#) assuming usage of 15 hours per day and a life expectancy of 12 years.

Table 2. Energy savings estimates for HFHCs by volume.

Volume Category (Cubic Feet)	Calculated Size (cubic feet)	Annual Energy Consumption (kWh)			Life Cycle Energy Consumption (kWh)			% Savings Baseline to CEE Tier 1 / ENERGY STAR	% Savings CEE Tier 1 / ENERGY STAR to CEE Tier 2
		Baseline	CEE Tier 1 / ENERGY STAR	CEE Tier 2	Baseline	CEE Tier 1 / ENERGY STAR	CEE Tier 2		
<5	2.5	958	548	274	11,496	6,576	3,288	43%	50%
5≤x<10	7.5	2,874	1,643	821	34,488	19,716	9,852	43%	50%
10≤x<15	12.5	4,791	2,738	1,369	57,492	32,856	16,428	43%	50%
15≤x<20	17.5	6,707	3,833	1,916	80,484	45,996	22,992	43%	50%
20≤x<30	25	9,581	5,475	2,738	114,972	65,700	32,856	43%	50%
30≤x<45	37.5	14,372	8,213	4,106	172,464	98,556	49,272	43%	50%
45≤x<60	52.5	20,121	11,498	5,749	241,452	137,976	68,988	43%	50%
60≤x<100	80	30,660	17,520	8,760	367,920	210,240	105,120	43%	50%
100≤x	117.5	45,032	25,733	12,866	540,384	308,796	154,392	43%	50%

Program Design Tips

- ✓ Smaller volume HFHCs: When adding HFHCs to your commercial kitchens program, be aware of how the program may impact the market for smaller HFHCs and how smaller HFHCs may impact your program. Some members found that by offering a single rebate amount for all HFHC sizes, the rebate covered most or all of the cost of smaller HFHCs. This resulted in some customers purchasing small HFHCs simply because they were virtually free, even if they did not have a current or foreseeable use for them. It also resulted in some dealers raising the price on small HFHCs by approximately the same amount of the rebate offered. In terms of the impact of small HFHCs on programs, the estimated savings of smaller units are significantly lower than the savings provided by larger units, so if a program ends up providing incentives on a larger number of smaller units than anticipated, the projected savings of the program will be significantly different than the actual savings. Some members have managed these concerns by establishing minimum volume requirements for their programs or developing size categories to better match financial incentives and estimated savings.
- ✓ Market segment risks: HFHCs, especially smaller units, are often purchased by rental companies. Because the units are rented to other customers through these companies, a program may not be able to ensure that the equipment will be used within their service territory. In addition, assumptions made about usage may not apply for rental companies.

Additional Resources

- [ENERGY STAR Hot Food Holding Cabinets Web page: http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc](http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc). ENERGY STAR includes specifications, qualified product lists, case studies, and general savings information about

commercial HFHCs. Links to other commercial foodservice equipment categories are also provided.

- [Pacific Gas and Electric Food Service Technology Center Life Cycle Cost Calculators](http://www.fishnick.com/saveenergy/tools/calculators/): <http://www.fishnick.com/saveenergy/tools/calculators/>. On this Web page, the FSTC provides life cycle cost calculators for HFHCs, with the ability for users to modify HFHC performance, usage, and utility rate characteristics. Calculators for other commercial cooking equipment categories are also provided.