

Restaurant BTU Calculator V2 -- Sq Ft + Equipment + Occupancy

A real cooling-load formula for Birmingham restaurants. Square footage plus equipment heat plus occupancy plus solar gain. Worksheet plus example calculations.

WHO IT IS FOR

Restaurant owners, operators, and facility managers sizing or resizing HVAC for any restaurant in the Birmingham metro.

WHAT IS INSIDE

The 4-input formula, equipment-heat reference table (commercial kitchen equipment by BTU output), occupancy load math, Birmingham solar gain factors, two worked examples, and the 5-question sanity check.

Written by John, 25-year HVAC technician

AL HVAC Licensed - Bonded - Insured - EPA 608 Universal Certified

Published 2026-05-12 -- Last reviewed 2026-05-12

Read online: <https://emergencyhvacrepairpros.com/downloads/restaurant-btu-calculator-v2/>

Why restaurant cooling is harder than office cooling

A restaurant's cooling load per square foot is 3-5x an office's. Commercial cooking equipment dumps massive radiant and convective heat. People dining add heat through metabolism. Big front-of-house windows let in solar. Air infiltration from constantly-opening front doors. Get any of it wrong and you have a hot dining room at peak service. This formula handles all of it.

The V2 formula

Total cooling load (BTU/hr) = base sq ft load + equipment heat + occupancy load + solar gain

- * Base sq ft load: kitchen sq ft 70 BTU + dining sq ft 50 BTU
- * Equipment heat: sum from kitchen equipment table
- * Occupancy load: max occupancy 400 BTU per person at dining + kitchen staff 600 BTU per person
- * Solar gain: south/west windows sq ft 80 BTU; east windows 60 BTU; north windows 30 BTU
- * Result is in BTU/hr; divide by 12,000 to get tons

Equipment heat reference (BTU/hr output)

Approximate sensible heat output for typical commercial kitchen equipment:

- * 6-burner gas range -- 13,000 BTU/hr
- * 12" gas griddle -- 10,000 BTU/hr
- * 24" gas charbroiler -- 18,000 BTU/hr
- * 36" gas charbroiler -- 26,000 BTU/hr
- * Salamander broiler -- 8,000 BTU/hr
- * Convection oven (gas) -- 14,000 BTU/hr
- * Convection oven (electric) -- 9,500 BTU/hr
- * Pizza deck oven (gas, double) -- 22,000 BTU/hr
- * Fryer (40 lb) -- 9,500 BTU/hr
- * Combi oven -- 11,000 BTU/hr
- * Steam table (4 well, electric) -- 6,000 BTU/hr
- * Hot holding cabinet -- 4,500 BTU/hr
- * Dishwasher (low-temp) -- 4,000 BTU/hr
- * Dishwasher (high-temp) -- 8,500 BTU/hr
- * Walk-in cooler exterior heat (compressor) -- 9,000 BTU/hr
- * Note: hood-vented equipment exhausts ~60% of these numbers; only count the residual radiated heat -- about 40% of the table values

Occupancy load

People generate heat:

- * Seated dining guest -- 400 BTU/hr (light activity)
- * Active waitstaff -- 550 BTU/hr (moderate activity)
- * Kitchen line cook -- 600-800 BTU/hr (sustained moderate-to-heavy activity)
- * Dishwasher / busser -- 550 BTU/hr
- * For peak-service sizing: use 100% of design max occupancy
- * For ASHRAE 62.1 ventilation compliance, also calculate per-person ventilation (separate but related to total HVAC capacity)

Birmingham solar gain

Birmingham's sun is harsh on west-facing storefronts. Solar gain factors:

- * Single-pane glass: south/west 110 BTU/sq ft, east 80, north 35
- * Double-pane glass: south/west 80 BTU/sq ft, east 55, north 25
- * Tinted/low-E glass: south/west 45 BTU/sq ft, east 30, north 18
- * Awnings or overhangs reduce by 30-50% on south/west exposures
- * Birmingham peak summer solar on a west-facing storefront is the worst calculator-vs-reality miss restaurants make

Worked example 1 -- 2,500 sq ft fast-casual

A fast-casual restaurant in Birmingham:

- * Kitchen: 800 sq ft. Dining: 1,700 sq ft
- * Equipment (hood-vented, count 40%): 2 fryers ($9,500 \times 2 \times 0.4 = 7,600$), 1 charbroiler ($26,000 \times 0.4 = 10,400$), 1 convection oven ($14,000 \times 0.4 = 5,600$), 1 griddle ($10,000 \times 0.4 = 4,000$), prep refrigeration (3,000), POS computers and lighting (2,000) = 32,600 BTU/hr
- * Occupancy: 60 dining seats $400 = 24,000$; 8 kitchen staff $700 = 5,600 = 29,600$ BTU/hr
- * Solar gain: 180 sq ft west-facing storefront, double-pane = 14,400 BTU/hr
- * Base load: $800 \times 70 + 1,700 \times 50 = 56,000 + 85,000 = 141,000$ BTU/hr
- * TOTAL: $141,000 + 32,600 + 29,600 + 14,400 = 217,600$ BTU/hr = 18.1 tons

Worked example 2 -- 1,500 sq ft pizzeria

A pizzeria in Birmingham:

- * Kitchen: 500 sq ft. Dining: 1,000 sq ft
- * Equipment: double pizza deck oven ($22,000 \times 0.4 = 8,800$), prep stations (3,000), small fryer ($9,500 \times 0.4 = 3,800$), refrigeration heat (3,000), lighting and POS (1,500) = 20,100 BTU/hr
- * Occupancy: 40 seats $400 = 16,000$; 5 staff $650 = 3,250 = 19,250$ BTU/hr
- * Solar gain: 120 sq ft east-facing windows, single-pane = 9,600 BTU/hr
- * Base load: $500 \times 70 + 1,000 \times 50 = 35,000 + 50,000 = 85,000$ BTU/hr
- * TOTAL: $85,000 + 20,100 + 19,250 + 9,600 = 133,950$ BTU/hr = 11.2 tons

The 5-question sanity check

Before sizing an install, answer:

- * 1. Is the kitchen hood properly sized and operating? Undersized hood = heat dumps into dining room and your formula is wrong
- * 2. Is the makeup air for the hood balanced? Negative-pressure restaurants suck in hot outside air at every door open
- * 3. Are the equipment numbers based on PEAK service, not average? Design for the worst day
- * 4. Is the dining room zoned separately from the kitchen? Two zones almost always beat one undersized system
- * 5. Has any contractor checked refrigeration heat rejection? Walk-in coolers and reach-ins all dump heat into the space

Common Birmingham restaurant sizing mistakes

- * Sizing on square footage alone -- undersizes by 40-60% in most restaurants
- * Ignoring the hood makeup air balance -- system has to overcome infiltration
- * Single zone for kitchen and dining -- kitchen overheats or dining freezes
- * Forgetting solar gain on west exposures -- peak service hours coincide with peak solar
- * Underspecified for late-summer afternoons -- design for the 95 deg F+ day, not the average

Sources

- * ASHRAE Handbook -- Heating, Ventilating, and Air-Conditioning Applications, Restaurant chapter
- * ASHRAE 62.1 -- Ventilation for Acceptable Indoor Air Quality
- * ACCA Manual N -- Commercial Load Calculation
- * NFPA 96 -- Standard for Ventilation Control of Commercial Cooking Operations
- * AHRI -- Commercial equipment performance data
- * Manufacturer cut sheets (True, Hobart, Vulcan, Garland, Pitco for equipment heat numbers)

Disclaimer

This guide is informational. It is not a substitute for licensed HVAC inspection, diagnosis, or service. Conditions vary by home and equipment. Refrigerant work, gas-line work, and high-voltage electrical work require an EPA Section 608 certified technician and a licensed HVAC contractor under Alabama law. When in doubt, call.

No pricing on this site is a quote. No response time is a guarantee. All ranges shown are observed market data, not promises.

About the author

John -- 25-year HVAC tech

AL HVAC Licensed - Bonded - Insured - EPA 608 Universal Certified

John has been turning wrenches on Birmingham HVAC systems for 25 years. Alabama HVAC contractor licensed, bonded, and insured. EPA Section 608 Universal certified. He has walked roofs, attics, crawlspaces, and condenser pads across every neighborhood in this metro and has written every guide on this site from the working tech's perspective -- not the salesman's.

More guides at:

<https://emergencyhvacrepairpros.com/downloads/>

Emergency HVAC Repair Pros

(205) 206-6606 -- Commercial HVAC across the Birmingham, AL metro