You Should Consider Direct Gas-Fired Industrial Air Heaters

Direct Gas-Fired Industrial Air Heaters provide SAFE, FLEXIBLE and COST EFFECTIVE approaches to Ventilation, Make-up Air, Heating for Buildings, Industrial Processes and more!

A few of the Numerous Applications are:

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

Direct-Fired Heater Division of gama

An Association of Appliance & Equipment Manufacturers

Introduction

Direct Gas-Fired Industrial Air Heaters offer safe, flexible, fuel efficient and cost effective building operation solutions! For more than 40 years Direct Gas-Fired Industrial 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 Industrial Air Heaters can reduce building heating costs by 30% 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 Industrial Air Heaters for use in commercial and industrial buildings and processes.

This booklet will provide valuable information for use when selecting a system to meet your heating and ventilation needs.

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Ventilation and Make-Up Air

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/or pressure control. The illustrations on the next page depict some of the problems that can be encountered when a building is short of tempered make-up air.

Direct Gas-Fired Industrial Air Heaters are widely recognized as the most cost effective means for delivering clean, tempered ventilation air to purge contaminants from a building or provide clean, tempered outdoor air for odor control.

Why Have a Direct Gas-Fired Make-Up Air System? It Solves These Problems:

Doors Are Hard to Open

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. Back-drafts 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.

Direct-Fired Make-Up Air Systems Can Solve Your Ventilation Problems!!!

To solve your ventilation problems you must start with clean outdoor air, which is naturally introduced through a Direct Gas-Fired Industrial Air Heater. The volume of clean air can be varied to meet the demands of the exhaust system and infiltration. Process loads vary throughout the day (i.e. intermittent paint booth operations, 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 industrial 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 industrial air heater, infiltration can be neutralized, improving comfort and indoor air quality.

O.K., How Do They Work?

Direct Gas-Fired Industrial 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 Industrial 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 options of installing the heater indoors or outdoors or in horizontal or vertical configurations permits added flexibility.

Heater Designs and Related Safety Standards

Direct Gas-Fired Industrial Air Heaters are available in the following designs:

Non-Recirculating

- Delivers 100% 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.

Safety Standards:

Manufacturers have their equipment tested and certified by independent third party testing agencies as complying with the most current version of the following national safety standards:

- American National Standard for **Non-Recirculating** Direct Gas-Fired Industrial Air Heaters, ANSI Z83.4/CSA 3.7 (a joint U.S./Canadian standard)

- American National Standard for **Recirculating** Direct Gas-Fired Industrial Air Heaters, ANSI Z83.18 (U.S. standard)

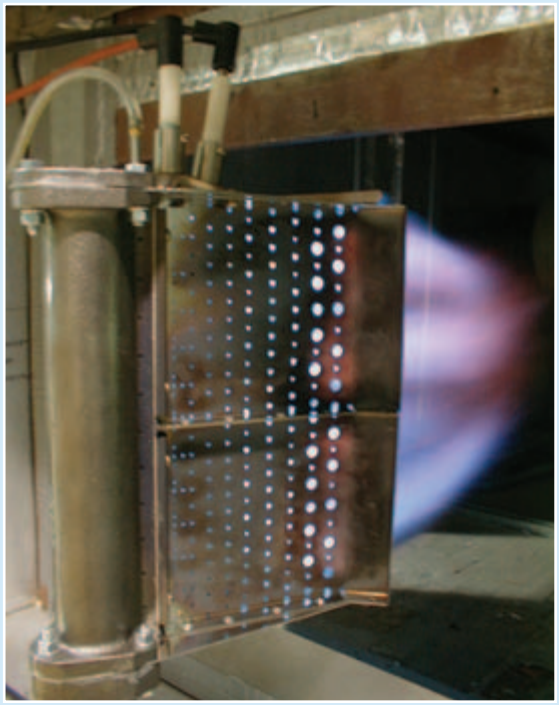
These standards specify construction requirements that address the combination of controls, burners and heating cabinets to ensure substantial and durable construction and safe operation. In addition, these standards subject the equipment to a variety of laboratory performance and safety-related tests. These tests are the result of years of experience in the manufacture, testing, installation, maintenance, inspection and research of this equipment.

Heater Emissions:

Both of the ANSI Z83.4/CSA 3.7 and ANSI Z83.18 Direct Gas-Fired Industrial Air Heater standards require testing to ensure that the equipment's emissions are below the maximum limits specified by these standards, as shown below. As the chart shows, these limits are well below the threshold limits established by OSHA and other public health organizations.

Contaminants	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 (Formaldehyde)	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



Look for the Testing Agency Mark:

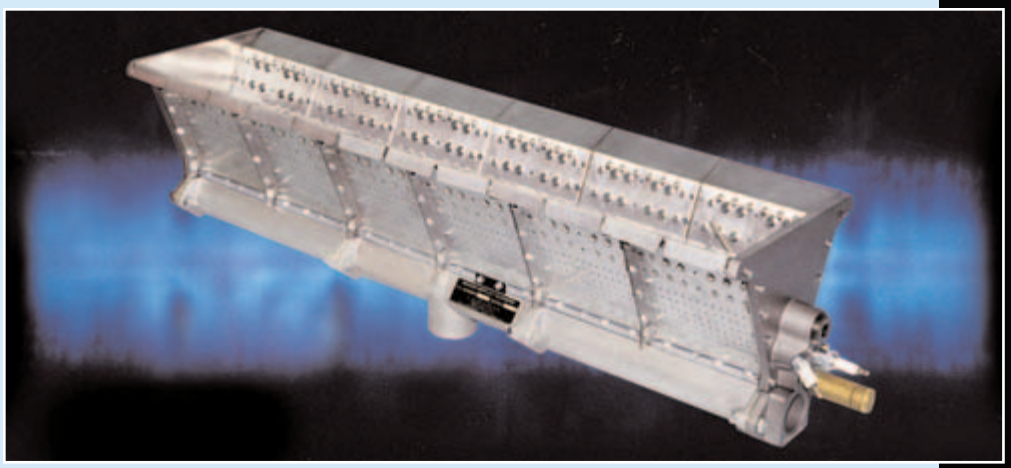
Nationally recognized independent third party testing agencies test and certify the manufacturer's equipment as complying with the most current applicable standards. A Direct Gas-Fired Industrial Air Heater that has been evaluated by an independent third party testing agency assures the user of its compliance with the relevant national safety standards.

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 industrial air heaters that reference the aforementioned national safety standards.

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



Other Heater Designs

Direct Gas-Fired Process Air Heaters

Direct Gas-Fired Industrial Air Heaters can be 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.

A proposed American National Standard for direct-fired process heaters is currently being developed. In the interim, testing agencies are evaluating and certifying such heaters in accordance with the ANSI Z83.4 Standard, with additional requirements and precautions to address the heater's operation in a unoccupied space.

Remember...

Direct Gas-Fired Industrial Air Heaters are:

- **SAFE**
  - In use for more than 40 years
  - Certified to American National and Canadian Safety Standards
  - Low Emission producers
- **FLEXIBLE**
  - Applicable for ventilation, make-up air and process heating
  - Available in numerous configurations to assure simple installation and operation
- **FUEL EFFICIENT**
- **COST EFFECTIVE**

For additional information and application assistance regarding the use of Direct Gas-Fired Industrial Heaters, please contact the GAMA member companies referenced on this booklet's back cover.

Supported by the following members of the Direct-Fired Heater Division of

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