

AirBoss “SmartAir”

Pricing Analysis

Big Box Facility Air Distribution System

New Construction Projects

AirBoss “Smart Design” (patented design technology)

compared to conventional designs with 4-way diffuser air distribution

AirBoss “SmartAir” air conditioning designs utilize ASHRAE load calculations with HVAC system reductions due to the impact of continuous air flow. AirBoss systems are being utilized in big box facilities, including critical inventory distribution centers such as pharma, food and electronics. More than 3100 AirBoss units are installed and are distributing heated and cooled air in more than 125 million sf of facility space in Kentucky and Indiana. This is significant in that over 4.85 billion cubic feet of interior space are successfully being managed by AirBoss “Smart Design” systems. The net effect of this is the owners and operators of facilities with AirBoss systems, on average, realize a \$.26 per square foot of utility savings for heat/cool systems or \$.17 per square foot for heat only systems, annually, calculations based on the included validated Engineering Analysis.

AirBoss “SmartAir” system operating concept:

Cooling

Typically, interior temperature is managed by a system of thermostats or sensors. When the temperature near a thermostat varies by 2° to 3° F, the system begins to operate. HVAC units draw air from the interior near the ceiling, pass it over cold coils and return it to the interior, about 20° F cooler. **For example**, assume a ‘hot’ day and an inside set temperature of 75° F. The air that is near the roof is typically 10° to 15° F hotter at the roof than at the thermostat. That being the case, the air that enters the HVAC system, with returns at the ceiling, is 10° to 15° hotter because of the differential between the floor and the ceiling temperatures. All legacy design systems with 4-way diffusers, for air circulation, create this condition, referred to as ‘heat stratification’. The AirBoss system prevents stratification and thus maintains a uniform floor to ceiling equilibrium. When equilibrium is achieved, an HVAC system does not require as many system units or tons to maintain the required temperature. It is more efficient to cool air that is 2° to 3° F from set point, vs air that is 10° to 15° F from set point. Bottom line here, AirBoss system efficiency will allow for a substantial reduction in HVAC tons and at the same time improve interior comfort for occupants, due to continuous air circulation.

Heating

The AirBoss heating solution offers significant cost-effective benefits. With its constant interior air circulation, in the heating season, an AirBoss system takes advantage of all internal heat loads which minimizes the need for additional heat from gas or electric heaters. A big advantage for AirBoss is continuous interior air circulation which eliminates the need to **continuously** run big hp RTU fans or supplemental ceiling fan systems. This is true for all seasons. **Ventilation:** A unique ventilation design strategy can be incorporated in the design that measurably improves warm weather ventilation when air conditioning is not in the design. **Flexibility:** If there is a possibility that air-conditioning might be added

to the system in the future, AirBoss is a very economical solution, with only the need to add cooling units to the already installed heat system. If there is a possibility that the facility use may change, AirBoss provides a cost-effective alternative to conventional heating designs.

AirBoss system highlights:

- Typical distribution center (actual FedEx Supply Chain facility housing medical products), 585,000 sf X 36' ceiling height, 68° - 70° in summer and winter. Heating therm savings = \$.17 sf and Cooling = \$.09 sf for a total annual savings of \$154,000, when compared to conventional; designs. Qualified for \$101,000 Vectren natural gas rebate.
- System air throw - forward direction, approx. 300' and sides 150' each direction. When operating 24/7 AirBoss systems provide a continuous flow of air, eliminating air temperature stratification. This AirFlow design provides improved comfort and eliminates the need to continuously run big hp RTU fans or supplemental air circulation devices including ceiling fans. The smart feature of AirBoss provides fine tuning of the direction and volume of air flow direction, depending on facility design and application.
- Maximizes the efficiencies of all roof top unit (RTU) HVAC systems allowing for 15 to 30% HVAC tonnage reduction.
- Reduces first cost for heat-cool solutions and quick payback for heat only designs (less than one year for heat only solutions when compared to 80/20 systems).
- Dramatic enhancement of corporate sustainability programs.
- Lower maintenance due to fewer units to service and repair, 15 to 30%
- Reduces equipment replacement cost at end of HVAC system life cycle.
- When there is even a possibility that a future tenant or owner may need to add air conditioning to a facility that has a legacy heat only system, the entire system will need to be replaced. If the facility has an AirBoss heat only system, there is only a need to add cooling units for cooling and continue to utilize the already installed heaters and AirBoss air distribution system.
- How a building is subdivided for tenants or owner functionality is not usually an issue with Airboss designs. With an AirBoss design there are no restrictions on where walls may be placed or how big or small a tenant space may be. Conversely, for example, should a 400,000 sf building that has four 80/20 units needs to be subdivided into something other than equal size units, additional units will be required along with the costly roof penetrations.
- TPO roof systems with AirBoss technology for air distribution **do not experience excessive positive interior pressure**. Excessive positive pressure is frequently an issue with 80/20 systems and systems with greater outside air intake. This condition can cause roof ballooning which can lead to a moisture buildup between the membrane roof material and the insulation. Trapped moisture can lead to mold and mildew which can also cause the TPO roof warranty to be voided.

Capital cost (labor and materials) analysis for new construction design scenarios:

- Heat only design comparisons, *note: Construction conditions and cost vary considerably. AirBoss "SmartAir" designs cost are competitive to lower when compared to conventional designs but the cost to operate AirBoss is considerably more economical and delivers a superior interior climate experience in all seasons.*
- Heat, air conditioning, ventilation and 24/7 circulation comparisons. AirBoss "SmartAir" designs provide significantly lower day one capital cost and a significantly lower downstream operating cost as well and delivers a superior interior climate experience in all seasons.
- The following analysis do not include the cost of labor or materials for electrical, gas, structural steel engineering or structural steel beef-up that could be required, but generally an AirBoss design is less expensive in all of these categories.

Design conditions for following conditions:

Warehouse or distribution center application,

Tilt-up open ceiling box design construction

400,000 sf w/30 ft ceiling height

Location: Louisville, KY

Design temperature: 95 °F summer, 0 °F winter

Electric cost: \$.094/kwh and gas cost: \$9.04/mcf

- **Heat Only Design Comparisons and 24/7 Circulation Comparisons**

- Design #1 – Heat only: Conventional Design**

temperature to 60° F

4 ea, 80/20 Rupp Model RAM Direct Recirculation Make-up Air Units.

15 hp/1,850,000 btu with 2 changes per hour, including:

- Summer ventilation options, included in pricing**

- 4 ea 36" X 48" relief wall louvers with bird screens*

- 10 ea American Coolair belt driven roof up-blast exhaust fans*

- 10 ea build up deck roof curbs 77" X 77"*

- 10 ea 108" X 120" intake louvers with bird screens*

Total installed budget system cost:

\$.47 per sf

Design #2 – Heat only: AirBoss “Smart Air” System Design

Provides summer and winter circulation

temperature to 60° F

8 ea, AirBoss ER 242-800 33,000 cfm units each with two
400,000 btu heater units: **Summer ventilation options, included in pricing**

8 ea transformers

4 ea American Coolair belt driven roof up-blast exhaust fan

4 ea built up deck roof curbs 61” X 61”

4 ea 120” X 60” intake louvers with bird screens

Total installed budget system cost: \$.45 per sf

• **Heat, Air Conditioning, Ventilation and 24/7 Circulation Comparisons**

Design #1 – Conventional Design, Heat and Air Conditioning:

temperature to 78° F, (6 months heating and 6 months cooling)

22 ea, 25- ton Rooftop units

w/concentric diffusers

4 ea, 80/20 units 15 hp/2,600,000 btu

Total installed budget system cost: \$1.42 per sf

Design #2 – AirBoss “Smart Air” Design,

Heat, Air Conditioning, ventilation and 24/7 Circulation:

temperature to 78° F, (6 months heat, with warm weather circulation design and 6 months cooling with 24/7 circulation)

12 ea, 25-ton Rooftop units:

12 ea AirBoss ER 242-800, 33,000 cfm units each with two 400,000 btu heater units:

8 ea transformers

4 ea American Coolair belt driven roof up-blast exhaust fans

4 ea built up deck roof curbs 61” X 61”

4 ea 120” X 60” intake louvers with bird screens

Total installed budget system cost: \$1.04 per sf