

Direct Gas-Fired Air Heaters

Selecting a System to Meet
Your Ventilation Needs



Air-Conditioning, Heating,
and Refrigeration Institute

Common Applications

- Waste Water Treatment Facilities
- Indoor Athletic Facilities
- Commercial Kitchens
- Aircraft Hangars
- Paint Booths
- Foundries
- Natatoriums
- Parking Garages
- Manufacturing Facilities
- Automobile Repair Facilities
- Warehouses and Distribution Spaces

Direct gas-fired air heaters offer safe, flexible, fuel efficient and cost effective building operation solutions.

For more than 45 years, direct gas-fired air heaters have successfully provided make-up air to regulate ventilation rates and offset building heat loss for millions of commercial and industrial customers.

Clean and efficient, direct gas-fired air heaters can reduce building heating costs by 30 percent or more.

The availability of direct gas-fired heaters in a variety of configurations, along with a distinguished safety record, has resulted in architects, consulting engineers, facility managers and owners increasingly specifying direct gas-fired air heaters for use in commercial and industrial buildings and processes.

To help you select a system that meets your heating and ventilation needs, the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), provides the following guidance.

Solves Common Ventilation Problems

When a new building is designed, consideration for mechanical ventilation is generally accomplished on the front end of the project.

Tempered make-up air is designed to offset the exhaust requirements of the building; however, after the building is occupied and processes are added, it is not uncommon that the need to balance the exhaust load with tempered replacement air has been overlooked.

In many facilities, this oversight can contribute to major problems with temperature and pressure control. To solve these ventilation problems, you must start with clean outdoor air, which is naturally introduced through a direct gas-fired air heater.

The volume of clean air can be varied to meet the demands of the exhaust system and infiltration.



Process loads can vary throughout the day with, for example, intermittent paint booth operations or welding processes. Direct gas-fired heating systems allow convenient and flexible control of ventilation rates to match these loads.

If the direct-fired heater is not interlocked directly with the source of the exhaust, a Building Pressurization Control System (BPCS) can automatically adjust to meet these varying demands.

The BPCS maintains a slight positive pressure (i.e. 0.02–0.05 inches water column) in the building or space with respect to the outdoors, or an area adjacent to the space. This is achieved by either: (1) turning on additional direct-fired air heaters, or (2) varying the air flow of a direct-fired heater, or (3) increasing the percentage of outside air.

If the varying ventilation loads are not addressed, negative pressure can:

- Create downdrafts in stacks, eroding indoor air quality.
- Adversely impact the normal operation of other gas-fired equipment.
- Prevent exhaust systems from functioning as designed due to added resistance.

Infiltration loads are potentially the largest source of cold drafts in a building. When infiltration enters a building, the heating system must work overtime to condition the air and reduce stratification.

When clean, tempered outdoor air is introduced through the direct gas-fired air heater, infiltration can be neutralized, improving comfort and indoor air quality.

How It Works

Direct gas-fired air heaters blend the outside air directly with a gas flame, creating the highest possible efficiency for energy transfer.

Every BTU of gas burned is delivered directly to the space. The heated outdoor air is delivered at temperatures slightly above the ambient space temperature, offsetting air being removed by the exhaust system.

Temperature controls typically maintain a constant discharge air temperature or space temperature by modulating the gas flow (typical modulation is 20:1) to adjust for varying outdoor temperatures and space needs.

During mild weather, the equipment is generally equipped with an economizer thermostat to disable the burner when the outdoor temperature approaches the desired indoor space temperature.

The clean outdoor air introduced through a direct gas-fired air heater improves the indoor air quality of the space. This equipment can be installed with a minimum amount of ductwork, providing an efficient and cost-effective installation.

Additionally, the heater can be installed indoors or outdoors or in horizontal or vertical configurations permitting added flexibility.

Offers Design Flexibility

Direct gas-fired air heaters are available in the following designs:

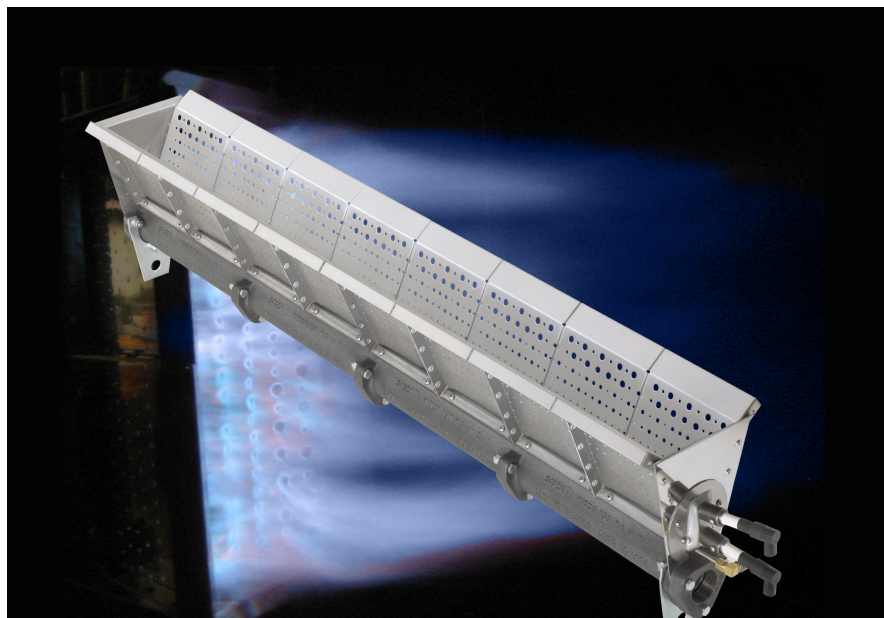
- **Non-Recirculating:** Delivers 100 percent outdoor air into the space.
- **Recirculating:** Delivers a mixture of outdoor air and indoor air.

Both designs are capable of delivering a wide range of outdoor air volumes to satisfy the building's varying exhaust or ventilation requirements.

Meets Safety Standards

Manufacturers have their equipment tested by an independent third-party testing agency to certify that it complies with the most current version of the following national safety standards:

- American National Standard for non-recirculating direct gas-fired air heaters, ANSI Z83.4/CSA 3.7 (a joint U.S./Canadian standard).
- American National Standard for recirculating direct gas-fired air heaters, ANSI Z83.18 (U.S. standard).





Direct gas-fired air heaters are a cost effective means for delivering clean, tempered ventilation air to purge contaminants from a building or provide clean, tempered outdoor air for odor control.

These standards specify construction requirements that address the combination of controls, burners and heating cabinets to ensure substantial and durable construction and safe operation.

In addition, these standards subject the equipment to a variety of laboratory performance and safety-related tests. These tests are the result of years of experience in the manufacture, testing, installation, maintenance, inspection and research of this equipment.

Low Heater Emissions

Both of the ANSI Z83.4/CSA 3.7 and ANSI Z83.18 direct gas-fired air heater standards require testing to ensure that the equipment’s emissions are below the maximum limits specified by these standards.

As the Heater Emission Limits chart shows, the ANSI limits for direct-fired units are well below the thresholds established by OSHA and other public health organizations.

Look for Certification Marks

Before selecting your direct-fired heater, always verify that it displays the mark of a nationally recognized testing agency, such as Intertek Testing Services (ETL), CSA International (CSA) or Underwriters Laboratories (UL).



Model Code Requirements

The National Fuel Gas Code, ANSI Z223.1/NFPA 54, and the International Fuel Gas Code, both contain requirements for non-recirculating and recirculating direct-fired air heaters that reference the national safety standards.

Additionally, the 2005 Edition of the Canadian B149 Gas Installation Code has included coverage for the harmonized U.S./Canadian standard for non-recirculating direct-fired air heaters.

HEATER EMISSION LIMITS

	Public Health Service and OSHA Limits ¹	ANSI Limits for Direct-Fired Units ²
Carbon Monoxide	50 ppm	5 ppm
Nitrogen Dioxide	5 ppm	0.50 ppm
Aldehydes	1.0 ppm	1.0 ppm
Carbon Dioxide	5,000 ppm	4,000 ppm

(1) OSHA 29 CFR 1910.1000 Table Z-1 & 1910.1048
 (2) ANSI Z83.4/CSA 3.7 & ANSI Z83.18

Direct Gas-Fired Process Air Heaters

This equipment is designed and certified to provide heating for industrial processes within commercial and industrial buildings. These heaters can be recirculating or non-recirculating and serve as a process heater in unoccupied spaces.

Some process heaters may also include operation as a non-recirculating make-up air heater if operated during periods when the space is occupied.

Process air heaters are certified to the American National Standard for Direct Gas-Fired Process Air Heaters, ANSI Z83.25.



Why Have a Direct Gas-Fired Make-Up Air System?

It Solves These Problems:

Hard to Open Doors

Are outward-opening doors hard to open? Do they slam shut? Are inward-opening doors hard to close? If so you need make-up air.

Fumes and Odors

Odors can't always be avoided, but a healthy exhaust system can get rid of them provided it is fed with an adequate supply of make-up air.

Poor Paint Jobs

Uniform paint coverage requires a steady flow of clean air. Backdrafts and fluctuating airflow causes varied coverage and waste.

Employees Out Sick

Cold air infiltration makes work stations near doors and outside walls hard to heat. Absenteeism rises when temperature drops.

Dust and Debris

Housekeeping is an endless problem. Dust and dirt are drawn in continuously through every opening while exhaust systems are operating.



Provided by AHRI's Direct Gas-fired Air Heaters Product Section



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