Design Guide

Sizing Dishroom Ventilation

Improving Operational Performance of Commercial Foodservice Dishrooms

Sizing Dishroom Ventilation will help you achieve optimum performance and energy efficiency in your commercial dishroom ventilation system. The information presented is applicable to new construction and, in some instances, retrofit construction.

This design guide is intended to augment comprehensive design information published in the ASHRAE Applications Handbook on HVAC as well as the other *Commercial Kitchen Ventilation* design guides. This guide also serves to supplement the *Specifying a Dishroom* and *Building Water Systems for Commercial Foodservice* design guides.

Introduction

Commercial dishrooms are often the highest source of heat and humidity in a foodservice facility, resulting in poor working conditions and high HVAC loads. Dishrooms need to be properly ventilated and conditioned to reduce condensation and mold growth as well as maintain a comfortable working environment for employees.

This design guide will present a brief overview of typical dishrooms and dishroom equipment as a foundation for characterizing dishroom equipment heat loads and recommending proper ventilation strategies. This guide is intended for foodservice designers and kitchen operators to estimate the indirect HVAC loads of their dishroom operation and size their air-conditioning and ventilation systems accordingly.

Commercial Foodservice Dishrooms

Foodservice dishrooms can be broken down into two main operations: pre-rinsing and dishwashing. A commercial foodservice pre-rinse operation (PRO) includes the dishroom equipment used to prepare dish and glasswares for processing through the dishmachine. PRO types can range from minimalist manual dry-scrapping-only operations with virtually no water use to dishrooms with large, motorized water- and energy-intensive rinsing and scrap processing equipment, with many types in between. The most common pre-rinse equipment includes pre-rinse spray valves (or "nozzles"), three-compartment sinks, power wash sinks, scrap collectors, and scrap collectors with troughs.

Dishmachines (or "dishwashing machines", "dishwashers") can vary greatly in size and throughput. Types of dishmachines include undercounter, door-type, rack conveyor, and flight-type conveyor. Dishmachines are primarily characterized by daily water use (expressed as gallons of water per dish rack, or gallons per hour for flight-types) and idle energy rate. Water use is a fundamental measure of efficiency as it correlates with the energy used to heat water and the amount of cleaning chemicals required for each cycle.

For more design information specific to pre-rinse operations and dishmachines, please refer to the ***Specifying a Dishroom*** design guide.

There are two types of commercial dishmachines based on sanitation method: ***low-temperature chemical-sanitizing*** and ***high-temperature sanitizing***. Low-temperature (or "low-temp") chemical-sanitizing machines wash at 120-140°F and final rinse at 140°F with the aid of chemical sanitizing agents. A low-temp dishmachine uses three chemicals: (1) a washing agent, (2) a rinse aid, and (3) a sanitizer. Normally, low-temp machines are not required to be installed under a ventilation hood (check with your local authority having jurisdiction).

High-temperature (or "high-temp") machines wash dishware at 150-160°F with a final rinse at 180°F, which is a high enough temperature to sanitize wares *without* the need for chemical sanitization. High-temp machines only use a washing agent and a rinse aid. The high rinse temperature is achieved by either an internal or external booster heater that "boosts" the incoming 140°F water supply from the facility's main water heater to achieve the minimum 180°F rinse temperature. Due to the intense heat generation, high-temp dishmachines are required to be direct vented or installed under a ventilation hood. High-temp machines are generally thought to have better washing performance without leaving chemical residue on glassware or otherwise blemishing certain dishware materials.

With the highest differential between incoming water temperature and final rinse temperature (and thus the greatest potential to transfer heat), some high-temp dishmachines use heat recovery to preheat the incoming cold water and reduce the demand on the building's hot water heater. There are three main high-temp dishmachine heat recovery technologies:

1. **Air to Water, Passive** — The most common heat recovery technology where incoming cold water is pumped through a heat exchanger coil located above the washing cavity during a rinse cycle. The steam generated by the rinse cycle preheats the incoming water for the next cycle and the incoming cold water condenses to steam, reducing the dishmachine moisture generation. This technology is becoming more common with door-type dishmachines; however, several manufacturers offer this type of heat recovery on conveyor machines as well. The typical 1-minute wash and rinse cycle is extended by 30-seconds with a heat recovery condensing cycle for door-type machines.

2. **Air to Water, Heat Pump** — A heat pump is used to heat the dishmachine wash tank. The heat pump is located above the rinse end of the conveyor machine. This technology captures the operating exhaust heat and vapor and converts it into usable energy to heat the wash and fresh rinse water. The cold side of the heat pump is used to cool down and condense the exhaust air from the rinse end of the dishmachine.

3. **Water to Water, Drain Water Heat Recovery** — A heat exchanger recovers heat from the drain water and transfers it to preheat the incoming cold water to the dishmachine. Certain jurisdictions require drain water temperatures to be tempered below 140°F, which may require installation of a heat exchanger on the dishmachine waste water line. This technology works best in higher flow dishmachines like conveyors. Overcooling of drain water may lead to grease coagulation in the waste stream and result in clogging. The heat exchangers are designed to be cleaned periodically.

Although heat recovery technologies add initial purchase cost, they reduce the heat to space generated by dishmachines and may allow machines to be installed without a ventilation hood in certain jurisdictions.

Bar/Café

Most bars collect their soiled glassware to be washed in either a three-compartment sink or an undercounter dishmachine. Bars are typically managed by a single person, who due to time constraints, may often be unable to wash glassware by hand. As a result, undercounter dishmachines are most commonly used. A café/coffee shop dishroom is similar in set up and operation. These types of dishrooms wash an estimated 50 racks of glassware per day.

Dishroom equipment in a typical bar/café include a pre-rinse spray valve, three-compartment sink, and possibly an undercounter dishmachine. Occasionally the three-compartment sink may be located in a separate prep room to the main dishroom.

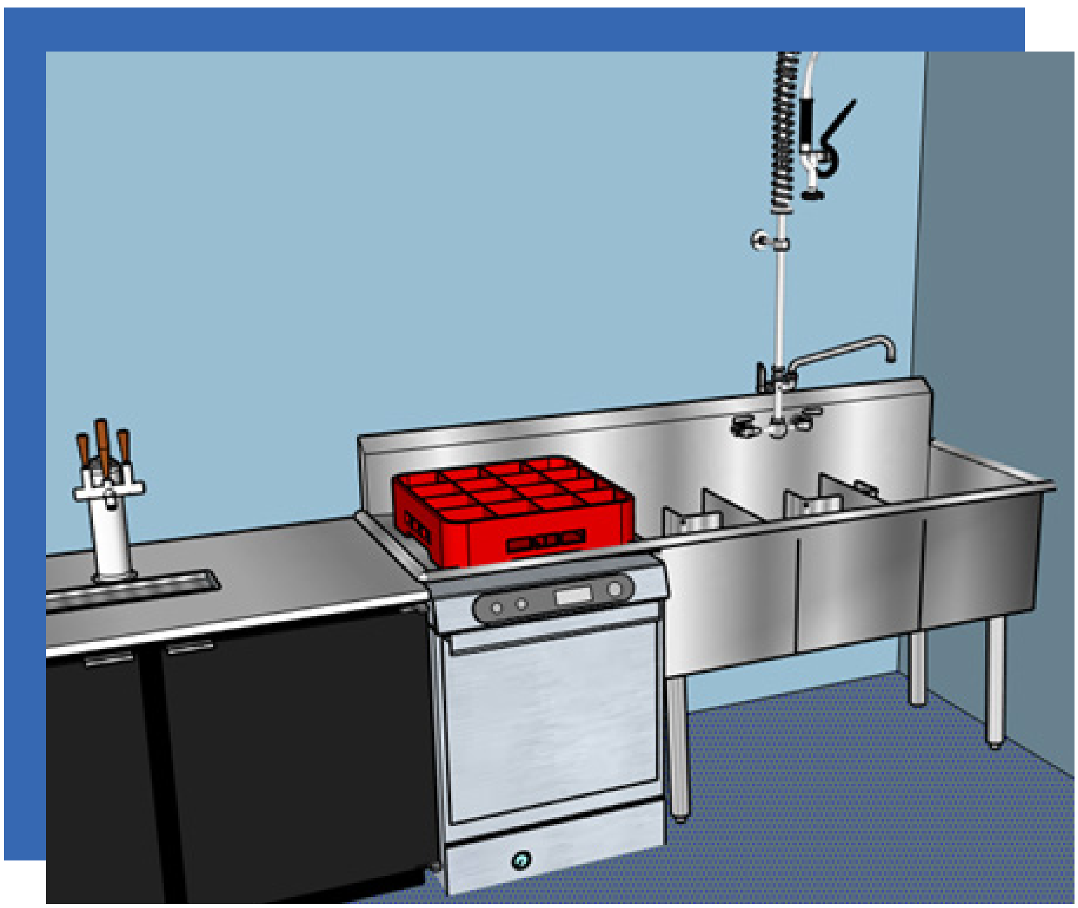

Figure 1. A typical dishroom in a bar or café.

Quick-Service Restaurants

Quick-service restaurants (QSRs) typically use disposable dishware instead of washable wares when serving their customers. QSRs also conduct the majority of their business through the drive-through, where most all food items are served in disposable wrappers.

Most of the time, QSRs only need to wash large utensils and wares that are soiled during the cooking process. These items include trays, sheet pans, tongs, spatulas, and various griddle and fryer accessories. Due to the low volume of resusable wares, washing can be handled with a three-compartment sink or a small dishmachine. Some QSRs use a power wash sink, which is essentially a three-compartment sink with an agitated wash component.

Typical equipment found in QSRs with disposables include a pre-rinse spray valve and a three-compartment or power wash sink. Certain municipalities in California are trying to reduce waste and may be targeting QSRs to switch from disposables to reusables in the future. If this mandate is enacted, QSRs would have to add a dishmachine to their dishroom operation, similar to the setup seen in small- to medium-sized restaurants.

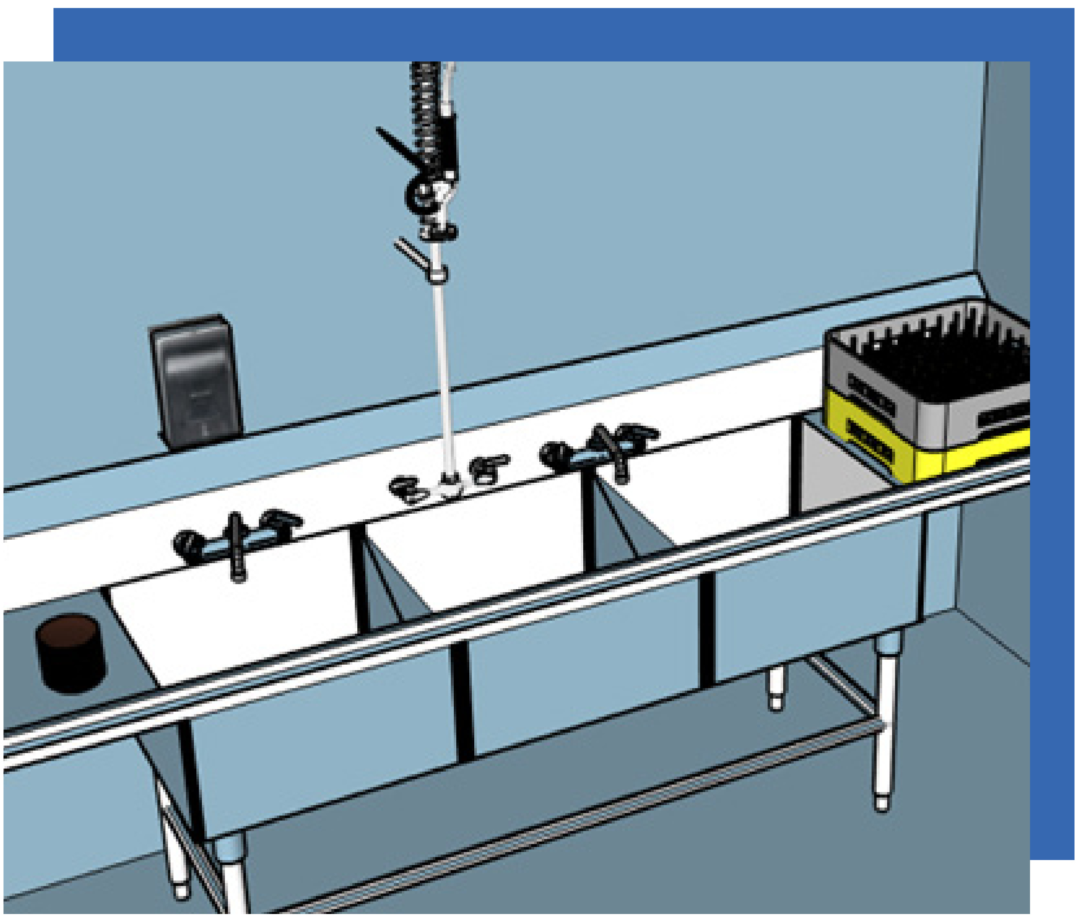

Figure 2. A typical dishroom in a quick-service restaurant.

Small- to Medium-Sized Restaurants

Small- and medium-sized restaurants need a dishmachine to clean wares used by customers as well as pots, pans, and utensils used in the kitchen. A door-type dishmachine is usually the best fit for these foodservice facilities with an estimated 150 racks of dishes washed per day (assuming 300 customers served and 2 customers' wares washed per rack). While most door-type dishmachines used in these establishments are low-temp, chemical-sanitizing, many restaurants are opting for high-temp door-type dishmachines that can better remove deposits on wares.

Typical equipment used in a small- to medium-sized restaurant include a pre-rinse spray valve, a three-compartment sink, and an upright door-type dishmachine. Dishes are pre-rinsed prior to loading in the dishmachine and the debris falls into the sink with a grinder/disposer. Door-type dishmachines need end tables attached on the loading and unloading end. These end tables can also be corner-mounted. Dishmachines are often drained 2-3 times per day depending on how well the dishes are pre-rinsed prior to loading/washing. Most dishmachines have a scrap basket collecting debris inside the wash tank, which can be emptied without draining the whole tank. Cleaning the scrap basket more often may reduce the number of times the tank is drained, saving water and energy.

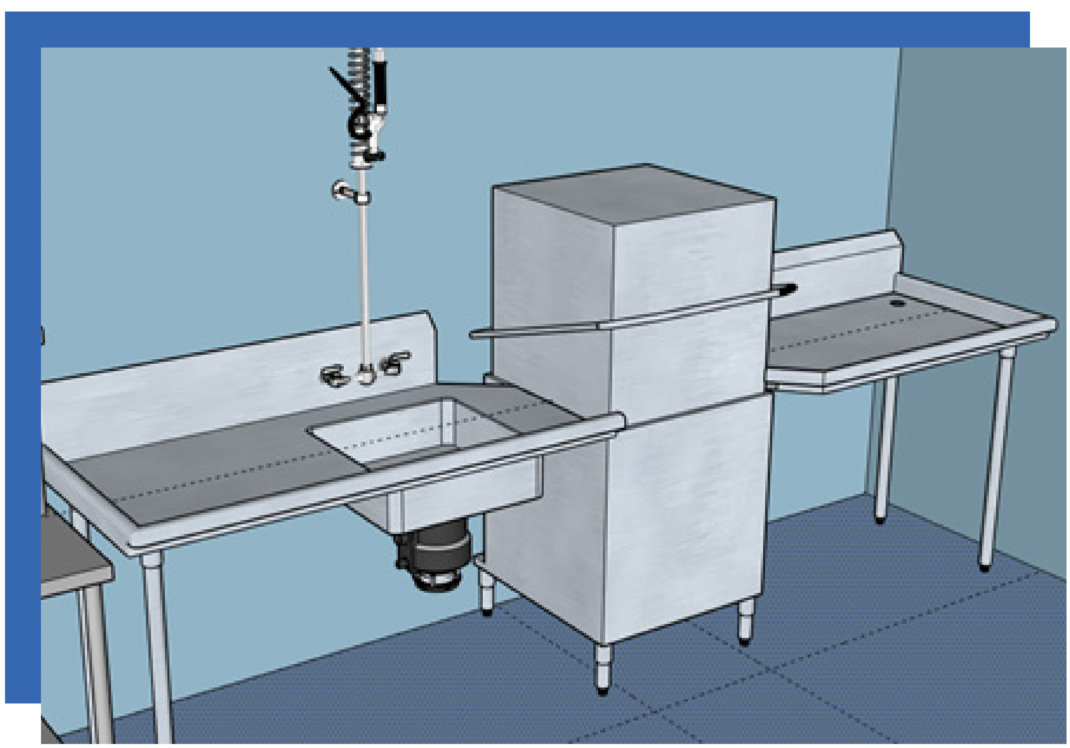

Figure 1. A typical dishroom in a small- to medium-sized restaurant.

Large Restaurants & Hotels

Large restaurant and hotel dishrooms are defined by their use of rack conveyor dishmachines that can handle a much larger volume of wares than door-type machines. Instead of washing each dish rack batch-by-batch, racks can be loaded continuously and several racks can be washed simultaneously. Conveyor dishmachines can also wash larger soiled cookwares that may not fit in door-type machines. As in the door-type dishmachine setup, wares are pre-rinsed prior to feeding into the conveyor dishmachine. Larger conveyor dishmachines 66"-80" in length usually have a prewash section. Longer end tables need to be installed on the exit end of the conveyor dishmachine to keep racks from backing up and stopping the conveyor. Maximum washing capacity with rack conveyor machines can only be achieved with two people operating the machine, one loading racks at the feeding end and another unloading racks at the other. Manufacturers usually list their wash capacity based on maximum conveyor belt speed, which is often much faster than a single person can load and unload racks from the machine.

Large restaurants and hotels typically have a pre-rinse spray valve, a three-compartment sink, and a conveyor dishmachine. It is estimated that a large restaurant or hotel will wash an average 300 racks of dishes per day.

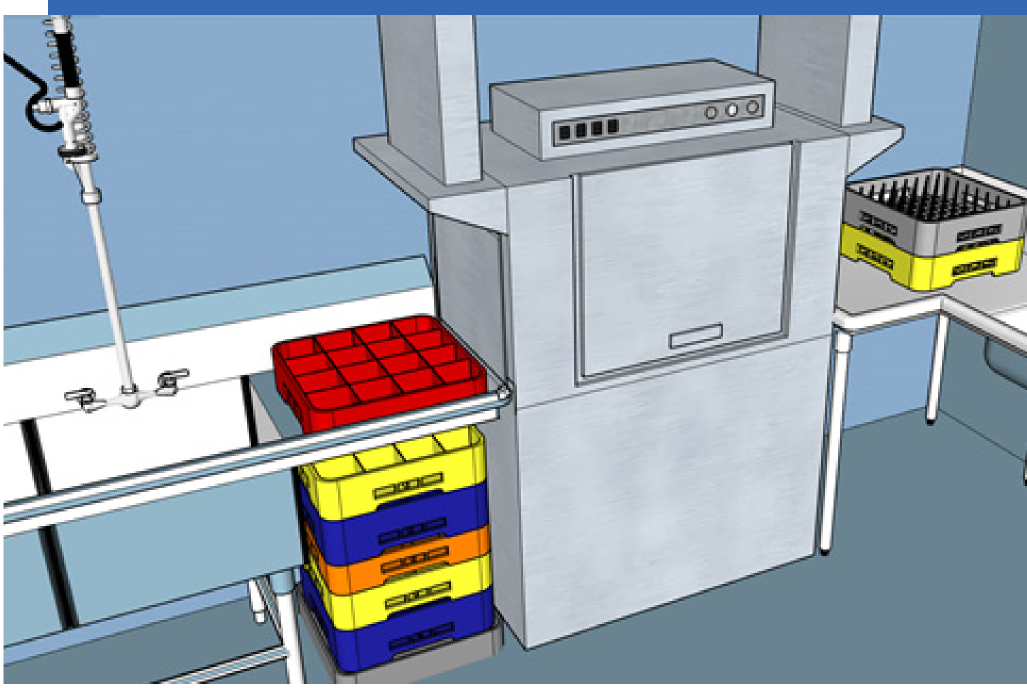

Figure 4. A typical dishroom in a large restaurant or hotel.

Cafeterias & Large Hotels/Casinos

Very large commercial foodservice dishrooms are often defined by their use of a flight-type conveyor dishmachine. These facilities serve thousands of meals per day and have several staff dedicated only to dishroom operations. These dishrooms are found in corporate cafeterias, large hotels & casinos, army bases, airport kitchens, college cafeterias, and large-scale production kitchens. Scrapping is often done using mechanical means like a scrap collector instead of a simple pre-rinse spray valve station alone. Flight-type dishmachines need to be operated by a minimum of two people due to the wares being placed directly onto the conveyor belt instead of in a dish rack.

Cafeterias and hotels usually have a pre-rinse spray valve, a scrap collector with trough, a flight-type conveyor dishmachine, and a pot and pan washing machine. Large cafeterias are estimated to wash 500 or more rack equivalents of wares per day. Flight-type dishmachine water consumption is characterized by rinse time instead of number of racks washed. Field research indicated an average of 8 hours of rinse time for a flight-type machine that is operating for 18 hours per day.

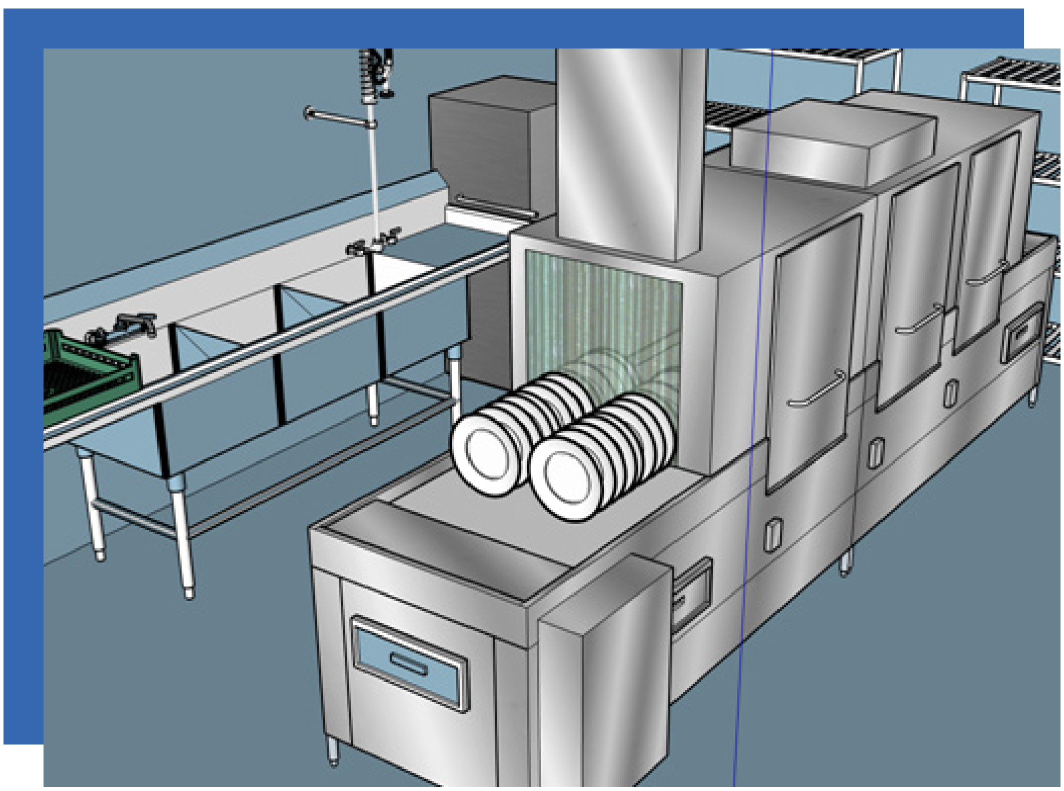

Figure 1. A typical dishroom in a cafeteria or hotel/casino.

Dishroom Equipment Heat Loads

As a substantial source of humidity and heat in a foodservice facility, dishrooms need to be properly ventilated and conditioned to limit condensation on walls and maintain a comfortable space for staff. Understanding the heat gain loads generated by common dishroom pre-rinse and dishwashing equipment is critical for properly sizing HVAC for dishrooms. All heat gain loads presented in this guide are peak values when equipment is operating at full capacity. Equipment heat gain will depend on hours of operation (often not coincident with kitchen operations) and the number of staff operating the equipment (e.g. four people operating a flight-type or two people operating a rack conveyor at full capacity). Dishrooms are often understaffed, so less people could be operating the equipment at less than its maximum capacity. Heat gain from dishroom sources can be split into the following categories:

- ***Convective Sensible***: Dry heat coming off washing equipment.
- ***Convective Latent***: Moisture load coming off pre-rinse and washing equipment.
- ***Radiant***: Negligible for dishrooms because all washing equipment operates below 200°F.

Most of the HVAC load in dishrooms is generated in the form of convective latent heat. The convective sensible load is also significant because pre-rinse and washing water ranges from 100°F to 190°F depending on the application. Pre-rinse operations are typically performed at 100-120°F and are often unhooded, while dish and warewashing occurs at a maximum of 120-140°F for low-temp dishmachines and 180-190°F for high-temp machines.

Figure 1 characterizes the heat gain for various pre-rinse operations equipment. The pre-rinse equipment with idle heat gain loads are the three-comp and power wash sinks at 2,700 Btu/h and 3,100 Btu/h, respectively.

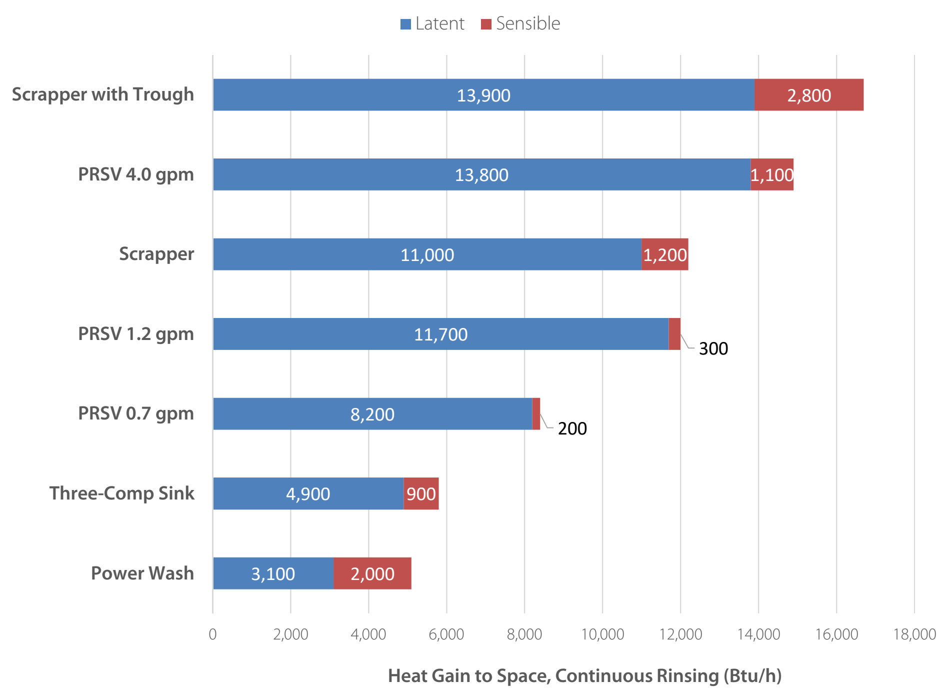

Figure 1. Heat Gain to Space for Various Pre-Rinse Operations Equipment.

Figure 2 characterizes the heat gain for various dishmachine types without a hood. All values given are for total heat load coming off the dishmachine **without** characterizing the percentage of the load that is captured by a hood.

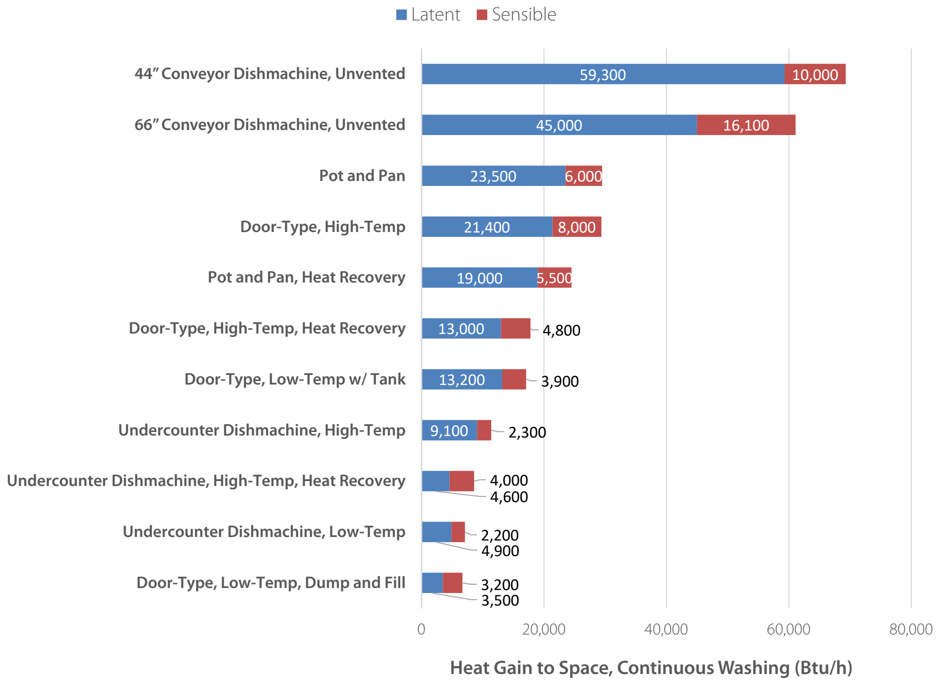

Figure 2. Heat Gain to Space of Various Unhooded/Unvented Dishmachines.

Figure 3 below shows dishmachine heat gain to space for door-type, rack conveyor, and flight-type dishmachines in different ventilation scenarios. The door-type machine heat gain to space values represent ventilation under two different sized hoods, while both the rack conveyor and flight-type conveyor values are presented with pant leg ducts attached, operating at 230 cfm inlet and 400 cfm outlet per manufacturer's specifications.

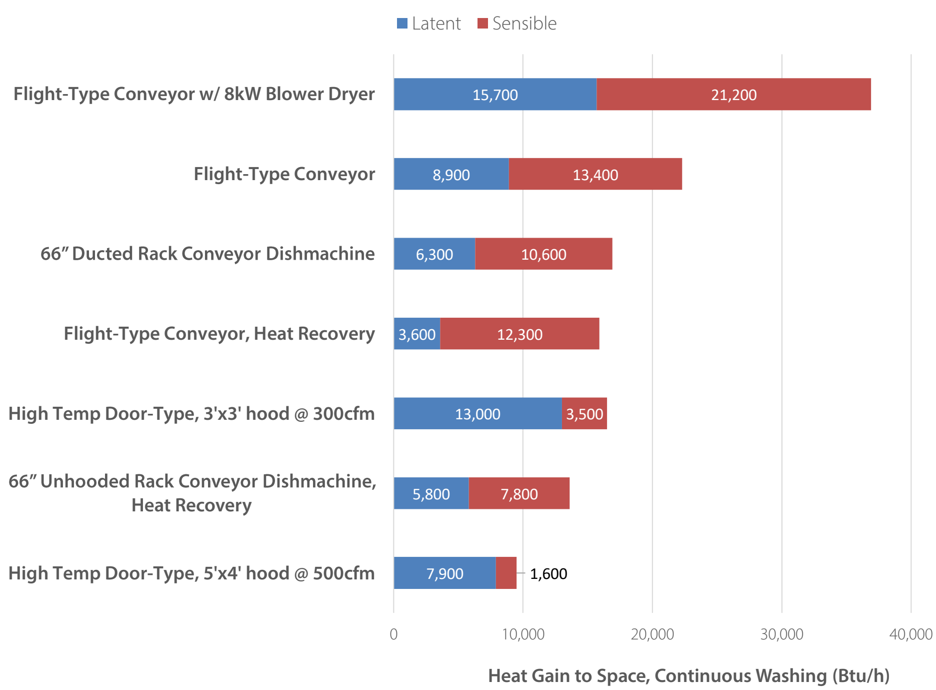

Figure 3. Heat Gain to Space of Various Hooded/Vented Dishmachines.

The table below summarizes the peak cumulative heat load values by dishroom type.

Table 1. Peak Pre-Rinse & Washing Equipment Heat Gains for Different Dishroom Operations.

Dishroom Type	Pre-Rinse Equipment & Heat Load	Washing Equipment & Heat Load	Dish Load	Total Maximum Load (1 hour Operation)
Bar/Café	• PRSV @ 12,000 Btu/h • 3-Comp Sink @ 5,800 Btu/h	High-Temp Undercounter @ 8,600 Btu/h	10 racks per hour @ 4,000 Btu/h	30,400 Btu/h
Quick-Service Restaurant	PRSV @ 12,000 Btu/h	Power Agitated Sink @ 5,100 Btu/h	10 racks per hour @ 4,000 Btu/h	21,100 Btu/h
Small- to Medium-Size Restaurant	PRSV @ 12,000 Btu/h	High-Temp Door-Type w/ 3' Hood (300 cfm) @ 18,200 Btu/h	40 racks per hour @ 16,000 Btu/h	46,200 Btu/h
Large Restaurant or Hotel	• PRSV @ 12,000 Btu/h • Scrap Collector @ 12,200 Btu/h	Rack Conveyor w/ Ducted Pant Legs @ 16,900 Btu/h	100 racks per hour @ 40,000 Btu/h	81,100 Btu/h
Cafeteria or Large Hotel/ Casino	• 2x PRSV @ 24,000 Btu/h • Scrap Collector w/ Trough @ 16,700 Btu/h	• Flight-Type w/ Ducted Pant Legs @ 22,300 Btu/h • Pot and Pan Washer @ 24,500 Btu/h	300 racks per hour @ 120,000 Btu/h	207,500 Btu/h

Dishmachine Ventilation

Different exhaust airflow rates for a hooded dishmachine can have varying effects on the heat gain to space in a dishroom. The higher the ventilation airflow rate (measured in cubic feet per minute, or cfm), the less heat and moisture escapes from the dishmachine to the surrounding space. The heat gain vs. exhaust airflow rate curves presented in this section are non-linear; as a result, there is a "sweet spot" between the two extremes of exhausting too much air and generating too much humidity in a dishroom. Ideally, the exhaust airflow rate would be optimized to minimize the amount of makeup air cooling to compensate for the exhausted air. The in-room conditioning should also be sufficient to handle the latent load left in the dishroom and minimize the humidity. This section will discuss proper ventilation sizing specific to high-temp door-type and rack conveyor dishmachines. For more detailed design information on commercial exhaust hoods, makeup air, and HVAC considerations, please refer to the *Optimizing Commercial Kitchen Ventilation* design guide series.

High-Temp Door-Type Dishmachine Ventilation

High-temp door-type dishmachines are typically installed under 3' x 3' hoods with a recommended exhaust rate of 300 cfm. Increasing the airflow rate to 1,200 cfm captures over 80% of the convective heat gain of the machine. An optimal flowrate in the range of 600-800 cfm captures over 60% of the heat gain generated by the high-temp machine. The following graph details the heat gain to space relative to the hood exhaust airflow rate for a high-temp door-type dishmachine under a 3' by 3' hood.

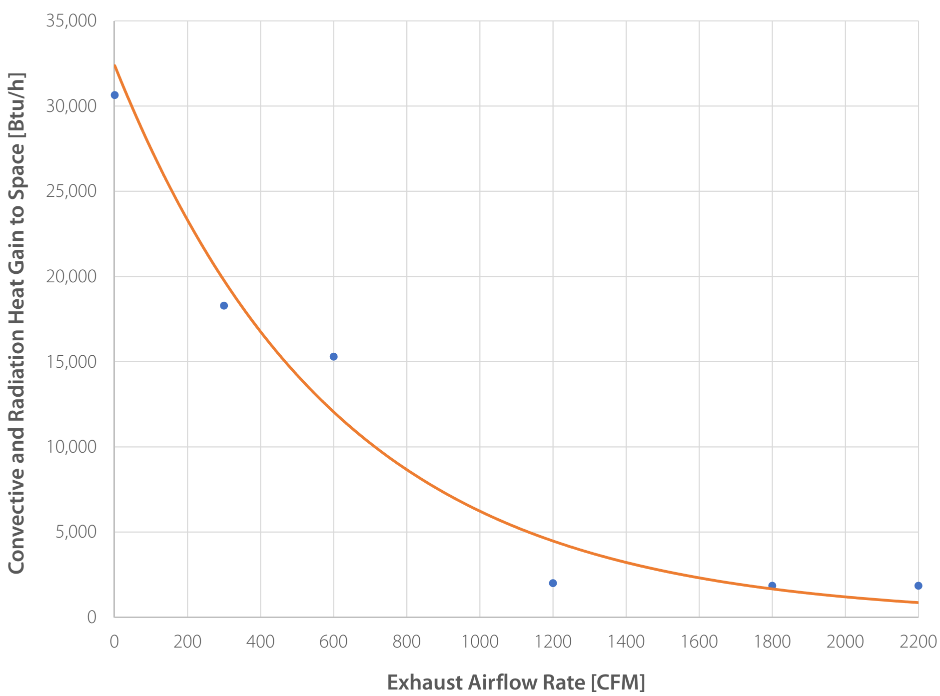

Figure 4. High-Temp Door-Type Dishmachine w/ 3' x 3' Hood — Exhaust Airflow Rate vs. Heat Gain Curve.

Increasing the hood size to 5′ x 4′ reduces the air velocity while maintaining the same exhaust airflow rate. A typical 5-foot hood over a high-temp door-type dishmachine would would be installed at 500 cfm, which would capture over 60% of the machine's heat load. Almost all convective load is captured at 1,000 cfm with a 5′ x 4′ hood as opposed to 1,200 cfm with a 3′ x 3′ hood.

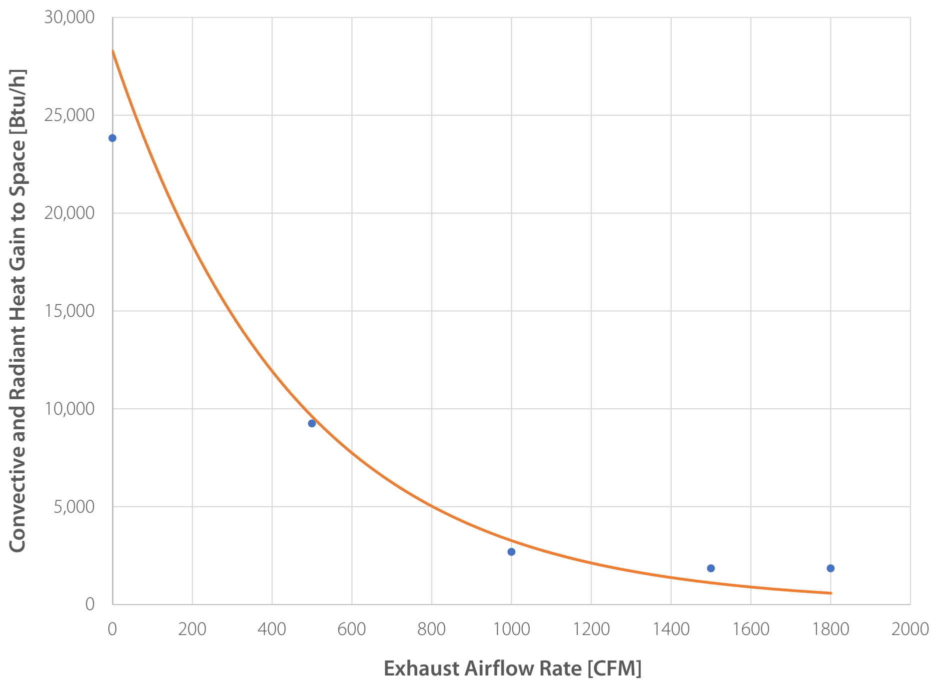

Figure 2. High-Temp Door-Type Dishmachine w/ 5′ x 4′ Hood — Exhaust Airflow Rate vs. Heat Gain Curve.

High-temp door-type dishmachines are rarely ventilated at airflows above 600 cfm; however, if airflow is set to 600 cfm, a 3′ x 3′ hood would result in 12,000 Btu/h heat gain, while the 5′ x 4′ hood at the same rate would result in only 8,000 Btu/h heat gain to space. Since dishmachine hoods are often operated at rates of 100 cfm per linear foot, a 3-foot hood would only operate at 300 cfm and a 5-foot hood would operate at 500 cfm, resulting in almost a 10,000 Btu/h decrease of heat gain to space. It is possible to run a 3-foot hood at higher airflow rates of 200 cfm/linear foot, acheiving a similar capture as a 5-foot hood at 120 cfm/linear foot, but that will result in increased static pressure and assumes the exhaust fan can handle the increased load.

Rack Conveyor Dishmachine Ventilation

High-temp rack conveyor dishmachines often get installed using pant leg ducts with 200 cfm on the loading and 400 cfm on the unloading end. Lab testing of a 66" rack conveyor dishmachine with ducted pant legs resulted in a 17,000 Btu/h heat load. This load increased to 61,000 Btu/h once the ducts were removed. A heat pump heat recovery version of the same rack conveyor machine with ducts resulted in only 13,000 Btu/h of heat gain to space.

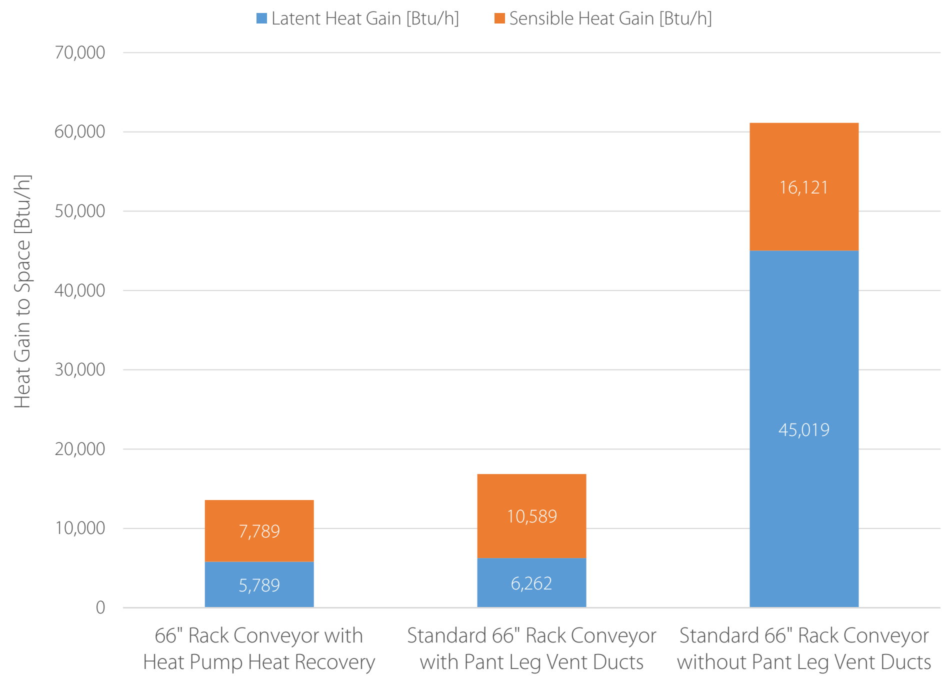

Figure 3. 66" Rack Conveyor Dishmachine — Heat Gain in Different Configurations.

The total heat gain of a 44" rack conveyor dishmachine is 70,000 Btu/h. If the rack conveyor is installed under at 10-foot ventilation hood, most of the load can be captured and contained at 1,800 cfm. Reducing the airflow rate down to 1,000 cfm, or 100 cfm/linear foot, results in a heat gain to space of 20,000 Btu/h. The heat gain from a rack conveyor dishmachine under a 10-foot hood at 120 cfm/linear foot is roughly equivalent to the aforementioned commonplace configuration of installation with pant leg ducts at 200 cfm/400 cfm. The curve below shows the heat gain vs. exhaust airflow rates for a 44" rack conveyor dishmachine under a 10-foot hood.

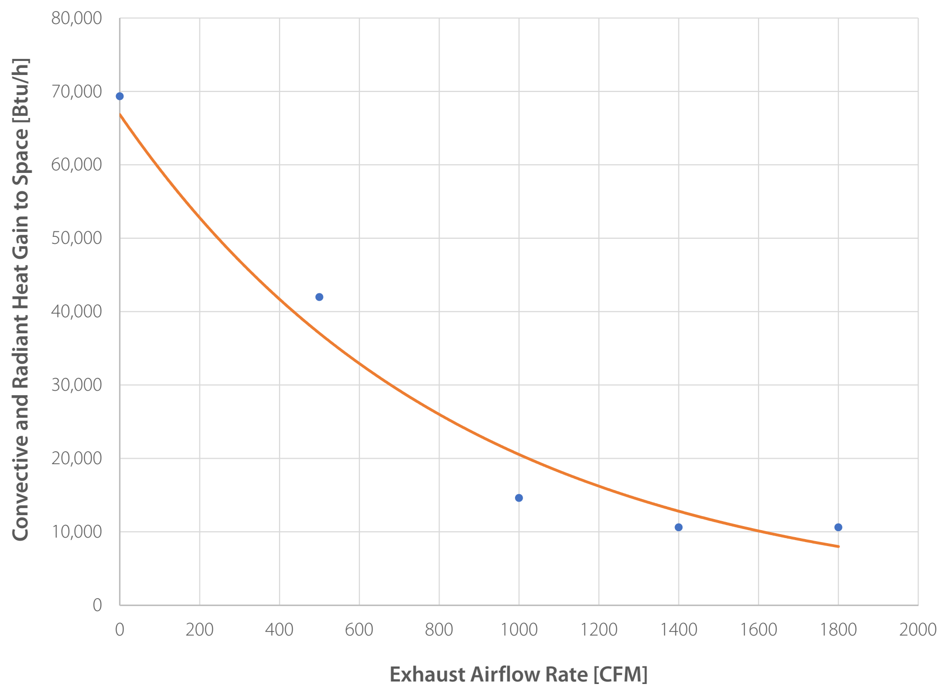

Figure 4. 44" Rack Conveyor Dishmachine w/ 10' Hood — Exhaust Airflow Rate vs. Heat Gain Curve.

Flight-Type Dishmachine Ventilation

Flight-type dishmachines have the highest washing output and often the highest water consumption. The following graph details the heat gain of an ENERGY STAR-rated, low-water consuming flight-type machine ducted at 200 cfm at the inlet and 400 cfm at the outlet. Flight-type heat gain is dominated by the sensible load because of their large surface area, while most of the latent load is contained within the unit. A standard flight-type machine generates more heat than a 44-66" rack conveyor machine, however, a heat recovery flight-type generates as much heat gain as a standard rack conveyor unit. Adding a heated blower dryer to a flight-type adds both a latent and sensible load. However, every rack of 10 dishes that exits any high-temp dishmachine generates 400 Btu of load if left to dry unvented in the dishroom.

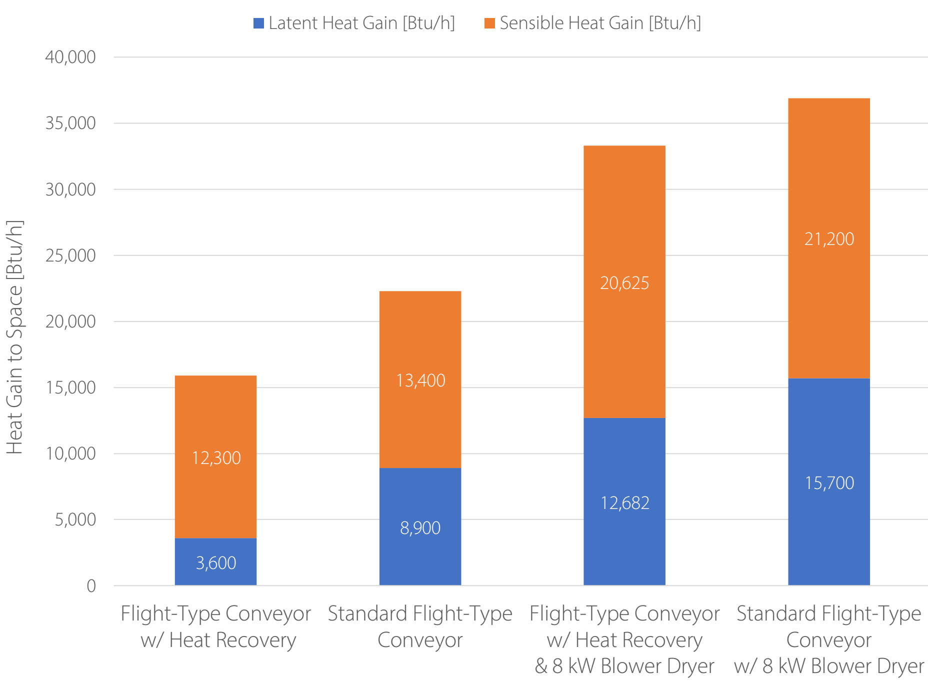

Figure 5. Flight-Type Conveyor Dishmachine — Heat Gain in Different Configurations.

Code Requirements & Spillage

The International Mechanical Code (IMC) is usually referenced in local codes to determine dishroom exhaust ventilation rates. Table 2 below details the spillage rates for dishrooms designed to the minimum IMC requirements. For more on exhaust ventilation codes, please reference the *Optimizing Commercial Kitchen Ventilation* design guide series.

Table 2. Minimum IMC Requirements for Dishmachine Ventilation.

Dishwashing Equipment Type	Minimum Ventilation Requirement per IMC	Heat Gain to Space (Max Btu/h)	% Capture
Low-Temp Door-Type Dishmachine	Unhooded	7,000 – 17,000	0
High-Temp Door-Type Dishmachine w/ 3' Hood	100 cfm per linear foot; 300 cfm total	20,000	38
High-Temp Door-Type Dishmachine w/ 5' Hood	100 cfm per linear foot; 500 cfm total	9,500	66
Rack Conveyor Dishmachine w/ Pant Leg Vent Ducts	Manufacturer Specified; 200 cfm inlet 400 cfm outlet	17,000	72
Rack Conveyor Dishmachine, w/ 10' Hood	100 cfm per linear foot; 1,000 cfm total	20,000	70

Ventilation rates could be increased above the IMC minimums to capture 80% of the heat emitted by dishmachines. Table 3 below shows the corresponding flow rates to achieve this capture threshold with non-heat recovery dishmachines.

Table 3. Ventilation Recommendations for 80% Capture of Non-Heat Recovery Dishmachines.

Dishwashing Equipment Type	Minimum Ventilation Requirement	Heat Gain to Space (Max Btu/h)	% Capture
High-Temp Door-Type Dishmachine w/ 3' Hood	330 cfm per linear foot; 1,000 cfm total	6,500	80
High-Temp Door-Type Dishmachine w/ 5' Hood	150 cfm per linear foot; 750 cfm total	5,600	80
Rack Conveyor Dishmachine w/ 10' Hood	140 cfm per linear foot; 1,400 cfm total	13,600	80

Key Takeaways

- *Dishrooms are the highest source of humidity in foodservice facilities and require adequate ventilation to reduce condensation and prevent mold growth.*

- *Heat recovery dishmachine technologies should be specified when possible to reduce heat gain to space and ventilation requirements.*

- *Most dishroom heat load is latent. High-temp dishmachines have a latent/sensible heat load split of 70/30; pre-rinse equipment is split 95/5.*

- *Pre-rinse equipment heat load must be considered when sizing dishroom ventilation. A pre-rinse spray valve can generate up to 14,000 Btu/h of latent load per hour, similar to a high-temp undercounter dishmachine washing back-to-back racks of dishes.*

- *Simply installing a dishmachine under a hood does not eliminate the heat gain to space in dishrooms. The HVAC system must be sized properly to compensate for the remaining heat gain generated. The values presented in this guide can assist in sizing HVAC systems appropriately for dishrooms. For more on HVAC and exhaust hoods, please refer to* **CKV Design Guide 4: Integrating Kitchen Exhaust with Building HVAC**.

- *Rack conveyors installed under a 10-foot hood operating at 1,200 cfm showed similar heat gain values to those installed with pant leg ducts operating at 200 cfm (inlet) and 400 cfm (outlet).*

- *Most high-temp door-type dishmachines are installed at 300 cfm under a 3-ft hood, which results in only 38% heat gain capture. Increasing the exhaust airflow rate to 1,000 cfm contains 80% of the heat gain generated by the dishmachine. Similar capture can be achieved with a 5-ft hood running only at 150 cfm per linear foot.*

Glossary

Door-Type Dishmachines — Door-type machines typically have a one rack capacity and most utilize a manual lever that opens/closes the dishwashing cavity for loading and washing. A standard door-type machine has a wash tank of 10-15 gallons. Door-type dump and fill machines do not have a wash tank and use the rinse water from the previous cycle as wash water for the next, which is held in a sump with a 1-2 gallon capacity. Pot and pan washing machines are specifically designed to wash large, bulky items and have a cavity sized to accomodate 1-2 racks.

Flight-Type Conveyor Dishmachines — Found in very large institutional facilities, these machines use a conveyor belt to feed items placed directly on the belt (without a dish rack) through prewash, wash, and rinse sections. Wider and longer in size than rack conveyors, flight-type machines consist of several sections and may have several tanks with individual water inlets. Some flight-types have the option of a heater blower dryer section that dries wares after the final rinse.

Heat Gain — Quantity of heat absorbed by an enclosed space (or system).

HVAC — Heating, Ventilation and Air Conditioning.

Power Wash Sink — Sometimes used in quick-service restaurant dishrooms to wash pans and trays, power wash sinks are similar to three-comp sinks except the washing compartment utilizes a resistance heater and water is agitated with a pump to improve washing quality and output.

Pre-Rinse Spray Valve (PRSV) — Pre-rinse spray valves (or "nozzles") are simple spray heads attached to a manual valve operated by a staff member. Food debris is sprayed off the plate into the sink prior to being loaded into a dishmachine or three-compartment sink. PRSVs are characterized by water flow rate and spray force; lower flow rate and higher spray force are associated with higher "cleanability" efficiency. Flow rates typically range from 0.65 to 4 gallons per minute (gpm); however, a 2018 Department of Energy (DOE) regulation limits the maximum flow rate of pre-rinse spray valves to 1.2 gpm. PRSVs are designed to provide maximum cleaning pressure while minimizing water consumption. High-pressure washing causes water to aerate and creates a significant latent load in the dishroom.

Rack Conveyor Dishmachines — Machines that use a conveyor belt to feed racks of dishes through separate wash and rinse sections. 44"-long conveyor machines are the most popular segment, while 60" versions add a prewash section before the wash section and 80" machines add an auxillary rinse section. Each section is separated by curtains. Conveyor wash tanks are usually 15-25 gallons, where prewash and auxillary rinse sections add 5-10 more gallons.

Scrap Collectors — A water fountain that is used to rapidly remove food debris from wares in a large deep well. Commonly referred to as "scrappers", scrap collectors are usually found in larger institutional kitchen dishrooms. Plates are placed under the fountain flushing debris down the drain, which either has a perforated basket or a grinder/disposer. The scrapper fountain is supplied with both fresh and recirculated water. Continuous fresh water is typically supplied at 2 gpm, while the recirculated water flow rate averages about 18 gpm.

Scrap Collectors with Troughs — A shallow "river" basin through which water flows to remove debris from dishware. Water flow is provided by multiple nozzles with a total flow rate of about 70 gpm (fresh + recirculated) when paired with a scrapper. The trough can be utilized by several people simultaneously as dishes are placed in the trough and cleaned as water flows over them. The trough usually feeds into a scrap collector at its endpoint.

Three-Compartment Sink — Each of the three compartments of these sinks is used for a separate purpose: (1) **Wash**, (2) **Rinse**, and (3) **Sanitize**. A chemical is added to each compartment for the cleaning process. These sinks are operated by hand and often used for pots and pans to soak before sanitization.

Undercounter Dishmachines — Similar in footprint to residential dishmachines, undercounter machines are primarily used for washing glassware. Undercounters can accomodate one rack of wares. These machines have a tank capacity of 3- to 5-gallons.

Notes and Acknowledgments

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Source

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Livchak, D., & Swierczyna, R. (2020). *Heat and Moisture Load from Commercial Dishroom Appliances and Equipment (RP-1778).* Atlanta, GA: ASHRAE.

Disclaimer

The results presented in this guide are derived from the controlled conditions of a laboratory environment. Field studies in active foodservice facilities have shown a wide variability in dishroom operations.