

AHRI Commercial & Industrial Force  
Air Heating

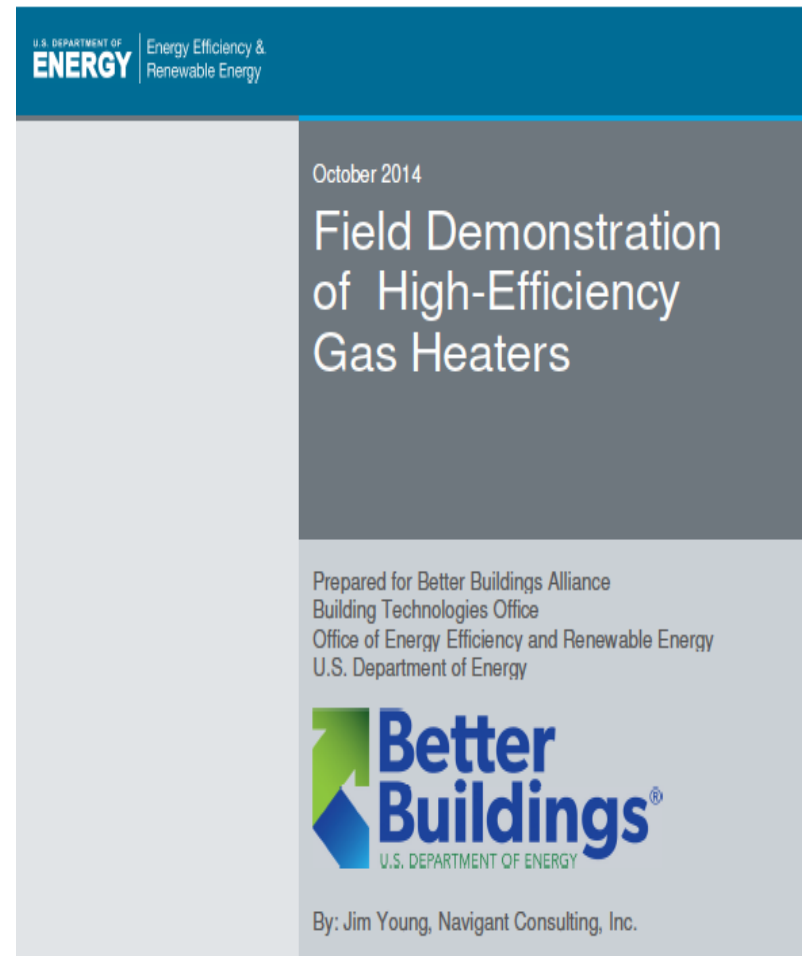
# High Temperature Heating and Ventilation Technology (HTHV)

# What is High Temperature Heating and Ventilation (HTHV) Technology.

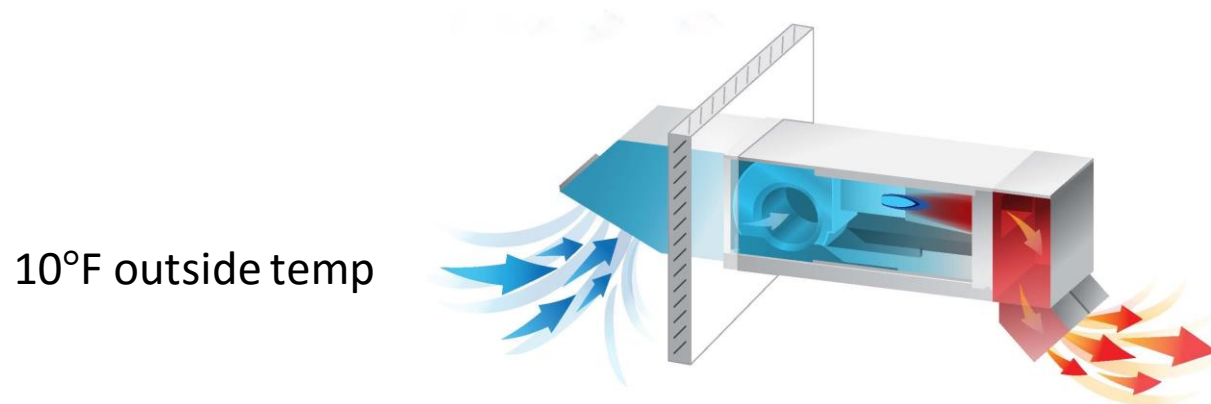
HTHV is a technology class of Make Up Air products that the Department of Energy first introduced in a field study conducted in the winter of 2012 - 2013 titled “Field Demonstration of High-Efficiency Gas Heaters”

<http://energy.gov/eere/buildings/downloads/fielddemonstration-high-efficiency-gas-heaters>.

The study was conducted to compare the energy savings of HTHV technology (92% efficient) to that of less efficient products that have traditionally been used to heat high bay buildings in the past.



HTHV is a 100% outside air, direct fired technology that improves a buildings indoor air quality by providing fresh air and even temperatures throughout the building. HTHV is 92% thermal efficient and 100% combustion efficient heating technology that must provide a minimum temperature rise 140°F and a minimum discharge temperature of 150°F based on an outside temperature of 10°F.



- > 140°F rise & > 150°F discharge temp

# Code Requirement

HTHV technology adheres to the **ANSI Z83.4-2017/CSA 3.7-2017** code (<http://csa.ca/ansi-z834-2017csa-37-2017>) which covers non-recirculating direct gas-fired heating and forced ventilation appliances for commercial and industrial application

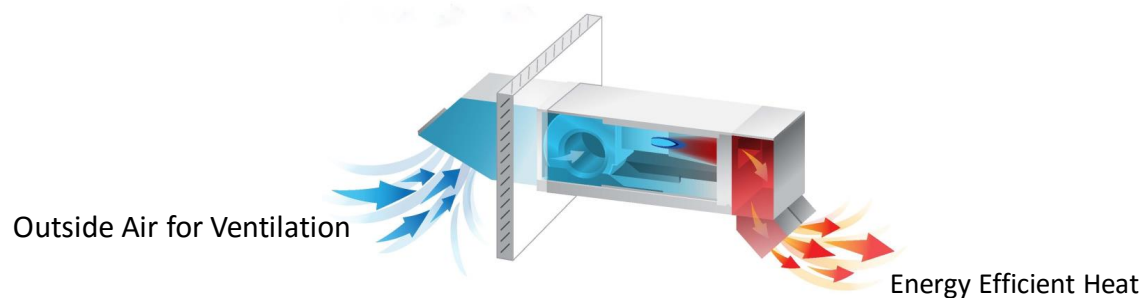
- ANSI Z83.4 is a Harmonized US/Canada standard for *non recirculating direct-fired heaters only. The requirements for the equipment are:*
  - 100% Outside Air Technologies / No Re-circulation
  - 160°F maximum discharge temperature
  - <5 ppm CO
  - <3 ppm NO<sup>2</sup>
- *Industrial & Commercial use only*
- *Permitted as Ventilation and/or Heating Devices for these Buildings*
- *Not to be used in residential applications or to supply any area containing sleeping quarters.*

# Benefits of HTHV....

## Heating / Ventilation / De-stratification

HTHV products are capable of providing three technologies in one piece of equipment for high bay buildings. As a heating device the 160°F max discharge temperature provides the necessary Btus for both the air and conduction loads of a high bay building.

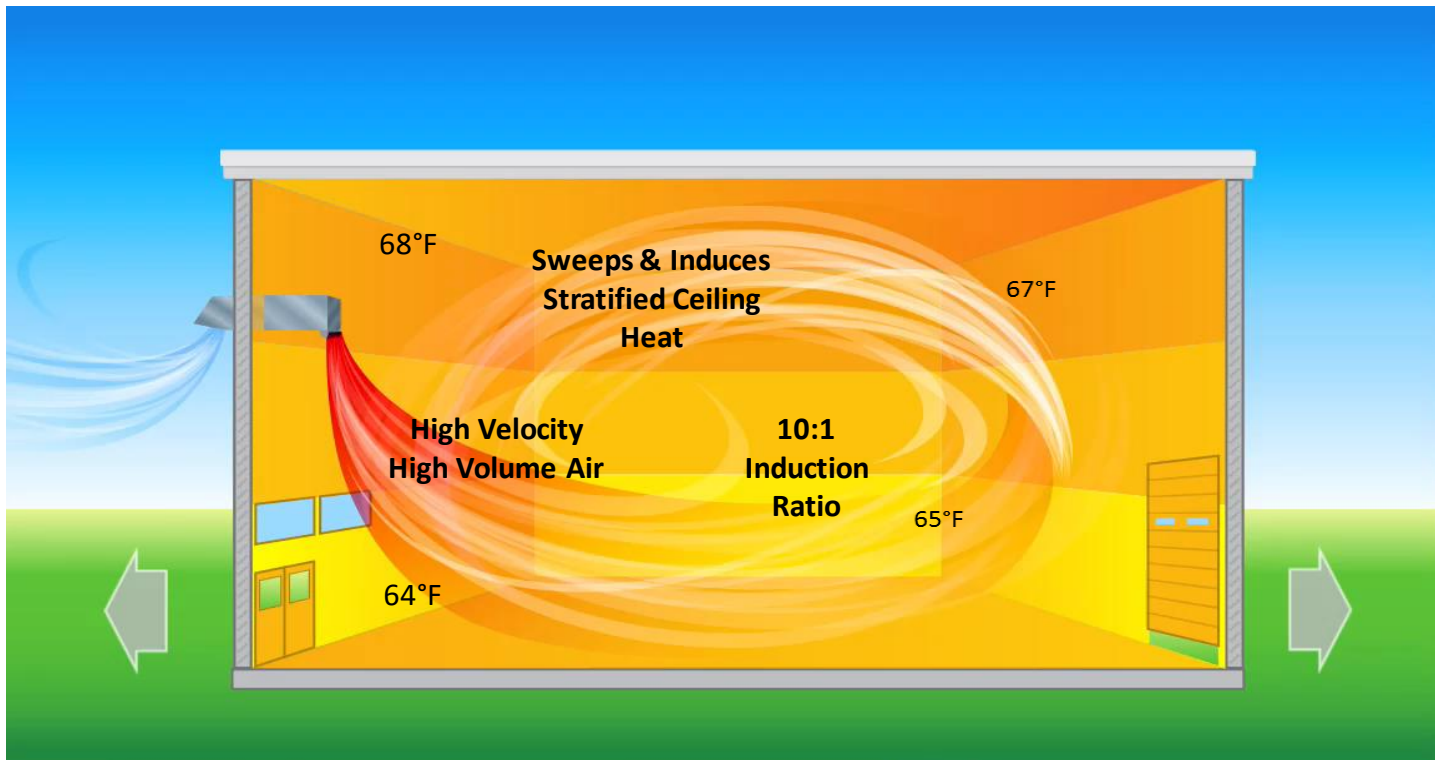
Because HTHV is a 100% outside air product it is also a ventilation source that can be used to meet or exceed ASHRAE 62.1 fresh air requirement during occupied hours. It can also be used as a stand alone ventilation source during no heating months as well.



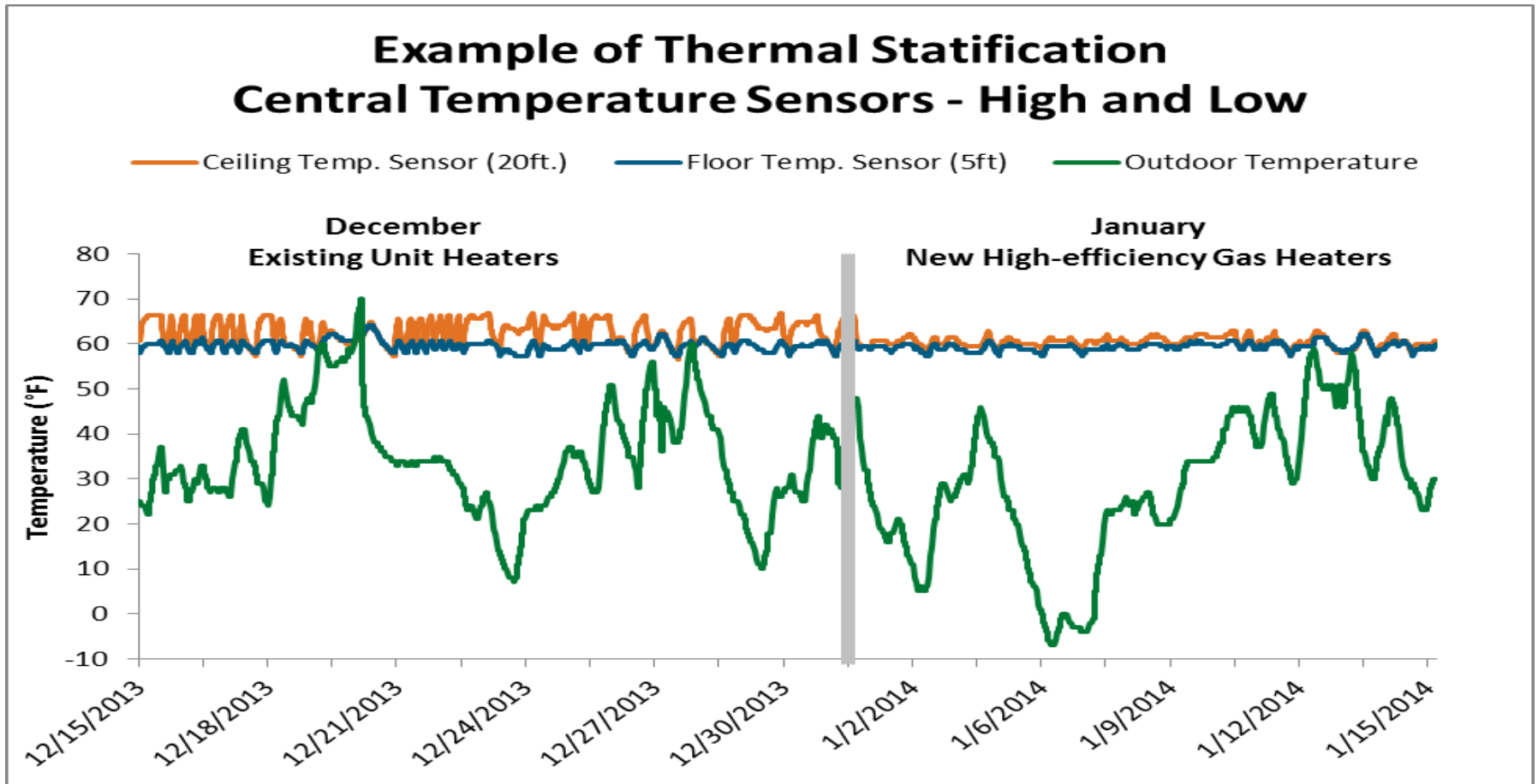
# Benefits of HTHV....

## De-stratification

HTHV products are equipped with high velocity blowers that can have a discharge rate of 1500 FPM. It is this high discharge rate that mixes the air within the space at a 10:1 Induction Ratio which de-stratifies the air. Due to this de-stratification effect, the temperature difference between floor and ceiling can be no more than 6 degrees. Because of this there is no need for additional de-stratification equipment.



Part of the DOE's field study of HTHV equipment was to monitor the technologies ability to de-stratify the air within the high bay structure that was being studied. The graph below is the actual temperature readings from sensors placed at 20' and 5' through out the building. The left side of the graph shows the wider variations of temperature difference with the less efficient technology and on the right a much smaller temperature variation between floor and ceiling by the HTHV technology.



# Benefits of HTHV....

## Energy Efficiency

### Computer Modeling Results

#### Energy Comparison for Heating Systems Standard Conditions

Equal Stratification for All Systems (4°F), ASHRAE 62.1 Ventilation (0.06 cfm/ft<sup>2</sup>)

Energy Consumption	Gas (therms)	Fan Electric (kWh)
ASHRAE 90.1 Baseline	30,907	76,733
HTHV	20,220	5,758
Draw-Thru	25,052	7,317
Recirculation	25,910	52,644
Unit Heater	30,481	16,289
Air Turnover	26,822	17,153
Infrared	32,156	11,164
<b>% Savings vs. 90.1 Baseline</b>		
HTHV	34.6%	92.5%
Draw-Thru	18.9%	90.5%
Recirculation	16.2%	31.4%
Unit Heater	1.4%	78.8%
Air Turnover	13.2%	77.6%
Infrared	-4.0%	85.5%
<b>% Increase vs. HTHV</b>		
Draw-Thru	23.9%	27.1%
Recirculation	28.1%	814.2%
Unit Heater	50.7%	182.9%
Air Turnover	32.6%	197.9%
Infrared	59.0%	93.9%

HTHV is one of the most energy efficient technologies available today to heat and ventilate high bay buildings.

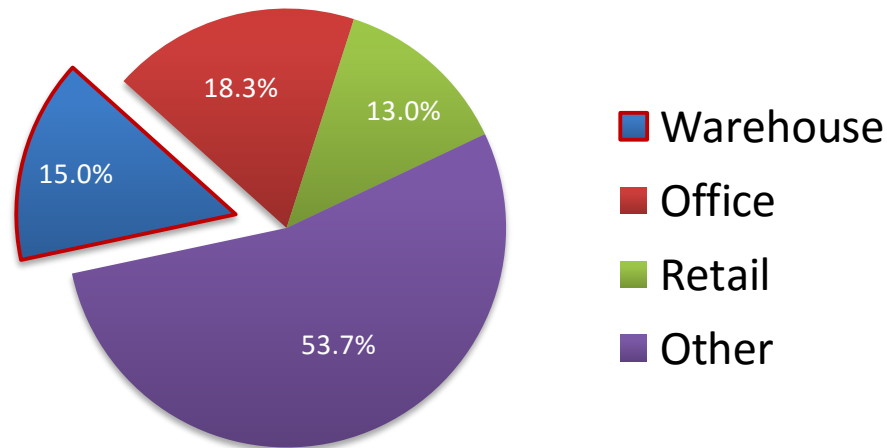
To demonstrate how HTHV's efficiency compares to other heating solutions an energy comparison was conducted by Gard Analytics, using energy analysis software,. The table on the left is the results of the analysis.



# HTHV is well suited for High Bay Applications which are 15% of the overall floor space in the U.S.

- Approximately 15% of U.S. commercial floor space belongs to the warehousing and distribution segment
- Larger segment than retail and almost as much floor space as all commercial office buildings

**U.S. Commercial Floor space by Sector**

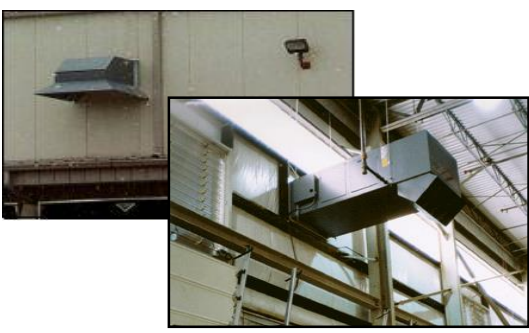


HTHV products also provide design flexibility for both new construction and retrofit projects. HTHV units can be installed in both vertical and horizontal configuration and in either an indoor or outdoor installation.

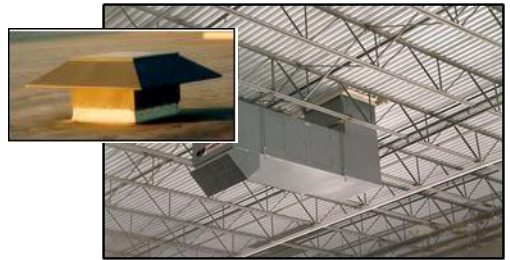
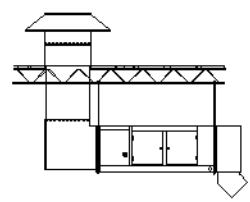
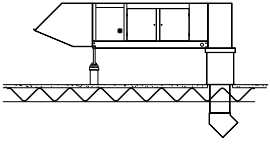
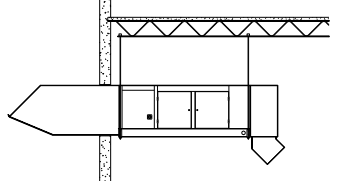


**Outdoor Vertical**

**Indoor Vertical Installation**



**Horizontal Thru Wall**



**Under Roof Installation**



**Roof Top Installation**