

PROPOSED HVAC SYSTEMS
FOR
Dover High School
Dover, NH

October 13, 2015

Prepared for:



Prepared by:



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Dover High School

Dover, NH

Power Point Presentation



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HVAC Systems Overview

For Dover High School
Dover, NH



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Life Cycle Cost Analysis HVAC System Options

HVAC System Options Overview

1. **Baseline: VAV RTU System (ASHRAE Baseline)**
2. **Option 1: Induction Unit System with DOAS**
3. **Option 2: Constant Volume Dehumidification Displacement System with DOAS**
4. **Option 2A: Variable Air Volume Dehumidification Displacement System with DOAS**
5. **Option 3: Variable Air Volume Fully Air-Conditioned Displacement System with RTU'S**
6. **Option 4: Variable Air Volume Dehumidification Displacement System with DOAS and Partial Geothermal for AC Areas**



HVAC System Comparison

Mixing vs. Displacement Systems

AIR CONDITIONING

- VENTILATION AIR COOLED AND SUPPLIED AT 55 DEG F. TO SPACE
- MAINTAINS SPACE TEMP. AT 75 DEG F.
- ADDITIONAL EQUIP. REQD. WITH INCREASED CAP. TO MAINTAIN 75 DEG F.
- INCREASED DUCT SIZES OR NEED FOR ADDITIONAL PIPING SYSTEM
- INCREASED CONSTRUCTION COST BY 20-30% (Dependent upon AC System)
- INCREASED OPERATIONAL COST BY 25-30% (APPROX. \$1.90/SF)

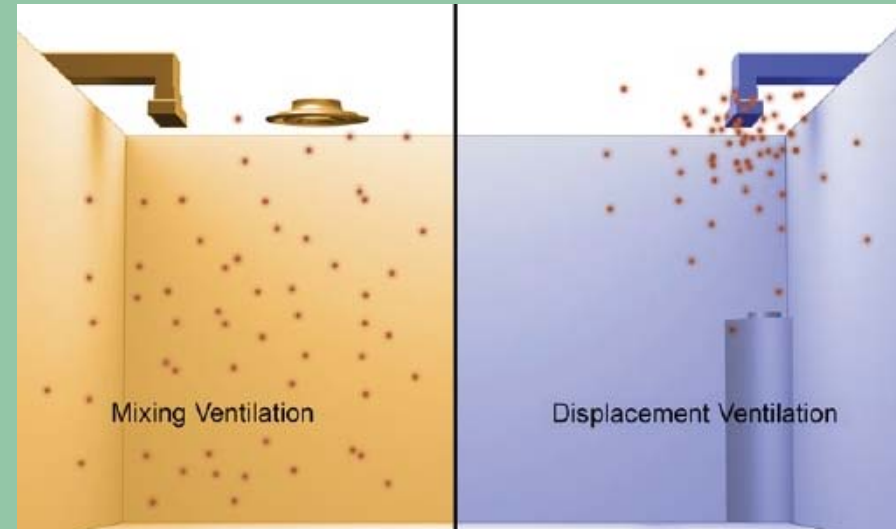
DEHUMIDIFIED AIR

- VENTILATION AIR COOLED BY DEHUMIDIFICATION AND REHEATED BY HOT GAS HEAT RECOVERY TO 68 DEG F.
- TEMP. FLOATS IN SPACE WITHIN COMFORT ZONE
- REDUCED DUCT SIZES OR NEED FOR SECONDARY EQUIPMENT
- REDUCED CONSTRUCTION COST WHEN COMPARED TO CONVENTIONAL NON-CONDITIONED BUILDINGS
- SIMILAR OPERATIONAL COST WHEN COMPARED TO CONVENTIONAL NON AIR CONDITIONED BUILDINGS (APPROX. \$1.40/SF)



Displacement System (Classrooms, Cafeteria, Gymnasium, Corridors)

- Ventilation air is provided from high efficiency packaged gas-fired heat/DX cooling RTU w/ ERV
- Air is delivered at low velocity and at low levels within the space
- The system uses naturally occurring buoyant forces within the space to create a vertical rise of the air throughout the space.
- 2-4° F differential supply air to space
- Supply air rises when heat source is contacted
- Displaces room air upward
- Air rises with pollutants to ceiling
- Air returns at ceiling back to air handling unit

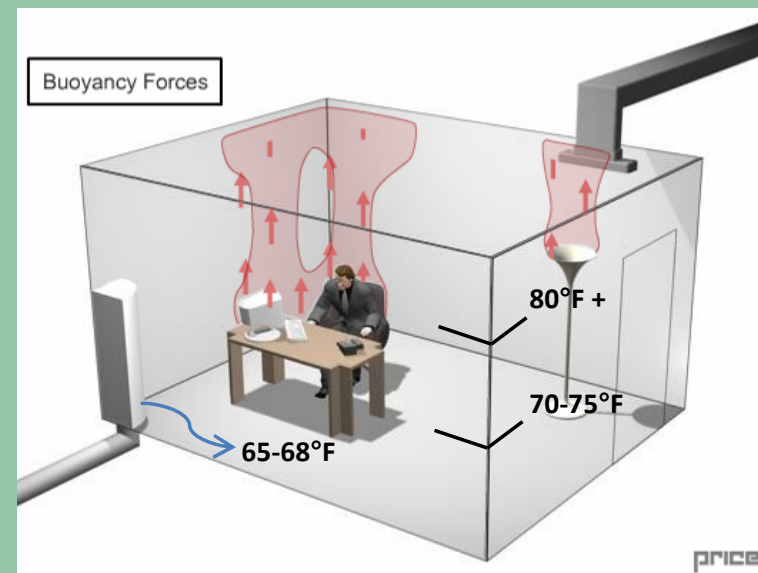


Mixed Systems

$$E_c = 0.8$$

DV Systems

$$E_c = 1.2 - 1.4$$



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Displacement System

Pros:

- Excellent pollution removal
- Very low noise levels
- Very low air velocity
- Low moisture levels
- Reduced cooling loads
- Reduced initial cost
- Variable volume reheat is not required
- High ventilation effectiveness



Displacement Diffuser
Options



Cons:

- Requires Perimeter Radiation Heating
- Dehumidification Only Design (Options 2 & 4) does not provide Cooling Setpoint temperature control



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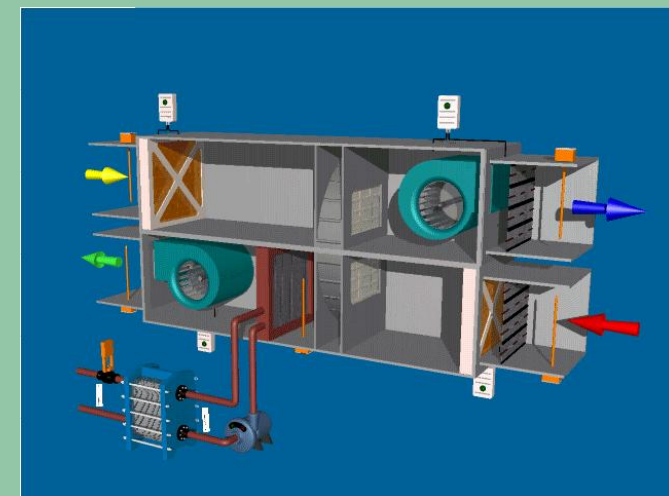
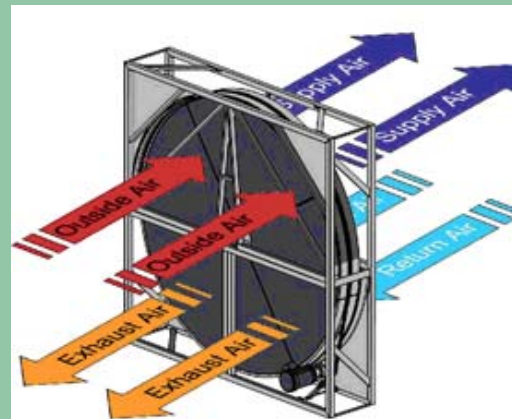
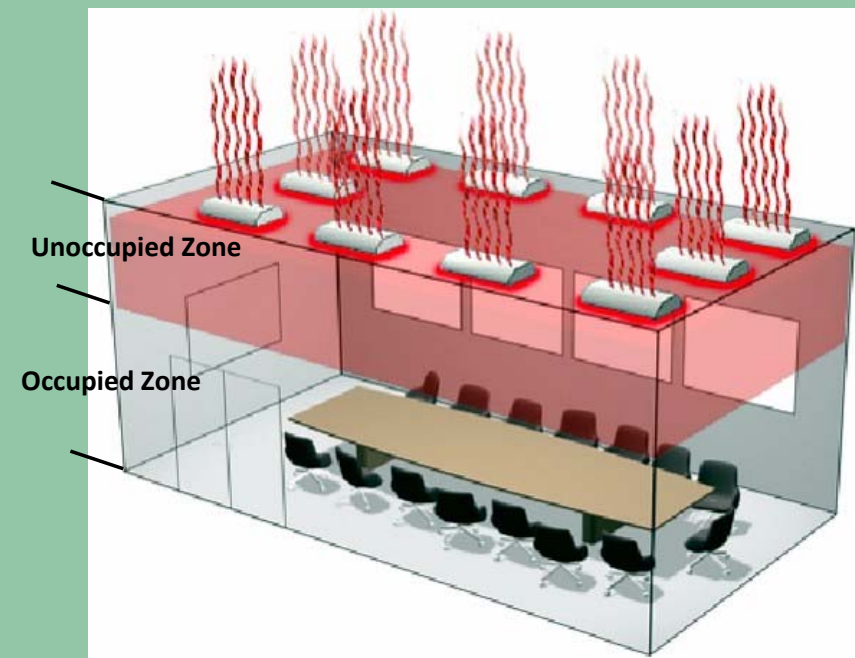
Displacement System – Energy Conservation

Load Calculation Reductions

- Conventional System: All heat generated in room is included in air flow calculation since all airflow is mixed.
- Displacement System: Only loads which occur in the Occupied Zone are factored
- Results in: Smaller equipment & systems and lower installed and operating costs for Displacement Systems

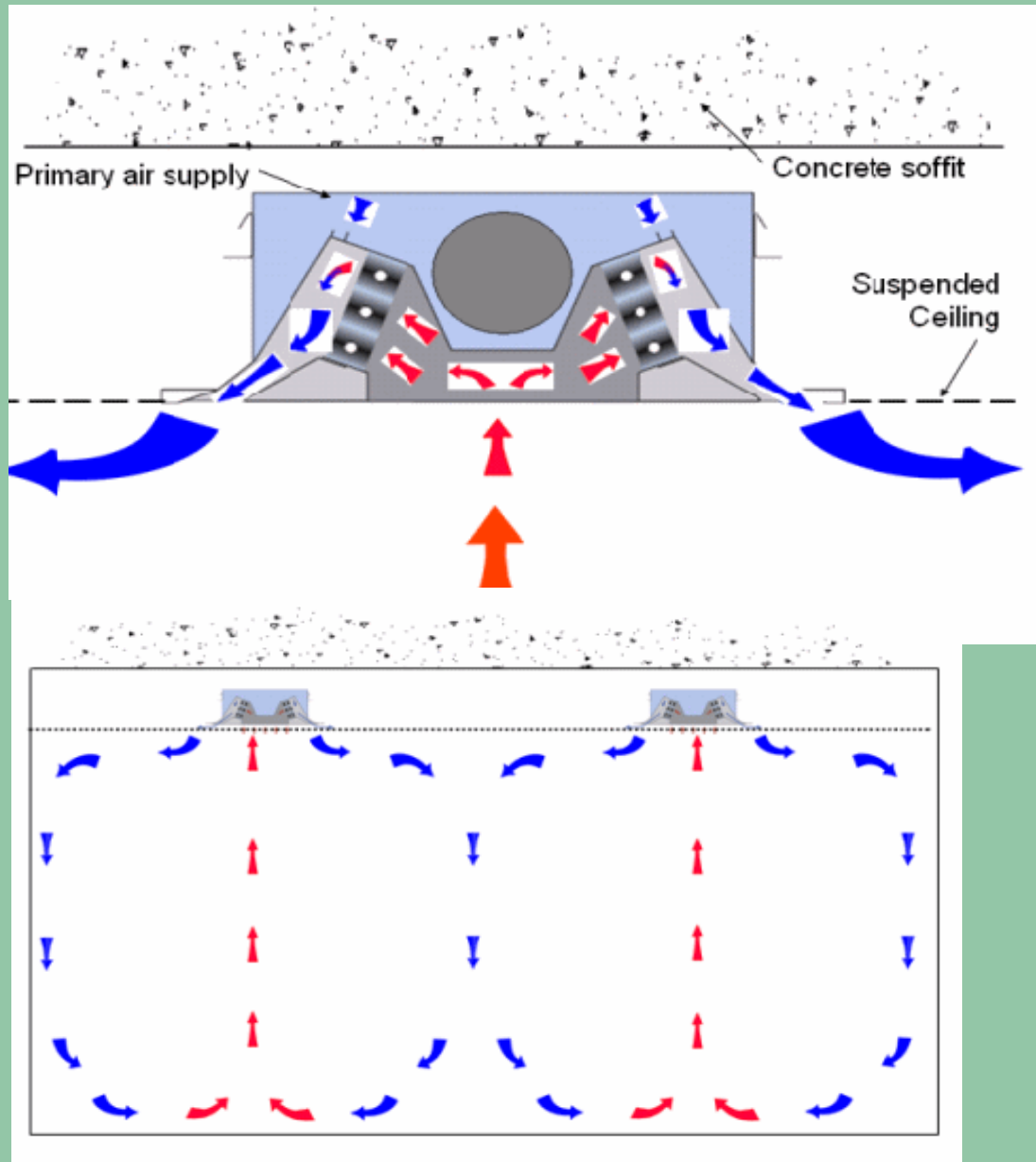
Additional Energy Efficiency Measures

- Energy Recovery: Transfers energy from the return air stream to the supply air stream to pre-heat or pre-cool the outside air.
- Variable Air Volume w/ CO2 Demand Control Ventilation: Modulates the airflow to large single zone areas in accordance to space mounted thermostat and CO2 sensors reducing energy consumption due to reduced air changes.



Induction Units (Administration)

- Ventilation air is provided from high efficiency packaged gas-fired heat/DX cooling RTU w/ ERV
- Primary (Ventilation) Air is supplied to plenum and discharges through nozzles
- Room air is induced through the heating/cooling coils
- Mixture of Primary and Room air is delivered to room through diffuser slots.
- Condensate drain pans and piping system for condensate removal



Induction Units

Pros:

- Energy efficient
- Low Noise Levels
- Flexibility of Installation
- Moderate first cost
- Simplified Controls (No Fans)
- Lower Maintenance (No Terminal Filters)



Cons:

- Requires increased coordination with “ceiling” system. (e.g. additional piping, HW, CHW & condensate piping)
- Requires additional ventilation air in some cases
- Increase Energy Consumption vs. Dehumidified Air System



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High Efficiency Heating Hot Water and Chilled Water Plant

Boiler Plant

- High efficiency (90%+) gas-fired condensing boilers
- Boiler temperature reset controls
- Variable speed pumps with VFD's



Chiller Plant

- High efficiency air-cooled chiller
- Chilled water temperature reset controls
- Variable speed pumps with VFD's



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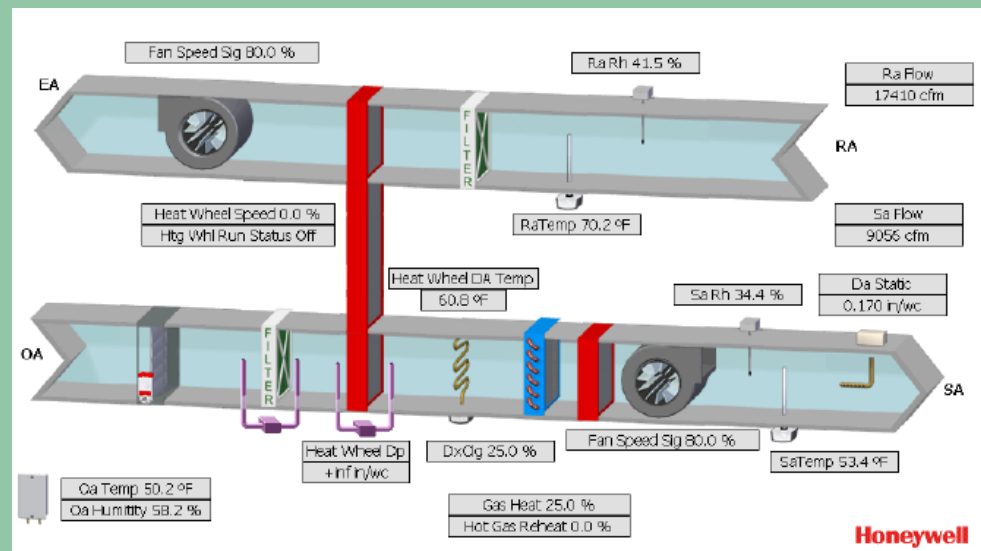
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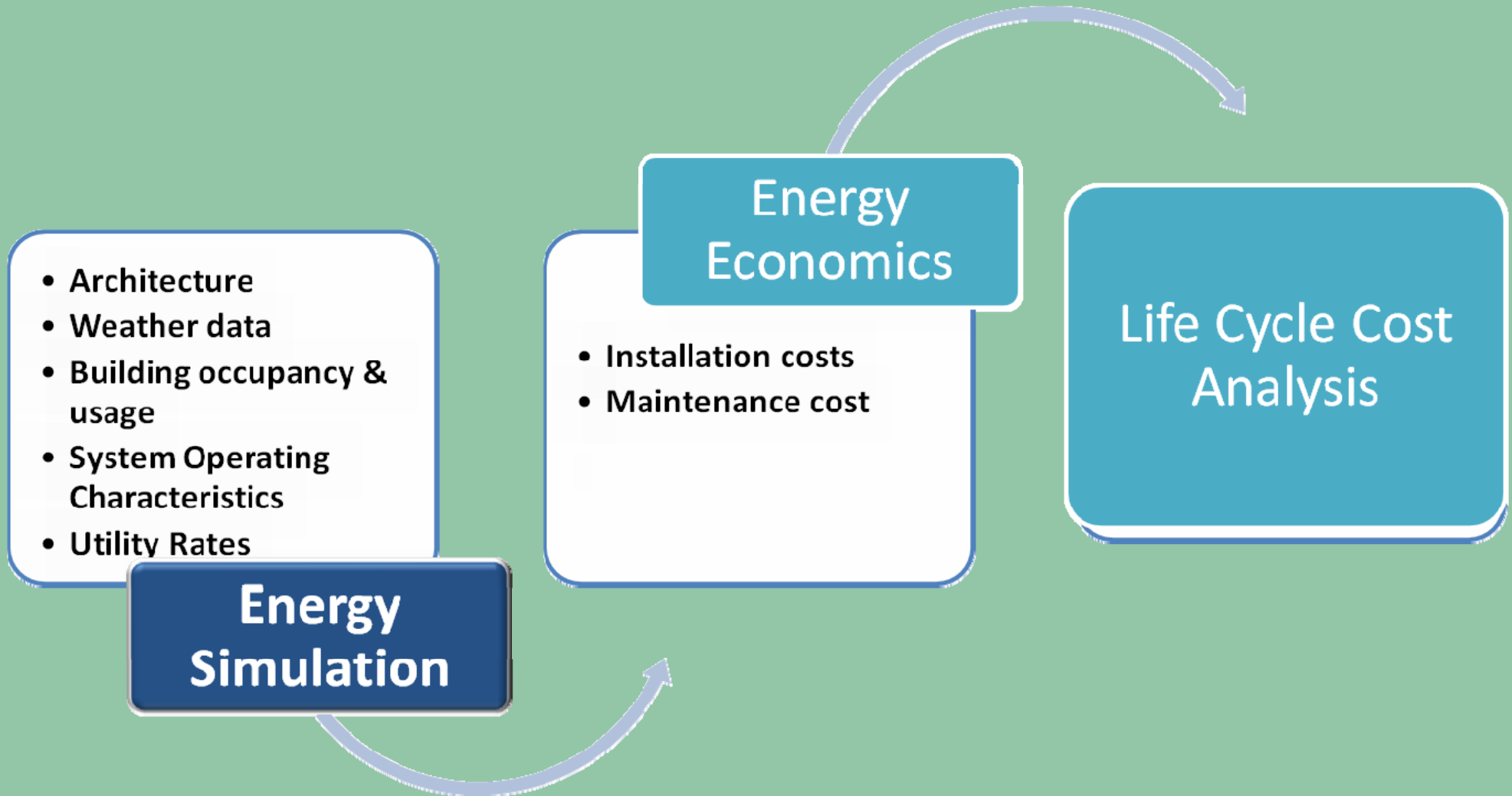
Building Automation and Energy Management System



- System (Zone) Scheduling
- Occupied-Unoccupied Control
- Night Setback Operation
- Lighting Control System Integration
- Increased Energy Savings
- Integrate with Preventative Maintenance Scheduling



Energy Economics Methodology



Energy Model Methodology

- Computer Simulation of **Building Energy Usage** using Department of Energy (DOE-2)/eQuest.
- Model consists of project specific:
 - Architectural features (geometry, orientation, envelope)
 - Local Weather Data
 - Occupancy, Lighting, Equipment schedules
 - HVAC System Data (specific to each system option)
 - Local Utility Rates



Energy Economics Methodology

- Computer calculation of HVAC System economics utilizing NIST BLCC 5.
- Calculation factors:
 - HVAC System and Maintenance Cost Estimates
 - Prepared in house using recent project cost data and industry standard estimating references.
 - Standard Industry Discount, Inflation and Interest Rates



Summary of Results

Baseline	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (MBTU)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility \$/s. f.	Annual kBTU/s. f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)*****
-	1. Hot water coil heating/chilled water coil cooling VAV AHU system with energy recovery (where code required) and terminal VAV boxes with hot water reheat coils 2. Code efficient gas-fired non-condensing boiler plant 3. Code efficient water-cooled chiller plant with cooling tower	\$13,764,200	2,202,600	11,389.0	\$258,143	\$146,116	\$404,259	\$1.31	61.2	\$69,625	\$473,884	-	-	-
Option	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (MBTU)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility \$/s. f.	Annual kBTU/s. f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)*****
1	1. Hot/chilled water coil induction units 2. 100% outside air gas-fired heating/direct expansion cooling CV ventilating units with energy recovery serving induction units 3. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls 4. High efficiency gas-fired condensing boiler plant 5. High efficiency air-cooled chiller plant	\$10,817,450	2,347,300	8,366.9	\$275,099	\$107,347	\$382,446	\$1.24	53.0	\$69,000	\$451,446	\$22,438	\$3,247,601	Instant*****
2	1. Dehumidification displacement ventilation diffusers with perimeter hot water heating radiation 2. 100% outside air gas-fired heating/direct expansion dehumidification CV ventilating units with energy recovery 3. 100% outside air gas-fired heating/direct expansion cooling units with energy recovery with terminal chilled/hot water coil induction units 4. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls 5. High efficiency gas-fired condensing central boiler plant 6. High efficiency air-cooled chiller plant	\$9,113,850	2,266,900	7,965.2	\$265,676	\$102,194	\$367,870	\$1.19	50.8	\$56,150	\$424,020	\$49,864	\$5,296,788	Instant*****
2A	1. Dehumidification displacement ventilation diffusers with perimeter hot water heating radiation 2. 100% outside air gas-fired heating/direct expansion dehumidification VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls 3. 100% outside air gas-fired heating/direct expansion cooling units with energy recovery with terminal chilled/hot water coil induction units 4. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls 5. High efficiency gas-fired condensing central boiler plant 6. High efficiency air-cooled chiller plant	\$9,421,950	2,067,000	7,790.4	\$242,255	\$99,951	\$342,206	\$1.11	48.0	\$62,550	\$404,756	\$69,128	\$5,233,777	Instant*****
3	1. Full air-conditioning displacement ventilation diffusers and perimeter hot water heating radiation 2. Gas-fired heating/direct expansion cooling VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls 3. 100% outside air gas-fired heating/direct expansion cooling units with energy recovery with terminal chilled/hot water coil induction units 4. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls 5. High efficiency gas-fired condensing central boiler plant 6. High efficiency air-cooled chiller plant	\$10,740,450	2,131,100	7,877.3	\$249,770	\$101,066	\$350,836	\$1.14	49.0	\$63,050	\$413,886	\$59,998	\$3,799,836	Instant*****
4	1. Full air-conditioning displacement ventilation diffusers and perimeter hot water heating radiation 2. Gas-fired heating/direct expansion dehumidification VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls 3. 100% outside air geothermal hot water coil heating/chilled water coil cooling units with energy recovery with terminal chilled/hot water coil induction units 4. Geothermal hot water coil heating/chilled water coil cooling VAV RTU's with energy recovery and demand ventilation controls 5. High efficiency gas-fired condensing central boiler plant 6. Geothermal well with water-to-water source heat pump chillers with water-to-water heat exchangers	\$10,962,850	2,109,400	7,123.8	\$247,223	\$91,399	\$338,622	\$1.10	46.3	\$63,650	\$402,272	\$71,612	\$3,728,392	Instant*****

Thank You

Questions and Discussions



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Design Narrative



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HVAC SYSTEMS NARRATIVE REPORT

OPTION 3F - NEW CONSTRUCTION

The following is the HVAC system narrative, which defines the scope of work and capacities of the HVAC system as well as the Basis of Design. The HVAC systems shall be designed and constructed for **LEED for Schools** where indicated on this narrative.

1. CODES:

All work installed under Division 230000 shall comply with the State of New Hampshire Building Code and all local, IBC 2012, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT:

The work of Division 230000 is described within the narrative report. The HVAC project scope of work shall consist of providing new HVAC equipment and systems as described here within. All new work shall consist of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating and Air Conditioning work and all items incidental thereto, including commissioning and testing.

3. BASIS OF DESIGN:

Project weather and Code temperature values are listed herein based on weather data values as determined from ASHRAE weather data tables and the International Energy Conservation Code.

Outside: Winter -2 deg. F, Summer 88 deg. F DB 73 deg. F WB

Inside: 70 deg. F +/- 2 deg F for heating, 75 deg. F +/- 2 deg F (55% RH) for cooling for areas with air conditioning, 78 deg. F +/- 2 deg. F (<60% RH) for areas with displacement/dehumidification*(see Displacement Ventilation note below). Unoccupied temperature setback will be provided (60 deg F heating (adj.), 85 deg F cooling/dehumidification (adj.).

Outside air shall be provided at the rate in accordance with ASHRAE guide 62.1-2010 and the International Mechanical Code as a minimum. All occupied areas will be designed to maintain 800 PPM carbon dioxide maximum.

4. SYSTEM DESCRIPTION:

A. Central Heating Plants: **LEED for Schools Credit EP2 & EC1**

Heating for the entire building will be through the use of a high efficiency gas-fired condensing boiler plant.

The new boiler plant shall be provided with (4) 2,500 MBH output boilers and (2) end suction base mounted primary and standby pumps with a capacity of 680 gpm each will be located in the mechanical room. Boilers shall each be sized for approximately 33% of the building radiation heating load. In addition to new boilers and pumps, new hot water accessories including air separators and expansion tanks shall be provided.

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The boiler plant will supply heating hot water to heating equipment and systems located throughout the building through a two-pipe fiberglass insulated schedule 40 black steel and copper piping system. The boiler plants shall supply a maximum hot water temperature of 160 deg F on a design heating day and the hot water supply water temperature will be adjusted downward based on an outside temperature reset schedule to improve the overall operating efficiency of the power plants. Primary and standby end suction base mounted pumps will be provided with variable frequency drives for variable volume flow through the water distribution system for improved energy efficiency.

Combustion air for each boiler will be directly ducted to each boiler through a galvanized ductwork distribution system. Venting from each boiler shall be through separate double wall aluminized stainless steel (AL29-4C) vent system and shall discharge approximately 12 feet above the roof level. Final venting height will be depending on the location of building intake air locations and adjacent roofs.

B. Central Cooling Plant: **LEED for Schools Credit EP2 & EC1**

A high efficiency central chilled water cooling plant consisting of a 35 ton high efficiency air cooled chilled, primary and standby chilled water pumps with VFDs, each with a capacity of 75 gpm, accessories, controls and steel and copper piping distribution system shall be provided to serve chilled water cooling HVAC equipment located throughout the building. The chilled water system will consist of a 35% propylene glycol solution. A glycol make-up feed unit system shall be provided.

The chiller plant shall serve active chilled beam induction units located in the Administration and Media Center areas of the building and select classrooms that require full air conditioning.

C. Classroom Heating and Ventilation (*General Classrooms, Learning Commons, Science, Art, SPED, Cosmetology, Pre-Engineering, Computer Tech/Programming, Life, Health and Family Cons Science*):
LEED for Schools Credit EP2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

It is proposed that new displacement ventilation systems are installed to serve the Building classroom areas under this Option.

New air handling units with supply and return fan with VFDs, energy recovery wheels, gas fired heating and DX cooling with modulating capacity control, sensible reheat wheel or heat pipe, and MERV 13 filtration will be provided to serve the new displacement ventilation system. Supply air will be provided to the space through new insulated, galvanized steel supply duct distribution system and shall be connected to wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

Each classroom will be provided with a variable air volume terminal box and CO2 sensor for demand ventilation control.

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It is estimated that the following air handling equipment will be required to serve these Classroom areas:

RTU-1, 2, 3, 4, 5, 6, 7, & 8: Eight (8) rooftop air handling units with a capacity of approximately 11,000 CFM (305 tons cooling, 470 MBH heating output) each, to serve the three main classroom wings, Business, SPED, Computer Technology & Programming, Life Science, Health Sciences, and Family Cons. Sciences Classroom areas.

Displacement Ventilation:

The displacement ventilation system for the classroom wings are intended to provide a maximum cooling temperature during peak cooling periods of approximately $78^{\circ}\text{F} \pm 2^{\circ}\text{F}$, however, the ventilation air provided will be extremely dry which will be the result of utilizing refrigeration equipment and hot gas reheat to reduce vapor pressure to an extremely low condition of approximately 50 grains of moisture per pound of air and reheating the air to a supply temperature of approximately 68°F which will be distributed to each space. The extremely dry condition of the supply air provides the perception of a condition that is cooler than is actually occurring due to the evaporation of moisture to the adjacent air from the occupants of the space.

Considering maximum cooling requirements occur primarily during the months of July and August when the majority of the academic areas are not in use, it would suggest maintaining slightly higher temperatures may not present a discomfort, however, will relate to a substantial operating cost savings and a reduced installation cost.

An additional major benefit of utilizing dry air within the building will be the overall reduction of vapor pressure typically present in outside ventilation air during summer months. This reduction in vapor pressure will dramatically reduce the amount of moisture entering the building and the potential of condensation resulting in moisture, and a direct relationship with the formation of mold.

Classrooms Requiring Full Air Conditioning:

Classrooms that require full air conditioning will be provided with supplemental cooling active chilled beam induction units.

D. Gymnasium:

LEED for Schools Credit EP2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

RTU-9 & 10: The gymnasium will be served by two (2) air-handling units of the recirculation design that are capable of 100% outside air operation. Each unit will be approximately 15,000 CFM and will include supply and return fans with VFDs, 740 MBH output gas-fired heating and 50 Tons DX cooling with modulating capacity control and hot-gas reheat, energy recovery wheel, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through an exposed galvanized steel supply duct with drum louvers to project the air to the floor. As levels of carbon dioxide drop generally relating to a reduction in population a variable frequency drive located in each air-handling unit will modulate to reduce airflow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the air handling unit by a low wall return air register.

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E. Fitness Room and Locker Rooms:

LEED for Schools Credit EP2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

RTU-11: The fitness room, Boys and Girls locker rooms, and adjacent PE office areas will be provided with a new roof-mounted dedicated outside air handling unit of the 100% outside air design with energy recovery. The unit will be approximately 8,400 CFM and will include a supply and exhaust fan with VFDs, 500 MBH output gas fired heating section with modulating capacity control, 26.5 ton DX cooling for dehumidification, energy recovery wheel, and MERV 13 filtration. Supply air ventilation will be provided to each space through new galvanized supply duct which will travel throughout each area to a series of ceiling mounted supply registers. Each space shall be provided with a variable volume (VAV) terminal box with combination temperature/CO2 sensor controls. The controls will reduce outside air as allowed to maintain a maximum of 800 PPM while providing sufficient ventilation to meet the required heating or cooling load of each space. As the VAV boxes modulate, the supply and return air fans associated Variable Frequency Drives (VFD) on the air handling unit will adjust the fan speed based on system static pressure, reducing the energy consumed by the fans. New exhaust air ductwork and air distribution devices shall be installed and shall be routed from each space to the new air handling unit.

F. Auditorium and Stage:

LEED for Schools Credit EP2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

The auditorium and stage will be provided with new roof-mounted air handling units of the recirculation design capable of providing 100% outside air variable volume fully air conditioned displacement ventilation air distribution to the Auditorium and Stage areas.

RTU-12: The Auditorium unit will be approximately 10,000 CFM and will include supply and return fans with VFDs, 480 MBH output gas fired heating section with modulating capacity control, 35 ton DX cooling system with modulating capacity control and hot-gas reheat, energy recovery wheel, and MERV 13 filtration.

RTU-13: The stage unit will be approximately 4,000 CFM and will include supply and return fans with VFD's, 180 MBH gas-fired heating section with modulating capacity control, 10 ton DX cooling system with modulating capacity control and hot-gas reheat, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation to the auditorium will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers under the seating. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

G. Music/Chorus/Band/Practice rooms:

LEED for Schools Credit EP2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

It is proposed that new displacement ventilation systems are installed to serve the Music,

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Chorus, Band and Practice classroom areas under this Option.

A rooftop air handling unit with supply and return fan with VFDs, energy recovery wheels, gas fired heating and DX cooling with modulating capacity control, sensible reheat wheel or heat pipe, and MERV 13 filtration will be provided to serve the new displacement ventilation system. Supply air will be provided to the space through new insulated, galvanized steel supply duct distribution system and shall be connected to wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

Each classroom will be provided with a variable air volume terminal box and CO2 sensor for demand ventilation control.

It is estimated that the following air handling equipment will be required to serve these Classroom areas:

RTU-14: One (1) rooftop air handling unit with a capacity of 3,500 CFM (15 tons cooling, 200 MBH heating output).

- H. Administration Areas (HS, CTC & Marketing) and Media Center:
LEED for Schools Credit EO2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

Spatial heating and air-conditioning for the HS, CTC Administration area, Marketing, Guidance offices, and Media Center will be served by horizontal ceiling concealed type ducted 4-pipe heating and cooling active chilled beam induction units with hot water and chilled water for the induction unit system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

RTU-15: The ventilation rooftop air handling will serve the Administration office areas of the building. The unit capacity will be approximately 4,500 CFM and will include supply and return fan with VFDs, 200 MBH output gas fired heating section with modulating capacity control, MERV 13 filtration, 13 ton capacity DX cooling section with modulating capacity control and hot-gas reheat, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

RTU-16: The ventilation rooftop air handling will serve the Media Center area of the building. The unit capacity will be approximately 2,000 CFM and will include supply and return fan with VFDs, 90 MBH output gas fired heating section with modulating capacity control, MERV 13 filtration, 6 ton capacity DX cooling section with modulating capacity control and hot-gas reheat, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

- I. Town Square/Forum:
LEED for Schools Credit EP2, EC1, EC5, IEQP1, IEQC1, 2, 3.1, 3.2, 5, 6.2 & 7.1

RTU-17: The Town Square/Forum will be provided with a new roof-mounted air handling

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units of the recirculation design capable of providing 100% outside air variable volume fully air conditioned displacement ventilation air distribution. The unit will be approximately 7,400 CFM and will include supply and return fans with VFDs, 360 MBH output gas fired heating section with modulating capacity control, 26 ton DX cooling system with modulating capacity control and hot-gas reheat, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

J. Kitchen:
LEED for Schools Credit EP2

The kitchen area shall be provided with new kitchen exhaust air fan and make-up air handling unit with hot water heating. The kitchen will be heated by a heating and ventilation air-handling units with gas fired heating, MUA-1 unit.

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the kitchen equipment vendor. This system installation shall be field installed and coordinated with the ATC and Electrical contractors.

K. Culinary:
LEED for Schools Credit EP2

The Culinary area shall be provided with new kitchen exhaust air fan and make-up air handling unit with hot water heating. The kitchen will be heated by a heating and ventilation air-handling units with gas-fired heating, MUA-2 unit.

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the kitchen equipment vendor. This system installation shall be field installed and coordinated with the ATC and Electrical contractors.

L. Wood Shop:

RTU-18: The Wood Shop will be provided with a gas fired roof mounted air handling unit of 100% outside air design. The unit will have a capacity of 6,000 CFM with 300 MBH output heating capacity. The unit will include a supply fan, exhaust fan, energy recovery wheel, gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed and maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through an overhead galvanized supply air distribution system. Return air will be delivered back to the rooftop unit via a galvanized return air duct distribution system connected to low wall return air

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registers. As levels of carbon dioxide drop generally relating to a reduction in population, the rooftop unit's outside air damper will modulate to reduce outside air flow ventilation while always maintaining a maximum of 1000 ppm and room temperature and humidity set points.

Also located within the wood shop will be a fully engineered dust collection system with all associated controls, filters, rotary valves and safety features such as explosion proof motors and fire extinguishing device located within the ductwork. Blast gates will also be provided for each piece of equipment. All ductwork shall be designed for high velocity systems with gasket locked connections. The system shall have a capacity of approximately 6000 cfm. A typical manufacture of this system would be Donaldson Torit, model DFO.

The system shall be equipped with a listed spark detection system locate down the duct upstream of the collector and downstream from the last material entry point. A high speed abort gate activated by the spark detector shall divert any burning material to atmosphere before it can enter the building. The abort gate shall have a manual reset so that after it has aborted, it can be reset to the normal position. A typical manufacture of this system would be GreCon, model RBS-2.

M. Welding Shop:

RTU-19: The Welding shop will be provided with a gas fired roof mounted air handling unit of the 100% outside air design. The unit will have a capacity of 3,000 CFM with 150 MBH output heating capacity. The unit will include a supply fan, exhaust fan, energy recovery wheel, gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed and maintaining a maximum of 1000 PPM. Supply air ventilation will be provided to the space through an overhead galvanized supply air distribution system. Return air will be delivered back to the rooftop unit via a galvanized return air duct distribution system connected to low wall return air registers. As levels of carbon dioxide drop generally relating to a reduction in population, the rooftop unit's outside air damper will modulate to reduce outside air flow ventilation while always maintaining a maximum of 1000 ppm and room temperature and humidity set points.

Also located within the welding shop will be welding boots which will require the appropriate exhaust systems. Each welding station will be provided with its own separate exhaust drop for individual exhaust air capture. Two exhaust fans at approximately 1500 cfm each.

N. Auto Technology Shop:

RTU-20: The Auto Technology shop will be provided with a gas fired roof mounted air-handling unit of the 100% outside air design. The unit will have a capacity of 3,500 CFM with 200 MBH output heating capacity. The unit will include a supply fan, exhaust fan, energy recovery wheel, gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed and maintaining a maximum of 1000 PPM. Supply air ventilation will be provided to the space through an overhead galvanized supply air distribution system. Return air will be delivered back to the rooftop unit via a galvanized return air duct distribution system connected to low wall return air registers. As levels of carbon dioxide drop generally relating to a reduction in population, the rooftop unit's outside air damper will modulate to reduce outside air flow

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ventilation while always maintaining a maximum of 1000 ppm and room temperature and humidity set points.

Also located within the shop will be a fully engineered vehicle capture exhaust system which will be utilized to capture the exhaust fumes of the small engines during start up procedures or demonstrations. The system will have an approximate capacity of 2000 CFM and will consist of explosion proof motors.

O. Auto Body Collision Shop:

RTU-21: The Auto Body Collision shop will be provided with a gas fired roof mounted air handling unit of the 100% outside air design. The unit will have a capacity of 8,000 CFM with 400 MBH output of heating capacity. The unit will include a supply fan, exhaust fan, energy recovery wheel, gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed and maintaining a maximum of 1000 PPM. Supply air ventilation will be provided to the space through an overhead galvanized supply air distribution system. Return air will be delivered back to the rooftop unit via a galvanized return air duct distribution system connected to low wall return air registers. As levels of carbon dioxide drop generally relating to a reduction in population, the rooftop unit's outside air damper will modulate to reduce outside air flow ventilation while always maintaining a maximum of 1000 ppm and room temperature and humidity set points.

Also located within the shop will be a fully engineered vehicle capture exhaust system which will be utilized to capture the exhaust fumes of the engines during start up procedures or demonstrations. The system will have an approximate capacity of 5000 CFM and will consist of explosion proof motors.

A paint booth will also be located within the shop area and will be provided with a packaged exhaust system with explosion proof motors sized at an approximate capacity of 12,000 cfm. To maintain neutral pressure within the space once the exhaust systems are activated the paint booth will be provided with its own dedicated make up air unit, MAU-3, to maintain a neutral pressure within the paint booth. The paint booth will operate as its own independent system rather than interlocking it with the shops air handling unit. This will prevent oversizing of the shops unit and consume less energy.

P. Building Technology Shop:

RTU-22: The Building Technology shop will be provided with a gas fired roof mounted air handling unit of 100% outside air design. The unit will have a capacity of 6,000 CFM with 300 MBH output of heating capacity. The unit will include a supply fan, exhaust fan, energy recovery wheel, gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed and maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through an overhead galvanized supply air distribution system. Return air will be delivered back to the rooftop unit via a galvanized return air duct distribution system connected to low wall return air registers. As levels of carbon dioxide drop generally relating to a reduction in population, the rooftop unit's outside air damper will modulate to reduce outside air flow ventilation while always maintaining a maximum of 1000 ppm and room temperature and humidity set points.

Also located within the wood shop will be a fully engineered dust collection system with

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all associated controls, filters, rotary valves and safety features such as explosion proof motors and fire extinguishing device located within the ductwork. Blast gates will also be provided for each piece of equipment. All ductwork shall be designed for high velocity systems with gasket locked connections. The system shall have a capacity of approximately 4000 cfm. A typical manufacture of this system would be Donaldson Torit, model DFO.

The system shall be equipped with a listed spark detection system locate down the duct upstream of the collector and downstream from the last material entry point. A high speed abort gate activated by the spark detector shall divert any burning material to atmosphere before it can enter the building. The abort gate shall have a manual reset so that after it has aborted, it can be reset to the normal position. A typical manufacture of this system would be GreCon, model RBS-2.

Q. Electrical Shop:

RTU-23: The Electrical Shop will be provided with a gas fired roof mounted air handling unit of 100% outside air design. The unit will have a capacity of 6,200 CFM with 300 MBH of heating capacity. The unit will include a supply fan, exhaust fan, energy recovery wheel, gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed and maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through an overhead galvanized supply air distribution system. Return air will be delivered back to the rooftop unit via a galvanized return air duct distribution system connected to low wall return air registers. As levels of carbon dioxide drop generally relating to a reduction in population, the rooftop unit's outside air damper will modulate to reduce outside air flow ventilation while always maintaining a maximum of 1000 ppm and room temperature and humidity set points.

R. Animal Science Building:

The Animal Science Building will be served by its own dedicated hot water boiler heating plant and gas-fired rooftop air handling units. It is estimated that three (2) wall mounted high efficiency gas fired boilers, each with a capacity of 330 MBH, will be provided to serve building hot water radiation and terminal heating equipment. In addition to the boilers, new hot water pumps equipped with VFD drives, hot water piping, valves, accessories and controls shall be provided as part of the boiler plant heating system.

RTU-24: The primary mechanical ventilation system for the Animal Science Building will include (1) air handling unit of the 100% outside air design. The unit will have a capacity of approximately 9,000 CFM with 380 MBH of heating. The unit will include a supply and exhaust fan, gas fired furnace with modulating gas valve, MERV 13 filtration and exhaust air energy recovery wheel. Supply air ventilation will be provided to occupied areas of the building including classrooms, locker rooms, offices, and storage area of the building that will satisfy building code requirements. Carbon dioxide controls will be provided that will monitor the overall level of carbon dioxide.

The Classrooms will be served by individual heating and cooling high efficiency heat pump AC units. The heat pump will be a concealed ceiling unit or a wall mounted unit pending on ceiling space. Ventilation air from the building ventilation unit or an exterior wall louver will be utilized to meet code required ventilation rates. These heat pumps will have associated grade mounted condensers and refrigerant lines which will communicate

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the interior unit to the roof mounted unit. Supplemental hot water radiation heating will also be provided in the classrooms.

S. Lobby, Corridor, and Entry Way Heating:

New hot water convectors, cabinet unit heaters and fin tube radiation heating equipment shall be installed to provide heating to these areas. Corridors shall be ventilated from adjacent air handling unit systems.

T. Custodial Support Areas:

HVU-1: Custodial support areas will be heated and ventilated by a heating and ventilation unit with an estimated capacity of 1,800 CFM. Storage areas will be heated by radiation heating equipment. Horizontal type unit heaters will heat areas adjacent to the loading dock. All custodial closets will be exhausted by exhaust air fan systems.

U. Utility Areas:

Utility areas will be provided with exhaust air fan systems for ventilation, and will typically be heated with horizontal type ceiling suspended unit heaters.

The main IDF room will be air conditioned by high efficiency ductless AC cooling units.

V. Testing, Adjusting, Balancing & Commissioning:

All new HVAC systems shall be tested, adjusted, balanced and commissioned as part of the project scope.

W. Automatic Temperature Controls – Building Energy Management System

A new DDC (direct digital control) automatic temperature control and building energy management system shall be installed to control and monitor building HVAC systems. Energy metering shall be installed to monitor the energy usage of building HVAC systems and utilities (fuel, gas, water).

The control system shall be as manufactured by Johnson Controls, Honeywell, Siemens or Equal.

5. TESTING REQUIREMENTS:

A. The mechanical contractor shall provide testing of the following systems with the owner and owner's representative present:

1. Boiler plant system
2. Chilled water plant system
3. Air handling unit systems including all rooftop units, indoor air handling systems and exhaust air systems
4. Terminal heating and cooling devices

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5. Automatic temperature control and building energy management system
- B. Testing reports shall be submitted to the engineer for review and approval before providing to the owner.
6. OPERATION MANUALS AND MAINTENANCE MANUALS: When the project is completed, the mechanical contractor shall provide operation and maintenance manuals to the owner.
7. RECORD DRAWINGS AND CONTROL DOCUMENTS: When the project is completed, an as-built set of drawings, showing all mechanical system requirements from contract and addendum items will be provided to the owner.
8. COMMISSIONING: The project shall be commissioned per Section 018000 of the specifications.

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Equipment Cuts



GARCIA • GALUSKA • DESOUSA
Consulting Engineers, Inc.

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Equipment Cuts
Boiler



SB Series

Commercial Condensing Boilers



Buderus
HYDRONIC SYSTEMS

- Ultra High Efficiency up to 98%
- Wide Range of Sizes: 484 — 4,079 MBH Gross Output
- Stainless Steel Fire Tubes for Long Life
- No Restriction on Return Temperature and Flow Rates
- Standard US Burners and Conventional Controls
- Perfect Match with Thermostream Boilers in Multiple Boiler Systems for Base Load Applications



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SB615	Unit of Measure	145	185	240	310	400	510	640
Performace data								
Gas Input	MBH	506	644	835	1080	1393	1776	2228
Gross IBR Output*	MBH	484	612	791	1022	1317	1678	2104
Max Output Range **	MBH	440 - 484	560 - 612	730 - 791	940 - 1022	1220 - 1317	1550 - 1678	1950 - 2104
Net IBR Rating	MBH	421	532	688	889	1145	1459	1830
Thermal Efficiency	%	95.6	95	94.8	94.6	94.5	94.5	94.4
Combustion Efficiency	%	97.1	96.7	96.5	96.4	96.3	96.2	96.2
Boiler Horse Power		14.4	18.2	23.6	30.5	39.3	50.1	62.8
Available Breeching Pressure	inch WC	Dependent on Burner						
Fireside Pressure Drop	inch WC	0.49	0.63	0.89	0.97	1.22	1.44	1.78
Piping Connections								
Vent Pipe Diameter (inner)	inch	7	7	8	8	10	12	12
Vent Conn. Height	inch	11¾	11¾	12	12	13	14½	14½
Boiler Supply Conn. (VK)	inch	2½	2½	3	3	4	4	4
Boiler Return (low) (RK1)	inch	2½	2½	3	3	4	4	4
Boiler Return 2 (RK2)	inch	2	2	2½	2½	2½	3	3
Physical Dimensions								
Length w/o Burner (L)	inch	68¾	68¾	70	70	70	75¼	75¼
Length w/o Jacket (Lk)	inch	60	60	61	61	61	66¼	66¼
Height (H)	inch	54¼	54¼	55½	55½	63½	69¼	69¼
Width (JW)	inch	35½	35½	38¼	38¼	38¼	43¼	43¼
Width w/o Jacket (WB)	inch	28¼	28¼	31¼	31¼	31¼	36¼	36¼
Dry Weight	lbs	1690	1700	1950	2030	2600	2970	3020
Water Content (approx)	gal	148	147	179	171	180	229	223

Approved venting material: AL29 4C, 316 stainless or CPVC.

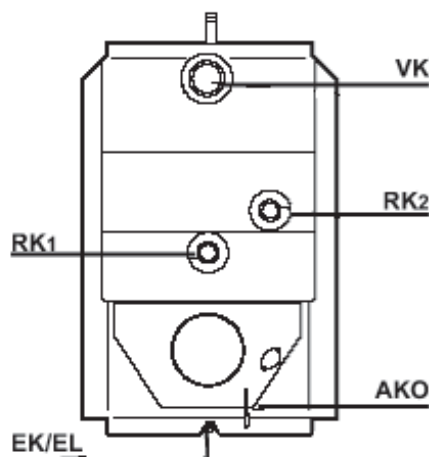
Boiler approved for side-wall venting.

See diagrams for dimension locations.

* Listed output based on IBR testing procedure.

** Output dependent on return temperature and firing rate.

- VK Supply Connection
 RK1 Low Temperature Return Connection
 RK2 High Temperature Return Connection
 AKO Condensate Drain
 Ek Water Feed
 EL Boiler Drain
 H Height
 WB Width without Jacket
 JW Width with Jacket
 L Length



SB 735 Rear View

SB735	Unit of Measure	790	970	1200
Performace data				
Gas Input	MBH	2751	3378	4179
Gross IBR Output*	MBH	2650	3251	4079
Max Output Range **	MBH	2400 - 2650	2950 - 3251	3650 - 4079
Net IBR Rating	MBH	2265	2827	3547
Thermal Efficiency	%	96.9	96.3	97.6
Combustion Efficiency	%	94.7	95.6	96.5
Boiler Horse Power		77.8	97	121.8
Available Breeching Pressure	inch WC	Dependent on Burner		
Fireside Pressure Drop	inch WC	1.98	2.31	2.6
Piping Connections				
Vent Pipe Diameter (inner)	inch	14	14	14
Vent Conn. Height	inch	19	19	19
Boiler Supply Conn. (VK)	inch	4	5	5
Boiler Return (low) (RK1)	inch	4	5	5
Boiler Return 2 (RK2)	inch	3	4	4
Physical Dimensions				
Length w/o Burner (L)	inch	91½	108¼	108¼
Length w/o Jacket (Lk)	inch	75½	92	92
Height (H)	inch	81¼	81¼	81¼
Width (JW)	inch	54	54	54
Width w/o Jacket (WB)	inch	43¾	43¾	46
Dry Weight	lbs	3811	4780	4855
Water Content (approx)	gal	494	660	668

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Equipment Cuts
Chiller





REVOLUTIONARY ENERGY SAVINGS

Air-cooled oil-free centrifugal chillers from Smardt Chiller Group

SMARTD

TD - 0081B
16 Dec 2011

CHILLER DIMENSIONS & CLEARANCES

Dimensions For Plant Layout Air-cooled Chiller

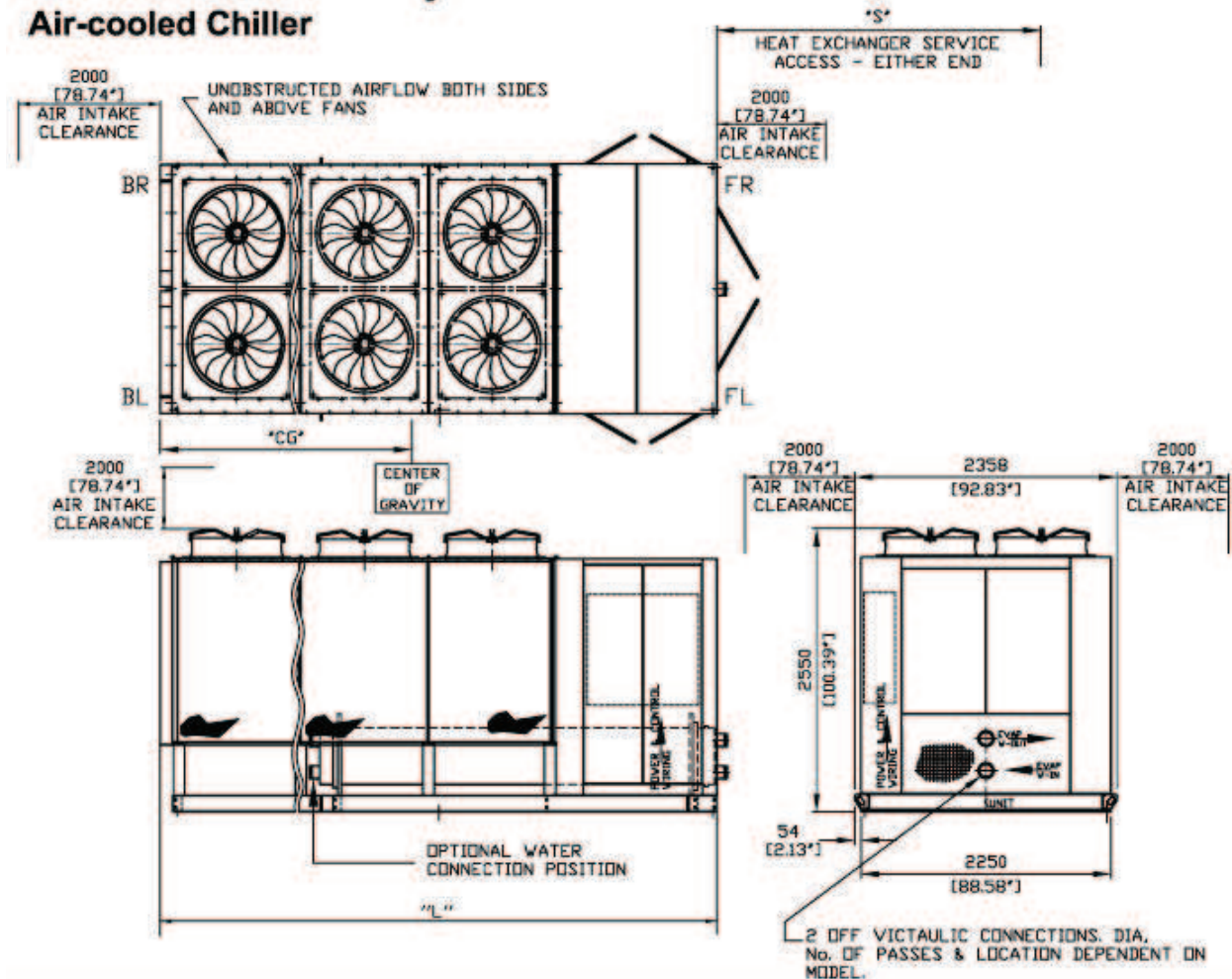


Figure 4: Chiller Dimensions & Clearances
(Ref. Table 2)

MINIMUM PLACEMENT CLEARANCES

UNIT PLACEMENT	SIDE CLEARANCE
Single unit, floor level	1830 mm (6'- 0")
Single unit, pit installation no deeper than height of unit	2440 mm (8'- 0")
Units side by side, floor level	3660 mm(12'- 0") between units, 1830 mm (6'- 0") on other sides
Units side by side, pit installation no deeper than height of unit	4880 mm (16'- 0") between units, 2440 mm (8'- 0") on other sides

Table 1: Minimum Placement Clearances

OVERALL DIMENSIONS, WEIGHTS, & PHYSICAL DATA

Model No.	No. of Comp'	No. of Fans	Length	Service Length	No. of Lifting Lugs	Empty Weight	Shipping Weight (Charged)	Operating Weight	Weight at Foot FR
			mm (ft-in)	mm (ft-in)		Kg (lbs)	Kg (lbs)	Kg (lbs)	Kg (lbs)
A027	1	4	3680 (12'-8")	8458 (27'-9")	4	3038 (6698)	3230 (7120)	3348 (7382)	899 (1983)
A030	1	6	5010 (16'-5¼")	8458 (27'-9")	4	3745 (8256)	4000 (8820)	4144 (9137)	1195 (2635)
A054	2	8	6150 (20'-21/8")	8458 (27'-9")	4	4798 (10578)	5150 (11360)	5323 (11735)	1528 (3368)
A059	2	10	7315 (24'-0")	8458 (27'-9")	6	5358 (11812)	5750 (12680)	5952 (13123)	1758 (3876)
A073	3	10	7315 (24'-0")	8458 (27'-9")	6	5846 (12888)	6250 (13780)	6467 (14258)	1903 (4195)
A082	3	12	8458 (27'-9")	8458 (27'-9")	6	6396 (14100)	6850 (15100)	7092 (15636)	2122 (4678)

Weight at Foot FL	Weight at Foot BR	Weight at Foot BL	Center of Gravity	R134a Charge	Water Content	Flow Range **	No. of Tube Passes	Water Conn. Sizes (Victualic)
Kg (lbs)	kg (lbs)	kg (lbs)	mm (ft-in)	kg (lbs)	kg (lbs)	L/s (gpm)		
943 (2079)	736 (1623)	770 (1697)	2060 (6'-9")	191 (422)	119 (262)	8-18 (127-285)	2	4
1238 (2729)	840 (1852)	871 (1921)	2870 (9'-5")	256 (564)	144 (317)	10-20 (127-285)	2	4
1570 (3461)	1099 (2422)	1127 (2484)	3505 (11'-6")	356 (782)	170 (375)	12-30 (127-285)	2	5
1800 (3969)	1224 (2698)	1211 (2670)	4300 (14'-1")	394 (868)	201 (443)	21-48 (333-713)	3	6
1945 (4289)	1295 (2856)	1324 (2918)	3680 (14'-1")	405 (892)	217 (478)	26-54 (412-856)	2	6
2169 (4782)	1387 (3057)	1415 (3119)	5260 (17'-3")	454 (1000)	243 (536)	26-54 (412-856)	2	6

The above table applies to 460 VAC - variable speed. For 575 VAC refer to SMARTD model specific equipment spec.

*Values differ by chiller model. Refer also to SMARTD model specific equipment spec for further details.

**gpm are U.S. gallons per minute

Table 2: Overall Dimensions, Weights, & Physical Data

*Includes full refrigerant charge - water circuits empty.

Weights may vary with individual tube count.

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Equipment Cuts
Pumps





Bulletin B-207G

Bell & Gossett



Series 1510 Centrifugal Pumps – Technical Bulletin

- For hydronic heating and cooling systems, industrial, pressure boosting and general pumping applications
- High efficiency, low operating costs
- Easy maintenance
- Seal options



Take away these seven standard features and you'll have a pump like everyone else's.



TRUE BACK PULLOUT

A B&G standard in design and construction. Ease in service is assured, while piping and motor remain undisturbed. Extended delays for repairs are virtually eliminated.

INTERNALLY SELF-FLUSHING MECHANICAL SEAL

This design is way ahead of its time. This unique seal design is proven in many years of service. It requires no special external flushing provisions, since the design provides for constant efficient flushing action internally.

This standard feature ensures maximum seal face lubrication, heat dissipation and debris removal without vulnerable, external flush tubing. The internal flushing action passes two and a half to three times the flow over the seal faces — compared to a few GPM for conventional, stuffing-box designed pumps.



COMPUTER CONTROLLED IMPELLER BALANCING

1510 impellers are balanced to HI/ANSI 1.1-1.5-1994 section 1.4.6.1.3.1, balance grade G6.3 standards. This method of computer balancing Impellers provides for quiet, efficient, vibration free performance. Diameters are computer selected at the factory to furnish assurance that your capacity requirements will be met.



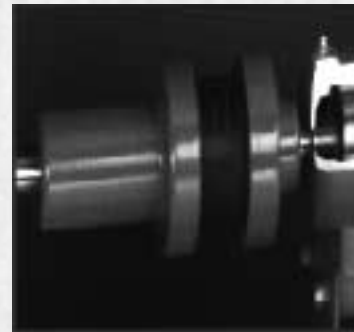
HEAVY DUTY, RUGGED BASEPLATE

The Bell & Gossett fabricated heavy duty baseplate is supplied as standard on every Series 1510 pump. Unlike rolled steel and "C" channel baseplates, the Series 1510 baseplate provides a heavy duty saddle assembly, full seam welds, closed baseplate ends and an open top to provide ease of access for proper equipment grouting.



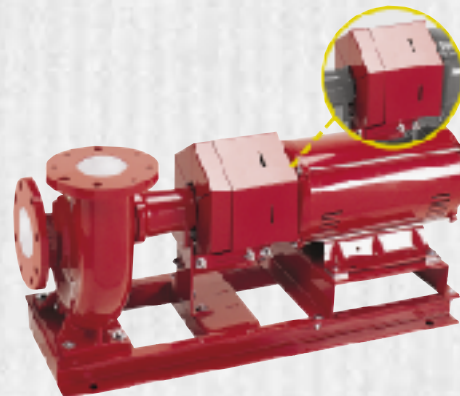
SOLID-FOOT MOUNTED VOLUTE

All Series 1510 pumps are provided as standard with an integrally cast volute foot located directly beneath the pump volute. This integrally cast foot ensures that the alignment between the volute and motor assembly is maintained. Without solid support beneath the volute, the piping weight alone will cause distortion which can lead to premature failure of the bearings, shaft and mechanical seal. This feature is equally important on hot water applications. The Series 1510 volute foot provides a solid foundation and eliminates the deflections which would otherwise exist within an unsupported overhung volute during the normal thermal expansion of the system piping against the volute.



CENTER DROP-OUT SPACER COUPLING

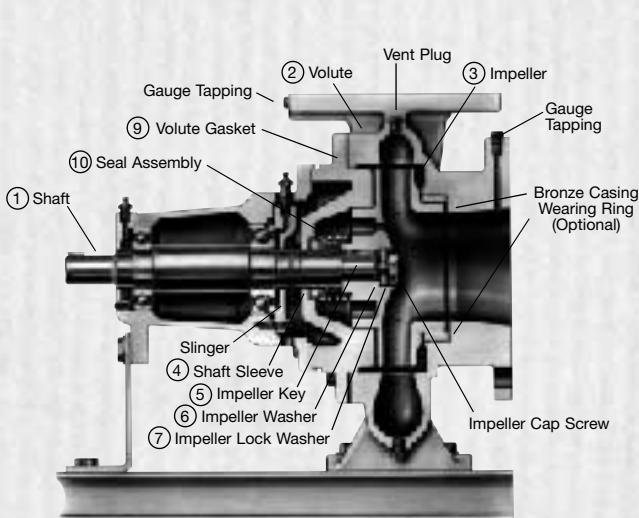
Unlike conventional jaw type or rigid style couplings, a center drop-out spacer coupling allows removal of the bearing frame and rotating element without disturbing the pump end pipe alignment or motor electrical connections.



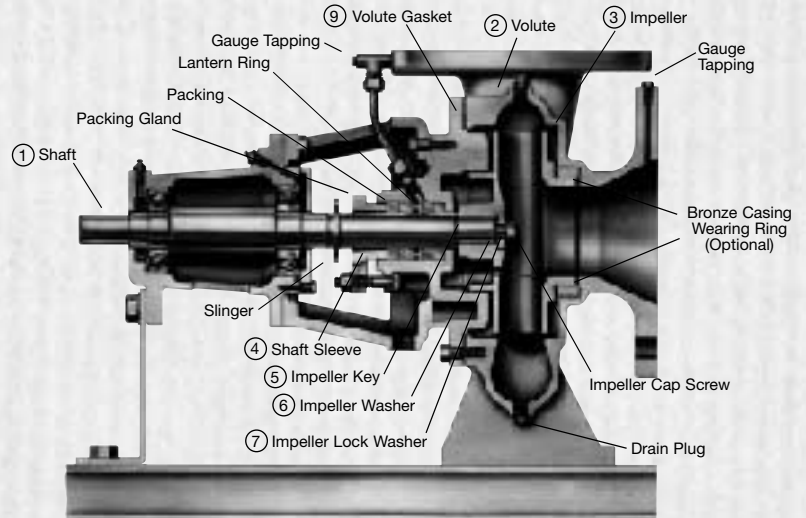
ANSI/OSHA-COMPLIANT COUPLING GUARD

The coupler guard complies with ANSI B15.1, Section 8 and OSHA 1910.219. The guard offers increased protection against potential injuries and is standard on all 1510 pumps. The guards include slotted viewing windows for easy inspection.

Materials of Construction



Standard Configuration



Optional -S Configuration

DESCRIPTION	BRONZE FITTED PUMP (STANDARD CONFIGURATION)	ALL IRON PUMP (OPTIONAL)	ALL BRONZE PUMP* (OPTIONAL)
1 Shaft	Steel SAE 1144	Steel SAE 1144	Steel SAE 1144
2 Volute	Cast Iron ASTM #A159	Cast Iron ASTM #A159	Cast Bronze ASTM #B584
3 Impeller	Cast Bronze ASTM #B584	Cast Iron ASTM #A159	Cast Bronze ASTM #B584
4 Shaft Sleeve	Aluminum Bronze ASTM #B111	#304 Stainless Steel ASTM #A312	Aluminum Bronze ASTM #B111
5 Impeller Key	#304 Stainless Steel	#304 Stainless Steel	#304 Stainless Steel
6 Impeller Washer	1510 – Steel	Stainless Steel	Brass
7 Impeller Lock Washer	#304 Stainless Steel	#304 Stainless Steel	#304 Stainless Steel
8 Impeller Cap Screw	#304 Stainless Steel	#304 Stainless Steel	#304 Stainless Steel
9 Volute Gasket	Cellulose Fiber	Cellulose Fiber	Cellulose Fiber
10 Seal Assemblies			
Standard Seal			
Bellows	Buna N	Buna N	Buna N
Faces	Carbon-Ceramic	Carbon-Ceramic	Carbon-Ceramic
Metal Parts	Brass	Stainless Steel	Brass
Spring	Stainless Steel	Stainless Steel	Stainless Steel
For Stuffing Box			
10A Flushed Single			
O-Rings	EPR	EPR	
Faces	Carbon-Tungsten Carbide	Carbon-Tungsten Carbide	
Metal Parts	Stainless Steel	Stainless Steel	
Spring	Stainless Steel	Stainless Steel	
Packed			
Packing	Graphited Impregnated Teflon	Graphited Impregnated Teflon	
Gland	Bronze	Cast Iron	
Lantern Ring	Filled TFE	Filled TFE	

OPTIONAL FEATURES

All Iron Construction
All Bronze Construction*
Bronze Casing Wear Ring
Stainless Steel Shaft Sleeve
Stainless Steel Shaft
Drip Pan
EPT/Tungsten Carbide Seal
(Standard Configuration only)
Stuffing Box Construction with several seal and packing options

SEAL SELECTION GUIDE FOR:

A. STANDARD SEALS

- BUNA-PH Limitations 7-9; Temperature Range -20°F to +225°F
- EPT-PH Limitations 7-11; Temperature Range -20°F to +250°F

For use on open or closed clear water systems. Maximum working pressure 175 psi.

B. FLUSHED SINGLE SEALS (Stuffing Box Design)

- PH Limitations 7-11; Temperature Range -20°F to +300°F**

For use on closed or open systems where the temperature or pressure requirements exceed the limitations of the standard seal. Available in 175 psi, or 250 psi working pressures.

C. FLUSHED DOUBLE SEALS (Stuffing Box Design)

PH Limitations 7-9;
Temperature Range 0°F to +250°F
For use on closed or open low pressure systems which may contain a high concentration of abrasives. An external flush is required. Maximum working pressure 175 psi.

D. PACKING (Stuffing Box Design)

PH Limitations 7-9;
Temperature Range 0°F to +190°F
For use on open or closed systems which require a large amount of make-up water, as well as systems which are subjected to widely varying chemical conditions and solids buildup.

* All Bronze Construction NOT available in following sizes: 1½"AC, 3AC, 3BC, 4AC, 5A, 4BC, 5BC, 6BC, all E, and all G sizes, or stuffing box configuration.

** For operating temperatures above 250°F, a cooled flush is required – and is recommended for temperatures above 225°F for optimum seal life. On closed systems, cooling is accomplished by inserting a small heat exchanger in the flush line to cool the fluid. Flush-line Filters and Sediment Separators are available on special request.

Series 1510 Centrifugal Pumps cont.'d

DIMENSIONS – INCHES (MM)			STANDARD MECHANICAL SEAL PUMP MODEL 1510, 1510-F								STUFFING BOX CONSTRUCTION PUMP MODEL 1510-PF, 1510-S																																																																																																																																																																																																																																																																																																																																																																																																										
PUMP SIZE DISCHARGE	SUCTION SIZE	MOTOR FRAME SIZE	HA	HB	HD	HL	HO	HP	Y	Z	HA	HB	HD	HL	HO	HP	Y	Z																																																																																																																																																																																																																																																																																																																																																																																																			
3 BC	4	182T-184T	14 ⁹ / ₁₆ (371)	31(787)	10 ³ / ₁₆ (273)	3 ¹¹ / ₁₆ (94)	18 ¹ / ₁₆ (464)	3 (76)	4 ³ / ₁₆ (121)	6 ¹ / ₁₆ (156)	14 ⁴ / ₁₆ (371)	34 ⁹ / ₁₆ (879) 39 ⁹ / ₁₆ (1000)	10 ¹ / ₁₆ (273)	3 ¹¹ / ₁₆ (94)	18 ¹ / ₁₆ (464)	3 (76)	4 ³ / ₁₆ (121)	6 ¹ / ₁₆ (156)																																																																																																																																																																																																																																																																																																																																																																																																			
		213T-215T		46 ¹ / ₁₆ (1181)							13(330)	4 ¹⁰ / ₁₆ (122)	20 ¹ / ₁₆ (521) 19 ¹ / ₁₆ (495)	16 (406)	46 ⁶ / ₁₆ (1181)	12(305)			4 ⁹ / ₁₆ (122)	19 ⁷ / ₁₆ (495) 20 ⁷ / ₁₆ (521) 19 ¹ / ₁₆ (495)	5 (127)																																																																																																																																																																																																																																																																																																																																																																																																
		284TS-286TS		42 ¹ / ₁₆ (1073)							14 (356)	6 ¹¹ / ₁₆ (170)	23 ¹ / ₂ (597)	5 (127)	16 (406)	42 ¹ / ₁₆ (1073)			14 (356)	6 ¹¹ / ₁₆ (170)	23 ¹ / ₂ (597)	5 (127)																																																																																																																																																																																																																																																																																																																																																																																															
		324TS-326TS		46 ¹ / ₁₆ (1181) 51 ¹ / ₁₆ (1314)												4 ⁹ / ₁₆ (110)				51 ¹ / ₁₆ (1314)			12(305)	4 ⁹ / ₁₆ (110)																																																																																																																																																																																																																																																																																																																																																																																													
3 Et†		184T	16 (406)	42 ¹ / ₁₆ (1073)	14 (356)	6 ¹¹ / ₁₆ (170)	23 ¹ / ₂ (597)	5 (127)	5 ¹ / ₂ (140)	7 ¹ / ₁₆ (187)	16 (406)	42 ¹ / ₁₆ (1073)	14 (356)	6 ¹¹ / ₁₆ (170)	23 ¹ / ₂ (597)	5 (127)	5 ¹ / ₂ (140)	7 ¹ / ₁₆ (187)																																																																																																																																																																																																																																																																																																																																																																																																			
		213T-215T																	46 ¹ / ₁₆ (1181) 51 ¹ / ₁₆ (1314)	4 ⁹ / ₁₆ (110)	51 ¹ / ₁₆ (1314)	12(305)	4 ⁹ / ₁₆ (110)																																																																																																																																																																																																																																																																																																																																																																																														
		254T																	56 (1422)	16 ¹ / ₂ (419)	4 ⁹ / ₁₆ (125)	26 (660)	6 (152)	24 (610)	56 (1422)	16 ¹ / ₂ (419)	4 ⁹ / ₁₆ (125)	26 (660)	6 (152)																																																																																																																																																																																																																																																																																																																																																																																								
		256T																	46 ¹ / ₁₆ (1181)	14 (356)	4 ⁹ / ₁₆ (105)	23 ¹ / ₂ (597)	5 (127)	5 ⁵ / ₁₆ (143)	8 (203)	16 (406)	46 ⁶ / ₁₆ (1181)	14 (356)	4 ⁹ / ₁₆ (105)	23 ¹ / ₂ (597)	5 (127)	5 ⁵ / ₁₆ (143)	8 (203)																																																																																																																																																																																																																																																																																																																																																																																				
3 G†		284T-286T	16 (406)	51 ¹ / ₁₆ (1314)	14 (356)	4 ⁹ / ₁₆ (105)	23 ¹ / ₂ (597)	5 (127)	5 ⁵ / ₁₆ (143)	8 (203)	16 (406)	51 ¹ / ₁₆ (1314)	14 (356)	4 ⁹ / ₁₆ (105)	23 ¹ / ₂ (597)	5 (127)	5 ⁵ / ₁₆ (143)	8 (203)																																																																																																																																																																																																																																																																																																																																																																																																			
		324T																	145T	31 (787)	10 ³ / ₁₆ (273)	4 ⁹ / ₁₆ (110)	18 ¹ / ₁₆ (464)	3 (76)	4 ⁹ / ₁₆ (125)	5 ¹ / ₁₆ (146)	14 ⁴ / ₁₆ (371)	34 ⁹ / ₁₆ (879)	10 ¹ / ₁₆ (273)	4 ⁹ / ₁₆ (110)	18 ¹ / ₁₆ (464)	3 (76)	4 ⁹ / ₁₆ (125)	5 ¹ / ₁₆ (146)																																																																																																																																																																																																																																																																																																																																																																																			
		182T-184T																	213T	215T	254T-256T	284TS-286TS	324TS-326TS	213T-215T	254T	256T	286TS	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-286T	324TS-326TS	364TS-365TS	404TS	213T-215T	254T	256T	284T-

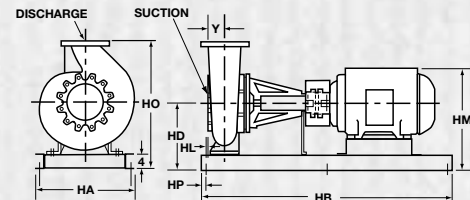
*13½" impeller for 1450 RPM service with "L" frame.

Maximum Working Pressure 175 psi (12 bar)

8G ONLY

DIMENSIONS – INCHES (MM)			STUFFING BOX CONSTRUCTION PUMP MODEL 1510-S						
PUMP SIZE DISCHARGE	SUCTION SIZE	MOTOR FRAME SIZE	HA	HB	HD	HL	HO	HP	Y
8G (203)	10 (254)	284T-445TS	28 (711)	70 (1778)	18 1/4 (464)	.44 (11)	35.7 (907)	1 1/4 (32)	4 1/4 (121)

Flanges are: 125# ANSI - Standard



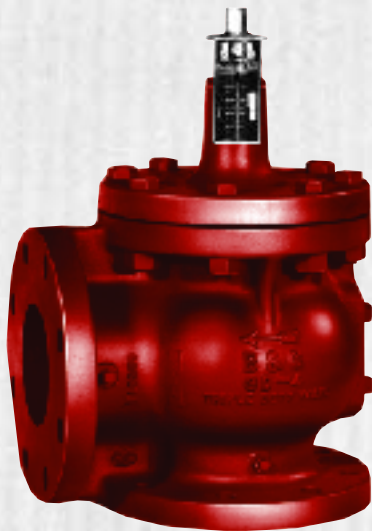
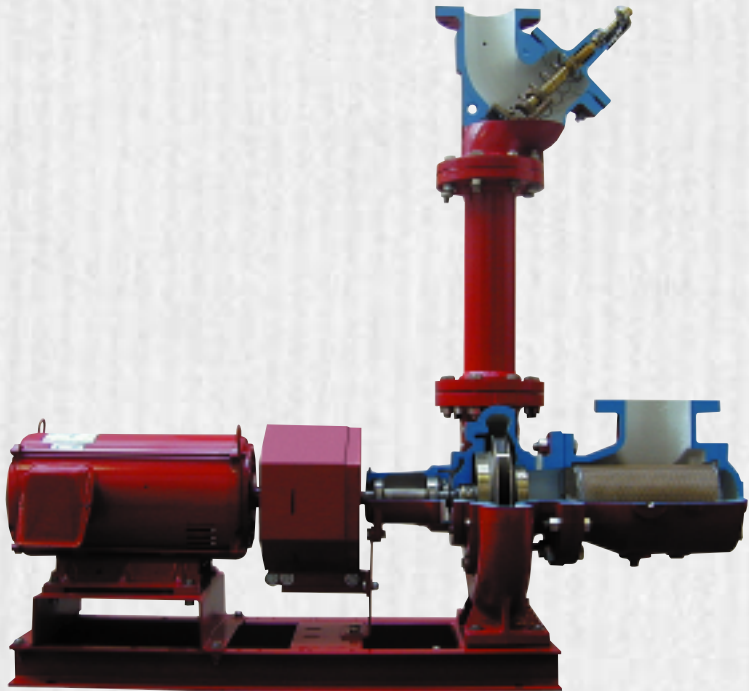
THE B&G End Suction Pump System

Consists of:

B&G Series 1510 Pump

B&G Triple Duty Valve

B&G Suction Diffuser



Triple Duty Valve

- Lowest Pressure Drop
- ASHRAE 90.1 Energy Efficient Design
- Three Valves in one!
 - Nonslam drip-tight check valve
 - Positive shutoff valve
 - Calibrated system balance valve
- EPDM Disc Soft Seat Design
- Repack Under Pressure
- Brass Seat & Bronze Disc
- Stainless Steel Stem
- Multi-turn Valve (8-9 turns) vs 1/4 turn range of control
- Available connections
 - Threaded – Flanged – Grooved
- ESP-Plus System Selection



Suction Diffuser

- Full length stainless steel straightening vanes
- Oversize cylinder assures minimum strainer pressure drop
- Pressure gauge tap
- Magnetic drain plug to protect pump seals
- Adjustable support foot
- Space saving design reduces the “footprint” size of the unit
- Available connections
 - Threaded – Flanged – Grooved
- Reducer and elbow provide multiple combinations of inlet and pump suction configurations which eliminate the need for reducer fittings
- ESP-Plus System Selection

Dover High School
Dover, NH

Equipment Cuts
Rooftop Units



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/30/2010 2:52 PM

JOB NAME	K00EPC(RT0009)	REP. OFFICE	House Account
JOB DESCRIPTION	Dover High School	SALESPERSON	PJA
MODEL NUMBER	RPS035D	CUSTOMER	-
UNIT TAGGING	Classroom RTU	ROOFTOP VERSION	4.76

GENERAL DATA

Unit dimensions (HxWxL ins)	55.5 x 94.0 x 407.0
Unit weight (lbs)	12505
Approval listing	ETL/MEA - UL
EER / IPLV at ARI Conditions	(14.8 / 13.3 w / heat wheel), (12.5 / 12.4 without heatwheel)

CASING DETAILS

Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Liners	Solid liner throughout, perforated liner in plenums
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	109.3
MROPD (amps)	125.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CONTROL DATA

Temperature controls	DAC - BacNet Ethernet comm card
Airflow controls	One duct static pressure sensor, One space static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 4 - 7.5
Capacity control	4 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	29.4
Compressor amps	4 - 14.7

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	5.2
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	5 / 12
Fin material	Aluminum
Total capacity (Btu/hr)	436327
Sensible capacity (Btu/hr)	320040
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	77.0 / 64.3
Leaving db / wb (F)	51.0 / 50.9
Face area (ft2)	27.0
Face velocity (ft/min)	416
Refrigerant type	R410A

DRAW-THRU**SUBCOOLER**

85056

51.0 / 50.9

58.0 / 53.3

MODULATING HOT GAS REHEAT

Rows / FPI	1 / 14
Fin material	Aluminum Micro-channel
Total capacity (Btu/hr)	258190
Sensible capacity (Btu/hr)	258190
Entering db / wb (F)	51.0 / 50.9
Leaving db / wb (F)	71.8 / 58.6
Face area (ft ²)	18
Face velocity (ft/min)	614

ENERGY RECOVERY

Ambient air temperatures (F)	87.0 / 74.0
Return air temperatures (F)	75.0 / 62.0
Minimum outside air volume (cfm)	6270
Minimum exhaust air volume (cfm)	6270
Wheel leaving air temperature (F)	78.6 / 66.2
Mixed air temperature (F)	77.0 / 64.3
Total effectiveness	0.65
Sensible effectiveness	0.70
Recovered Capacity	178651
Wheel Depth (ins)	4.0

FAN PERFORMANCE

Air volume (cfm)	11245
Altitude (ft)	200
Air modulation device	Inverter
Fan diameter / type	24" / AF DWDI
Fan speed (rpm)	1451
Fan brake horsepower (HP)	9.4
Motor size (HP)	15.0
Motor amps	18.9
Motor efficiency / type	92.4% / Premium efficiency
Drive service factor / type	Std. 115% / Fixed
Fan isolation	Springs w/ seismic restraint
Fan section options	Light and receptacle

HEATING PERFORMANCE

Type of heat	Natural gas
Model size (mbh)	320
Heat exchanger	Stainless steel primary, Stainless steel secondary
EDB / LDB (F)	48.2 / 74.5
Capacity (Btu/hr)	320000
Capacity control	20-to-1 High turndown
Gas pressure regulator	Std. 0.5 psi
Furnace combustion efficiency	80 %
Air pressure drop (in WC)	0.07

FILTER DATA

Filter efficiency / type	85%, MERV 13
Face area (ft ²)	50
Face velocity (ft/min)	225
Filter qty / size (ins)	10 / 16.0 x 20.0 x 2.0 10 / 16.0 x 25.0 x 2.0
Energy recovery wheel filter qty/size	6 / 16.0 x 20.0 x 2.0 6 / 16.0 x 25.0 x 2.0

PLENUM DATA

Outside air option

COOLING**HEATING**

7.0 / 5.0
72.0 / 54.0
6270
6270
46.7 / 38.3
57.9 / 45.2
0.65
0.70
388082
4.0

SUPPLY**RETURN / EXHAUST**

11245
200
Inverter
24" / AF SWSI
1720
8.1
15.0
18.9
92.4% / Premium efficiency
Std. 115% / Fixed
Springs w/ seismic restraint
None

FINAL**DISCHARGE**

-

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/30/2010 2:52 PM

Opening location	Bottom	Bottom
Plenum options	None	None
Smoke detector	Yes	Yes

AIR PRESSURE DROPS (in WC)**SUPPLY****RETURN**

External static pressure	1.00	1.00
Heat Recovery	1.14	1.22
Draw-thru filter	0.17	
Filter Loading	0.50	
Cooling	0.80	
Subcool Reheat	0.18	
HGRH coil	0.18	
Heating	0.07	
Total static	4.04	2.22

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	98	93	91	90	87	83	79
Unit discharge	85	81	77	73	70	64	56	48
Unit return	90	92	92	88	87	82	74	67

SHIPPING SECTION DETAILS**LENGTH****WEIGHT**

Section 1	407.0	12505
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WARRANTY**PARTS****COMPRESSOR****HEAT EXCHANGER**

Standard (yrs)	1	1	1
Extended (yrs)	None	4	None

NOTES

1) Add Sub-cool Reheat coil (5000) (+0.18"apd)

As a standalone component, unit meets or exceeds the 2009 requirements of ASHRAE 90.1 - 2007. The approving authority is responsible for compliance of multi-component building systems.

Opening

- A Condensate drain connection (1.5 MPT)
- B Return air inlet
- C Discharge air outlet

Dimensions measured from ⊕

X	Y	Z	W(Width)	H(Height)
175.00	95.50	2.70	-	-
76.00	6.00	2.00	82.00	22.00
298.00	12.00	0.00	76.00	20.00

- Pre-Filters.
- Heat Wheel.
- R.A. Fan.

4" MERV 13 Filters

Supply Fan
Discharge Plenum
w/ HGRH coil.

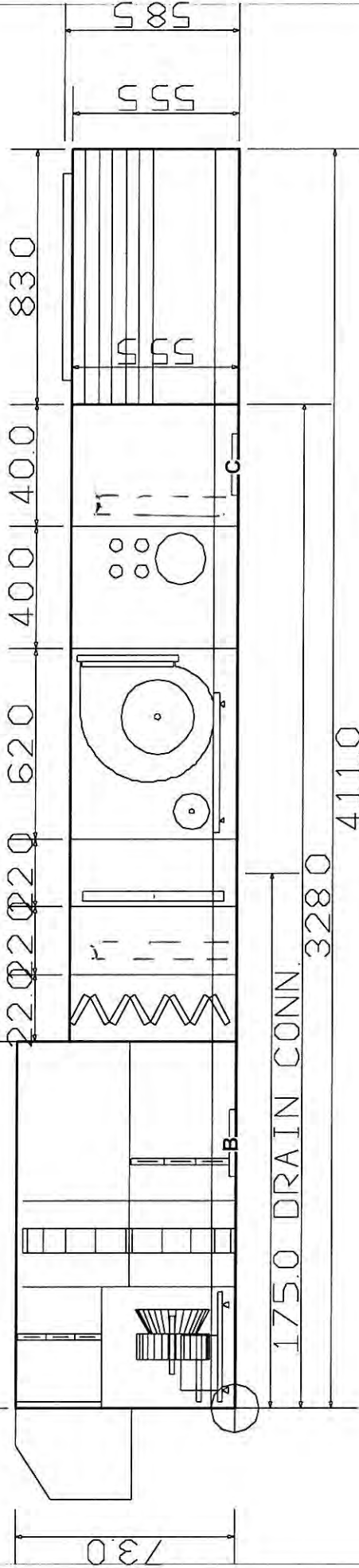
Subcool

Gas Heat

Dx coil

Condensing Section.

130.0 40.0 28.0 52.0
120.0



VIEW: Right Side
 DRAWN: 23 November 2010 (10-25)
 JOB NAME: Dover High School
 UNIT TAGGING: Classroom RTU
 MODEL: RPS035D

Opening

A Condensate drain connection (1.5 MPT)

B Return air inlet

C Discharge air outlet

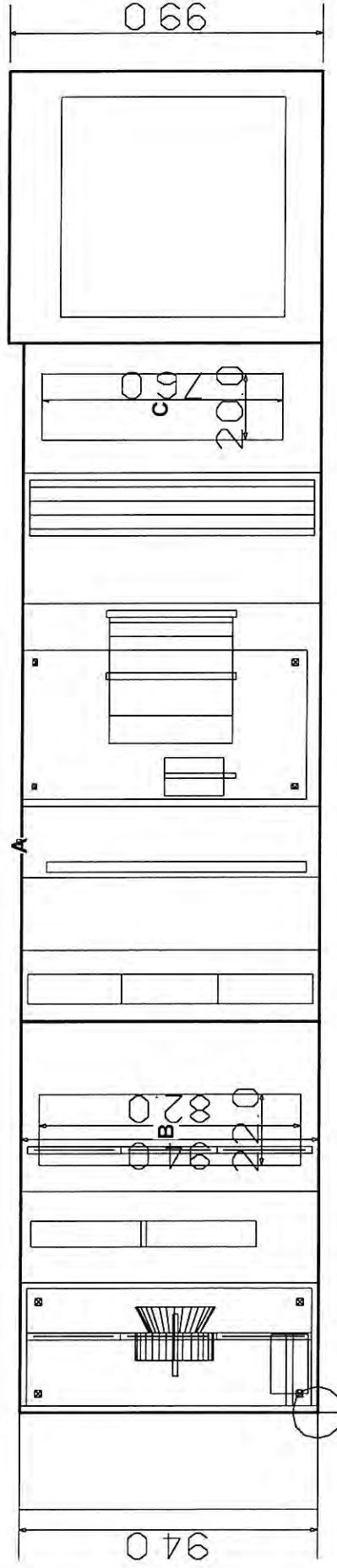
Dimensions measured from ⊕

X Y Z W(Width) H(Height)

175.00 95.50 2.70 -

76.00 6.00 2.00 82.00 22.00

298.00 12.00 0.00 76.00 20.00



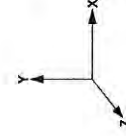
VIEW: Top

DRAWN: 23-November-2010 (10:25)

JOB NAME: Dover High School

UNIT TAGGING: Classroom RTU

MODEL: RT-5050D



Opening

A Condensate drain connection (1.5 MPT)

B Return air inlet

C Discharge air outlet

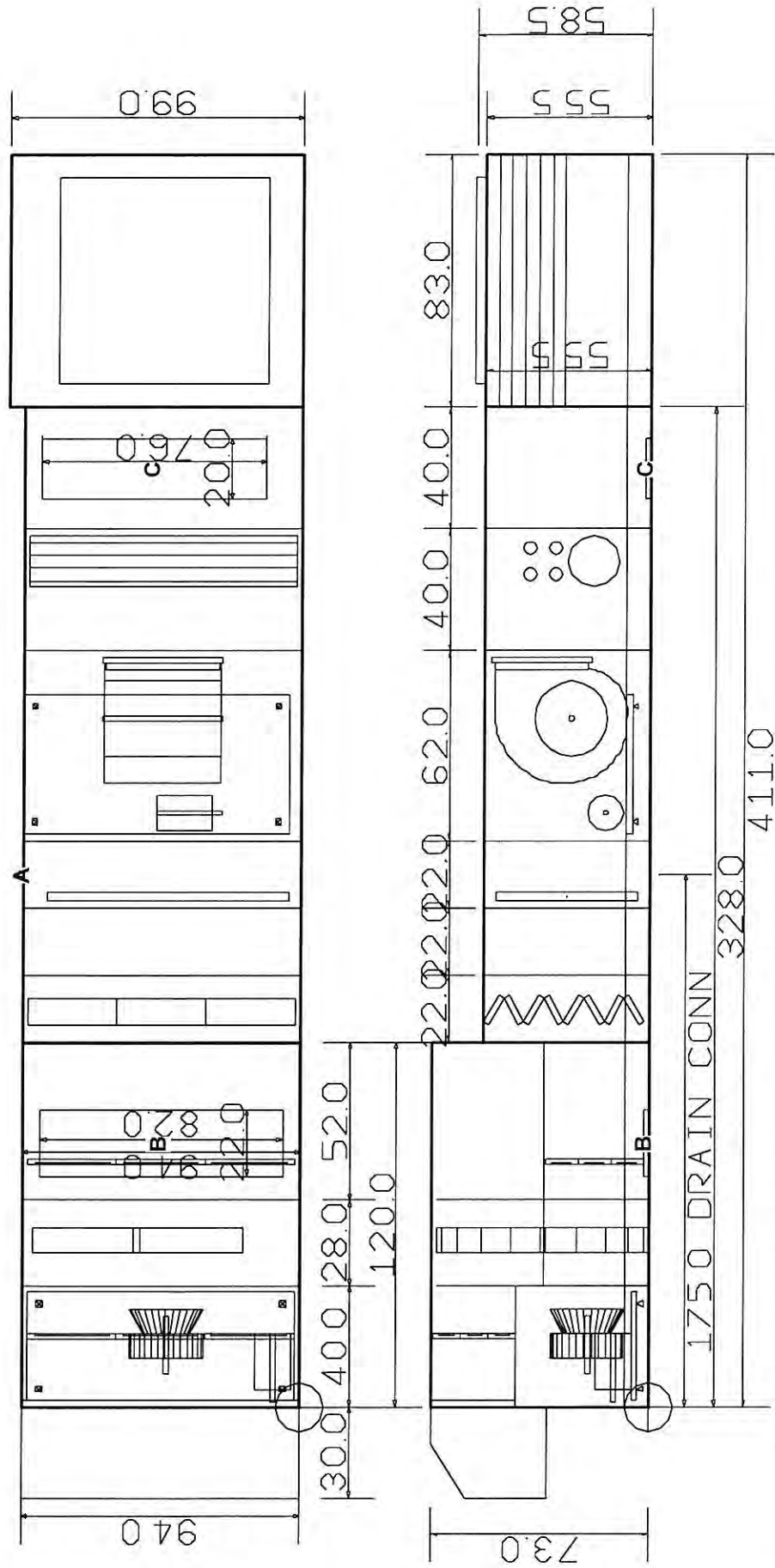
Dimensions measured from ⊕

X Y Z W(Width) H(Height)

175.00 95.50 2.70 -

76.00 6.00 2.00 82.00 22.00

298.00 12.00 0.00 76.00 20.00



VIEW: General Arrangement No Ends

DRAWN: 23-November-2010 (10:25)

JOB NAME: Dover High School

UNIT TAGGING: Classroom RTU

MODEL: RPS035D

Dover High School
Dover, NH

Equipment Cuts
Makeup Air Units



IGX

Tempered Supply Fan

IGX-110-H12

CONSTRUCTION FEATURES

• Exterior housing constructed of galvanized steel • Weatherization • Removable access panels • Painted or galvanized steel blower and bearing supports • Forward curved steel blower and motor • Fan assembly is mounted on vibration isolators • Motor pulleys are adjustable through 10 hp and fixed for 15 hp and greater • Fan shaft is mounted in permanently lubricated ball bearings (up through size 118) or ball bearing pillow blocks (size 120 and greater) • Static free belts • Corrosion resistant fasteners are standard.



Selection

Heating Indirect Gas
Cooling Packaged DX
Airflow Arrangement Recirculation
Mixing Box 2" Disposable
Unit Arrangement Horizontal
Weatherhood Aluminum Mesh

Performance

Volume 2,000 CFM
Total SP 0.584 in wg
External SP 0.25 in wg
Power 0.52 hp
Fan RPM 840

Job Properties

Elevation 0 ft
Winter Dry Bulb 7 F
Summer Dry Bulb 87 F
Summer Wet Bulb 75 F

Unit Configuration

Discharge Position Downblast
Coating Galvanized
Insulation Type Double Wall
Insulation Location Entire Unit
Isolation Spring
Recirculation Control Modulating
Recirc Mod. Control External 2-10 Vdc
Weatherization Yes
Mounting Options Mounting By Others

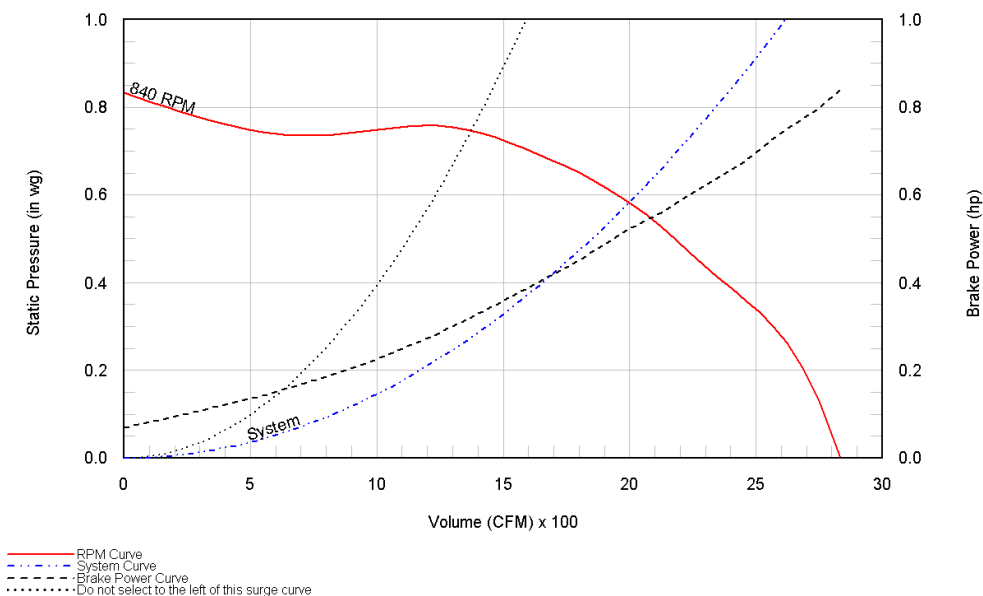
Electrical Configuration

Control Center Yes
Cooling Inlet Air Sensor Yes

Outlet Sound Power by Octave Band

62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
85.4	81.4	74.8	69.9	68.3	65.4	63	55.6	74.5	63.5	11.7

- LwA - A weighted sound power level based on ANSI S1.4
- dBA - A weighted sound pressure level base on 11.5 dB attenuation per octave band at 5.0 ft.
- Noise Criteria (NC) based on an average attenuation of 11.5 dB per octave band at 5.0 ft.



IGX

Tempered Supply Fan

IGX-110-H12

Heating Information

Heating Type	Indirect Gas
Gas Type	Natural
Furnace Size	250.0 MBH
Energy Input	250.0 MBH
Energy Output	200.0 MBH
Leaving Dry Bulb	99.6 F
Heat Exch. Material	Aluminized Steel
Unit Installation	Outdoor
Outdoor Venting	Standard
Furnace Control	8 Stage

Cooling Information

Cooling Type	Packaged DX
Face Area	6.250
Rows Deep	2
Fins per Inch	10
Face Velocity	320 ft/min
Entering Dry Bulb	87.0 F
Entering Wet Bulb	75.0 F
Leaving Dry Bulb	67.9 F
Leaving Wet Bulb	64.1 F
Cool Coil SP	0.128 in wg
Refrigerant Velocity	2,130 ft/min
Suction Temp	43.4 F
Refrigerant	R-410a
Cooling Capacity	82.5 MBH

Motor Data

Mark	Fan	HP	V/C/P	Mtr. Amps	RPM	Enclosure	Efficiency
-	Supply Fan	3/4	460/60/3	1.6	1725	ODP	Standard

MCA/MOP: 19.3 / 30

Filter Data

Type	Qty	Size
2" Disposable	4	15" x 20" x 2"

Weights

Unit Weight* : 1,910 lb

* Weight does not include accessories external to the unit (curb, exhaust fan(s), diffuser, etc).

IGX

Make-Up Air w/Packaged DX cooling

Condensing Performance

Condensing Unit Details

The DX package will come equipped with the following components:

- Hermetic scroll type compressors
- Compressors mounted in an isolated compartment to be serviceable without affecting airflow and on neoprene vibration isolation to minimize vibration transmission and noise
- Crankcase heater on compressor
- Thermal expansion valve for refrigerant flow control
- Multiple condensing fans to allow fan cycling for head pressure control
- Liquid-Line filter drier
- High pressure manual reset cutout
- Low-pressure auto-reset cutout
- Built in time delay for compressor protection
- Service/charging valves
- Moisture-indicating sight glass
- Condensing coils with 3/8" copper tubes mechanically bonded to aluminum fins

EER Information

EER @ AHRI Conditions: 11.7

EER @ Operating Conditions: 13

COMPRESSOR

Nominal Tonnage / Compressor	Cooling Stages	Compressor Type
6	1	StandardScroll

CONDENSING COIL

Face Area (ft. sq.)	Rows	FPI	Condensing Temperature	Ambient Temperature
13.5	3	14	124.1 F	95.0 F

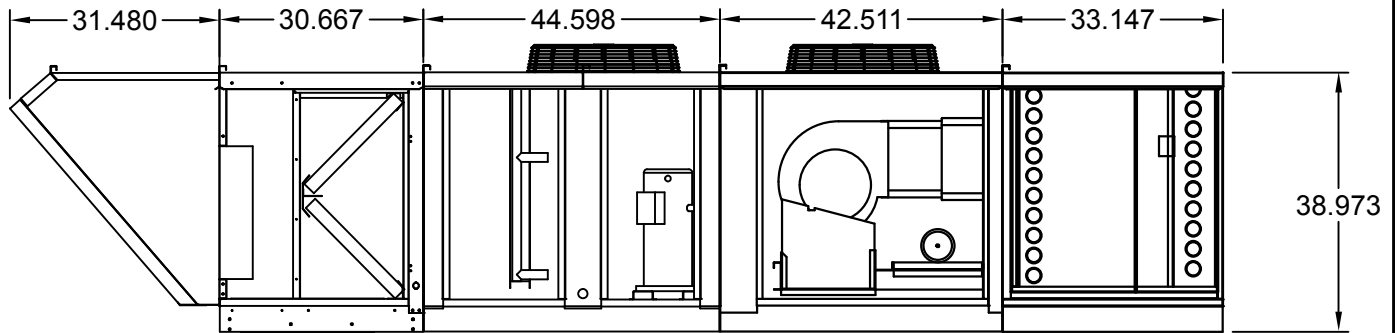
CONDENSING FAN

Quantity	Diameter	Motor	
		Motor Size (Watts)	RPM
2	20	580	1100

IGX

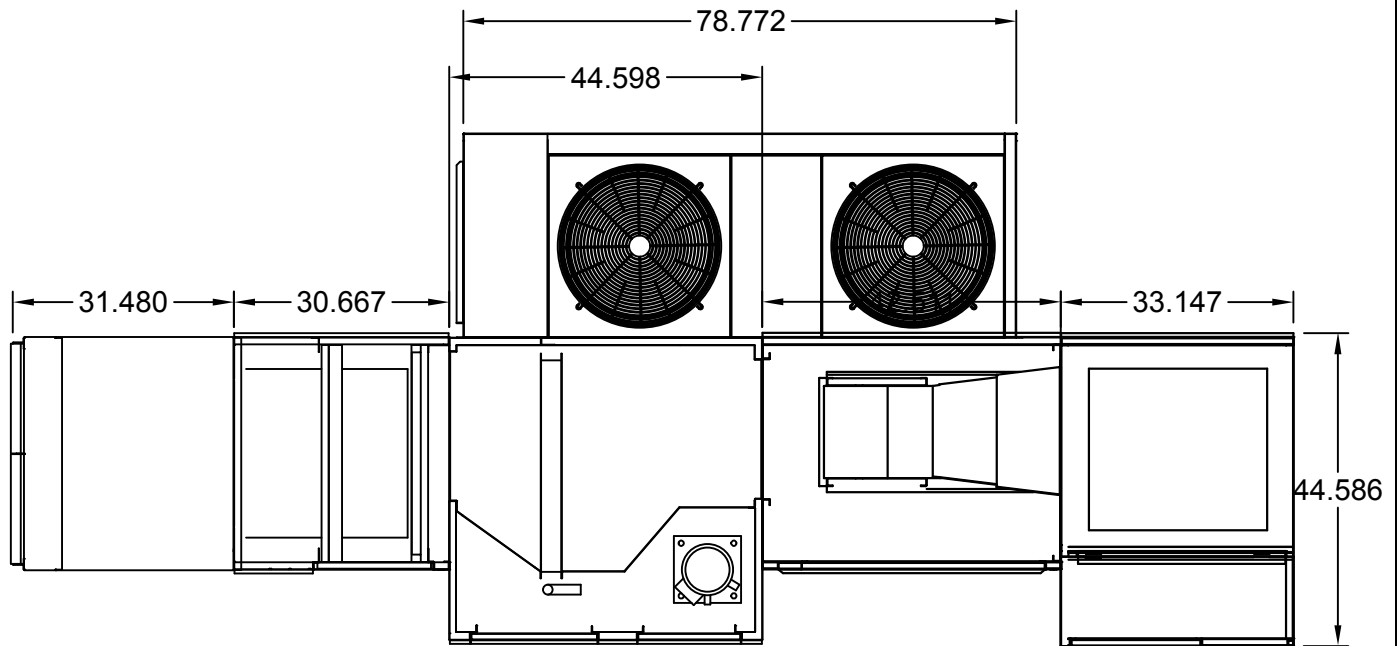
Tempered Supply Fan

IGX-110-H12



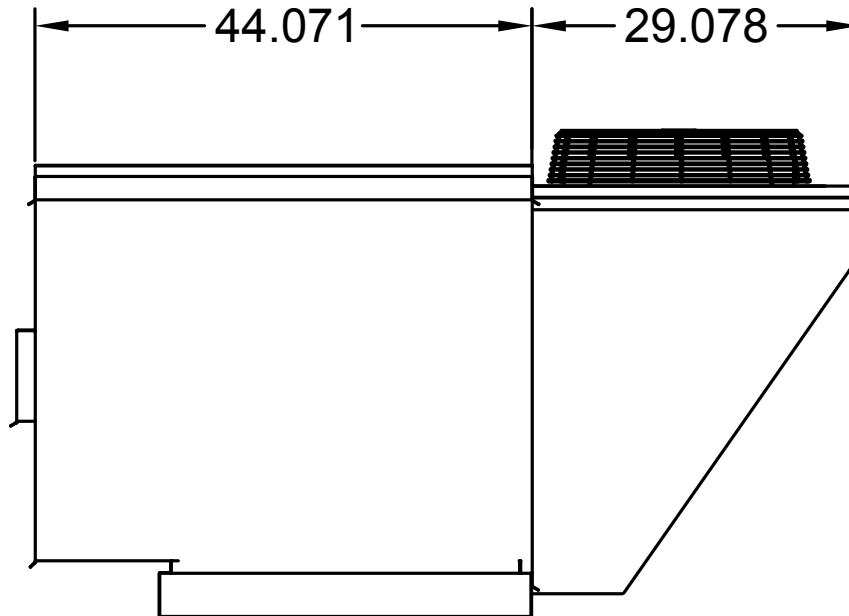
ELEVATION VIEW

* Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow.

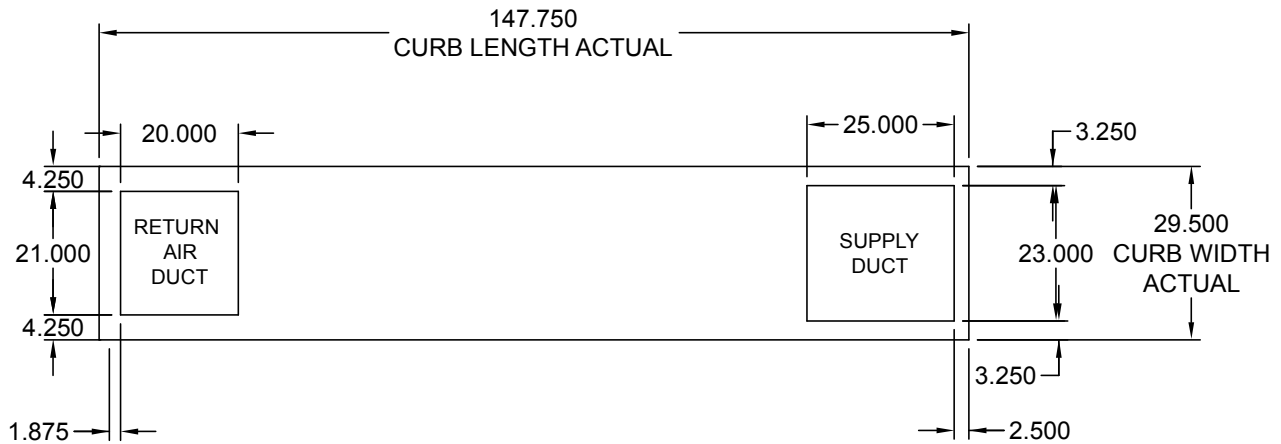


PLAN VIEW

* Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow.



END VIEW



*NOTE: ROOF OPENINGS CAN BE AS LARGE
AS THE CURB SIZE - 3.5" OR AS SMALL
AS THE DUCT SIZE + 1/2".

FOOTPRINT VIEW

Dover High School
Dover, NH

Equipment Cuts
Displacement Diffusers



Floor Mounted Displacement Diffusers

DF Series

price®

Product Overview

Model

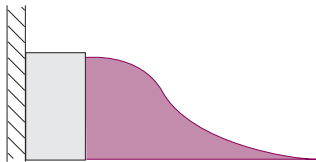
One way pattern
Three way pattern
Corner one way
Wall mounted one way
Recessed one way
Lay-in One Way

DF1
DF3
DF1C
DF1W
DF1R
DF1L

PRICE DF Series displacement diffusers represent a unique and effective method of air distribution where air quality requirements are high. They are designed to deliver conditioned cool air effectively to large open spaces with exceptional penetration while maintaining the low air velocities required for occupant comfort. Typical applications include restaurants, hotel or office lobbies, convention centers, theaters, schools as well as larger meeting rooms and cafeterias.

Air Pattern

Most conventional diffusers are designed to produce high aspiration or mixing rates. The low face velocities achieved with the PRICE DF series diffusers cause little or no entrainment leading to a properly stratified room atmosphere. Air is typically delivered in a cool layer approx. 2-3" thick that floats deep into the room, displacing the warmer, contaminated air above it.



Rectangular 1-Way Displacement Diffusers

DF1 Series

Product Information

The **PRICE DF1 Series** displacement diffusers are designed to produce a one-way low velocity air supply perpendicular to the diffuser face. The DF1 discharges air evenly across its perforated face with minimal turbulence or induction of room air. The cool supply air flows down to the floor level and gradually fills the occupied space. Typically installed against a wall or pillar, the diffuser can blend with a variety of surroundings. The superior air quality and low noise levels realized with the DF1 make it suitable for office space, restaurants, supermarkets, theaters, hotels, convention centers, schools or any application where air quality and occupant comfort demands are high.

Features

- Optional inlet locations, top, bottom, rear or from either side.

Construction/Finish

DF1

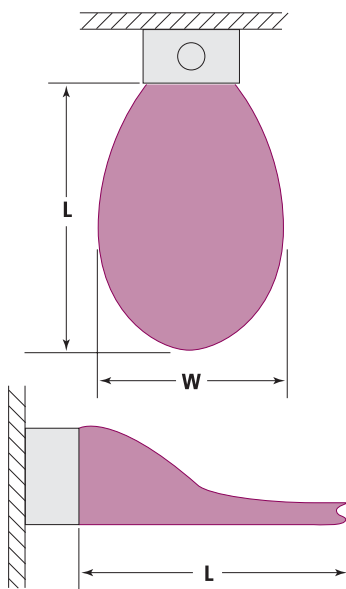
- Diffuser frame and equalization baffle – aluminum.
- Side, top and bottom panels – coated steel.
- Perforated front panel – coated steel.
- Finish – B12 White.

For optional and special finishes see color matrix.

Options

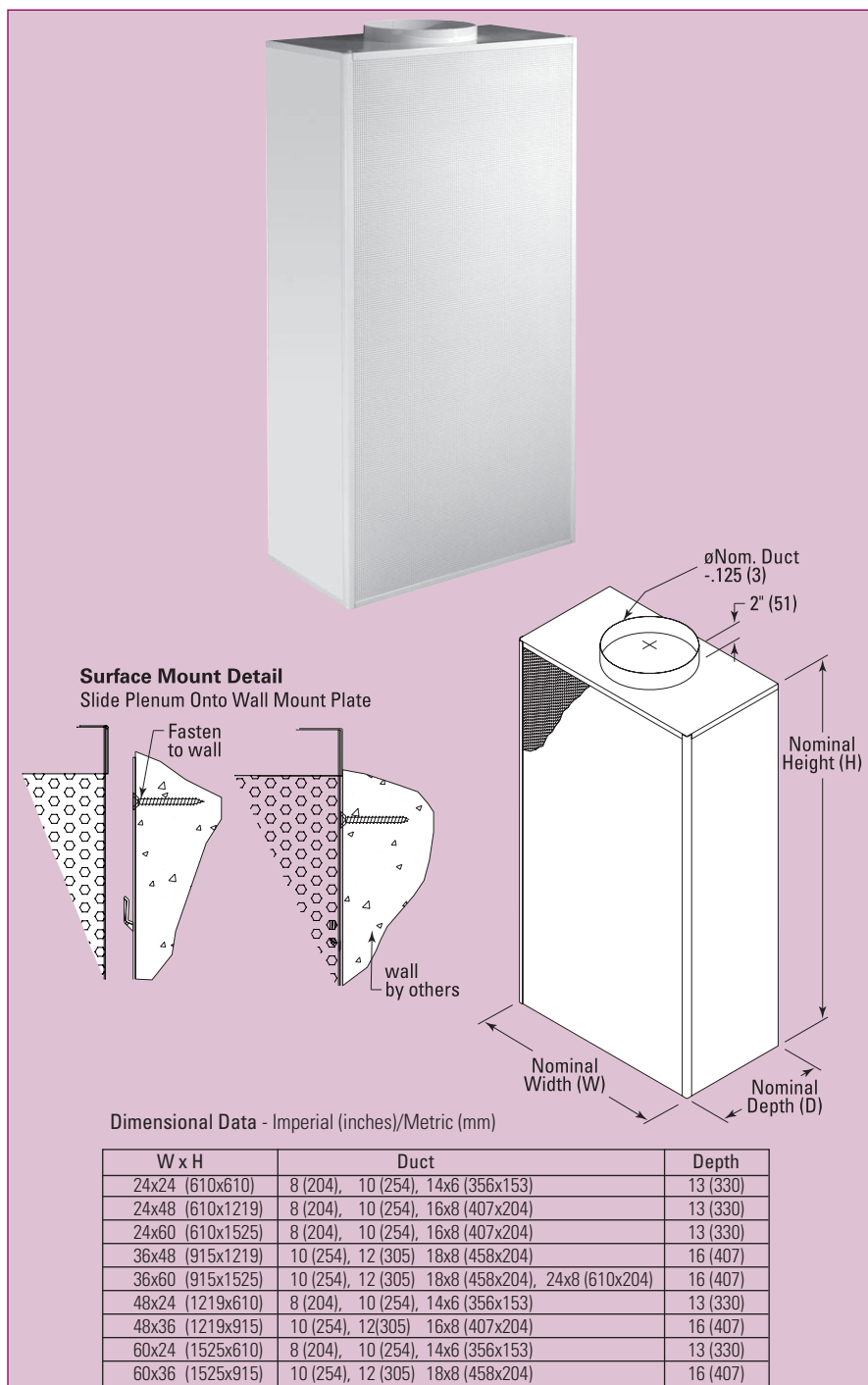
- Base
- Duct Covers
- AFSD

Air Pattern



Product Information Index

Performance Data J56
Accessories J90
Suggested Specification J108



✓ Product Selection Checklist

- 1] Select diffuser Size based on desired performance characteristics.
- 2] Select inlet location and size.
- 3] Select Options and Accessories if required.
- 4] Select Finish.

Example: DF1/24 x 24/Top/10

Rectangular 1-Way Displacement Diffusers

DF1 Series

price[®]

Performance Data — Imperial Units

Unit Size [Face Area, ft ²] W x H x D	Inlet Size in.	Face Velocity FPM	Airflow CFM	Total Pressure in.wg.	Static Pressure in.wg.	Noise Criteria NC	Adjacent Zone			
							$\Delta T = 5^{\circ}F$		$\Delta T = 10^{\circ}F$	
							Length ft.	Width ft.	Length ft.	Width ft.
24x24x13 [3.6]	8	20	72	—	—	—	7	4	10	10
	8	30	108	0.02	—	—	11	8	13	12
	8	40	144	0.03	—	—	13	8	16	14
	8	50	180	0.05	0.03	—	15	10	18	16
48x24x13 [7.4]	8	20	148	0.02	—	—	13	4	15	10
	8	30	222	0.04	—	—	16	8	19	12
	8	40	295	0.07	0.02	—	19	8	22	14
	8	50	369	0.11	0.04	20	21	10	24	16
60x24x13 [9.3]	8	20	186	0.02	—	—	14	4	17	10
	8	30	278	0.05	—	—	18	8	21	12
	8	40	371	0.09	—	17	21	8	23	14
	8	50	464	0.14	0.03	25	23	10	25	16
	10	30	278	0.03	—	—	18	8	21	12
	10	40	371	0.06	0.03	—	21	8	23	14
	10	50	464	0.10	0.05	20	20	12	23	16
	10	50	464	0.10	0.05	20	20	12	23	16
48x36x16 [11.3]	10	20	226	0.02	—	—	13	8	16	12
	10	30	338	0.04	—	—	17	10	20	16
	10	40	451	0.08	0.03	16	20	12	22	16
	10	50	564	0.12	0.05	23	22	12	24	18
	12	30	338	0.03	—	—	17	10	20	14
	12	40	451	0.06	0.04	—	20	12	22	16
	12	50	564	0.09	0.06	19	22	12	24	18
	12	50	564	0.09	0.06	19	22	12	24	18
60x36x16 [14.2]	10	20	284	0.02	—	—	15	8	18	12
	10	30	425	0.06	—	—	19	10	21	14
	10	40	567	0.10	0.03	20	21	12	24	16
	12	30	425	0.04	0.02	—	19	10	21	14
	12	40	567	0.07	0.04	16	21	12	24	16
	12	50	709	0.11	0.06	23	23	12	26	18
24x48x13 [7.4]	10	20	148	0.01	—	—	8	10	11	14
	10	30	222	0.03	—	—	12	12	15	16
	10	40	295	0.05	0.03	—	14	14	17	18
	10	50	369	0.07	0.05	16	18	14	19	20
36x48x16 [11.3]	10	20	226	0.02	—	—	11	10	14	14
	10	30	338	0.04	—	—	15	12	18	16
	10	40	451	0.08	0.03	16	18	14	20	18
	10	50	564	0.12	0.05	23	20	14	22	20
24x60x13 [9.3]	10	20	186	0.02	—	—	9	10	11	16
	10	30	278	0.03	—	—	12	14	15	18
	10	40	371	0.06	0.03	—	15	14	18	20
	10	50	464	0.10	0.05	20	17	16	20	22
36x60x16 [14.2]	10	20	284	0.02	—	—	12	10	15	16
	10	30	425	0.06	—	—	16	14	18	18
	10	40	567	0.10	0.03	20	18	14	21	20
	10	50	709	0.15	0.05	27	20	16	23	22
	12	30	425	0.04	0.02	—	15	14	18	18
	12	40	567	0.07	0.04	16	18	14	21	20
	12	50	709	0.11	0.06	23	20	16	23	22
	18x8	30	425	0.03	0.02	—	15	14	18	18
	18x8	40	567	0.06	0.04	—	18	14	21	20
	18x8	50	709	0.09	0.06	21	20	16	23	22
	18x8	50	709	0.09	0.06	21	20	16	23	22
	18x8	50	709	0.09	0.06	21	20	16	23	22

Performance Notes:

- Sound and Pressure Drop tested in accordance with ASHRAE Standard 70-1991 "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- Airflow is in cubic feet per minute, CFM.
- Pressure is in inches of water, in.wg.
- The NC values, sound pressure level, are based on a room absorption of 10 dB, re 10⁻¹² watts and one diffuser.
- Blanks (—) indicate an NC below 15 or a pressure below 0.01 in.wg.
- ΔT is the under-temperature which is the difference between the room air temperature 3 1/2 feet above the floor and the temperature of the supply air.
- Adjacent Zone at 1" above the floor at a minimum velocity of 40 FPM.
- Adjacent Zone, determine by test in accordance with "Nordtest method aerodynamic testing and rating at low velocity".
- Length is the maximum length of the adjacent zone.
- Width is the maximum width of the adjacent zone.

Rectangular 1-Way Displacement Diffusers

DF1 Series

Performance Data — Metric Units

Unit Size W x H x D	Inlet Size mm.	Face Velocity m/s	Airflow L/s	Total Pressure in.pa.	Static Pressure in.pa.	Noise Criteria NC	Adjacent Zone			
							$\Delta T = 2.8^{\circ}\text{C}$		$\Delta T = 5.6^{\circ}\text{C}$	
							Length m.	Width m.	Length m.	Width m.
600x600x330	203	0.10	34	—	—	—	2.1	1.2	3.0	3.0
	203	0.15	51	4.3	—	—	3.4	2.4	4.0	3.7
	203	0.20	68	7.6	—	—	4.0	2.4	4.9	4.3
	203	0.25	85	11.9	7.8	—	4.6	3.0	5.5	4.9
600x1200x330	203	0.10	70	4.3	—	—	4.0	1.2	4.6	3.0
	203	0.15	105	9.6	—	—	4.9	2.4	5.8	3.7
	203	0.20	139	17.1	6.0	—	5.8	2.4	6.7	4.3
	203	0.25	174	26.7	9.4	20	6.4	3.0	7.3	4.9
600x1500x330	203	0.10	88	5.5	—	—	4.3	1.2	5.2	3.0
	203	0.15	131	12.5	—	—	5.5	2.4	6.4	3.7
	203	0.20	175	22.1	—	17	6.4	2.4	7.0	4.3
	203	0.25	219	34.6	7.2	25	7.0	3.0	7.6	4.9
	254	0.15	131	8.6	—	—	5.5	2.4	6.4	3.7
	254	0.20	175	15.2	8.0	—	6.4	2.4	7.0	4.3
	254	0.25	219	23.8	12.5	20	6.1	3.7	7.0	4.9
900x1200x406	254	0.10	107	4.7	—	—	4.0	2.4	4.9	3.7
	254	0.15	160	10.7	—	—	5.2	3.0	6.1	4.3
	254	0.20	213	18.9	8.3	16	6.1	3.7	6.7	4.9
	254	0.25	266	29.6	13.0	23	6.7	3.7	7.3	5.5
	305	0.15	160	7.8	—	—	5.2	3.0	6.1	4.3
	305	0.20	213	13.9	8.8	—	6.1	3.7	6.7	4.9
	305	0.25	266	21.8	13.8	19	6.7	3.7	7.3	5.5
900x1500x406	254	0.10	134	6.1	—	—	4.6	2.4	5.5	3.7
	254	0.15	201	13.8	—	—	5.8	3.0	6.4	4.3
	254	0.20	268	24.5	7.7	20	6.4	3.7	7.3	4.9
	305	0.15	201	10.1	5.6	—	5.8	3.0	6.4	4.3
	305	0.20	268	18.0	9.9	16	6.4	3.7	7.3	4.9
	305	0.25	335	28.2	15.5	23	7.0	3.7	7.9	5.5
1200x600x330	254	0.10	70	2.9	—	—	2.4	3.0	3.4	4.3
	254	0.15	105	6.6	—	—	3.7	3.7	4.6	4.9
	254	0.20	139	11.8	7.2	—	4.3	4.3	5.2	5.5
	254	0.25	174	18.4	11.2	16	4.9	4.3	5.8	6.1
1200x900x406	254	0.10	107	4.7	—	—	3.4	3.0	4.3	4.3
	254	0.15	160	10.7	—	—	4.6	3.7	5.5	4.9
	254	0.20	213	18.9	8.3	16	5.5	4.3	6.1	5.5
	254	0.25	266	29.6	13.0	23	6.1	4.3	6.7	6.1
1500x600x330	254	0.10	88	3.8	—	—	2.7	3.0	3.4	4.9
	254	0.15	131	8.6	—	—	3.7	4.3	4.6	5.5
	254	0.20	175	15.2	8.0	—	4.6	4.3	5.5	6.1
	254	0.25	219	23.8	12.5	20	5.2	4.9	6.1	6.7
1500x900x406	254	0.10	134	6.1	—	—	3.7	3.0	4.6	4.9
	254	0.15	201	13.8	—	—	4.6	4.3	5.5	5.5
	254	0.20	268	24.5	7.7	20	5.5	4.3	6.4	6.1
	254	0.25	335	38.3	12.1	27	6.1	4.9	7.0	6.7
	305	0.15	201	10.1	5.6	—	4.6	4.3	5.5	5.5
	305	0.20	268	18.0	9.9	16	5.5	4.3	6.4	6.1
	305	0.25	335	28.2	15.5	23	6.1	4.9	7.0	6.7
	457x203	0.15	201	8.3	5.5	—	4.6	4.3	5.5	5.5
	457x203	0.20	268	14.7	9.7	—	5.5	4.3	6.4	6.1
	457x203	0.25	335	23.0	15.2	21	6.1	4.9	7.0	6.7

Performance Notes:

- Sound and Pressure Drop tested in accordance with ASHRAE Standard 70-1991 "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- Airflow is in Litres per second, L/s.
- Pressure is in Pascals, pa.
- The NC values, sound pressure level, are based on a room absorption of 10 dB, re 10-12 watts and one diffuser.
- Blanks (—) indicate an NC below 15 or a Pressure below 2.5 pa.
- ΔT is the under-temperature which is the difference between the room air temperature 1 meter above the floor and the temperature of the supply air.
- Adjacent Zone at 25mm above the floor at a minimum velocity of 0.2 m/s.
- Adjacent Zone Dimensions tested in accordance with nordtest method aerodynamic testing and rating at low velocity.
- Length is the maximum length of the adjacent zone.
- Width is the maximum width of the adjacent zone.

Displacement Accessories

Duct Covers

price[®]

Product Information

Price Duct Covers for Displacement Diffusers provide a consistent look from floor to ceiling. These products continue the appearance of the diffuser while concealing the duct work for an architecturally appealing installation. To ensure that the duct is completely hidden, the cover is supplied in solid sheets, but continues the other features of the unit such as extrusions and color. The duct cover is available in varying lengths and can be split into multiple sections to create a symmetric look with the diffuser. These units are perfect for top ducted diffusers where exposed duct work is not desired, such as hotel lobbies, office boardrooms, and restaurants. See specific product for availability.

Features

- Seamless construction
- Matches corresponding product design.
- Variable height to match look of diffuser and fit into any room height

Construction

- Face – 21 Gauge steel
- Support Extrusion (where required) - Aluminum

Finish: **B12**

For optional and special finishes see color matrix.

Sizes

- Width, Radius/Diameter, Depth are all based on diffuser
- Support Extrusion (where required) - Aluminum
- Finish – B12 White

For optional and special finishes see color matrix.



DFIC-DC – Duct Cover for DFIC

Product Information Index

Suggested SpecificationJ114

J-90

All Metric dimensions () are soft conversion.
Imperial dimensions are converted to metric and rounded to the nearest millimeter.

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Product Information

Price Bases for Displacement Diffusers allow the diffuser to be installed above floor level, creating a look that is consistent with the existing décor. These products continue the look of base board heights and provide access to bottom ducted units for easier installation. The Base also provides protection from damage or moisture during cleaning. To ensure that the duct is completely hidden, the cover is supplied in blank sheets, but continues the other features of the unit such as extrusions and color. The base is available in varying lengths and is inset from the face of the diffuser by 1". The easy installation of the product allows it to be ordered with a displacement unit or as a secondary order if the look is required after the original diffusers installation. See specific product for availability.

Features

- Seamless construction
- Matches corresponding product design
- Variable height to match desired look of diffuser

Construction

- Face – 21 Gauge steel
- Legs – Extruded Aluminum

Finish:

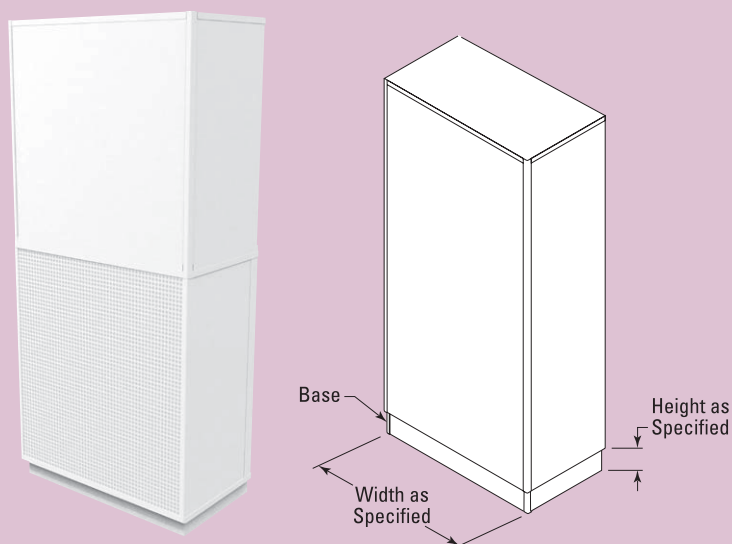
B12

For optional and special finishes see color matrix.

Sizes

- Width, Radius/Diameter, Depth are all based on diffuser ordered
- Height ranges from 2" to 6"

Face View – DF1/DF3 Shown



DR180-B – Base for DR180



Flat Faced Displacement Diffusers

DF1 Series

Flat Faced Displacement Diffuser, 1-Way

Supply and install Price DF1 1-Way Flat Faced Displacement diffuser of the sizes and capacities indicated on the drawings or diffuser schedule.

The 1-Way Flat Faced Displacement diffuser, model DF1, shall be constructed with an equalization baffle behind the operative diffuser face for uniform, low velocity, distribution of supply air. Both the equalization baffle and face shall be securely retained in the diffuser frames. The diffuser frames shall be constructed of high strength aluminum extrusion for rigidity and protection of the operative face and side panels. There shall be no visible fasteners on the front or side panels. The operative face shall be constructed of painted high-gauge steel, side and end panels may be provided in painted steel. All perforated materials shall be fastened to the frame with vibration dampening. The frame and internal baffling elements shall be constructed of aluminum. The paint shall be powder coat polyester. Epoxies and their derivatives are unacceptable. Visible non-metallic components are unacceptable. The diffuser shall be supplied with concealed mounting brackets that do not require puncturing the diffuser to install.

The diffuser shall be available for duct connection into any non-operative panel. Air shall be delivered to the space at low noise levels and low velocities that are even across the diffuser face, in all ducting configurations.

Diffuser manufacturer shall provide sound and pressure drop data derived from tests in accordance with ASHRAE standard 70-1991. Performance data for adjacent zone shall be provided based on test in accordance with Nordtest method, AirTerminal Devices: Aerodynamic Testing + Rating at Low Velocity NT VVS 083.

Base:

Supply and install a base under each displacement diffuser. The base shall be manufactured by the displacement Diffuser manufacturer. The base shall allow for removal from the space for access to the inlet of the diffuser if ducted from below.

The base shall have an extruded aluminum frame and 22 gauge solid steel face. Base heights shall be as indicated on the drawings. Finish shall be B12 – white, or as indicated.

Duct Cover:

Supply and install a duct cover over each displacement diffuser. The duct cover shall be manufactured by the displacement Diffuser manufacturer. The duct cover shall allow for removal from the space for access to the inlet of the diffuser if ducted from below.

The duct cover shall have an extruded aluminum frame and 22 gauge steel solid steel face to ensure full coverage of duct and wall behind cover. Perforated materials are unacceptable. duct cover heights shall be as indicated on the drawings. Finish shall be B12 – white, or as indicated.

DF3 Series

Flat Faced Displacement Diffuser, 3-Way

Supply and install Price DF3 3-Way Flat Faced Displacement diffuser of the sizes and capacities indicated on the drawings or diffuser schedule.

The 3-Way Flat Faced Displacement diffuser, model DF3, shall be constructed with equalization baffles behind the operative diffuser faces for uniform, low velocity, distribution of supply air. Both the equalization baffles and faces shall be securely retained in the diffuser frames. The diffuser frames shall be constructed of high strength aluminum extrusion for rigidity and protection of the operative faces. There shall be no visible fasteners on the front or side panels. The operative faces shall be constructed of painted high-gauge steel, and end panels may be provided in painted steel. All perforated materials shall be fastened to the frame with vibration dampening. The frame and internal baffling elements shall be constructed of aluminum. The paint shall be powder coat polyester. Epoxies and their derivatives are unacceptable. Visible non-metallic components are unacceptable. The diffuser shall be supplied with concealed mounting brackets that do not require puncturing the diffuser to install.

The diffuser shall be available for duct connection into any non-operative panel. Air shall be delivered to the space at low noise levels and low velocities that are even across the diffuser face, in all ducting configurations.

Diffuser manufacturer shall provide sound and pressure drop data derived from tests in accordance with ASHRAE standard 70-1991. Performance data for adjacent zone shall be provided based on test in accordance with Nordtest method, AirTerminal Devices: Aerodynamic Testing + Rating at Low Velocity NT VVS 083.

Base:

Supply and install a base under each displacement diffuser. The base shall be manufactured by the displacement Diffuser manufacturer. The base shall allow for removal from the space for access to the inlet of the diffuser if ducted from below.

The base shall have an extruded aluminum frame and 22 gauge solid steel face. Base heights shall be as indicated on the drawings. Finish shall be B12 – white, or as indicated.

Duct Cover:

Supply and install a duct cover over each displacement diffuser. The duct cover shall be manufactured by the displacement Diffuser manufacturer. The duct cover shall allow for removal from the space for access to the inlet of the diffuser if ducted from below.

The duct cover shall have an extruded aluminum frame and 22 gauge steel solid steel face to ensure full coverage of duct and wall behind cover. Perforated materials are unacceptable. duct cover heights shall be as indicated on the drawings. Finish shall be B12 – white, or as indicated.

Dover High School
Dover, NH

Equipment Cuts
Variable Air Volume Box



Single Duct Terminal Units

SPV, SEV, SDV Series

Single Duct – Controller Type

price



Product Overview

General Information

Price has, as a primary component of its terminal unit line, the SPV (pneumatic controls), SDV (digital controls) SEV (electronic controls) single duct VAV assemblies. These units are designed to control the airflow rate of conditioned air into an occupied space in response to a control signal, usually a thermostat. The clean and efficient design of these single duct terminal units result in a system component which has minimal pressure drop reducing fan horsepower requirements, and low noise generation for quiet operation. A compact configuration makes this unit easier to use in today's crowded mechanical spaces or in retrofitting existing systems.

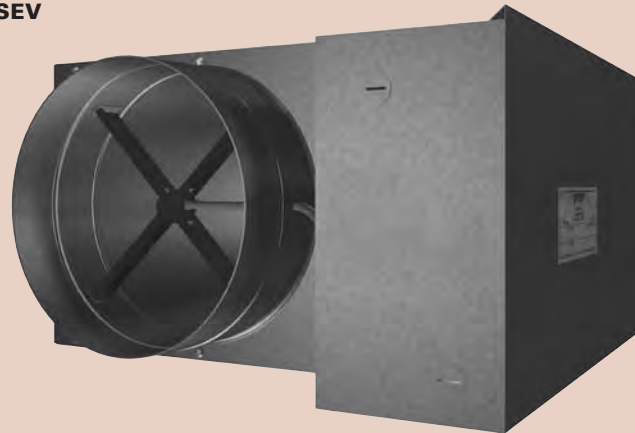
Control options for this product line are wide and varied with pneumatic, analog electronic and state of the art direct digital control available to suit most any application. Most of the control options utilize the exclusive Price SP300 multipoint sensor for accurate duct air velocity pressure measurement. This allows the terminals to monitor the desired flow rate, as dictated by the thermostat, and compensate instantly for any changes in supply air pressure that might tend to alter the supply volume. In other words, the net result is a pressure independent variable air volume system.

In addition to the basic volume control assembly, a complete line of accessories is offered to meet specific job requirements. Sound attenuators, multi-outlet adaptors and heating coils are all available. These are factory assembled to the basic assembly for shipment as an integrated unit (see page F34).

Features:

- Capacities ranging from 50 – 8000 cfm in 11 sizes.
- Pressure independent operation.
- Can be used for VAV or constant volume applications.
- Available with pneumatic, electronic or direct digital controls.
- Factory calibrated to job requirements.
- Individually adjustable minimum and maximum air volumes – easily field adjusted.
- SP300 multi-point flow sensor designed to maintain control accuracy independent of field installation conditions.
- Gauge taps for flow measurement and balancing.
- Conveniently accessible externally mounted controls.
- Inlet connection bead offers a means for secure flex duct connections.
- A full 2" inlet connection to secure flex and hard duct connections.
- Full range of accessories available (i.e. coils, attenuators, etc.)

Model SEV



SXV X000

Controller Type

- P — Pneumatic
- E — Electronic
- D — Digital
- M — Manual

Controls

- 5 — Supplied by others (Digital Only)
- 6 — Pressure Dependent
- 8 — Pressure Independent by Price

✓ Product Selection Checklist

- 1) Select Unit Inlet Size based on control and acoustic parameters.
- 2) Select Control type (Pneumatic, Electronic, Digital) based on system design.
- 3) Select Accessories (Multi-Outlet Adaptor, Attenuator) as required.
- 4) Select Reheat Coil, if required.
- 5) Select Control Sequence based on system design.

- NEMA1 Protective metal shrouds for electronic and digital (by Price) controls. Protective metal cover optional for pneumatic controls.
- Compact, lightweight design for ease of installation.
- 22 gauge zinc-coated steel housing (optional 20 gauge available).
- 1/2" (13) thick, min. 1.5 lb density fiberglass internal insulation, coated to prevent air erosion—meets requirements for NFPA90A and UL181. 3/4" (19) and 1" (25) insulation also available as an option.
- Damper blade constructed of two layers of heavy gauge galvanized steel with a sandwiched peripheral gasket of cross linked polyurethane foam to ensure tight seal and no damper deflection.
- Plated damper shaft is mounted in self-lubricating bearings.
- Discharge complete with slip and drive cleat duct connections.

- Special liners and insulations available see pages F39-F42.
- Certified in accordance with the ARI 880 certification program.
- Electronic & DDC units are CSA certified.

Product Information Index

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Single Duct Terminal Units

SPV, SDV Series

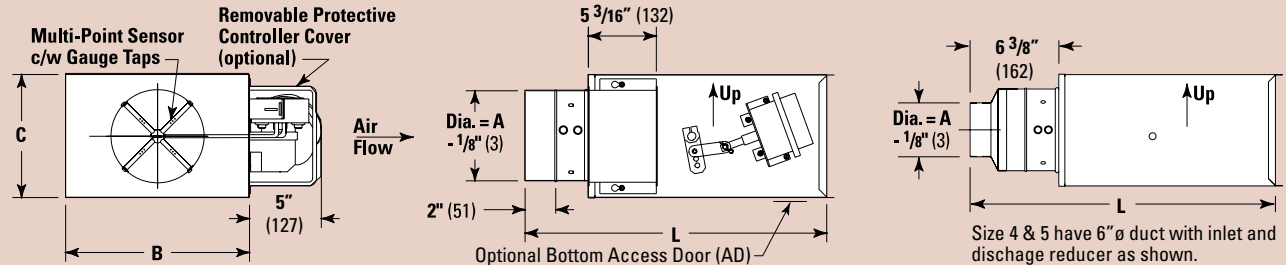
Single Duct – Controller Type

PRICE

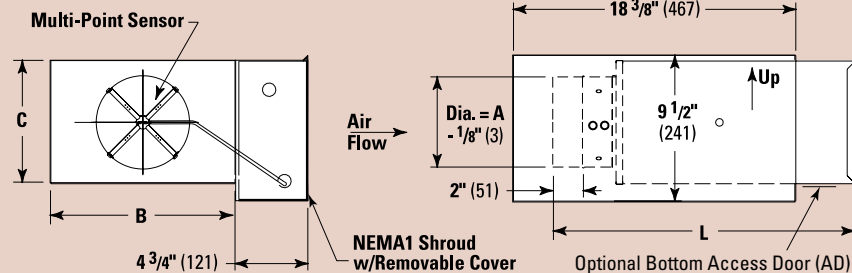
Dimensional Data



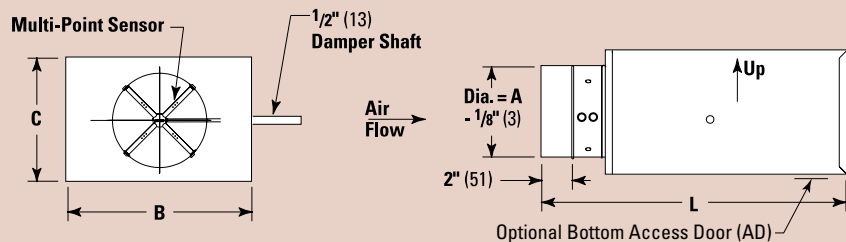
SPV8 Size 4 - 16



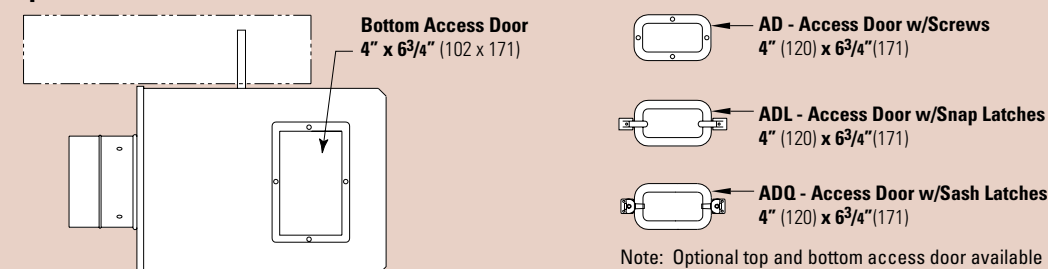
SDV8 Size 4 - 16



SDV5 Size 4 - 16



Optional Access Door



Note: Optional top and bottom access door available (TB)

- 1/2 in. [13] thick, min. 1.5 lb density fiberglass internal insulation which meets requirements of NFPA 90A and UL181. Optional 3/4 in. [19] and 1 in. [25] also available.
- 22 gauge zinc-coated steel housing. Mechanically sealed and gasketed, leak resistant construction.
- Rectangular discharge opening with slip and drive cleat duct connection.
- Control assembly will be supplied as illustrated on right hand side unless specified otherwise.
- Gauge taps are standard on units with pneumatic controls.
- Clean, dry, 20 psi [138 KPa] control air required for pneumatic unit.
- Optional insulated access door 4 x 6 3/4" (102 x 171) attached with 4 screws or optional latches
- SPV8 - Pneumatic actuator supplied and mounted by Price.
- SDV5 - Controls by others.
- SDV8- Controls supplied and mounted by Price.
- SMV6 - Manually adjustable damper with locking quadrant.

Unit	L/s	cfm	IP Units (in.)				SI Units [mm]			
			Outlet	Inlet	Length		Outlet	Inlet	Length	
Size	Range	Range	B	C	A	L	B	C	A	L
4	0-106	0-225	12	8	4	22 1/8	305	203	102	562
5	0-165	0-350	12	8	5	22 1/8	305	203	127	562
6	0-212	0-450	12	8	6	20 1/8	305	203	152	511
7	0-307	0-650	12	10	7	20 1/8	305	254	178	511
8	0-378	0-800	12	10	8	20 1/8	305	254	203	511
9	0-496	0-1050	14	12 1/2	9	20 1/8	356	318	229	511
10	0-637	0-1350	14	12 1/2	10	20 1/8	356	318	254	511
12	0-991	0-2100	16	15	12	20 1/8	406	381	305	511
14	0-1416	0-3000	20	17 1/2	14	23 5/8	508	445	356	600
16	0-1888	0-4000	24	18	16	23 5/8	610	457	406	600

Single Duct Terminal Units

SPV, SDV Series

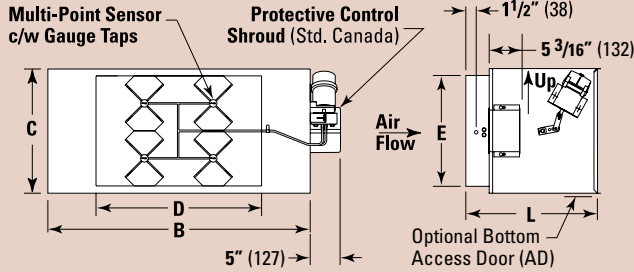
Single Duct – Controller Type

PRICE

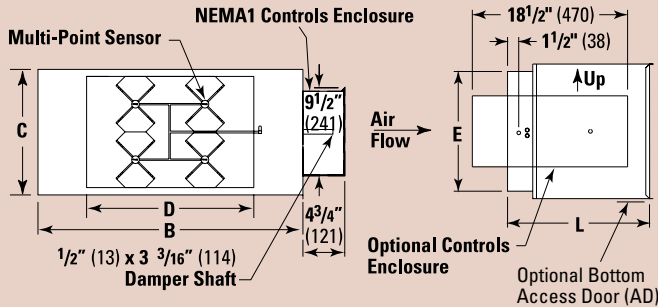
Dimensional Data



SPV8 Size 24 x 16



SDV5 and SDV8 Size 24 x 16

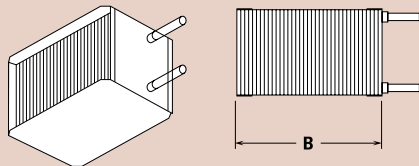


- 1/2 in. [13] thick, min. 1.5 lb density fiberglass internal insulation which meets requirements of NFPA 90A and UL181. Optional 3/4 in. [19] and 1 in. [25] also available.
- 22 gauge zinc-coated steel housing. Mechanically sealed and gasketed, leak resistant construction.
- Rectangular discharge opening with slip and drive cleat duct connection.
- Control assembly will be supplied as illustrated on right hand side unless specified otherwise.
- Gauge taps are standard on units with pneumatic controls.
- Clean, dry, 20 psi [138 KPa] control air required for pneumatic unit.
- Optional insulated access door 4 x 6 3/4" (102 x 171) attached with 4 screws or optional latches
- SPV8 - Pneumatic actuator supplied and mounted by Price.
- SDV5 - Controls by others.
- SDV8 - Controls supplied and mounted by Price.
- SMV6 - Manually adjustable damper with locking quadrant.

Unit Size	L/s Range	cfm Range	IP Units (in.)					SI Units [mm]				
			Outlet		Inlet		Length	Outlet		Inlet		Length
			B	C	D	E		B	C	D	E	
24 x 16	0 – 3776	0 – 8000	38	18	23 7/8	15 7/8	19	965	457	603	403	483

Accessories

Water Coil Section



Coil Connections

- Size 4 – 8 1 Row - 1/2 in. [13] OD
- Size 9 – 24x16 1 Row - 7/8 in. [22] OD
- Size 4 – 24x16 2, 3, 4 Row - 7/8 in. [22] OD

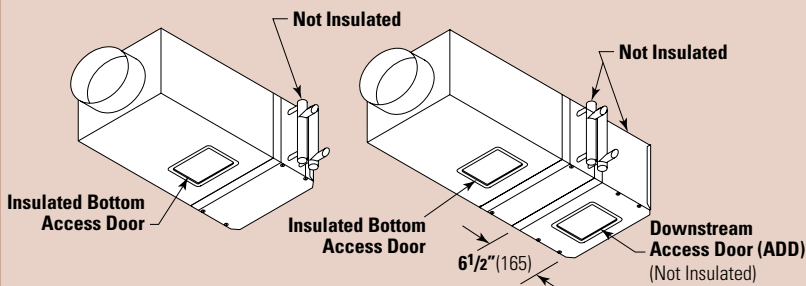
Dimension 'L'

- For 1 row or 2 row Coils L = 5 in. [127]
- For 3 and 4 Row Coils L = 7 1/4 in. [184]

Dimensional Data – IP (in.)/SI [mm]

Unit Size	B	C
4, 5, 6	12 [305]	8 [203]
7, 8	12 [305]	10 [254]
9, 10	14 [356]	12 1/2 [318]
12	16 [406]	15 [381]
14	20 [508]	17 1/2 [445]
16	24 [610]	18 [457]
24 x 16	38 [905]	18 [457]

Note: • 1 and 2 row High Capacity (HC) coils available with 12 fins per inch – see performance tables



AD - Access Door w/Screws
4" (102) x 6 3/4" (171)

ADL - Access Door w/Snap Latches
4" (102) x 6 3/4" (171)

ADQ - Access Door w/Sash Latches
4" (102) x 6 3/4" (171)

Note: Optional top and bottom access door available

Single Duct Terminal Units

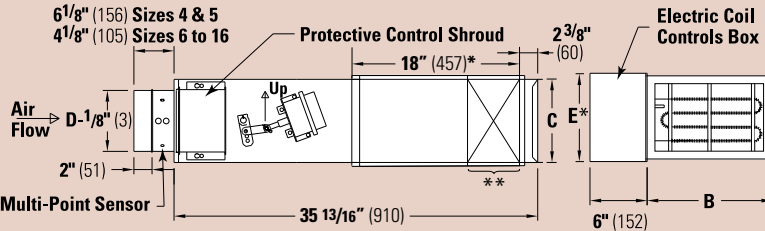
SPV, SDV Series

Single Duct – Controller Type

price

Accessories

Electric Duct Heater Size 4-16

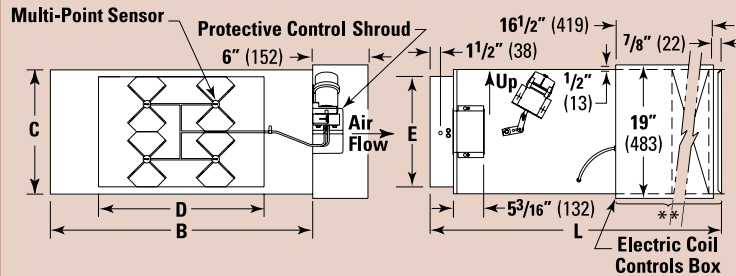


* Consult submittal drawing for actual configuration and dimensions.

** Heater section not insulated. Insulation option available.

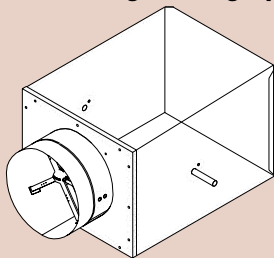
Unit Size	Outlet B	Outlet C	Inlet D	Control Box E
4	12 in. [305mm]	8 in. [203mm]	4 in. [102mm]	12 in. [305]
5	12 in. [305mm]	8 in. [203mm]	5 in. [127mm]	12 in. [305]
6	12 in. [305mm]	8 in. [203mm]	6 in. [152mm]	12 in. [305]
7	12 in. [305mm]	10 in. [254mm]	7 in. [178mm]	12 in. [305]
8	12 in. [305mm]	10 in. [254mm]	8 in. [203mm]	12 in. [305]
9	14 in. [356mm]	12 1/2 in. [318mm]	9 in. [229mm]	12 in. [305]
10	14 in. [356mm]	12 1/2 in. [318mm]	10 in. [254mm]	12 in. [305]
12	16 in. [406mm]	15 in. [381mm]	12 in. [305mm]	17 in. [432]
14	20 in. [508mm]	17 1/2 in. [445mm]	14 in. [356mm]	17 in. [432]
16	24 in. [610mm]	18 in. [447mm]	16 in. [406mm]	17 in. [432]

Electric Duct Heater Size 24 x 16



			IP Units (in.)			SI Units [mm]		
Unit Size	Max L/s	Max cfm	Outlet B	Inlet C	Length L	Outlet B	Inlet C	Length L
24 x 16	3776	8000	38	18	38 1/2	965	457	978

LL Low Leakage Casing Option



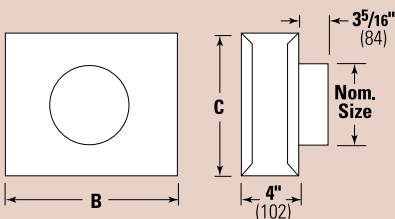
Casing is factory sealed with external duct sealer

Ultra Low Leakage. cfm					
Size	.25 in.	Ps 0.5 in.	Ps 1.0 in.	Ps 3.0 in.	Ps 6.0 in. Ps
4, 5, 6	< 1	1	1	2	3
7, 8	1	1	1	2	3
9, 10	1	1	1	2	3
12	1	1	1	2	4
14	1	2	2	3	5
16	1	2	2	4	7

Note: Ps = Inlet static pressure, in. w.g.

For CLL- certified low leakage construction option see catalog pages F

RDC Round Discharge Collar



Unit Size	IP RDC Outlet	SI RDC Outlet
4, 5, 6	4, 5, 6	102, 127, 152
7, 8	7, 8	178, 203
9, 10	9, 10	229, 254
12	12	305
14	14	355
16	16	406

Single Duct Terminal Units

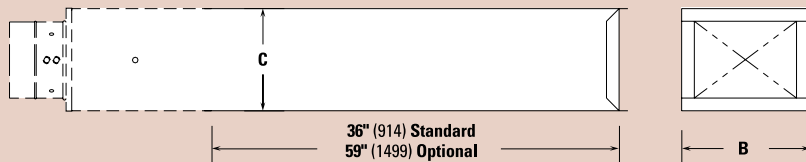
SPV, SDV Series

Single Duct – Controller Type

PRICE

Accessories

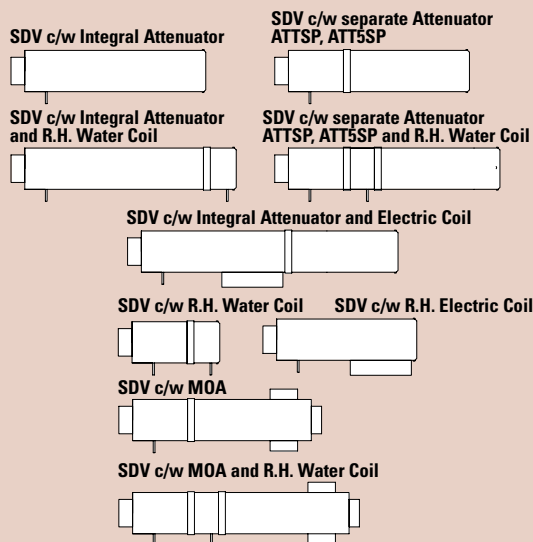
ATT Attenuator Section



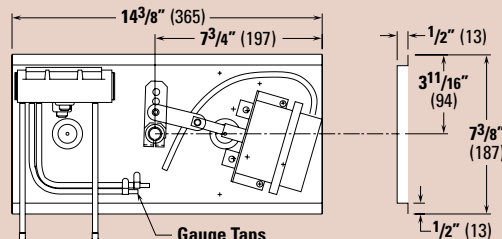
Discharge attenuator section is provided as integral extension to the single Duct Terminals size 4-16. Separate attenuators are also available. Note that water coil is attached to the end of integral construction unit and between terminal and attenuator for separate construction coded ATTSP. See typical accessories configuration example below.

Unit Size	IP Units		SI Units	
	B	C	B	C
4, 5, 6	12	8	305	203
7, 8	12	10	305	254
9, 10	14	12 1/2	356	318
12	16	15	406	381
14	20	17 1/2	508	445
16	24	18	610	457

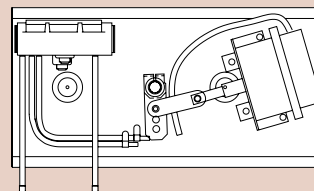
Typical Accessories Configurations



PKIT – Pneumatic Controls Kit



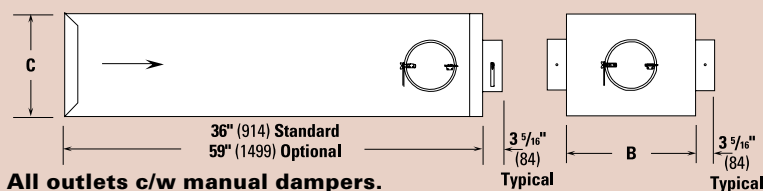
Damper Normally Open - PKIT-NO



Damper Normally Closed - PKIT-NC

22 gauge zinc-coated mounting plate with pneumatic controls for field/warehouse installation.

MOA Multi-Outlet Attenuator Section



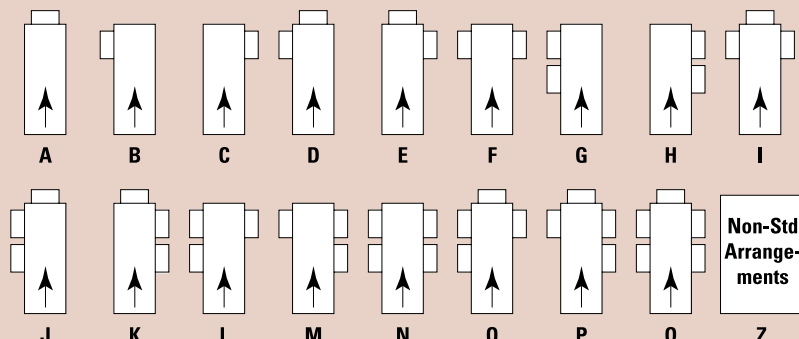
All outlets c/w manual dampers.

M.O.A. Outlets

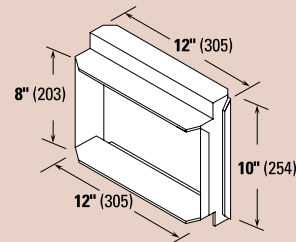
Standard outlet sizes are listed below.

Unit Size	MOA Outlets
4, 5, 6	6 in. [152]
7, 8	8 in. [203]
9, 10, 12	10 in. [254]
12	12 in. [305]
14, 16	16 in. [406]

Standard MOA Outlet Arrangements



ACS Adaptor Coupling Section*



* Used to attach a size 8 MOA to a size 4,5, or 6 terminal, allowing larger outlet sizes.

Single Duct Terminal Units

SP300 Sensor

Single Duct – Controller Type

price®

SP300 Sensor

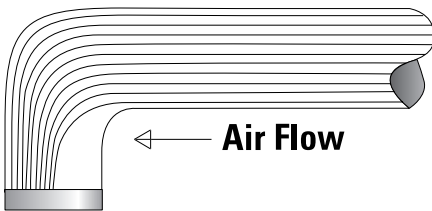
The **PRICE SP300 Velocity Pressure Sensor** represents the next generation of airflow measurement devices, significantly advancing VAV sensing technology. Developed by PRICE Engineering, the SP300 addresses many of the sensor issues that are critical to today's modern HVAC designs:

Improved Accuracy

Traditional Velocity Pressure Sensors function best under ideal inlet conditions. Most devices require at least four inlet diameters of straight duct before the air terminal connection – a condition that may not exist for a job site installation. Space constraints, other mechanical system components, and structural elements, are factors that can influence air terminal inlet conditions.

When poor inlet conditions exist, the profile of the air moving through the terminal and across the sensor becomes distorted, resulting in non-uniform velocity distribution, and inaccurate airflow measurements. Under these conditions, the flow sensor must provide a true averaged velocity pressure signal for proper control.

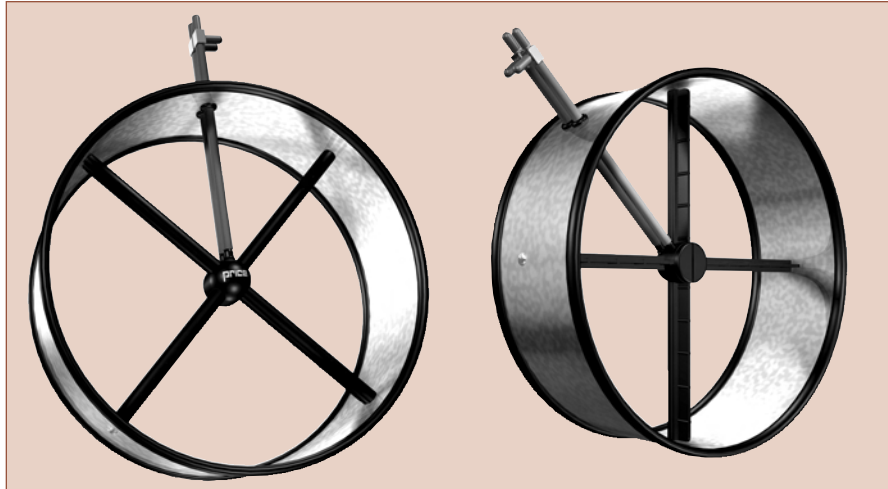
The PRICE SP300 overcomes the effects of variable inlet velocities by averaging and amplifying pressure signals.



Optimal Center Averaging

To compensate for variations in pressure within the inlet, the PRICE SP300 averages the high and low Velocity Pressures that are found on opposing sides of the duct. These measurements are collected and averaged in a chamber located at the center of the sensor. The signal is then sent to the airflow controller.

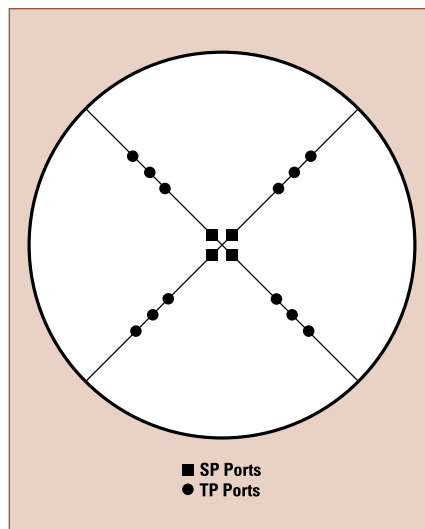
Multiple ports for sensing both Total (TP) and Static (SP) Pressures are designed and located to maximize accuracy. Extensive research and lab testing was conducted under various airflow conditions to determine the proper location of the multiple sensing ports. Twelve total pressure ports are located on the upstream side of the sensor legs. Four static pressure ports are located on the downstream side of the averaging chamber. The multiple sensing ports not only provide a good indication of velocity across the duct but



prevent loss of signal due to blockage by dust or dirt.

While equal area velocity pressure traverses are recommended for uniform flow conditions, substantial errors occur with non-uniform flow created by a 90° elbow, for example. The total and static pressure port locations for each size of the Price SP300 sensor have been determined by extensive lab tests and experimentation. The end result is flow measurement accuracy within 5% with a 90° sheet metal elbow connected directly to the terminal unit inlet.

Elbows, transitions and duct takeoffs, within three duct diameters of the terminal unit inlet should be avoided due to sound and pressure drop considerations. However, when job conditions do necessitate less than ideal inlet conditions, the Price SP300 will maintain flow accuracy.



Optimal Signal Amplification

Amplifying the Velocity Pressure signal that is sent to the controller will enhance accuracy, especially under low airflow conditions. It is important to note, however, that too much amplification, and the methods used to achieve it, can be detrimental to sensor performance. In fact, sensors that provide excess amplification may require the use of controllers with higher velocity pressure ranges, thereby reducing low end resolution. The amplification of the SP300 sensor has been designed to provide velocity pressure signals which fall within the standard 0-1.0 inch range of most flow controllers and transducers. By matching the sensor output to the controller input range, optimum flow accuracy is obtained.

Generally, VAV controllers require a minimum differential pressure signal of .03" w.g. to maintain reasonable control accuracy. The PRICE SP300 will provide a .03" w.g. signal for flows as low as 400 FPM at the inlet. Most sensors require more airflow and a higher differential pressure, and many will not function properly below 700 FPM.

Precise control at minimum settings is critical in maintaining the air change rates called for by ASHRAE and good IAQ design practices. Accurate control at minimum flow can also reduce the requirement for reheat and increase room comfort conditions by prevention of overcooling.

PATENTED
by **price**

Single Duct Terminal Units

SP300 Sensor

Single Duct – Controller Type

SP300 Sensor

Aerodynamic Profile

The PRICE SP300 sensor utilizes aerodynamic principles to optimize the velocity pressure signal amplification. Strategic location of the total and static pressure ports provides the necessary amplification without the need to increase the sensor profile. An increased sensor profile can result in added noise levels and higher minimum static pressure requirements, both of which are undesirable. The Price SP300 sensor has been designed with minimum cross-section and an aerodynamic profile which has negligible pressure drop or noise contribution.

Structural Integrity

The PRICE SP300 has superior tensile strength compared to other flow sensors on the market. PRICE does not recommend lifting terminals by the air flow sensor, however, it is often a common practice in the field. With this in mind the PRICE SP300 has been designed with molded reinforcement to prevent accidental handling damage. To ensure reliability, the SP300 was subjected to numerous tensile strength tests. These tests prove that the SP300 successfully withstands loads beyond 115lbs., significantly exceeding the weight of typical Single Duct Terminal Units.

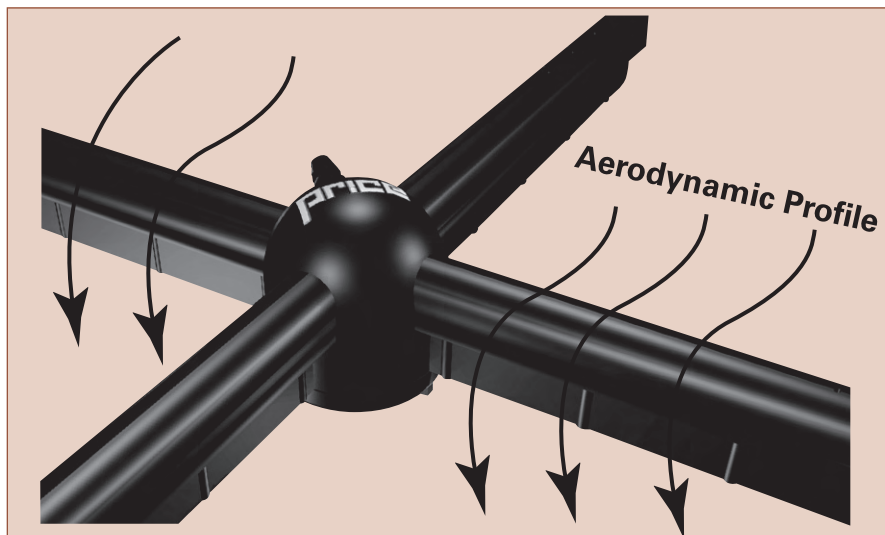
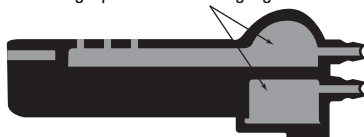
All plastic components are Fire Resistant and meet UL 94-VO.

Control tubing is protected by grommets at the duct wall, and is securely fastened to the sensor.

The rugged construction features of the SP300 sensor ensure a trouble free installation and reliable operation.

Sensor X-Section

Note large pressure averaging chambers



Optional removable SP300 Sensor is available and suggested for hospital grade jobs where sensor needs to be removed and periodically cleaned due to build up of lint.



Single Duct Terminal Units

SPV, SEV, SDV Series

Single Duct – Controller Type



Recommended Air Volume Ranges

CP 101

Unit Size	L/s Min.*	L/s Max.	cfm Min.*	cfm Max.
4	24	106	50	225
5	30	165	63	350
6	31	212	66	450
7	47	307	99	650
8	62	378	132	800
9	79	496	167	1050
10	104	637	221	1350
12	143	991	304	2100
14	207	1416	439	3000
16	268	1888	568	4000
24 x 16	560	3775	1187	8000

CP 100 & CP 200 Controller

Unit Size	L/s Min.*	L/s Max.	cfm Min.*	cfm Max.
4	34	106	71	225
5	43	165	90	350
6	44	212	93	450
7	66	307	140	650
8	88	378	187	800
9	112	496	237	1050
10	147	637	312	1350
12	203	991	430	2100
14	293	1416	621	3000
16	379	1888	803	4000
24 x 16	792	3775	1680	8000

Electronic or Digital Controls

Unit Size	L/s Min.*	L/s Max.	cfm Min.*	cfm Max.
4	24	106	50	225
5	30	165	63	350
6	31	212	66	450
7	47	307	99	650
8	62	378	132	800
9	79	496	167	1050
10	104	637	221	1350
12	143	991	304	2100
14	207	1416	439	3000
16	268	1888	568	4000
24 x 16	500	3775	1187	8000

Notes:

Factory calibrated controls must be selected within the above flow range limits. A minimum value of zero is also available. When an auxiliary flow setting is specified, the value must be greater than the minimum setting and within the range limits.

On controls mounted by Price but supplied by others, the air volume ranges are guidelines only.

*Minimum air flow limit is based on min .02" w.g. differential pressure signal from air flow sensor (.04" w.g. for CP100 and CP200). Selection of air flow limits below the listed values is not recommended. Stability and accuracy may not be acceptable at lower than recommended air flow limits. The actual performance will vary depending on the terminal unit controls supplied.

Dover High School
Dover, NH

Equipment Cuts
Induction Units



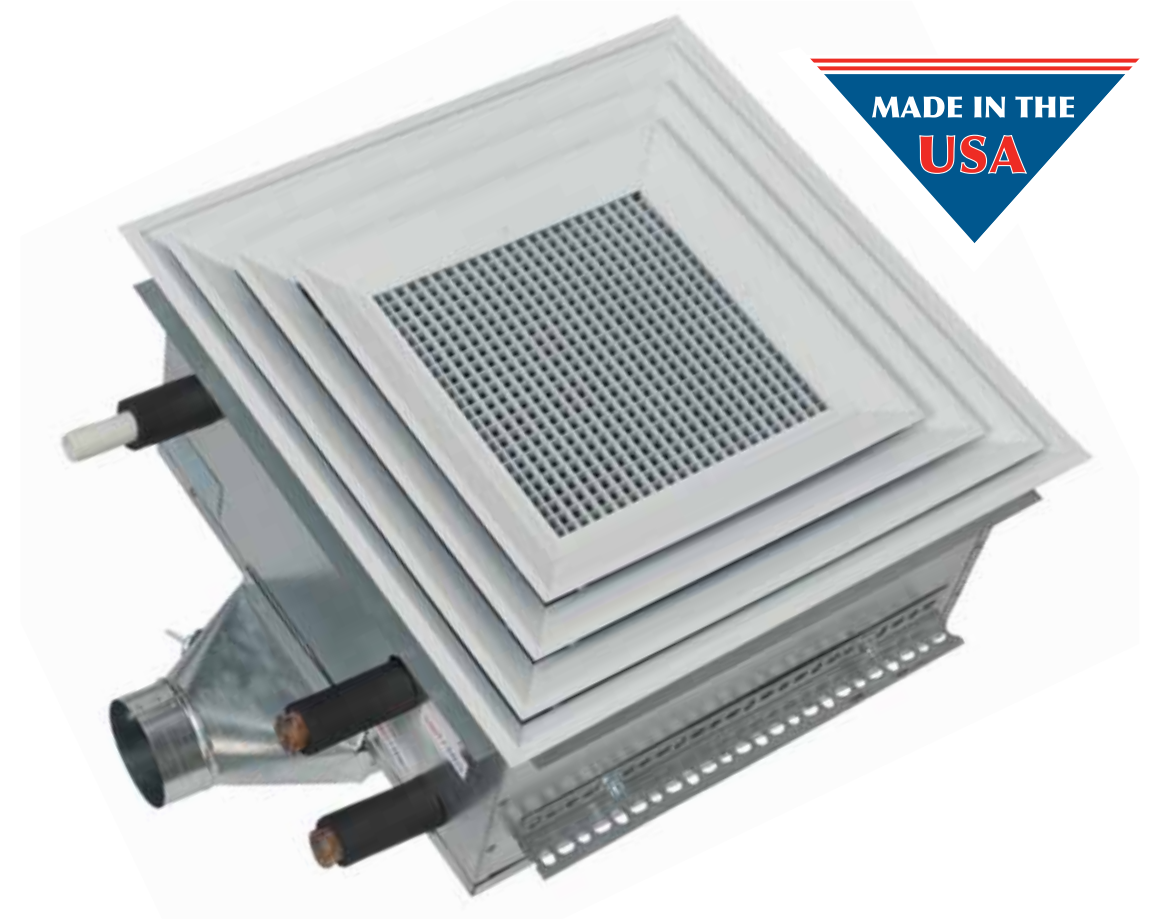
FOR THE ENERGY EFFICIENT BUILDINGS OF TODAY AND TOMORROW



Manufacturer of
High Efficiency HVAC Equipment

Featuring Q Air Terminals
Active Chilled Beams
Induction Units

FOR THE ENERGY EFFICIENT BUILDINGS OF TODAY AND TOMORROW



American Owned and Operated

NuClimate Air Quality
Systems, Inc.

6295 East Molloy Road
East Syracuse, New York 13057
Telephone (315) 431-0226
Fax (315) 431-0227

www.chilledbeam.com

advantages

Q Terminal Induction System Provides:

- ✓ **Lower Operating Costs**
 - Decreased energy consumption at the air handler
 - Save 25-35% on HVAC costs versus VAV systems
- ✓ **Lower Maintenance Costs**
 - No wiring
 - No fans
 - No compressors
 - No moving parts to fail
- ✓ **Lower Construction Costs**
 - Less ducting required
 - Higher cooling and heating capacities = fewer units
 - Fewer units = less copper piping
 - Reduction in the size of the DOAS/AHU
 - Reduction in the size of the chiller/boiler
- ✓ **Added Benefits**
 - Qualifies for LEED points
 - Quiet systems
 - ETL tested
 - American made

product profiles

Q Terminal Features by System:

Model
Q360 & MiniQ360



360 Degree Blow

- Fits 48" x 48" & 24" x 24" ceiling grids
- Outside air inputs: 60 - 476 CFM
- Inlet pressure required: .40" - 1.0"
- Btu cooling range 55 degree chilled water: 12,743 - 26,391
- Btu cooling range 45 degree chilled water: 18,906 - 38,672
- Btu heating range 120 degree hot water: 13,112 - 24,595
- Btu heating range 180 degree hot water: 28,805 - 43,189
- Arrangements: 2 pipe or 4 pipe systems
- ETL - Independently tested
- Drain pan meets International Building Code
- Airflow: 12 feet throw at 100 fpm all surround
- Noise levels: NC18 - NC33

Model
Q1 & Q1L



One Way Blow

- Fits 24" x 24" ceiling grids
- Outside air inputs: 45 - 100 CFM
- Inlet pressure required: .40" - 1.0"
- Btu cooling range 55 degree chilled water: 3,090 - 6,639
- Btu cooling range 45 degree chilled water: 5,000 - 8,790
- Btu heating range 120 degree hot water: 3,784 - 5,377
- Btu heating range 180 degree hot water: 8,614 - 12,184
- Arrangements: 2 pipe or 4 pipe
- ETL - Independently tested
- Drain pan meets International Building Code
- Airflow: 19 feet throw at 100 fpm one way
- Noise Levels: NC24 - NC33

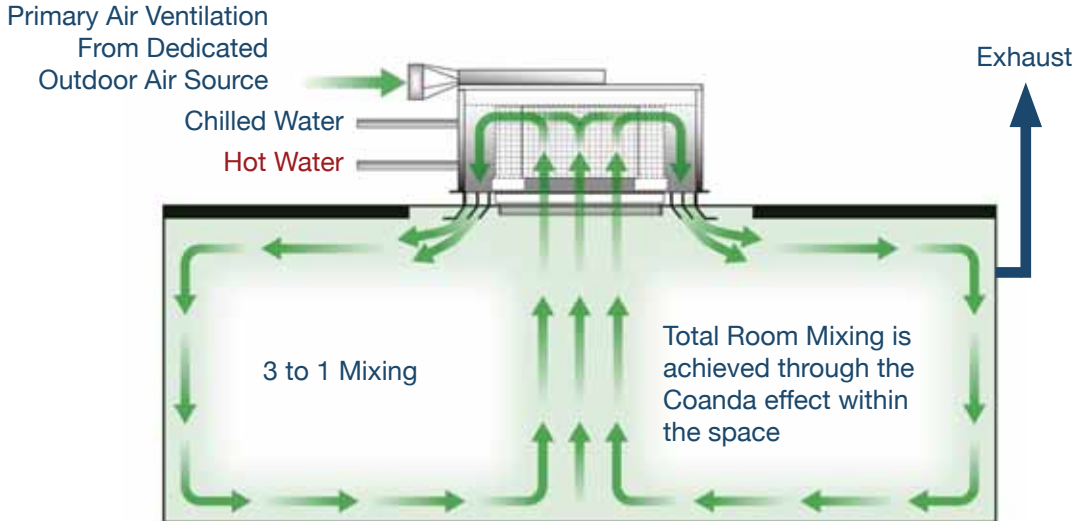
Model
QLS & QLW



One Way Blow

- Fits 48" x 24" and 48" x 12" ceiling grids
- Outside air inputs: 30 - 203 CFM
- Inlet pressure required: .40" - 1.0"
- Btu cooling range 55 degree chilled water: 1,151 - 2,817
- Btu cooling range 45 degree chilled water: 2,280 - 7,241
- Btu heating range 120 degree hot water: 1,751 - 6,191
- Btu heating range 180 degree hot water: 3,877 - 13,836
- Arrangements: 2 pipe or 4 pipe
- ETL - Independently tested
- Drain pan meets International Building Code
- Airflow: 22 feet throw at 100 fpm one way
- Noise levels: NC24 - NC35

Q Terminal System Overview



Dover High School

Dover, NH

Equipment Cuts
Registers, Grilles and Diffusers



GARCIA • GALUSKA • DESOUSA
Consulting Engineers, Inc.

Grilles and Registers Application Guidelines

Introduction

Application Guide

It is the intent of this section to give some basic application guidelines for the use of supply and return grilles and registers in a simple non-technical manner. The information presented here is based on Price's laboratory results as well as commonly accepted industry practices supported by ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers). These application guidelines are designed to enhance your ability to use the performance data in this catalog to select an air outlet that will create an air pattern in the occupied space conducive to the comfort of the occupant.

Grille Type & Application Single Deflection Supply

A grille or register with a single set of adjustable blades which controls the air pattern in only one direction depending on blade orientation. Horizontal blades control rise and drop of the airstream. For example, to prevent unwanted drop in a free space (no ceiling) application or blow warm air down in a high sidewall application. Vertically oriented blades control the spread of the air pattern and would be used where throw, not drop, is a prime concern. These would be the most economical type of outlet. (See Figure 1) Example — Model 510 or 21.

Double Deflection Supply

A grille or register consisting of two sets of adjustable blades oriented perpendicular to each other to allow control of the air pattern in both horizontal and vertical planes. While both sets of blades have an affect on the air pattern, the front or outward most set has the most influence. The front blades should be horizontal if control of rise and drop is primary (i.e. free space or high sidewall) or vertical if spread and throw are the largest concerns. Double deflection outlets are the most flexible type of grille or register. (See Figure 2) Example — Model 520 or 22.

Eggcrate Return

A grille or register with a cubical grid core to be used for return or exhaust where maximum free area is desired and "see through" is not a concern. Typically used in ceiling applications where see-through sight lines are minimized to directly below the grille. (See Figure 3) Example — Model 80 Series.

Figure 1. Model 510 Single Deflection Supply

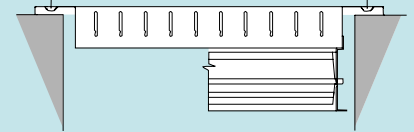
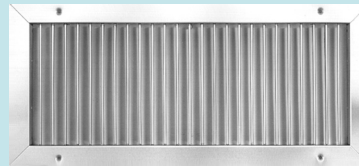


Figure 2. Model 520 Double Deflection Supply

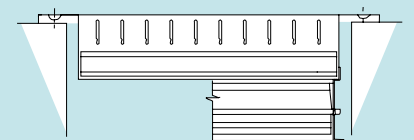
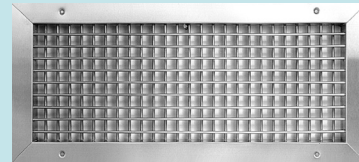


Figure 3. 80 Series
Aluminum Egg Crate Return

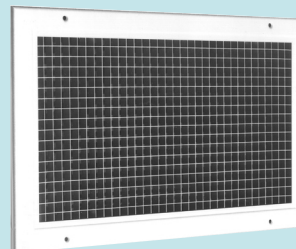


Figure 4. 10 Series Perforated Return

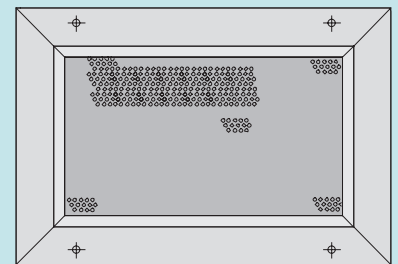
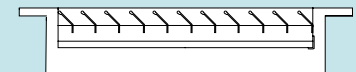
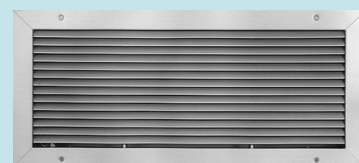


Figure 5. Model 530 Louvered Return



Perforated Return

This grille utilizes a symmetrically perforated sheet metal core for free areas of approximately 50%. It is typically used in ceiling applications where "see through" and blending with the mounting surface are of prime concerns. (See Figure 4) Example — Model 10 Series.

Louvered Returns

These grilles and registers utilize a core of parallel fixed blades set at a deflection, usually 45 degrees from horizontal, to provide a return or exhaust unit with minimum "see through". The most common application is sidewall with blade deflection upward in high applications and down in lower applications. This type of outlet usually has a slightly higher sound and pressure drop than either the eggcrate or perforated. (See Figure 5). Example — Model 530 or 630.

Louvered High Induction Directional Diffusers SMX / AMX Series

price[®]

Product Information

Models

Fixed Air Pattern

Steel Construction
Aluminum Construction

SMX
AMX

The **PRICE SMX / AMX** Series of louvered high induction directional diffusers are specifically designed to solve difficult high cooling load problems. Internally mounted discharge vanes are engineered to create a high rate of induction that will rapidly mix warm room air with cool, supply air. This rapid mixing quickly equalizes the temperature differential between the two air masses, thus minimizing the chance of uncomfortable drafts.

One, two, three and four way blows are available in a variety of sizes to ensure the right amount of air is delivered where it is needed, with comfort.

Application

- This diffuser is ideally suited to any high cooling load commercial application such as perimeter zone office spaces, auditoriums, convention centers, meeting rooms, restaurants, health care facilities etc.

Construction

- **SMX** - Steel construction (except style **6**, **33** frames - extruded aluminum frame).
- **AMX** - Extruded aluminum construction. For styles **3P**, **4P**, **17P** steel frame and panel standard. Optional aluminum frame and panel in style **3PAL**, **4PAL**, **17PAL**.
- Steel (**SMX**) and aluminum (**AMX**) mixing vanes fixed to the back of louvers.
- Optional opposed blade damper in steel (**3**) or aluminum (**3AL** - AMX only) construction.
- Optional rounded core corners eliminate sharp corners on diffuser face.
- Optional offset neck (steel - **SMX**, aluminum - **AMX**) fits outside duct.
- Optional **SR / SR3** square to round adaptor coated steel.

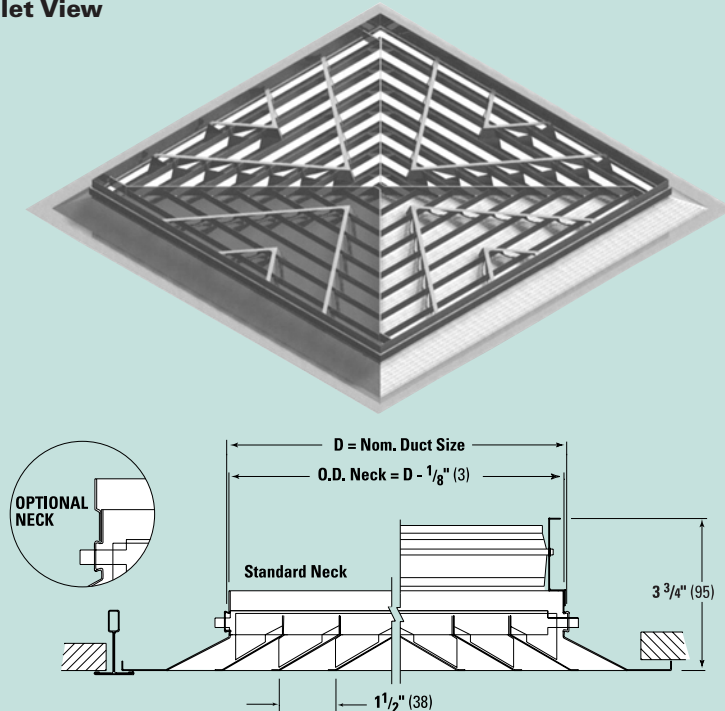
Finish

White Powder Coat **B12**
Optional Damper - steel **B17**
For optional and special finishes see color matrix.

Product Information Index

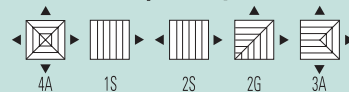
Dimensions, Core Styles C112
Frame Selection C113
Accessories / Options C168 - C172
Performance Data C115 - C118
Suggested Specification.C184

Inlet View

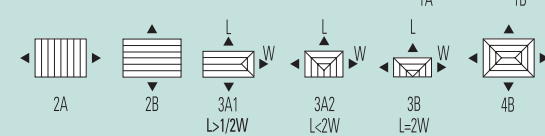


Core Styles

Available in Square Styles



Available in Rectangular Styles



Available Duct Sizes

Price SMX / AMX louvered high induction directional diffusers are available in duct sizes from 6" x 6" to 24" x 24" in 3" increments. Round inlet sizes are available by

utilizing the square to round neck adaptor type SR and SR3 (see page C170). Diffuser size recommendations for T-bar lay-in applications are listed on page C113.

✓ Product Selection Checklist

- 1) Select Duct Size based on desired performance characteristics.
- 2) Select Face Size based on ceiling module (Lay-In applications only).
- 3) Select Diffuser type by model number (SMX - Steel, AMX - Aluminum).
- 4) Select Frame / Panel style according to installation requirements.
- 5) Select Core Style based on application.
- 6) Select Opposed Blade Damper (3 - Steel, 3AL - Aluminum, AMX only), Square to Round adaptor (SR) or both (SR3 - Steel damper, 3AL - aluminum damper, AMX only).
- 7) Select inlet diameter for square to round adaptor.
- 8) Select rounded core corners (RCC), offset neck (ON) or both (RCCON).
- 9) Select Finish.

Example: 12" x 12" / SMX / 1 / 4A / B12

All Metric dimensions () are soft conversion.
Imperial dimensions are converted to metric and rounded to the nearest millimetre.

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Dover High School
Dover, NH

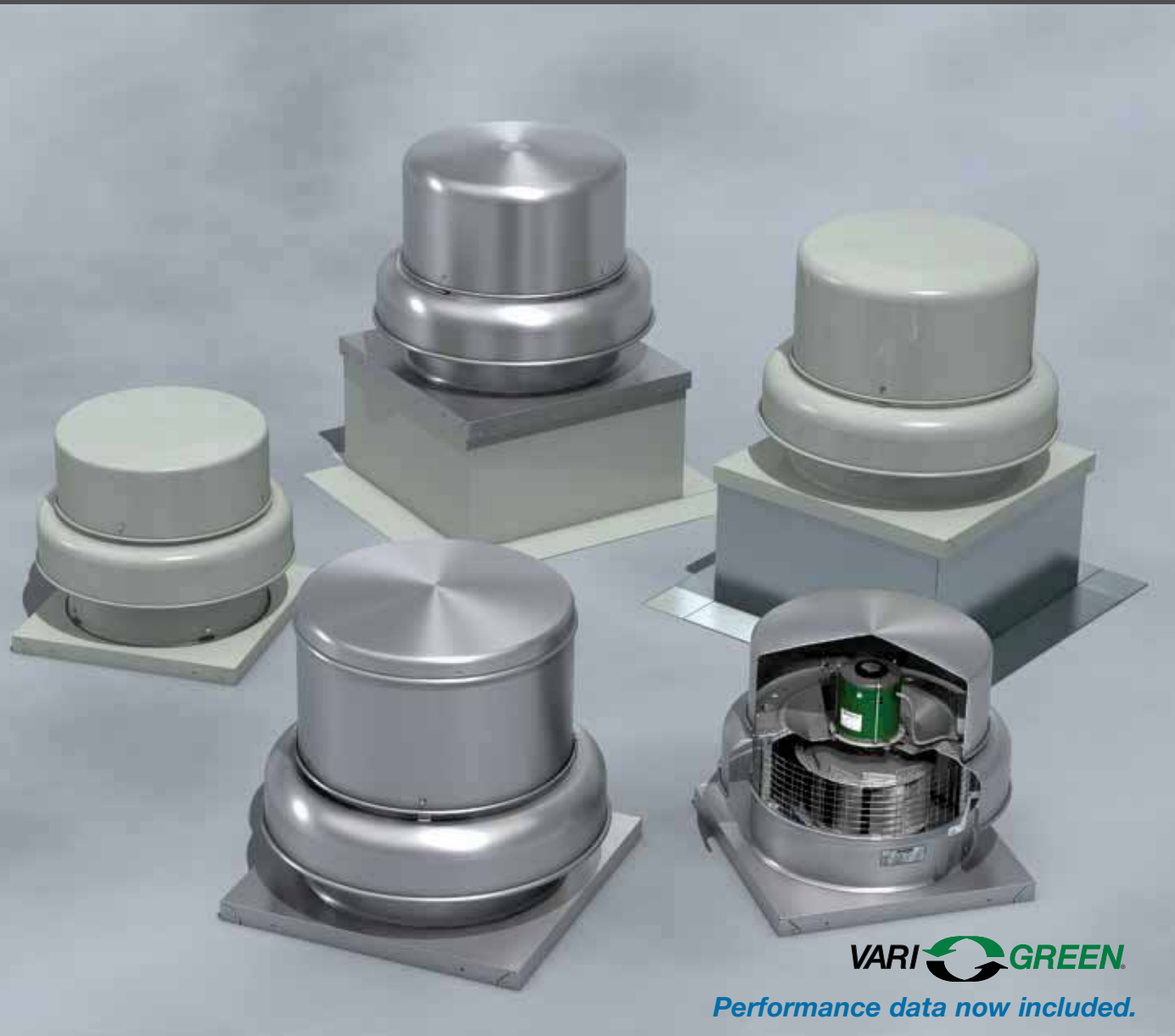
Equipment Cuts
Exhaust Fans



Centrifugal Roof Downblast Exhaust Fans

Models G and GB

- General Clean Air • Light Contaminants
- Seismic • High Wind • Variable Volume



VARI  GREEN.

Performance data now included.

 **GREENHECK**
Building Value in Air.



BUILDING VALUE IN AIR.

March
2013

Models G and GB

Spun Aluminum • Downblast

Centrifugal Roof Exhaust Fans

Model Comparison

Model	Location		Mounting					Airflow				Application						Drive Type		Impeller Type			Performance		Relative Cost	
	Outdoor	Indoor	Roof Curb	Base/Floor	Hanging	Wall	Ceiling Mounted	Exhaust	Supply	Reversible	Recirculate	General/Clean Air	Contaminated Air	Spark Resistant	Grease (UL 762)	Smoke Control (UL)*	High Wind**	Continuous High Temp (above 200°F)	Belt	Direct	Centrifugal	Propeller/Axial	Mixed Flow	Maximum Volume (cfm)		Maximum Static Pressure (in. wg)
G	✓		✓					✓				✓		✓			✓			✓	✓			6,308	1.75	\$
GB	✓		✓					✓				✓		✓		✓	✓		✓		✓			44,700	3.25	\$

* Smoke Control available on models: 101, 101HP, 121, 131, 141, 141HP, 161, 161HP, 200, 240, 300, 360, 420 and 480.

** High wind limited to sizes 300 and smaller

Greenheck models G and GB centrifugal roof exhaust fans provide the industry's best performance and durability for general clean air applications where air is discharged downward, toward the roof surface.

- Broadest performance in the industry, up to 3.25 in. wg (810 Pa) and 45,000 cfm (76,500 m³/hr).
- Most advanced motor cooling of any fan in its class.
- Performance as cataloged is assured. All fan sizes are tested in our AMCA Accredited Laboratory, and all models are licensed to bear the AMCA Sound and Air Performance seals.
- UL Listed for electrical.
- Greenheck subjects these products to extensive life testing, assuring you that the fans will provide years of reliable performance.

Direct Drive, G

- Use for short and/or low resistance ductwork

Belt Drive, GB

- For average length and/or average resistance ductwork
- High volume/average pressure

High Pressure, GB-HP and G-HP

- For long and/or high resistance ductwork
- Low volume/high pressure



Construction Features

Models G and GB

Standard Construction Features

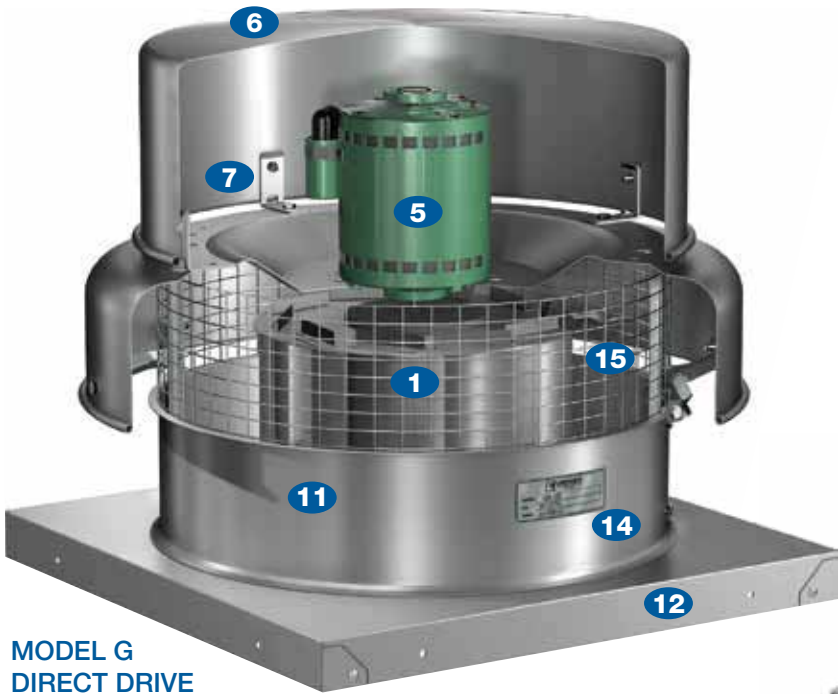
1	Wheel	An aluminum, backward-inclined, non-overloading centrifugal wheel is utilized to generate high-efficiency and minimal sound. Wheel cones are carefully matched to the venturi for maximum efficiency. Each wheel is robotically welded and statically and dynamically balanced for long life and quiet operation.
2	Disconnect Switch	NEMA-1 switch is factory mounted and wiring is provided from the motor as standard (other switches are available). All wiring and electrical components comply with the National Electrical Code® (NEC) and are either UL Listed or Recognized.
3	Fan Shaft	Precisely sized, ground and polished so the first critical speed is at least 25% over the maximum operating speed. Where the shaft makes contact with bearings, tight tolerances result in longer bearing life.
4	Bearings	100% factory tested and designed specifically for air handling applications with a minimum L ₁₀ life in excess of 100,000 hours (L ₅₀ life of 500,000 hours).
5	Motor	Carefully matched to the fan load and is mounted out of the airstream.
6	Motor Cover	Constructed of aluminum and attached with fasteners that provide for easy removal and access to motor compartment and drive assembly.
7	Motor Cooling	Cooling fins located on top of the fan wheel draw outside air through a large space between the fan shroud and the motor cover directly into the motor compartment. Positive motor cooling with fresh air results in maximum motor life.
8	Lifting Points	Various lifting points are located on the drive frame and bearing plate (on select sizes).
9	True Vibration Isolation	Vibration isolators, with no metal-to-metal contact, support the drive assembly and wheel for long life and quiet operation.
10	Drive Assembly	Belts, pulleys, and keys are oversized 150% of driven horsepower. Machined cast pulleys are adjustable for final system balancing. Belts are static-free and oil-resistant.
11	Lower Windband	Heavy-gauge aluminum with formed edges for added strength and provides weather resistance.
12	Curb Cap	Curb cap (with integral deep spun venturi) is constructed of aluminum and is one-piece for a weather-tight fit.
13	Internal Conduit Chase	A large diameter conduit for installing electrical wiring through the curb cap into the motor compartment.
14	Nameplate	Permanent stamped aluminum plate for exact model and serial number identification.
15	Galvanized Birdscreen	Rigid wire protects the fan discharge from birds and small objects.
16	Fan Shroud	One-piece, heavy-gauge aluminum with a rolled bead for extra strength directs exhaust air downward.
17	Mounting Holes	Curb cap has prepunched mounting holes to ensure correct attachment to the roof.

High Wind Construction Features

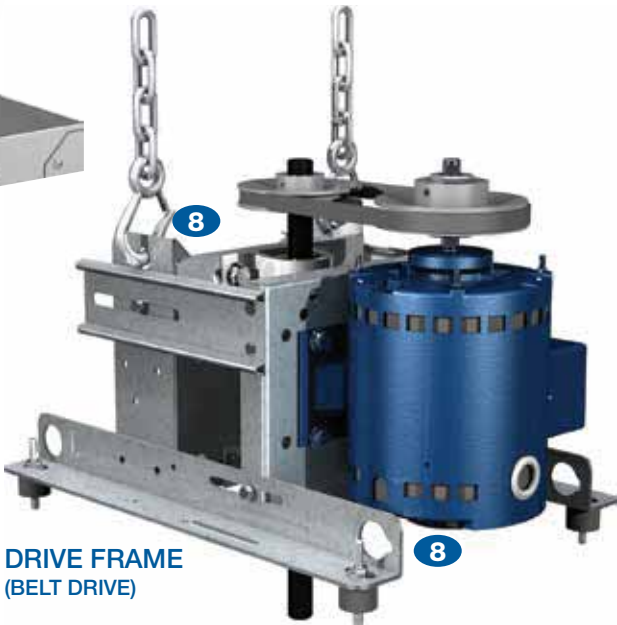
18	Internal Supports	Heavy-gauge supports and bracing are added for additional strength to withstand a load of 75 psf.
19	Reinforced Wind Band	High wind fans include additional reinforcement for maximum strength.
	Roof Curb (page 10)	High wind-load fans are certified for use with Greenheck model GPFHL, GPFHD, GPF or equivalent in high wind applications. Roof curbs ship separate for field installation with attachment details provided.

Construction Features

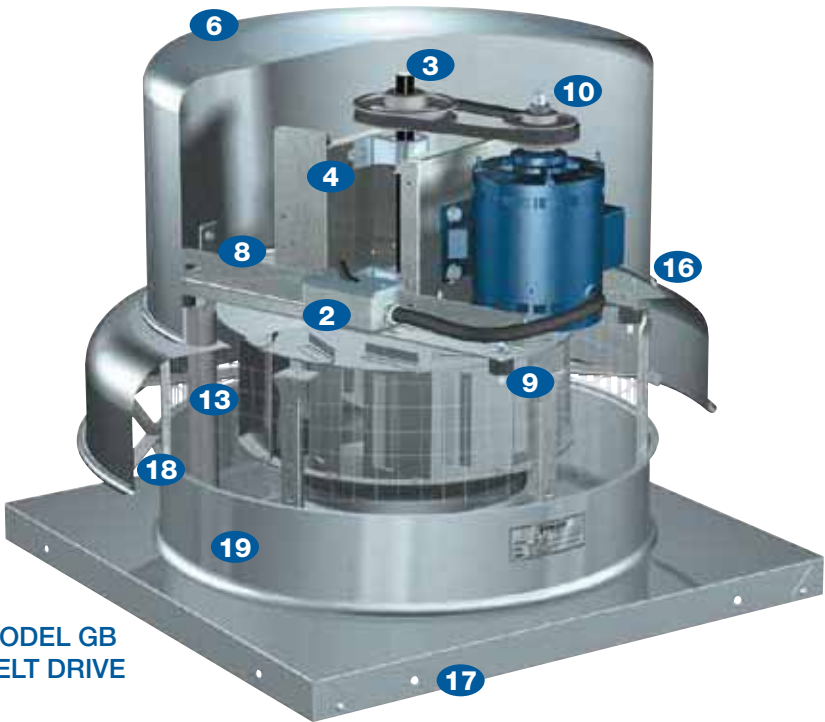
Models G and GB



MODEL G
DIRECT DRIVE



DRIVE FRAME
(BELT DRIVE)



MODEL GB
BELT DRIVE



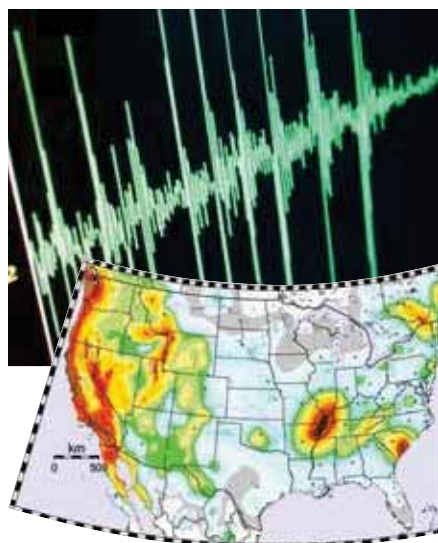
Emergency Smoke Control - GB

When you buy a Greenheck model GB with the smoke control option, you receive a fan with the industry's best performance and durability for smoke control applications (as found in emergency smoke control systems).

GB smoke control models are:
 101, 101-HP, 121, 131, 141, 141-HP,
 161, 161-HP, 200, 240, 300, 360,
 420, 480

- UL/cUL Listed for 500°F (260°C) for 4 hours and 1,000°F (538°C) for 15 minutes.
- Half the weight of traditional smoke control fans, ideal choice for roof load concerns.
- Low profile, height is less than half of traditional smoke control fans, maximum of 52½ inches (1334 mm) from curb cap to top of fan.
- Multiple applications, capable of exhausting general clean air and satisfying emergency smoke control regulations.

Seismic - G and GB



With changes in building codes and standards, more equipment is being required to be seismically certified in areas of the country not commonly thought of as being in seismically active zones.

The International Building Code (IBC) is designed to provide model code regulations that safeguard public health and safety in all U.S. communities. This code is intended to improve the performance and design of non-structural systems subject to seismic events.

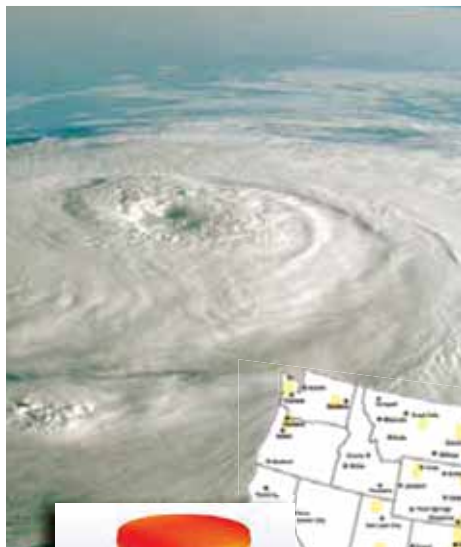
The State of California, one of the most active seismic areas in the United States, has the Office of Statewide Health Planning and Development (OSHPD) to regulate the design and construction of healthcare facilities to ensure they are safe and capable of providing services to the public after a seismic event.

OSHPD developed their own unique certification process to incorporate the IBC and ASCE testing standards to ensure equipment remains operable after a seismic event.

Note: All G and GB models meet seismic requirements.

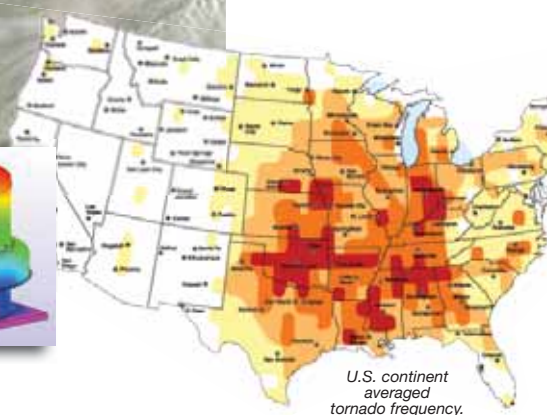
Protocols designed for seismic standards:

Seismic Testing Criteria	All Greenheck seismically certified models have been tested using the most severe seismic event that is found on the Spectral Response Map per IBC Figures 1613.5 (1-2). Our testing is performed under the worst case scenario using the highest mapped seismic load, highest level occupancy category, worst case site class, and highest code mandated importance factor, thereby allowing Greenheck's seismically certified fans to be used anywhere in the United States under any conditions
California OSHPD Test Protocols	The California Office of Statewide Health Planning and Development (OSHPD) requires all certified models be shake table tested in accordance with ICC ES AC-156, in which the fans are physically subjected to the same or greater forces than they will see during a seismic event. Subjecting Greenheck model G and GB fans to this type of testing ensures the fans will operate without problems after a seismic event.
OSHPD Certification No. 0148-10	The OSHPD certification numbers and supporting documents can be viewed on OSHPD's website ensuring that the fan has been subjected to and passed rigorous testing standards.
State Licensed P.E. Calculations	When using the fans in applications which are not covered by California OSHPD standards, Greenheck models G and GB have been certified by a third party engineering firm to IBC 2009, 2012 and ASCE 7-05 standards. These engineers hold professional engineering (P.E.) licenses in all 50 states, so no matter where your job is located, you are backed by a P.E. signature for your state.
Certified Independent Third-Party Testing	All Greenheck seismically certified fan models have gone through extensive testing procedures. Greenheck models G and GB have been certified to IBC 2009, 2012, ASCE 7-05 and California OSHPD standards through both engineering calculations and shake table testing of all models by independent third party engineering firms.



High Wind and Hurricane - G and GB

Greenheck is leading the High Wind Standard for roof top fans and ventilators. Forceful winds and wind-borne debris are the cause of most hurricane damage. Hurricane winds start at 75 mph. and can exert a force of 75 pounds per square foot of pressure—or over 900 pounds on a fan and curb. Forceful winds are not the only problem, wind-borne debris can also cause detrimental effects to objects and structures. High winds and extreme forces are the cause of most storm damage. By analyzing calculations, computer simulations, actual testing, and other standards—Greenheck developed the High Wind Standard.



Atlantic, Gulf and Pacific history of major hurricane tracks.

Protocols designed to protect against wind-borne debris and severe wind-loads:

Structural Performance Load	A static load that is 1.5 times the design load (91.5 pounds per square foot of pressure) is applied both positively and negatively to simulate wind force loads in each direction. Structural Performance per Dade County Protocol TAS-202 (ASTM-E330).
Miami-Dade County Test Protocols	Greenheck worked with Miami-Dade County to outline a High Velocity Hurricane Zone standard for rooftop fans. Greenheck model USGF was the first rooftop fan certified and approved by the Miami-Dade Building Code Compliance office and Texas Department of Insurance for use in hurricane zones. Models G and GB have been certified by an independent third party to the ASTM E-330 Static Pressure Difference Standard, Florida Building Code Test Protocol TAS-201 (large missile impact), 202 (static pressure difference) and 203 (cyclic pressure) Static Pressure Difference.
Miami-Dade NOA Numbers	The certifications can be viewed on the Miami-Dade County website under the NOA numbers listed here. Models G and GB are the first downblast aluminum fans in the industry that have received a Miami-Dade NOA for high wind and hurricane zones. Miami-Dade NOA 12-0120.13 for models G and GB.
Florida Product Approval	Florida Product Approval ensures that products which have been approved can be used anywhere in the State of Florida which are not governed by the Miami-Dade County high wind regulations. More information can be found on the Florida Building Code website. Florida Product Approval FL13225.1 for models G and GB
State Licensed P.E. Calculations	Structural calculations performed by a licensed Professional Engineer (P.E.) on models G and GB include Finite Element Analysis (FEA) and a stamped P.E. report of the fans compliance to ASCE 7-05 Minimum Design Loads for Buildings and Other Structures Standard and the Florida Building Code. The ASCE 7-05 Standard meets the IBC, Florida and Miami-Dade codes.
Computational Fluid Dynamics (CFD)	All Greenheck high wind models have been analyzed using Computational Fluid Dynamics (CFD). CFD is computer software designed to simulate the flow of high speed winds over the surface of objects. The software records the force profile exerted on the fan so it can be utilized in Finite Element Analysis (FEA).
Finite Element Analysis (FEA)	Utilizing the results from CFD analysis, Greenheck can accurately predict the stress, strain, and deflection resulting from high wind loads. Greenheck high wind units have been proven to withstand high winds through Finite Element Analysis utilizing CFD results.

Model G VARI GREEN



Greenheck's electronically commutated (EC) Vari-Green (VG) motor combines motor technology, controllability and energy-efficiency into one single low maintenance unit and is the industry's first fully controllable motor. When combined with Greenheck's G fans, all the CFM and static pressure ranges of a belt drive can be attained with the benefits of a direct drive.

Motor Information					
HP	RPM	Volts	Phase	FLA	Enclosure
1/6	1725	115	Single	3.1	TENV
1/4	1725	115	Single	3.9	ODP
1/2	1725	115	Single	6.2	ODP
1/2	2500	115	Single	6.5	ODP
3/4	1725	115	Single	10.1	ODP
3/4	2200	115	Single	11.3	ODP
1	1725	115	Single	12.4	ODP
1	1725	115/208-230	Single	12.0/6.0	TEFC
2	1725	208-230	Single	12.0	TEFC

Benefits

Operates on AC power that's converted to DC—providing a more efficient motor operation as compared to an AC operation.

- The motor can attain up to 85% efficiency and reduce energy consumption.
- Watt savings of 30-70% depending on RPM.
Note: As motor speed is turned down, efficiency stays high as compared to an AC motor that decreases dramatically.
- Operates cooler than a standard AC motor at lower RPMs. A cooler motor has longer motor life and reduces energy consumption.
- 80% usable RPM turndown versus 30%, see Motor Turndown Comparison chart at right.
- G fans with Vari-Green motors can provide all the CFM and static pressure ranges of a comparable belt drive.
- Maintenance costs are reduced as there are no belts or bearings to replace and no pulleys to adjust.
- Direct drive fans are often preferred where maintenance access is difficult.
- Provides a solution for demand controlled ventilation applications.

Vari-Green Advantages

- Initial cost is similar to a belt drive
- Lower operating cost
- No maintenance, no belts, pulleys or bearings
- Easy RPM adjustment

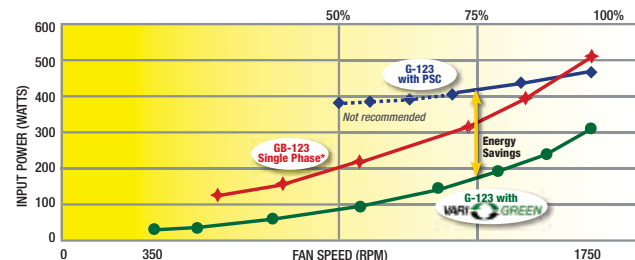
Features

1. **Dial on Motor Control** - a potentiometer (dial on motor control) is mounted on the motor for easy speed adjustment for system balance. Simply turn the dial. There are no belts and pulleys to adjust.
2. **Control Wire Inputs** - the motor accepts a 0-10V DC signal from Building Automated Systems or other controls to adjust motor speed.



Comparisons: Belt, Direct Drive with PSC and Direct Drive with Vari-Green

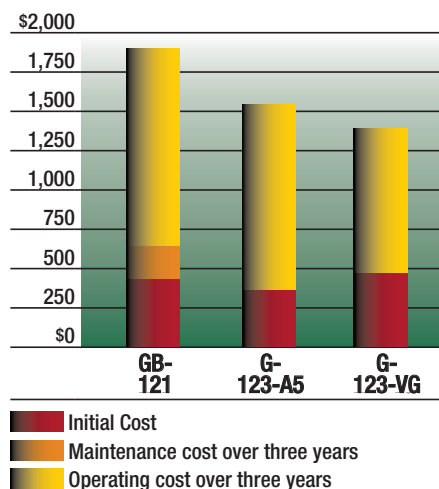
Motor Turndown Comparison



The length of each curve indicates the practical turndown range. Data is for 1/2 hp motors with load of 0.35 Bhp at full speed

Constant Volume Life Cycle Analysis

Three Year Cost Comparison



Analysis is based on operating costs for a period of three years where the fans operate continuously at 1725 rpm, 24/7, with an energy rate of \$0.10/kWh. Maintenance on the GB-121 is estimated at \$65/yr.

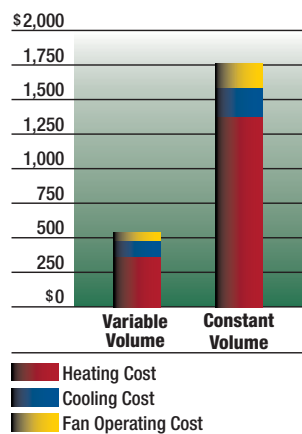
Note: Example is based on a relative cost. Use and installation variables may produce different results.

Demand Control Ventilation for Multistory Buildings



Applications requiring constant pressure or variable volume can utilize G fans with Vari-Green motors and Vari-Green controls. Demand control ventilation systems reduce the amount of energy used by decreasing the speed of the fan when demand is low. This in turn lessens the amount of conditioned air exhausted and further reduces total operating costs associated with air conditioning and heating in multistoried buildings such as hotels, multifamily complexes, institutional facilities, and high rise commercial buildings.

Variable Volume Operating Cost Analysis

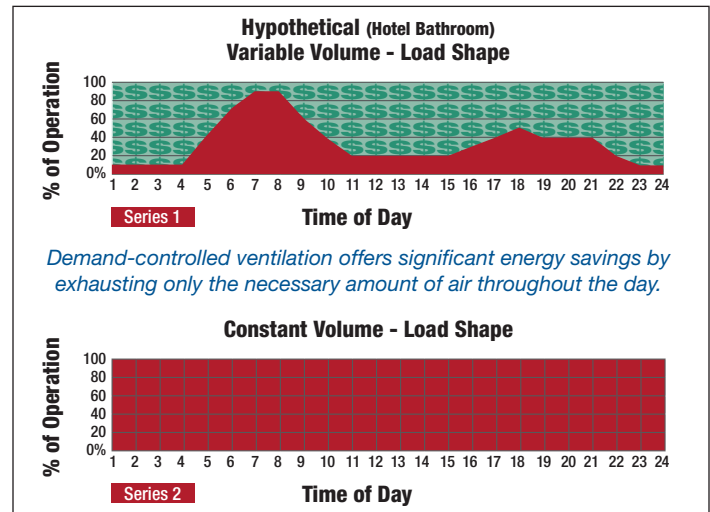


Example of potential savings based on a northeast city in the USA using Vari-Green components for variable volume.

The Vari-Green constant pressure control is preprogrammed and easy to install for applications that include venting dryers, bathrooms, residential type kitchen space or industrial process exhaust.

Contact fans@greenheck.com for more information.

Daily Operating Comparison: Variable Volume and Constant Volume



Demand-controlled ventilation offers significant energy savings by exhausting only the necessary amount of air throughout the day.

Note: A standard VFD compatible motor can also function within a Variable Volume system.

Vari-Green® Controls

Transformer - Provides 24V power from the existing line voltage at the fan to the Vari-Green motor and controls. Dual voltage primary (120/240V) transformer provided with the fan.

Remote Dial - Allows for remote, manual airflow adjustments. Wall plate with dial may be mounted in a standard 2x4 inch electrical junction box.

Two Speed Control with Integral Transformer

Control allows motor rpm to be set at two independent speeds (high or low). Meets minimum airflow requirements with the ability to bump up to high speed in an emergency or meet maximum airflow requirements, or reset down to low for energy conservation.

Constant Pressure Control - Indoor - Control Vari-Green motor via static (variable volume) or velocity (constant CFM) pressure on the inlet or outlet side of the fan. Optional one or two duct or room probes for use in:

- Multifamily structures - Apartments, condos, hotels; clothes dryers, residential kitchens and bathrooms.
- Institutional facilities - Schools, prisons, multistory office buildings; bathrooms.

Constant Pressure Control - Outdoor

Control a Vari-Green motor via static pressure on the inlet side of the fan. Includes one duct probe and transducer for use in:

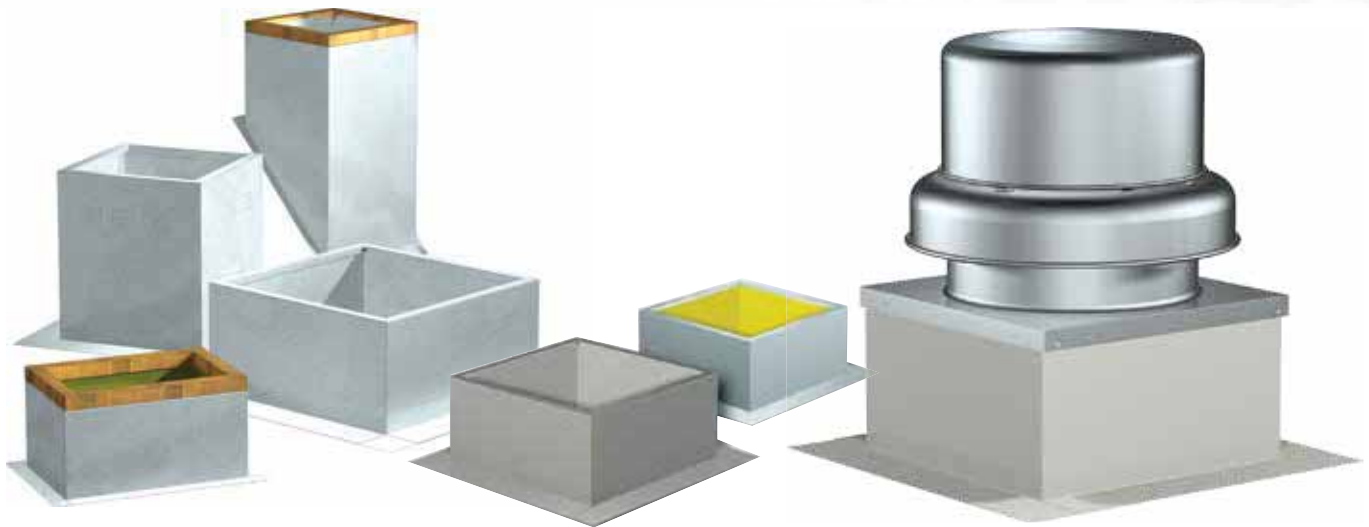
- Multifamily structures - Apartments, condos, hotels; residential kitchen, dryer facilities and bathrooms.
- Institutional facilities - Schools, prisons, multistory.

Air Quality - VOC - Control a Vari-Green motor via changes in volatile organic compounds (VOC's). VOC's are gasses that are emitted from humans, building materials, perfumes, foods, and furniture off-gassing. Range is 0-2000 CO₂ PPM equivalent.

- Institutional facilities - Schools, court house, hospitals; bathrooms, waiting rooms, cafeteria.
- Commercial buildings - Office space, conference rooms, bathrooms, break room.

Air Quality - Temperature and Humidity - Control Vari-Green motor via changes in temperature, humidity, or both. Range is 32 to 120°F and 0 to 100% relative humidity.

- Multifamily structures - Apartments, condos, hotels; bathrooms, utility rooms.
- Commercial buildings - Office buildings, office space, conference rooms, utility rooms, bathrooms.



Roof Curbs

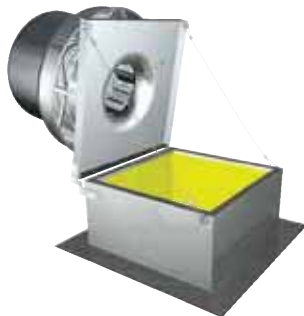
Prefabricated roof curbs reduce installation time and costs by ensuring compatibility between the fan, the curb and roof opening. All curbs are insulated with fiberglass. A wide variety of roof curbs are available, including: flanged, pitched and sound-absorbing.

Hinged Curb Cap with Cables (Field Installed)

Mounted to the curb cap, allows entire fan to tilt away from curb for access to wheel and ductwork. Includes restraint cables.

Hinged Base (Factory Mounted)

Allows for easy maintenance. Hinge and restraining cables are factory mounted to a subbase attached directly to curb without additional height added.



Curb Seal

Rubber seal between fan and curb to assure proper sealing when attached to a curb.

Curb Extensions

Extensions raise the fan discharge above the roofline and provide an accessible mounting location for dampers. Insect screen bases, constructed with a removable fine mesh, are recommended for applications where insect entry must be prevented.



High Wind and Severe Duty Roof Curbs

GPF/GPFP/GPFR – Approved for high wind applications up to a 75 psf wind-load rating. Constructed of 18 gauge steel, formed and welded sides, and a 5-inch flashing flange. GPF is available up to 42 inches in height. GPFP and GPFR are available up to 24 inches in height.

Severe Duty Curbs – Designed for heavy compression loads exceeding 1,000 lbs. and carry a 130 psf wind-load rating.

GPFHL (Heavy Load) - 14 gauge galvanized steel with internal vertical support members and a 5-inch flashing flange.

GPFHD (Heavy Duty) - 12 gauge galvanized steel with internal vertical support members and a double thick 5-inch flashing flange.

GPFHL and HD are available up to 24 inches in height. Note: Maximum 24 inch height restriction on all curb models certified for high wind.

For detailed curb information refer to Roof Curbs, Extensions and Equipment Supports catalog.

Mounting details for the roof curb to the roof substrate and the fan to the curb are included with each model G and GB installation manual.

For additional severe duty information, refer to the Greenheck High Wind brochure.

Tie-Down Points

Four brackets located on the shroud for securing the fan in high wind applications. Cables and anchors by others.



Options and Accessories

Speed Controllers for Standard Motors

Available for use with shaded pole and permanent split capacitor (PSC) open motors on model G fans. They provide an economical means of system balancing with direct drive fans.



Disconnect Switches

A wide selection of NEMA rated switches are available for positive electrical shutoff and safety, including: dust-tight, rainproof, and corrosion-resistant. Switches may be internally or externally mounted.



Dampers

Designed to prevent outside air from entering back into the building when fan is off. Includes gravity and motorized dampers. Damper sizes are shown on each performance data page.



Motor Starters -

The fundamental function of a motor starter is to protect the motor from damage that can occur from overheating. With a Greenheck motor starter you will be provided with the best motor protection available.



Specific model components may include; SmartStart™ technology, physical interface, overload protection, disconnect, magnetic contactor, NEMA-1 or NEMA-3R steel enclosures and pre-engineered easy system integration. For complete information on specific Greenheck Motor Starter models refer to greenheck.com, Motor Starter page.

Birdscreen

Galvanized mesh is standard, optional aluminum or stainless steel rigid wire are also available.



G and GB models are Listed for electrical (UL/cUL 705) File no. E40001

GB models for Emergency Smoke Control Systems (UL/cUL Listed for 500°F (260°C) for 4 hours and 1,000°F (538°C) for 15 minutes) File no. MH17511

Note: UL/cUL is optional and must be specified.

Coatings

A wide variety of coatings and colors are available. Greenheck coatings and resistance charts can be found in the Performance Coatings Commercial and Industrial Fans catalog and in our Product Application Guide—Performance Coatings for Ventilation Products.



Primer is applied at the factory to allow for final finish in the field.



Permatector™ is our standard coating. Typically used for applications that require corrosion resistance in indoor and outdoor environments.



Hi-Pro Polyester is resistant to salt water, chemical fumes and moisture in more corrosive atmospheres. Typically used for applications that require superior chemical resistance, excellent abrasion and outdoor UV protection. This coating exceeds protective qualities of Air Dried Heresite and Air Dry Phenolic.



Baked Enamel Decorative Coatings are heat cured enamels applied either as wet paints or electrostatic powders. Customers can choose from 16 standard decorative colors or color match any color.

General Clean Air (figure 1)

Models G and GB exhaust fans are designed to meet the needs of general clean air applications. Tests were conducted to assure safe, rugged and reliable fans.

Due to the varying types of airstreams encountered in commercial ventilation, system designers must be aware of national, state, and local codes and guidelines governing these installations. Local code authorities should be consulted before proceeding with any ventilation project.

- When roofing materials extend to the top of the curb, roof curbs should be 1½ inches (¾ inch on each side) less than the unit curb cap to allow for roofing and flashing.
- For recommended duct size, damper size, and roof opening dimensions, refer to the performance data pages. (starting on pg. 14)
- Installation must include a means for inspecting, cleaning and servicing the exhaust fan.

High Wind, Hurricane and Seismic (figure 2)

- Roofing materials can extend to the top of the curb, roof curbs should be 1 inch (25 mm) total, or ½ inch (13 mm) on each side, less than the unit curb cap to allow for roofing and flashing.

Note: The typical installations shown are recommendations based on national codes. Local authority may supersede these recommendations.

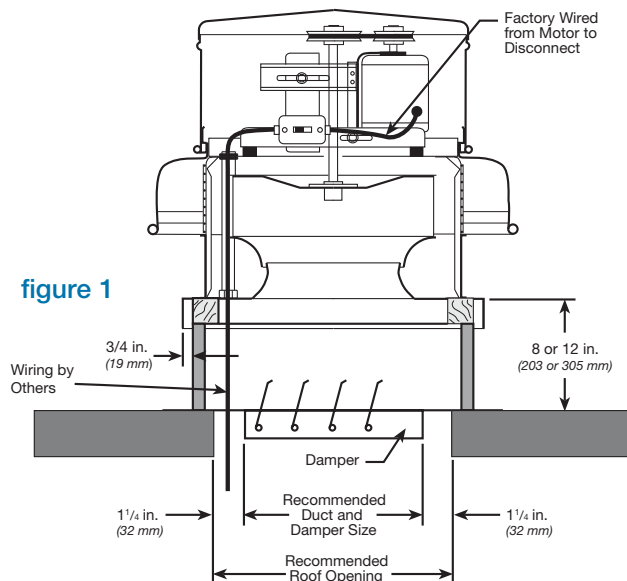


figure 1

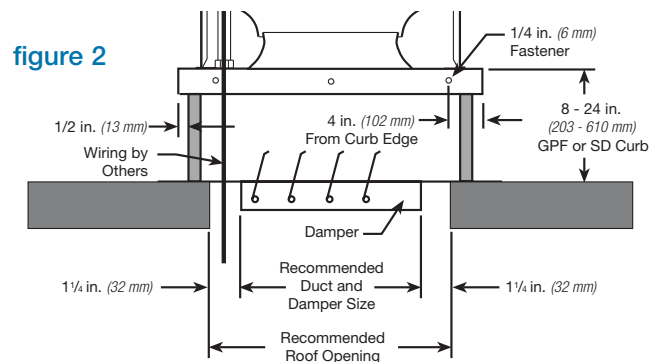
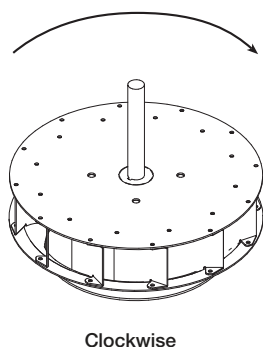


figure 2



Clockwise

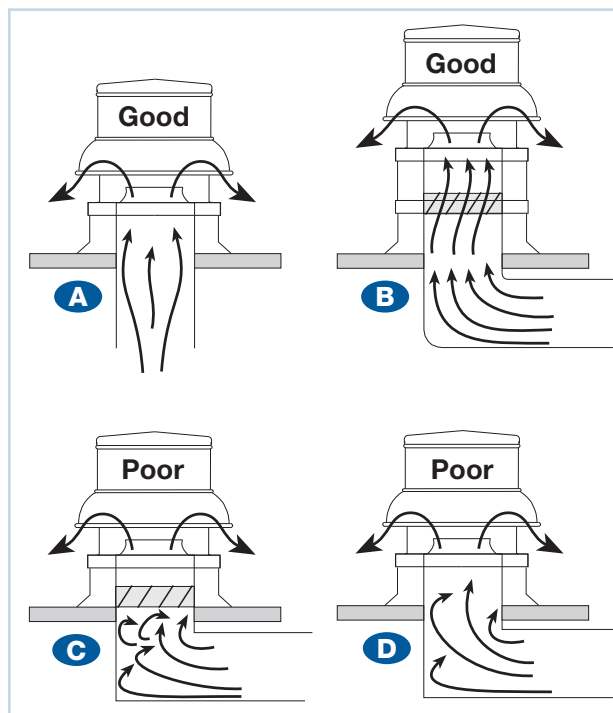
Wheel Rotation

Direction of rotation is very critical. Rotation in the wrong direction will result in excessive horsepower, possible motor burnout, and increased noise levels. Check rotation by energizing the unit momentarily. The rotation should be the same as the rotation decals affixed to the unit and is clockwise when viewed from the top of the unit.

Fan Inlet Connections

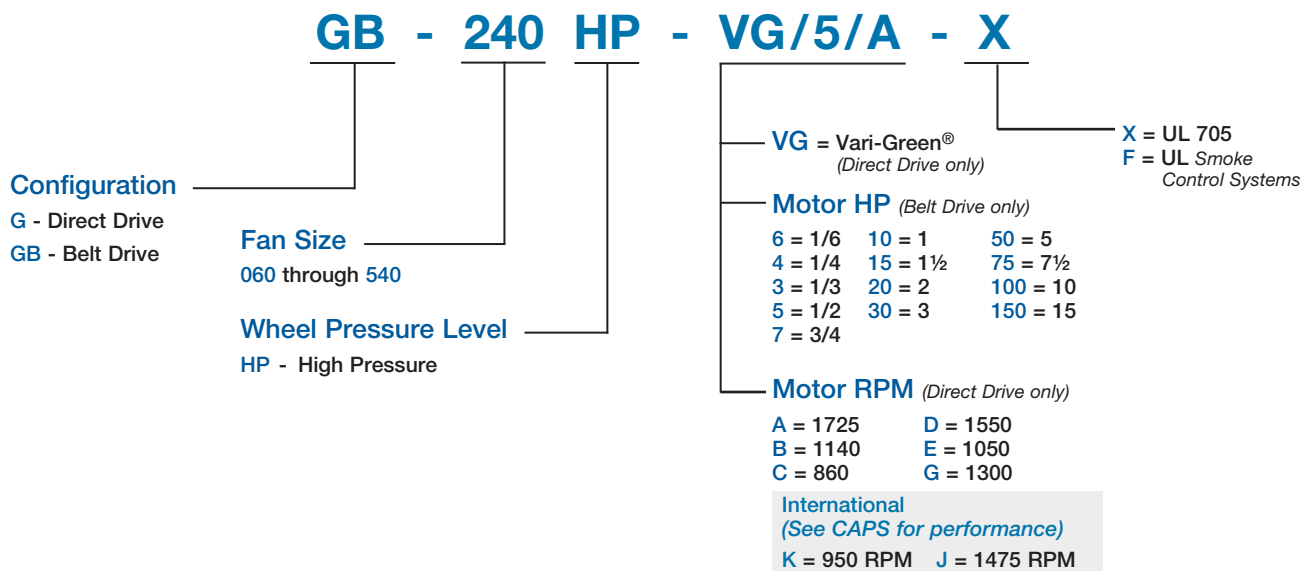
In order to assure proper fan performance, caution must be exercised in fan placement and connection to the ventilation system. Obstructions, transitions, poorly designed elbows, improperly selected dampers, etc., can cause reduced performance, excessive noise, and increased mechanical stress. For performance to be as published, the system must provide uniform and stable airflow into the fan.

- A** Provide uniform airflow at fan inlet to assure optimum performance.
- B** Provide uniform airflow at fan inlet and through the damper to assure optimum performance.
- C** Dampers must open fully. Use motorized dampers in low airflow applications to reduce losses.
- D** Avoid sharp turns or entrance conditions which cause uneven flow. Use turning vanes in elbows to reduce adverse effects.



Model Number Code

The model number code system is designed to completely identify the fan. The correct code letters must be specified to designate belt or direct drive. The remainder of the model code is determined by the size and performance.



Dover High School
Dover, NH

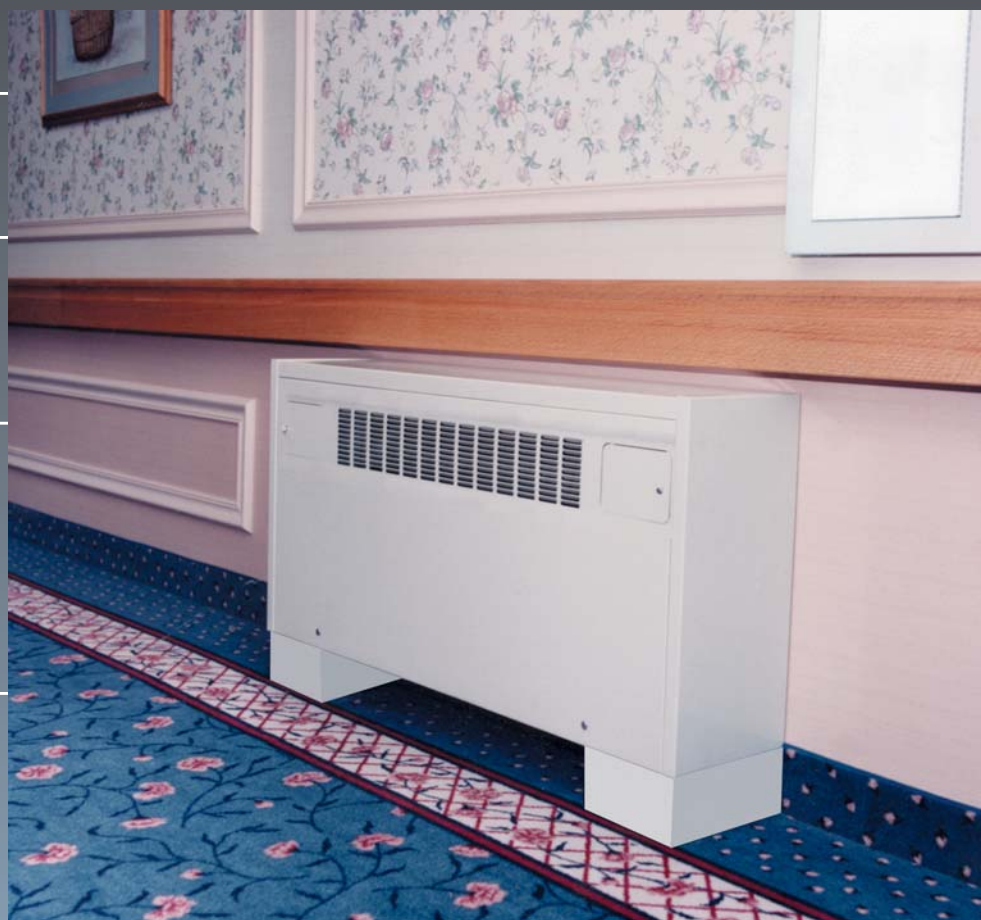
Equipment Cuts
Unit Heaters



STERLING[®]

CABINET UNIT HEATERS

FOR STEAM AND HOT WATER



CABINET UNIT HEATERS

SELECTION AND "ROUGH IN" MADE EASY - ONLY THE LENGTHS VARY



The Sterling Cabinet Unit Heater is the industry's most recent design. Years of manufacturing and engineering experience combined with a concern for appearance have resulted in a crisply styled unit that will blend with almost any room decor and provide reliability, durability, individual control and quiet operation.

As unit size increases, only the length changes. The depth and height remain constant, thus allowing the designer to have uniformity of appearance when units of various sizes are installed in adjacent areas.

The wide selection of floor, wall and ceiling units with a variety of air flow arrangements allows for exactly matching design requirements.

The standard 16 gauge front panel is rugged enough to withstand harsh treatment. Exposed cabinetry is provided with a prime coat of neutral eggshell baked enamel, which in many instances can serve as the finish. Back and side panels are 18 gauge.

The pedestal base for floor models is the height of most mop boards.

Field repainting to match the decor is possible and factory applied decorator colors are available as an option.

Recessed models are provided with a field installed wall seal that allows for full or partial recessing depending on the model. The wall seal kit is also available as an option for full or partial recessing of most other models.

The solid state speed control provides infinite variations from high to low speed, giving the occupant finger tip control over fan speed and room temperature.

All units are CSA
certified.



10 MODELS - 28 ARRANGEMENTS - 8 CFM SIZES



F

FLOOR TYPE



FI

FLOOR TYPE, INVERTED FLOW



FS

FLOOR TYPE SLOPE TOP



FSI

FLOOR TYPE SLOPE TOP, INVERTED FLOW



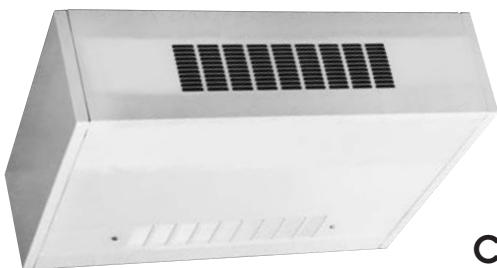
**W
&
WI**

WALL TYPE and INVERTED FLOW



**RW
&
RWI**

RECESSED WALL and INVERTED FLOW



C

CEILING MOUNTED



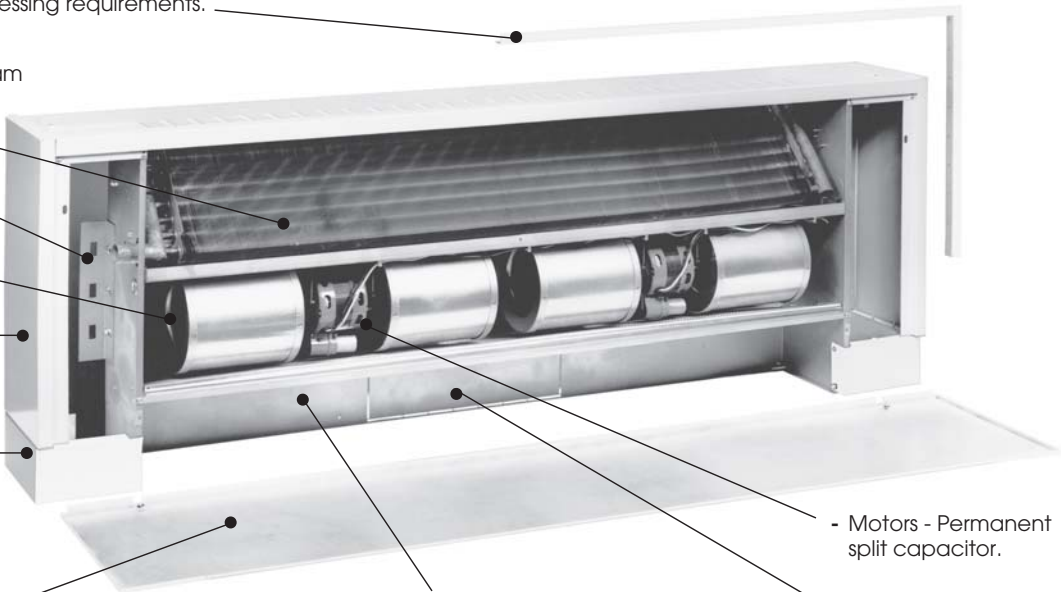
RC

RECESSED CEILING MOUNTED

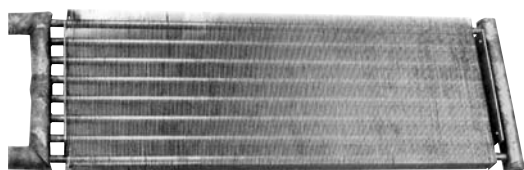
See page 6 for arrangements.

CABINET UNIT HEATER STANDARD FEATURES

- Adjustable wall seal to suit recessing requirements.
- Copper Aluminum coil for steam or hot water.
- Support bracket to wall.
- Whisper quiet blowers.
- Cabinet finish neutral eggshell baked powder.
- Leveling legs optional.
- 16 Gauge steel front panel with insulation, standard.
- Motors - Permanent split capacitor.
- Permanent washable filter, aluminum fiber media.
- Outside air knockout provided standard on "F" and "FS" models.



- Speed Control / Access doors - Standard on all floor and wall models.



- Steam Coil (Standard) - Brazed copper tube and header with aluminum fin. Factory tested to 250 PSI.



- Optional High Capacity 2 row coil.



- Access Area.

CABINET UNIT HEATERS

RATINGS AND SPECIFICATIONS

ENTERING WATER - 200°
ENTERING AIR - 60°

TABLE I

UNIT SIZE	02	03	04	06	08	10	12	14
HEATING CAP. - HOT WATER								
MBH	16.4	22.8	29.8	48.0	54.5	62.0	75.6	78.5
20 WTD GPM	1.64	2.28	2.98	4.80	5.46	6.20	7.56	7.85
HIGH CAP. - COIL 2 ROW								
HEATING CAP. MBH	25.8	35.4	46.3	69.8	87.6	101.8	119.8	128.6
HOT WATER GPM	2.58	3.54	4.63	6.98	8.76	10.18	11.98	12.86
20 WTD.								
HEATING CAP. - STEAM								
2 PSIG MBH	22.6	31.4	41.0	66.1	75.1	85.4	104.1	108.2
STANDARD EDR	94	131	171	276	313	356	434	451
COIL COND. LB/HR	23.4	32.5	42.4	68.4	77.7	88.4	107.7	112
COIL:								
NUMBER FINS PER INCH	12	12	12	12	12	12	12	12
FACE AREA-FT²	.97	1.5	1.8	2.6	2.8	3.1	3.6	4.4
COIL CONNECTIONS	1-1/4CU	1-1/4CU	1-1/4CU	1-1/4CU	1-1/4CU	1-1/4CU	1-1/4CU	1-1/4CU
BLOWERS:								
NUMBER	1	1	2	2	3	3	4	4
DIAMETER/WIDTH	5-3/4 / 7	5-3/4 / 7	5-3/4 / 7	5-3/4 / 7	5-3/4 / 7	5-3/4 / 7	5-3/4 / 7	5-3/4 / 7
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT
RPM - HI	1050	1050	1050	1050	1050	1050	1050	1050
LOW	875	875	875	875	875	875	875	875
CFM:								
HIGH	230	335	430	630	860	1060	1230	1410
LOW	185	270	345	505	685	845	985	1130
MOTOR: H.P.	1/15	1/15	1/10	1/10	1 @ 1/10 1 @ 1/15	1 @ 1/10 1 @ 1/15	1/10	1/10
NUMBER	1	1	1	1	2	2	2	2
VOLTS/PHASE/HERTZ	115/1/60	115/1/60	115/1/60	115/1/60	115/1/60	115/1/60	115/1/60	115/1/60
AMPERES	.8	.8	1.4	1.4	2.2	2.2	2.8	2.8
CONTROLS - STD.	VAR.	VAR.	VAR.	VAR.	VAR.	VAR.	VAR.	VAR.
FILTER:								
NO.	1	1	1	1	1	1	1	1
TYPE	PERM.	PERM.	PERM.	PERM.	PERM.	PERM.	PERM.	PERM.
LENGTH	19-3/4	27-3/4	31-3/4	43-3/4	45-3/4	50-3/4	57-3/4	69-3/4
WIDTH	8-11/16	8-11/16	8-11/16	8-11/16	8-11/16	8-11/16	8-11/16	8-11/16
THICKNESS	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
dB. LEVEL 18" FROM UNIT								
	50	52	53	54	55	55	56	56
LENGTH	35	43	47	59	61	66	73	85
HEIGHT	25	25	25	25	25	25	25	25
DEPTH	9-1/2	9-1/2	9-1/2	9-1/2	9-1/2	9-1/2	9-1/2	9-1/2

CABINET UNIT HEATERS

SHIPPING WEIGHT
(LBS)

	SIZE							
STYLE	02	03	04	06	08	10	12	14
F-FI	92	109	122	148	166	176	196	221
FS-FSI	94	111	124	150	168	178	198	223
W-WI-RW-C	97	115	128	157	175	185	207	234
RC	102	121	135	164	183	194	215	243

Dover High School
Dover, NH

Equipment Cuts
Fintube Radiation





Rittling...

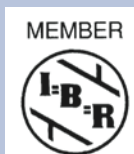
*Custom-Building
Innovative Hydronic Systems
For Commerce, Industry
and Institutions Since 1946*

*Rittling long ago coined the phrase
"Reinventing Finned Tube" to describe
its commitment to design innovation...
and its unlimited custom engineering
capability. For decades, Rittling's
constantly-expanding inventory... and
proven ability to control costs without
compromising the highest quality
standards in manufacturing...have
made the name synonymous with
image, performance, reliability, price,
delivery and service.*

*Rittling's diversity and flexibility have
freed architects from the constraints
of designing around limited catalog
selections of standard elements and
enclosure configurations. Today Rittling
engineers can draw on, or modify,
any of 60 different hydronic heating
elements...and 97 standard enclosure
models... to build any system an
architect can draw to tolerances
of less than .015 inch... at an
exceptionally competitive cost.*

*For the architects of the future, Rittling
will continue to advance finned tube
technology in still more new direc-
tions... and develop ever more efficient,
cost-effective hydronic heat transfer
systems.*

*Fifty years of quality, innovation
and service... and we're just getting
warmed up.*



ARCHITECTURAL ENCLOSURES

To complement contemporary architectural and interior design, models in these series feature enclosures with clean-cut, unobtrusive linear profiles of classic simplicity and strong horizontal lines. The linear effect is further enhanced by flush, "hairline-crack" joints and completely concealed mounting hardware.

These sturdy, high-output enclosures are available in over 16 standard models, with fronts and tops of 14-, 16-, or 18-gauge furniture quality rolled steel. The air outlet is a handsome and rugged extruded aluminum grille that extends the full length of the cover. All models may be modified to suit any hot water or steam heating application, and ordered with any of Rittling's 42 hydronic heating elements.

Rittling Accessories Custom-Fit Any Installation With NO Metal Cutting!

*A full line of accessories is available to insure
a professional custom fit, including:*

- 3½-inch End Caps
- 12-inch End Caps
- Inside and Outside Corners (90°, 135°)
- Wall Trim and Supports
- Access Sections with Stamped Access Doors
- Custom-Sized Column Enclosures
- Control Dampers: Standard Knob-type and Aluminum Slide

FEATURES AND RATINGS

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PEDESTAL (PBG/PIBG).....	14-16
SLOPE TOP (SBG/SIBG).....	17

*For Slope Top ratings please refer to the FS5 and FS3
ratings charts in the Regency Catalog*

ACCESSORIES.....	18
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For Slope Top Accessories, see the Regency Catalog

RATINGS CORRECTION DATA.....	19-21
SUGGESTED ENGINEERING SPECIFICATIONS...	Back Cover
WARRANTY.....	Back Cover

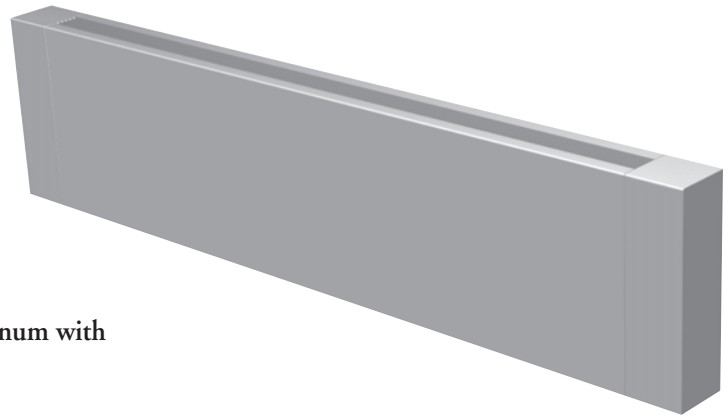
BG3/IBG3 - LOW PROFILE

DIMENSIONS:

- Depth $3\frac{15}{16}$ inches
- Heights 8, 11, 14 inches

GRILLES:

- BG Series $1\frac{15}{16}$ -inch wide extruded aluminum with vertical pencilproof grillwork
- IBG Series $1\frac{15}{16}$ -inch wide heavy-duty, clear anodized aluminum with 15° angular deflection, pencilproof grillwork.



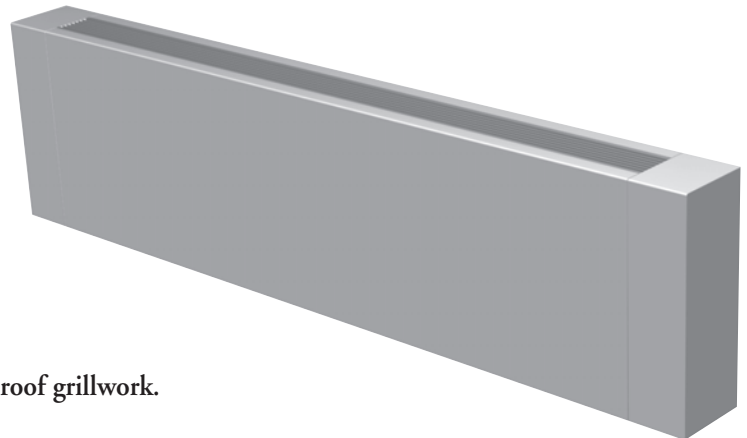
BG5/IBG5 - STANDARD

DIMENSIONS:

- Depth $5\frac{3}{8}$ inches
- Heights 14, 20, 24 inches

GRILLES:

- BG Series $2\frac{1}{4}$ -inch wide extruded aluminum with vertical pencilproof grillwork
- IBG Series $3\frac{1}{8}$ -inch wide heavy-duty, clear anodized aluminum with 15° angular deflection, pencilproof grillwork.



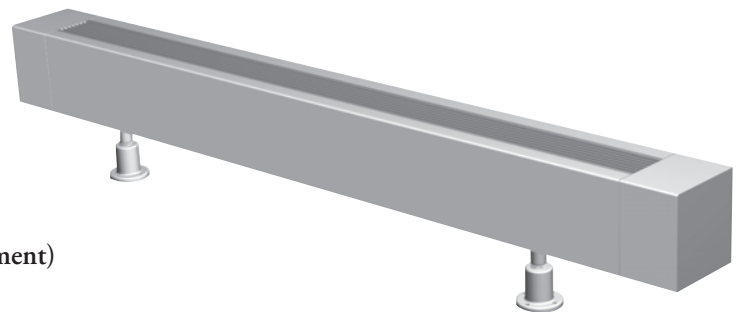
PBG/PIBG - PEDESTAL

DIMENSIONS:

- Depth $5\frac{1}{2}$ inches (1-Row Element)
 $10\frac{1}{2}$ inches (2-Row Element)
- Heights 10 inches above finished floor adjustable with pedestal
6 inches (1-Row Element) 6 inches (2-Row Element)

GRILLES:

- PBG Series $2\frac{1}{4}$ -inch wide extruded aluminum with vertical pencilproof grillwork
- PIBG Series $3\frac{1}{8}$ -inch wide heavy-duty, clear anodized aluminum with 15° angular deflection, pencilproof grillwork.



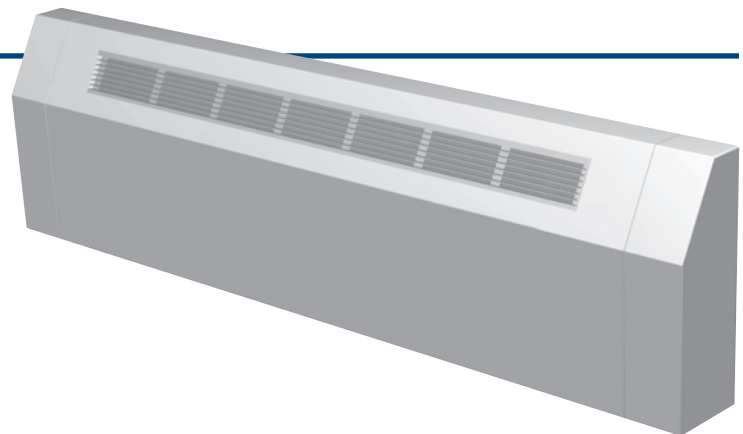
SBG/SIBG - SLOPE TOP

DIMENSIONS:

- Depth $3\frac{15}{16}$ inches (low profile)
- Heights 8, 11, 14 inches
- Depth $5\frac{3}{8}$ inches (standard)
- Heights 14, 20, 24 inches

GRILLES:

- SBG Series Extruded aluminum with vertical pencilproof grillwork. Widths: $1\frac{15}{16}$ -inch (low profile), $2\frac{1}{4}$ -inch (standard)
- SIBG Series Heavy-duty clear anodized aluminum with 15° angular deflection, pencilproof grillwork. Widths: $1\frac{15}{16}$ -inch (low profile), $3\frac{1}{8}$ -inch (standard).



BG3/IBG3 LOW PROFILE

APPLICATION:

Rittling's Low Profile Bargrille Enclosure provides an attractive architectural design with a slimline appearance and a depth of less than 4 inches.

ENCLOSURE:

- 14- to 18-gauge CRS, phosphatized with painted finish.
- 1-foot to 8-foot lengths in 6-inch increments.
- Powder coated finish in decorator colors available.
- 8-inch, 11-inch or 14-inch standard heights.
- Custom heights from 6 inches to 36 inches available.
- Available in 18-gauge and 16-gauge stainless steel.

GRILLE:

- BG - Standard aluminum extrusion, etched finishes, pencilproof.
- IBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

ELEMENT:

- Steel or copper/aluminum.
- 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
- Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

MOUNTING:

- Mounting channel
- Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.

HANGERS:

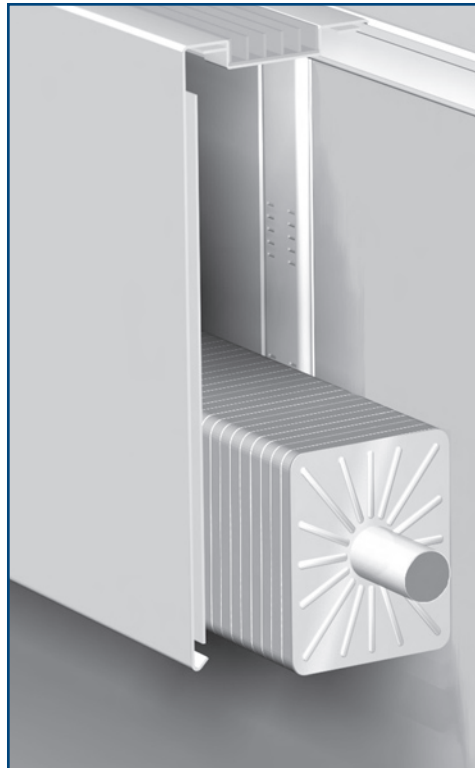
- Self-gauging, snap fit, expansion cradle with positive-locking, bottom-mounting clip provide easy installation as well as security.
- 16-gauge Galvannealed steel.
- Slide cradle will accommodate $1\frac{3}{4}$ -inch linear expansion for quiet operation.

JOINTS:

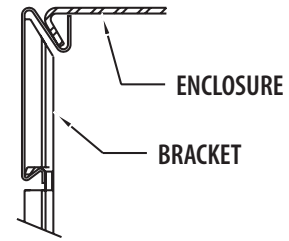
- Internal joggle joiners provide hairline joints without any external fasteners.

DAMPER:

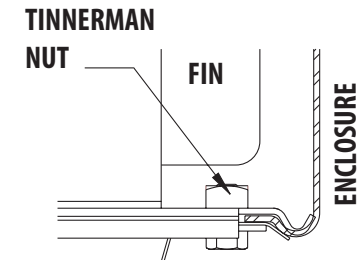
- (Optional) Durable knob, security tamper proof or aluminum slide available.
- Consult factory for 8-inch height.



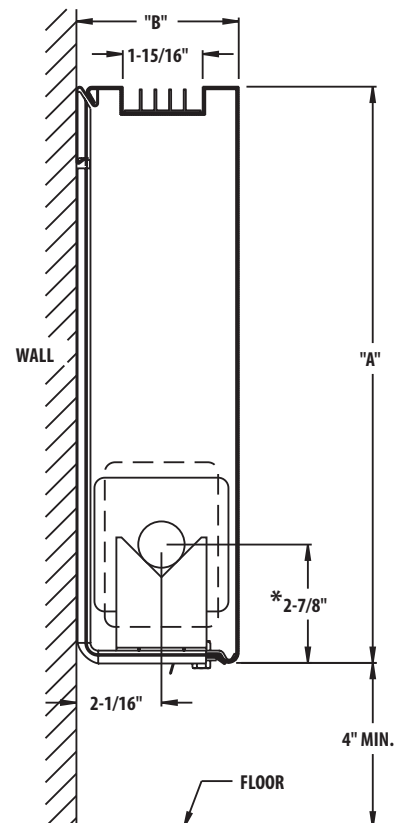
Cutaway view of IBG3 enclosure showing $3\frac{1}{4}" \times 3\frac{1}{4}"$ fin configuration.



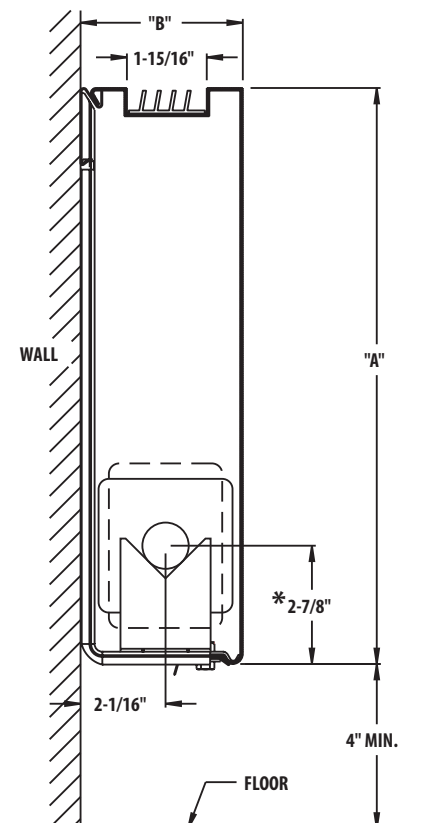
MOUNTING CHANNEL DETAIL



POSITIVE LOCKING BOTTOM MOUNTING CLIP DETAIL



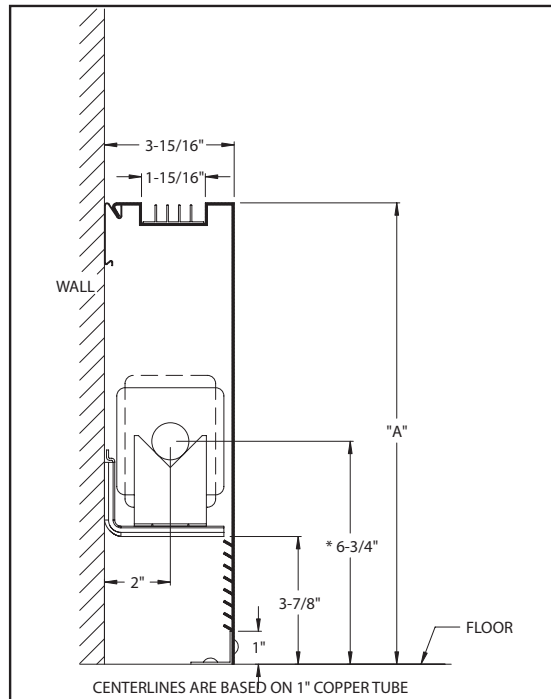
* CENTERLINES ARE BASED ON 1" COPPER TUBE



* CENTERLINES ARE BASED ON 1" COPPER TUBE

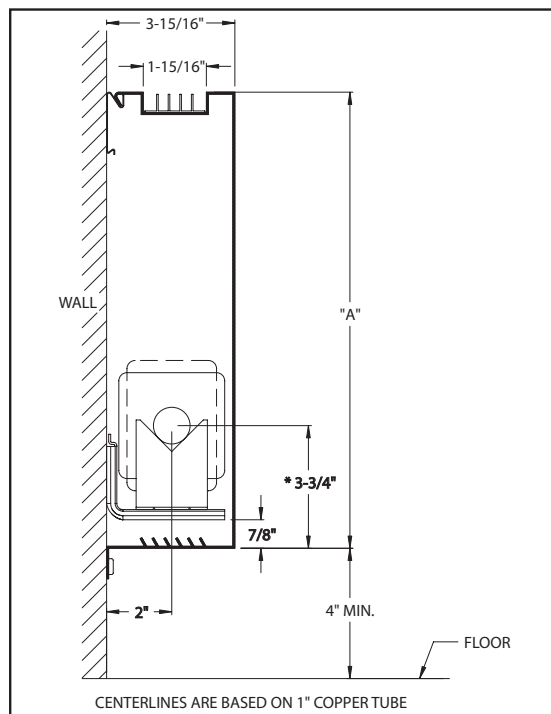
BG3				
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	$\frac{3}{4}"$, 1", $1\frac{1}{4}"$	$2\frac{3}{4}" \times 4"$	8"	$3\frac{5}{16}"$
$1"$, $1\frac{1}{4}"$	$\frac{3}{4}"$, 1", $1\frac{1}{4}"$	$3\frac{1}{4}" \times 3\frac{1}{4}"$	11"	14"

IBG3				
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	$\frac{3}{4}"$, 1", $1\frac{1}{4}"$	$2\frac{3}{4}" \times 4"$	8"	$3\frac{5}{16}"$
$1"$, $1\frac{1}{4}"$	$\frac{3}{4}"$, 1", $1\frac{1}{4}"$	$3\frac{1}{4}" \times 3\frac{1}{4}"$	11"	14"



BGVL3

PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	8"	3 15/16"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	11"	
			14"	



BGHL3

PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	8"	3 15/16"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	11"	
			14"	

BGVL3/BGHL3 LOW PROFILE

APPLICATION:

Rittling's Low Profile Bargrille Enclosure provides an attractive architectural design with a slimline appearance and a depth of less than 4 inches.

ENCLOSURE:

- 14- to 18-gauge CRS, phosphatized with painted finish.
- 1-foot to 8-foot lengths in 6-inch increments.
- Powder coated finish in decorator colors available.
- 8-inch, 11-inch or 14-inch standard heights.
- Custom heights from 6 inches to 36 inches available.
- Available in 18-gauge and 16-gauge stainless steel.

GRILLE:

- BG - Standard aluminum extrusion, etched finishes, pencilproof.
- IBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

ELEMENT:

- Steel or copper/aluminum.
- 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
- Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

MOUNTING:

- Mounting channel
- Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.
- Urethane gasket for air seal available.

HANGERS:

- 16-gauge Galvannealed steel.
- Slide cradle will accommodate 1 3/4"-inch linear expansion for quiet operation.

JOINTS:

- Internal joggle joiners provide hairline joints without any external fasteners.

DAMPER:

- (Optional) Durable knob or security tamper proof available.
- Consult factory for 8-inch height.

NOTE: To determine capacity ratings for BGVL3, BGHL3, derate BG3/IBG3 ratings by 12.5%.

IBGVL3/IBGHL3

LOW PROFILE

APPLICATION:
Rittling's Low Profile Bargrille Enclosure provides an attractive architectural design with a slimline appearance and a depth of less than 4 inches.

- ENCLOSURE:**
- 14- to 18-gauge CRS, phosphatized with painted finish.
 - 1-foot to 8-foot lengths in 6-inch increments.
 - Powder coated finish in decorator colors available.
 - 8-inch, 11-inch or 14-inch standard heights.
 - Custom heights from 6 inches to 36 inches available.
 - Available in 18-gauge and 16-gauge stainless steel.

- GRILLE:**
- BG - Standard aluminum extrusion, etched finishes, pencilproof.
 - IBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

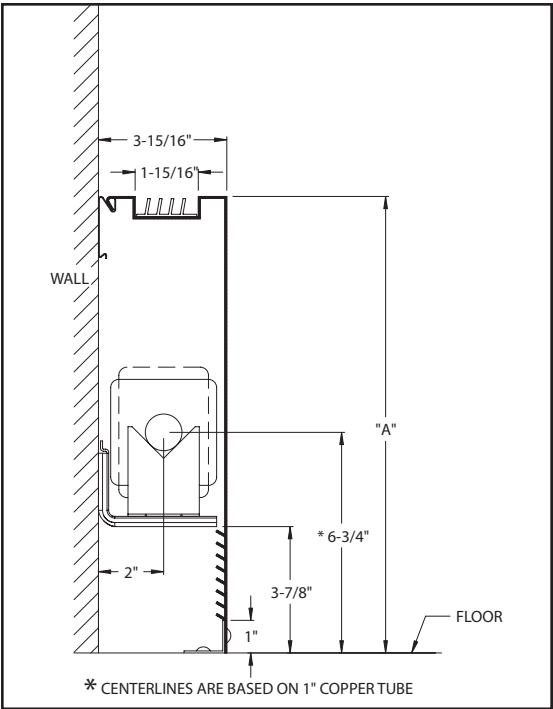
- ELEMENT:**
- Steel or copper/aluminum.
 - 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
 - Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

- MOUNTING:**
- Mounting channel
 - Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.
 - Urethane gasket for air seal available.

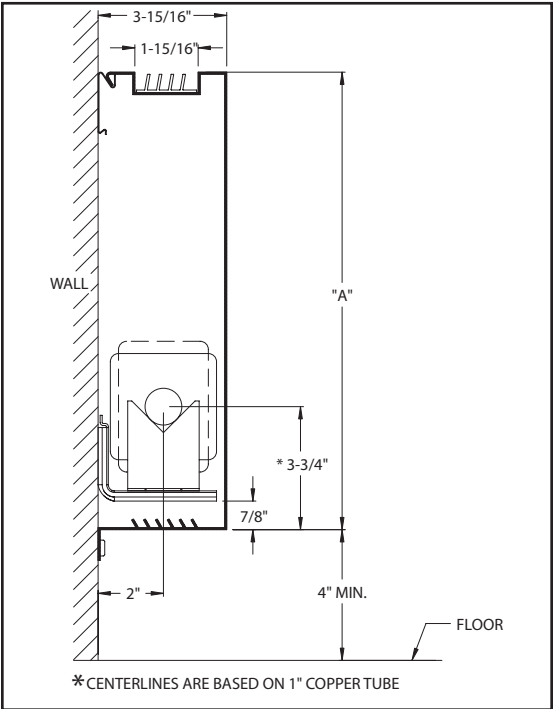
- HANGERS:**
- 16-gauge Galvannealed steel.
 - Slide cradle will accommodate 1 3/4 -inch linear expansion for quiet operation.

- JOINTS:**
- Internal joggle joiners provide hairline joints without any external fasteners.

- DAMPER:**
- (Optional) Durable knob or security tamper proof available.
 - Consult factory for 8-inch height.



IBGVL3				
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	8"	3 5/16"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	11"	
			14"	



IBGHL3				
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	8"	3 5/16"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	11"	
			14"	

NOTE: To determine capacity ratings for IBGVL3 and IBGHL3, derate BG3/IBG3 ratings by 12.5%.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

BG3/IBG3
LOW PROFILE

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft²/ft)	STEAM HEAT	HOT WATER HEAT			
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53

STEEL FINNED TUBING

1" DIA. STEEL	1S-3¼ X 3¼-32	1	8	12	3.20	770	600	530	470	410
		1	11	15	3.40	820	640	570	500	430
		1	14	18	3.50	840	660	580	510	450
		2	14	18	4.80	1150	900	790	700	610
	1S-3¼ X 3¼-40	1	8	12	3.50	840	660	580	510	450
		1	11	15	3.80	920	720	630	560	490
		1	14	18	4.00	960	750	660	590	510
		2	14	18	5.40	1300	1010	900	790	690
	1S-3¼ X 3¼-48	1	8	12	4.00	960	748	660	590	510
		1	11	15	4.30	1030	803	710	630	550
		1	14	18	4.50	1080	842	750	660	570
		2	14	18	6.10	1470	1146	1010	900	780
1¼" DIA. STEEL	1¼S-3¼ X 3¼-32	1	8	12	3.10	750	590	520	460	400
		1	11	15	3.30	800	620	550	490	420
		1	14	18	3.40	820	640	570	500	530
		2	14	18	4.70	1130	880	780	690	600
	1¼S-3¼ X 3¼-40	1	8	12	3.40	820	640	570	500	430
		1	11	15	3.80	900	700	620	550	480
		1	14	18	3.90	940	730	650	570	500
		2	14	18	5.30	1270	990	880	770	670
	1¼S-3¼ X 3¼-48	1	8	12	3.90	940	730	650	570	500
		1	11	15	4.20	1010	790	700	620	540
		1	14	18	4.40	1060	830	730	650	560
		2	14	18	6.00	1440	1120	990	880	760

COPPER FINNED TUBING

¾" DIA. COPPER	¾C-2¾ X 4-32	1	8	12	4.30	1030	800	710	630	540
		1	11	15	4.60	1100	860	760	670	580
		1	14	18	4.90	1170	910	810	710	620
		2	14	18	6.70	1600	1250	1110	980	850
	¾C-2¾ X 4-40	1	8	12	4.70	1130	880	780	690	600
		1	11	15	5.10	1220	950	840	740	650
		1	14	18	5.40	1290	1010	890	790	680
		2	14	18	9.30	2220	1230	1080	940	1176
	¾C-2¾ X 4-48	1	8	12	5.10	1220	950	840	740	650
		1	11	15	5.60	1340	1050	920	870	710
		1	14	18	5.90	1410	1100	970	860	750
		2	14	18	8.00	1930	1500	1330	1180	1020
1" DIA. COPPER	1C-2¾ X 4-32	1	8	12	4.20	1010	790	700	620	540
		1	11	15	4.50	1080	840	750	660	570
		1	14	18	4.80	1150	900	730	700	610
		2	14	18	6.60	1580	1230	1090	960	840
	1C-2¾ X 4-40	1	8	12	4.60	1110	870	770	680	590
		1	11	15	5.00	1200	940	830	730	640
		1	14	18	5.30	1270	990	880	770	670
		2	14	18	7.30	1750	1370	1210	1070	930
	1C-2¾ X 4-48	1	8	12	5.00	1200	940	830	730	640
		1	11	15	5.50	1320	1030	910	810	700
		1	14	18	5.80	1390	1080	960	850	740
		2	14	18	7.90	1900	1480	1310	1160	1010

*EDR - Equivalent
Direct Radiation area
(for steam heat)
per active (finned)
lineal foot of tube.

IMPORTANT RATING INFORMATION

- Guaranteed ratings based on:
- Installation at height shown. (Lower heights are not recommended; for greater heights refer to Table 1 on page 19.)
 - Entering air temperature of 65°F. (For other temperatures, refer to Table 2 or Table 3 on page 19.)
 - Steam at nominal 1 (actual 0.9) psig and 215°F. (For other conditions, refer to Table 2 on page 19.)
 - Water average temperature (°F) shown and velocity of 3 fps or more. (For lower velocities, see Figure 1 on page 20.)

(continued on next page)

Figure 1 on page 20 depicts the interrelations of water velocities, flow rates, pressure drops, and temperature drops with respect to total Btu requirements for all four tube diameters. Linear expansion of steel and copper finned tube with temperature is shown in Figure 4 on page 21.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

BG3/IBG3
LOW PROFILE

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft ² /ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

COPPER FINNED TUBING

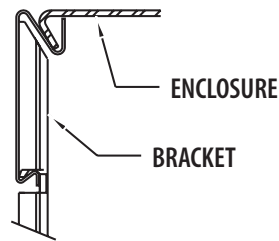
1 1/4" DIA. COPPER	1 1/4C-2 3/4 X 4-32	1	8	12	4.00	960	750	660	590	510
		1	11	15	4.30	1030	800	710	630	550
		1	14	18	4.60	1110	870	770	680	590
		2	14	18	6.30	1510	1180	1040	920	800
	1 1/4C-2 3/4 X 4-40	1	8	12	4.50	1080	840	750	660	570
		1	11	15	4.80	1150	900	790	700	610
		1	14	18	5.10	1220	950	840	740	650
		2	14	18	7.00	1680	1310	1160	1020	890
	1 1/4C-2 3/4 X 4-48	1	8	12	5.00	1180	920	810	720	630
		1	11	15	5.30	1270	990	880	770	670
		1	14	18	5.60	1340	1050	920	820	710
		2	14	18	7.70	1850	1440	1280	1130	980
3/4" DIA. COPPER	3/4C-3 1/4 X 3 1/4-32	1	8	12	4.10	980	760	680	600	520
		1	11	15	4.40	1050	820	720	640	560
		1	14	18	4.70	1130	880	780	690	600
		2	14	18	6.40	1540	1200	1060	940	820
	3/4C-3 1/4 X 3 1/4-40	1	8	12	4.50	1080	840	750	660	570
		1	11	15	4.90	1170	910	810	710	620
		1	14	18	5.10	1240	970	860	760	660
		2	14	18	7.10	1710	1330	1180	1040	910
	3/4C-3 1/4 X 3 1/4-48	1	8	12	5.00	1200	940	830	730	640
		1	11	15	5.40	1300	1010	900	790	690
		1	14	18	5.40	1370	1070	950	840	730
		2	14	18	7.90	1890	1480	1300	1150	1000
1" DIA. COPPER	1C-3 1/4 X 3 1/4-32	1	8	12	4.00	960	750	660	590	510
		1	11	15	4.30	1030	800	710	630	550
		1	14	18	4.60	1110	870	770	680	590
		2	14	18	6.30	1510	1180	1040	920	800
	1C-3 1/4 X 3 1/4-40	1	8	12	4.40	1060	830	730	650	560
		1	11	15	4.80	1150	900	790	700	610
		1	14	18	5.10	1220	950	840	740	650
		2	14	18	7.00	1680	1310	1160	1020	890
	1C-3 1/4 X 3 1/4-48	1	8	12	4.90	1180	920	810	720	630
		1	11	15	5.30	1270	990	880	770	670
		1	14	18	5.60	1340	1050	920	820	710
		2	14	18	7.70	1850	1440	1280	1130	980
1 1/4" DIA. COPPER	1 1/4C-3 1/4 X 3 1/4-32	1	8	12	3.50	850	660	590	520	450
		1	11	15	3.80	920	720	630	560	490
		1	14	18	4.00	960	750	660	590	510
		2	14	18	5.50	1320	1030	910	810	700
	1 1/4C-3 1/4 X 3 1/4-40	1	8	12	4.40	1060	830	730	650	560
		1	11	15	4.70	1130	880	780	690	600
		1	14	18	5.00	1200	940	830	730	640
		2	14	18	6.90	1660	1290	1150	1010	880
	1 1/4C-3 1/4 X 3 1/4-48	1	8	12	4.80	1150	900	790	700	610
		1	11	15	5.20	1250	980	860	760	660
		1	14	18	5.50	1320	1030	910	810	700
		2	14	18	7.50	1800	1400	1240	1100	950

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

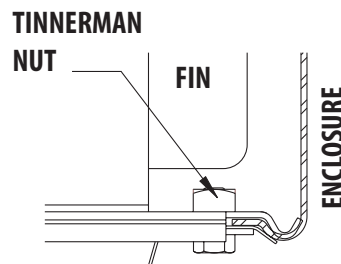
For important ratings information regarding above charts, see page 5.



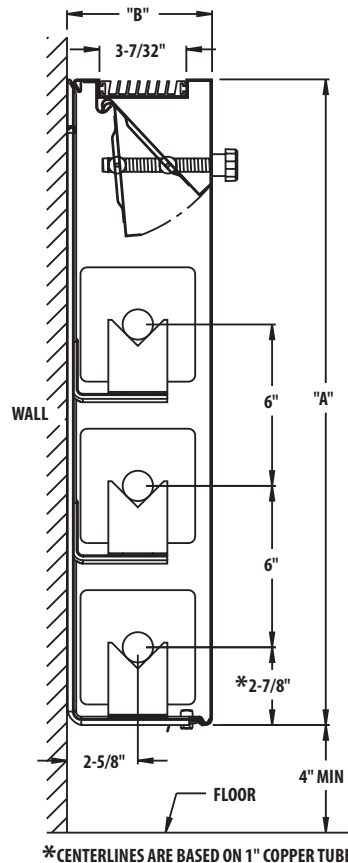
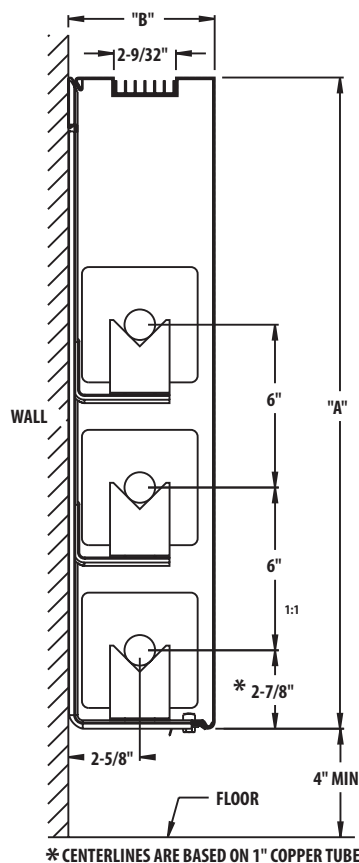
Cutaway view of IBG5 enclosure showing 4 1/4" x 4 1/4" fin configuration.



MOUNTING CHANNEL DETAIL



POSITIVE LOCKING BOTTOM MOUNTING CLIP DETAIL



BG5					IBG5				
PIPE SIZE		FIN SIZE	A	B	PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER				STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	14"		N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	14"	
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"	1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"
1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"		1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"	

BG5/IBG5 STANDARD

APPLICATION:

Rittling's Standard Bargrille Enclosures provide high output in an attractive architectural design with a depth of 5 3/8 inches.

ENCLOSURE:

- 14- to 18-gauge CRS, phosphatized with painted finish.
- 1-foot to 8-foot lengths in 6-inch increments.
- Powder coated finish in decorator colors available.
- 14-inch, 20-inch or 24-inch standard heights.
- Custom heights from 6 inches to 36 inches available.
- Available in 18-gauge and 16-gauge stainless steel.

GRILLE:

- BG - Standard aluminum extrusion, etched finishes, pencilproof.
- IBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

ELEMENT:

- Steel or copper/aluminum.
- 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
- Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

MOUNTING:

- Mounting channel
- Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.
- Urethane gasket for air seal available.

HANGERS:

- Self-gauging, snap fit, expansion cradle with positive-locking, bottom-mounting clip provide easy installation as well as security.
- 16-gauge Galvannealed steel.
- Slide cradle will accommodate 1 3/4 -inch linear expansion for quiet operation.

JOINTS:

- Internal joggle joiners provide hairline joints without any external fasteners.

DAMPER:

- (Optional) Durable knob, security tamper-proof or aluminum slide available.

BGVL5/BGHL5

STANDARD

APPLICATION:

Rittling's Standard Bargrille Enclosures provide high output in an attractive architectural design with a depth of 5³/₈ inches.

ENCLOSURE:

- 14- to 18-gauge CRS, phosphatized with painted finish.
- 1-foot to 8-foot lengths in 6-inch increments.
- Powder coated finish in decorator colors available.
- 14-inch, 20-inch or 24-inch standard heights.
- Custom heights from 6 inches to 36 inches available.
- Available in 18-gauge and 16-gauge stainless steel.

GRILLE:

- BG - Standard aluminum extrusion, etched finishes, pencilproof.
- IBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

ELEMENT:

- Steel or copper/aluminum.
- 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
- Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

MOUNTING:

- Mounting channel
- Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.
- Urethane gasket for air seal available.

HANGERS:

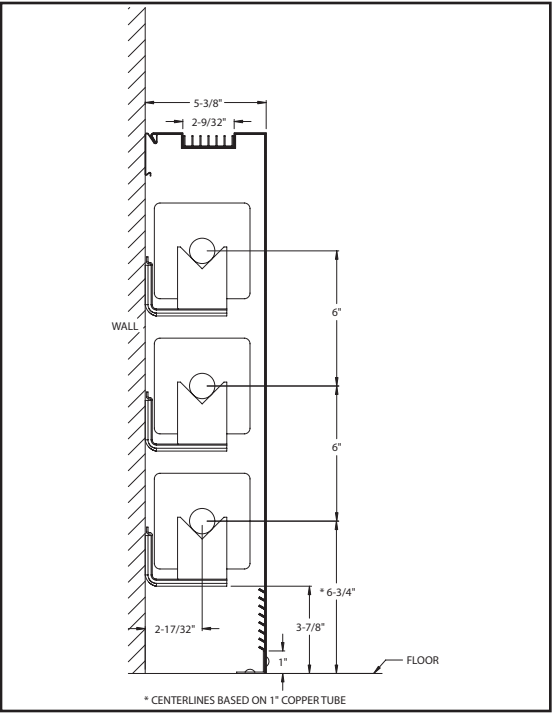
- 16-gauge Galvannealed steel.
- Slide cradle will accommodate 1³/₄-inch linear expansion for quiet operation.

JOINTS:

- Internal joggle joiners provide hairline joints without any external fasteners.

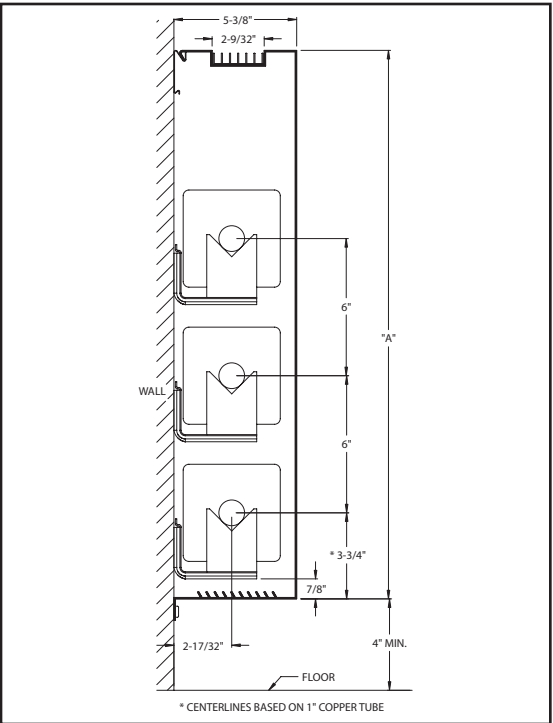
DAMPER:

- (Optional) Durable knob or security tamper-proof available.



BGVL5

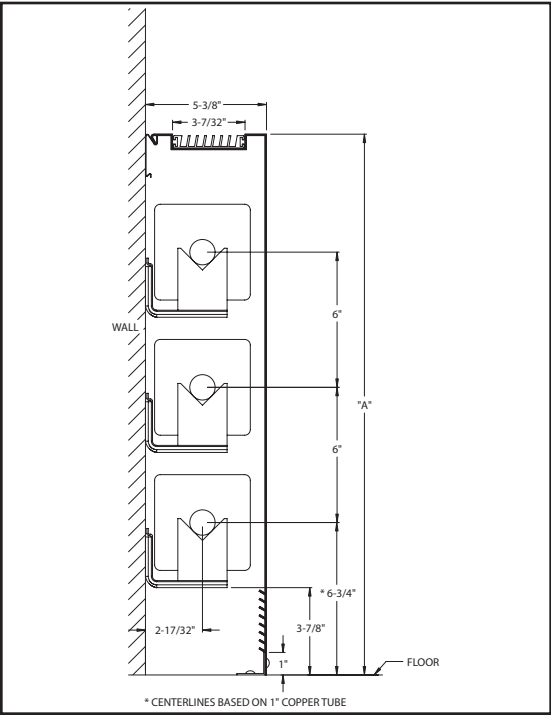
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	14"	5 3/8"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"
1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"	5 3/8"



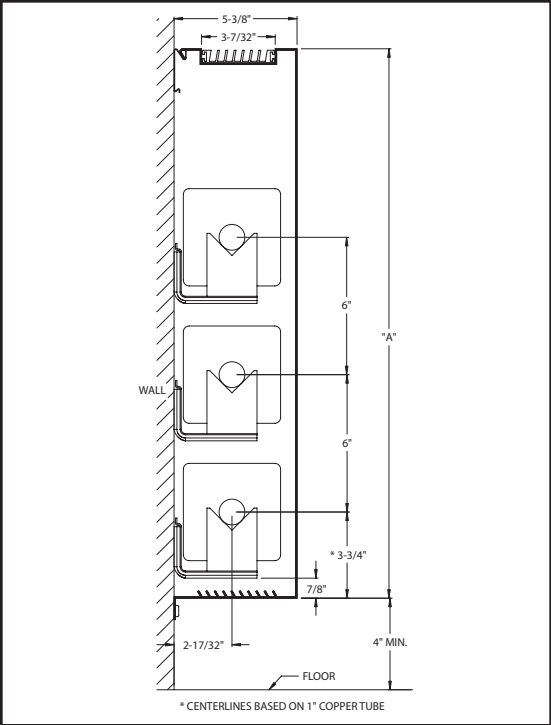
BGHL5

PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	14"	5 3/8"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"
1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"	5 3/8"

NOTE: To determine capacity ratings for BGVL5, BGHL5, derate BG5/IBG5 ratings by 12.5%.



IBGVL5				
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	14"	5 3/8"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"
1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"	5 3/8"



IBGHL5				
PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	14"	5 3/8"
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"
1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"	5 3/8"

IBGVL5/IBGHL5 STANDARD

APPLICATION:
Rittling's Standard Bargrille Enclosures provide high output in an attractive architectural design with a depth of 5 3/8 inches.

- ENCLOSURE:**
- 14- to 18-gauge CRS, phosphatized with painted finish.
 - 1-foot to 8-foot lengths in 6-inch increments.
 - Powder coated finish in decorator colors available.
 - 14-inch, 20-inch or 24-inch standard heights.
 - Custom heights from 6 inches to 36 inches available.
 - Available in 18-gauge and 16-gauge stainless steel.

- GRILLE:**
- BG - Standard aluminum extrusion, etched finishes, pencilproof.
 - IBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

- ELEMENT:**
- Steel or copper/aluminum.
 - 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
 - Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

- MOUNTING:**
- Mounting channel
 - Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.
 - Urethane gasket for air seal available.

- HANGERS:**
- 16-gauge Galvannealed steel.
 - Slide cradle will accommodate 1 3/4 -inch linear expansion for quiet operation.

- JOINTS:**
- Internal joggle joiners provide hairline joints without any external fasteners.

- DAMPER:**
- (Optional) Durable knob or security tamper-proof available.

NOTE: To determine capacity ratings for IBGVL5 and IBGHL5, derate BG5/IBG5 ratings by 12.5%.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

BG5/IBG5
STANDARD

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft ² /ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

STEEL FINNED TUBING

1" DIA. STEEL	1S-3¼ X 3¼-32	1	14	18	4.00	960	750	660	580	510
		1	20	24	4.10	980	760	680	600	520
		2	20	24	6.20	1490	1160	1030	910	790
		1	24	28	4.30	1030	800	710	630	540
		2	24	28	6.60	1570	1220	1080	960	830
		3	24	28	7.60	1820	1420	1250	1110	960
	1S-3¼ X 3¼-40	1	14	18	4.50	1080	840	740	660	570
		1	20	24	4.80	1150	900	790	700	610
		2	20	24	6.80	1640	1280	1130	1000	870
		1	24	28	5.00	1200	940	830	730	640
		2	24	28	7.10	1710	1330	1180	1040	910
		3	24	28	8.30	1980	1540	1370	1210	820
	1S-3¼ X 3¼-48	1	14	18	5.00	1200	940	830	730	640
		1	20	24	5.60	1350	1050	930	820	710
		2	20	24	7.80	1870	1460	1290	1140	990
		1	24	28	5.80	1400	1090	970	850	740
		2	24	28	7.80	1860	1450	1280	1130	980
		3	24	28	8.90	2130	1660	1470	1300	1130
1¼" DIA. STEEL	1¼S-3¼ X 3¼-32	1	14	18	3.90	940	730	650	570	500
		1	20	24	4.00	960	750	660	590	510
		2	20	24	6.10	1460	1140	1010	890	770
		1	24	28	4.20	1010	790	700	620	540
		2	24	28	6.40	1540	1200	1060	940	820
		3	24	28	7.40	1780	1390	1230	1090	940
	1¼S-3¼ X 3¼-40	1	14	18	4.40	1060	830	730	650	560
		1	20	24	4.70	1130	880	780	690	600
		2	20	24	6.70	1610	1260	1110	980	850
		1	24	28	4.90	1180	920	810	720	630
		2	24	28	7.00	1680	1310	1160	1020	890
		3	24	28	8.10	1940	1510	1340	1180	1030
	1¼S-3¼ X 3¼-48	1	14	18	4.90	1180	920	810	720	630
		1	20	24	5.50	1320	1030	910	810	700
		2	20	24	7.40	1780	1390	1230	1090	940
		1	24	28	5.70	1370	1070	950	840	730
		2	24	28	7.60	1820	1420	1260	1110	960
		3	24	28	8.70	2090	1630	1440	1270	1110

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

IMPORTANT RATING INFORMATION

- Guaranteed ratings based on:
- Installation at height shown. (Lower heights are not recommended; for greater heights refer to Table 1 on page 19.)
 - Entering air temperature of 65°F. (For other temperatures, refer to Table 2 or Table 3 on page 19.)
 - Steam at nominal 1 (actual 0.9) psig and 215°F. (For other conditions, refer to Table 2 on page 19.)
 - Water average temperature (°F) shown and velocity of 3 fps or more. (For lower velocities, see Figure 1 on page 20.)

Figure 1 on page 20 depicts the interrelations of water velocities, flow rates, pressure drops, and temperature drops with respect to total Btu requirements for all four tube diameters. Linear expansion of steel and copper finned tube with temperature is shown in Figure 4 on page 21.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

BG5/IBG5
STANDARD

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft ² /ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

STEEL FINNED TUBING

1" DIA. STEEL	1S-4¼ X 4¼-32	1	14	18	5.80	1400	1090	970	850	740
		1	20	24	6.10	1450	1130	1000	890	770
		2	20	24	9.00	2150	1630	1480	1310	1140
		1	24	28	6.10	1490	1160	1030	910	790
		2	24	28	9.40	2250	1760	1550	1370	1190
		3	24	28	10.10	2590	2020	1790	1580	1370
	1S-4¼ X 4¼-40	1	14	18	6.60	1570	1220	1080	960	830
		1	20	24	7.10	1690	1310	1170	1030	900
		2	20	24	9.90	2380	1860	1640	1450	1260
		1	24	28	7.20	1730	1350	1200	1060	920
		2	24	28	10.30	2470	1930	1700	1510	1310
		3	24	28	11.80	2840	2220	1960	1730	1510
	1S-4¼ X 4¼-48	1	14	18	7.30	1760	1370	1210	1070	930
		1	20	24	8.20	1960	1530	1350	1200	1040
		2	20	24	10.90	2620	2050	1810	1600	1390
		1	24	28	8.40	2010	1570	1390	1230	1070
		2	24	28	11.30	2710	2110	1870	1650	1440
		3	24	28	13.05	3130	2440	2160	1910	1660
1¼" DIA. STEEL	1¼S-4¼ X 4¼-32	1	14	18	5.70	1370	1070	950	840	730
		1	20	24	5.90	1420	1110	980	870	750
		2	20	24	8.80	2110	1650	1460	1290	1120
		1	24	28	6.10	1460	1140	1010	890	770
		2	24	28	9.20	2210	1720	1520	1350	1170
		3	24	28	10.60	2540	1980	1750	1550	1350
	1¼S-4¼ X 4¼-40	1	14	18	6.40	1540	1200	1060	940	820
		1	20	24	6.90	1660	1290	1150	1010	880
		2	20	24	9.70	2330	1820	1610	1420	1230
		1	24	28	7.10	1700	1330	1170	1040	900
		2	24	28	10.10	2420	1890	1670	1480	1280
		3	24	28	11.60	2780	2170	1920	1700	1470
	1¼S-4¼ X 4¼-48	1	14	18	7.20	1730	1350	1190	1060	920
		1	20	24	8.00	1920	1500	1320	1170	1020
		2	20	24	10.70	2570	2000	1770	1570	1360
		1	24	28	8.20	1970	1540	1360	1200	1040
		2	24	28	11.10	2660	2070	1840	1620	1410
		3	24	28	12.80	3070	2390	2120	1870	1630
2" DIA. STEEL	2S-4¼ X 4¼-32	1	14	18	5.70	1370	1070	950	840	730
		1	20	24	6.00	1430	1120	990	870	760
		2	20	24	8.60	2070	1610	1430	1260	1100
		1	24	28	6.10	1470	1150	1010	900	780
		2	24	28	8.90	2140	1670	1480	1310	1130
		3	24	28	10.20	2450	1910	1690	1490	1300
	2S-4¼ X 4¼-40	1	14	18	6.50	1560	1220	1080	950	830
		1	20	24	6.80	1630	1270	1120	990	860
		2	20	24	9.30	2230	1740	1540	1360	1180
		1	24	28	7.20	1730	1350	1190	1060	920
		2	24	28	9.80	2350	1830	1620	1430	1250
		3	24	28	11.30	2710	2110	1870	1650	1440
	2S-4¼ X 4¼-48	1	14	18	7.40	1780	1390	1230	1090	940
		1	20	24	7.70	1850	1440	1280	1130	980
		2	20	24	10.00	2400	1870	1660	1460	1270
		1	24	28	8.30	1990	1550	1370	1210	1050
		2	24	28	10.60	2540	1980	1750	1550	1350
		3	24	28	12.20	2930	2290	2020	1790	1550

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

(continued on next page)

For important ratings information regarding above charts, see page 10.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

BG5/IBG5
STANDARD

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft ² /ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

COPPER FINNED TUBING

3/4" DIA. COPPER	3/4C-2 3/4 X 4-32	1	14	18	5.30	1280	1000	890	780	680
		1	20	24	5.90	1400	1090	970	860	740
		2	20	24	7.70	1860	1450	1280	1130	990
		1	24	28	6.10	1470	1150	1010	900	780
		2	24	28	8.50	2050	1600	1410	1250	1090
		3	24	28	9.90	2360	1840	1630	1440	1260
	3/4C-2 3/4 X 4-40	1	14	18	5.90	1430	1120	990	880	760
		1	20	24	6.60	1590	1240	1100	970	840
		2	20	24	8.00	1930	1510	1330	1180	1020
		1	24	28	7.00	1690	1320	1170	1030	900
		2	24	28	9.00	2170	1690	1500	1330	1150
		3	24	28	10.50	2510	1960	1730	1530	1330
	3/4C-2 3/4 X 4-48	1	14	18	6.50	1570	1220	1080	960	830
		1	20	24	7.40	1790	1400	1240	1100	950
		2	20	24	8.40	2030	1590	1400	1240	1080
		1	24	28	7.80	1880	1470	1300	1150	1000
		2	24	28	9.50	2270	1770	1570	1390	1210
		3	24	28	10.90	2600	2030	1800	1590	1380
3/4" DIA. COPPER	3/4C-4 1/4 X 4 1/4-32	1	14	18	6.80	1620	1300	1120	990	860
		1	20	24	7.20	1720	1340	1190	1050	910
		2	20	24	10.60	2530	1970	1750	1540	1340
		1	24	28	7.50	1800	1400	1240	1100	950
		2	24	28	11.70	2810	2190	1940	1710	1490
		3	24	28	13.40	3210	2500	2210	1960	1700
	3/4C-4 1/4 X 4 1/4-40	1	14	18	7.90	1900	1482	1310	1160	1010
		1	20	24	8.60	2070	1610	1430	1260	1100
		2	20	24	11.60	2770	2160	1910	1690	1470
		1	24	28	9.00	2160	1680	1490	1320	1150
		2	24	28	12.60	3020	2360	2080	1840	1600
		3	24	28	14.50	3470	2710	2390	2120	1840
	3/4C-4 1/4 X 4 1/4-48	1	14	18	8.50	2040	1590	1410	1240	1080
		1	20	24	9.80	2340	1830	1610	1430	1240
		2	20	24	13.60	3270	2550	2260	1990	1730
		1	24	28	10.50	2510	1960	1730	1530	1330
		2	24	28	14.70	3520	2750	2430	2150	1870
		3	24	28	16.70	3940	3070	2720	2400	2090
1" DIA. COPPER	1C-2 3/4 X 4-32	1	14	18	5.30	1270	990	880	770	670
		1	20	24	5.80	1390	1080	960	850	740
		2	20	24	7.70	1850	1440	1280	1130	980
		1	24	28	6.10	1460	1140	1010	890	770
		2	24	28	8.50	2040	1590	1410	1240	1080
		3	24	28	9.80	2350	1830	1620	1430	1250
	1C-2 3/4 X 4-40	1	14	18	5.90	1420	1110	980	870	750
		1	20	24	6.60	1580	1230	1090	960	840
		2	20	24	8.00	1920	1500	1320	1170	1020
		1	24	28	7.00	1680	1310	1160	1020	890
		2	24	28	9.00	2160	1680	1490	1320	1140
		3	24	28	10.40	2500	1950	1730	1530	1330
	1C-2 3/4 X 4-48	1	14	18	6.50	1560	1190	1070	950	830
		1	20	24	7.40	1780	1390	1230	1090	940
		2	20	24	8.40	2020	1580	1390	1230	1070
		1	24	28	7.80	1870	1460	1290	1140	990
		2	24	28	9.40	2260	1760	1560	1380	1200
		3	24	28	10.80	2590	2020	1790	1580	1370

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

For important ratings information regarding above charts, see page 10.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

BG5/IBG5
STANDARD

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft ² /ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

COPPER FINNED TUBING

1" DIA. COPPER	1C-4¼ X 4¼-32	1	14	18	6.60	1590	1240	1100	970	850
		1	20	24	7.00	1690	1320	1200	1030	900
		2	20	24	10.40	2480	1930	1710	1510	1310
		1	24	28	7.30	1760	1370	1220	1070	930
		2	24	28	11.50	2750	2150	1900	1680	1460
		3	24	28	13.20	3150	2460	2170	1920	1670
	1C-4¼ X 4¼-40	1	14	18	7.70	1860	1450	1280	1130	990
		1	20	24	8.40	2030	1580	1400	1240	1080
		2	20	24	11.40	2720	2120	1880	1660	1440
		1	24	28	8.80	2120	1650	1460	1290	1120
		2	24	28	12.40	2960	2310	2040	1810	1570
		3	24	28	14.20	3400	2650	2350	2070	1800
	1C-4¼ X 4¼-48	1	14	18	8.30	2000	1560	1380	1220	1060
		1	20	24	9.60	2290	1790	1580	1400	1210
		2	20	24	13.40	3210	2500	2210	1960	1700
		1	24	28	10.30	2460	1920	1700	1700	1300
		2	24	28	14.40	3450	2690	2380	2100	1830
		3	24	28	16.10	3860	3010	2670	2350	2050
1¼" DIA. COPPER	1¼C-2¾ X 4-32	1	14	18	5.10	1220	950	840	740	650
		1	20	24	5.70	1370	1070	950	840	730
		2	20	24	7.60	1820	1420	1260	1110	960
		1	24	28	6.00	1440	1120	990	880	760
		2	24	28	8.40	2020	1580	1390	1230	1070
		3	24	28	9.70	2330	1820	1610	1420	1230
	1¼C-2¾ X 4-40	1	14	18	5.70	1370	1070	950	840	730
		1	20	24	6.40	1540	1200	1060	940	820
		2	20	24	7.90	1900	1480	1310	1160	1010
		1	24	28	6.90	1660	1290	1150	1010	880
		2	24	28	8.90	2140	1670	1480	1310	1130
		3	24	28	10.20	2450	1910	1690	1490	1300
	1¼C-2¾ X 4-48	1	14	18	6.40	1540	1200	1060	940	820
		1	20	24	7.30	1750	1370	1210	1070	930
		2	20	24	8.30	1990	1550	1370	1210	1050
		1	24	28	7.70	1850	1440	1280	1130	980
		2	24	28	9.30	2230	1740	1540	1360	1180
		3	24	28	10.70	2570	2000	1770	1510	1360
1½" DIA. COPPER	1½C-4¼ X 4¼-32	1	14	18	6.60	1580	1230	1090	960	840
		1	20	24	7.00	1680	1310	1160	1020	890
		2	20	24	10.30	2470	1920	1700	1510	1310
		1	24	28	7.30	1750	1360	1200	1070	930
		2	24	28	11.40	2740	2140	1890	1670	1450
		3	24	28	13.10	3140	2450	2170	1920	1660
	1½C-4¼ X 4¼-40	1	14	18	7.70	1850	1440	1280	1130	980
		1	20	24	8.40	2020	1570	1390	1230	1070
		2	20	24	11.30	2710	2110	1870	1650	1440
		1	24	28	8.80	2110	1640	1460	1290	1120
		2	24	28	12.30	2950	2300	2040	1800	1560
		3	24	28	14.10	3380	2640	2330	2060	1790
	1½C-4¼ X 4¼-48	1	14	18	8.25	1980	1540	1370	1210	1050
		1	20	24	9.50	2280	1780	1570	1390	1210
		2	20	24	13.25	3180	2480	2190	1940	1690
		1	24	28	10.10	2410	1880	1660	1470	1280
		2	24	28	14.10	3380	2640	2332	2060	1790
		3	24	28	15.80	3780	2950	2610	2310	2000

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

(continued on next page)

For important ratings information regarding above charts, see page 10.

PBG/PIBG PEDESTAL

APPLICATION:

Rittling's Pedestal Bargrille Enclosure offers a slimline appearance in a strong floor mounted enclosure.

ENCLOSURE:

- 14- to 18-gauge CRS, phosphatized with painted finish.
- 1-foot to 8-foot lengths in 6-inch increments.
- Powder coated finish in decorator colors available.
- Available in 18-gauge and 16-gauge stainless steel.
- One-row, two-row high, two-row wide or many other custom configurations available.

GRILLE:

- PBG - Standard aluminum extrusion, etched finishes, pencilproof.
- PIBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

ELEMENT:

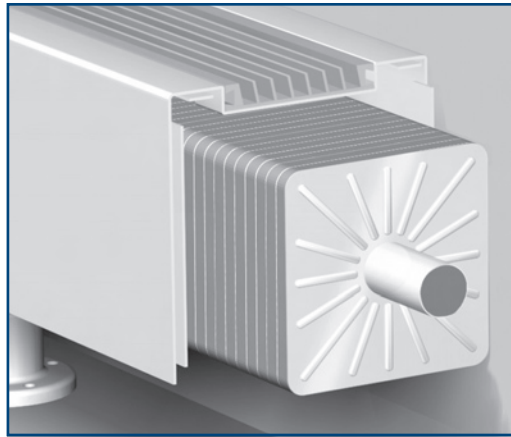
- Steel or copper/aluminum.
- 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
- Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

MOUNTING:

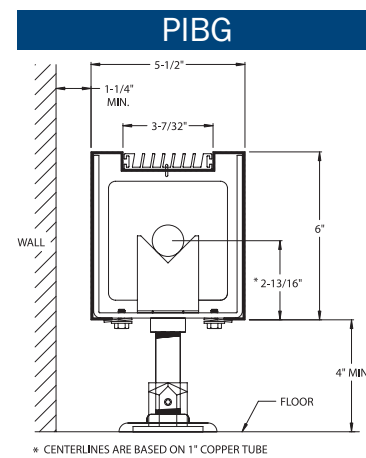
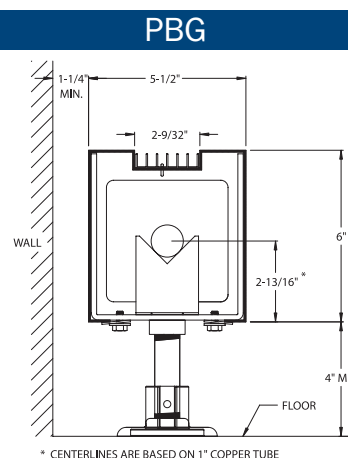
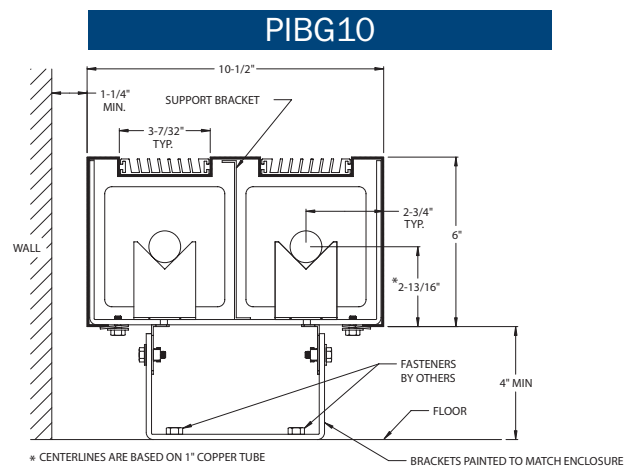
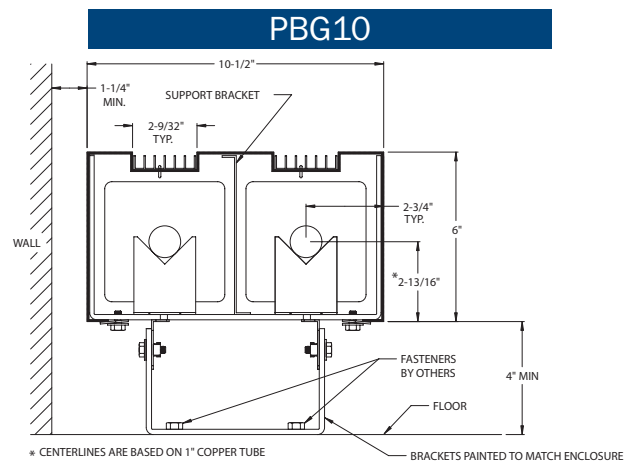
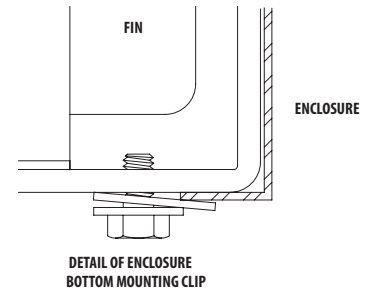
- Standard 3/4" pedestal with floor flange.
- 3/16" x 1 1/2" U-shaped bottom bracket for 2-row application.
- Cast aluminum floor flange with setscrew adjustment (optional).
- Enclosure mounts to a cradle type expansion bracket with positive-locking, bottom mounting clip to provide easy installation and security.

JOINTS:

- Internal joggle joiners provide hairline joints without any external fasteners.



Cutaway view of PIBG enclosure showing 4 1/4" x 4 1/4" fin configuration.



GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

PBG/PIBG
PEDESTAL

FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft ² /ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

STEEL FINNED TUBING

1" DIA. STEEL	1S-3¼ X 3¼-32	1	6	10	3.80	910	710	630	560	480
		2W	6	10	6.90	1660	1290	1150	1010	880
		2H	12	16	5.70	1360	1060	940	830	720
	1S-3¼ X 3¼-40	1	6	10	4.10	980	770	680	600	520
		2W	6	10	7.20	1730	1350	1190	1060	920
		2H	12	16	6.20	1480	1160	1020	900	790
	1S-3¼ X 3¼-48	1	6	10	4.40	1050	820	720	640	560
		2W	6	10	8.00	1910	1490	1320	1170	1010
		2H	12	16	6.60	1570	1230	1080	960	830
1¼" DIA. STEEL	1¼S-3¼ X 3¼-32	1	6	10	3.70	890	700	610	540	470
		2W	6	10	6.80	1630	1270	1120	990	860
		2H	12	16	5.60	1330	1040	920	810	700
	1¼S-3¼ X 3¼-40	1	6	10	4.00	960	750	660	590	510
		2W	6	10	7.10	1700	1330	1170	1040	900
		2H	12	16	6.10	1450	1130	1000	880	770
	1¼S-3¼ X 3¼-48	1	6	10	4.30	1030	800	710	630	550
		2W	6	10	7.80	1870	1460	1290	1140	990
		2H	12	16	6.40	1540	1200	1060	940	820
1" DIA. STEEL	1S-4¼ X 4¼-32	1	6	10	5.30	1280	1000	880	780	680
		2W	6	10	9.80	2350	1830	1620	1430	1250
		2H	12	16	7.50	1800	1400	1240	1100	950
	1S-4¼ X 4¼-40	1	6	10	5.60	1330	1040	920	810	700
		2W	6	10	10.40	2500	1950	1730	1530	1030
		2H	12	16	8.00	1980	1540	1310	1210	1050
	1S-4¼ X 4¼-48	1	6	10	6.10	1470	1150	1010	900	780
		2W	6	10	11.20	2690	2100	1860	1640	1430
		2H	12	16	8.80	2120	1650	1460	1290	1120
1¼" DIA. STEEL	1¼S-4¼ X 4¼-32	1	6	10	5.20	1250	980	860	760	660
		2W	6	10	9.60	2300	1790	1590	1400	1220
		2H	12	16	7.30	1760	1370	1210	1070	930
	1¼S-4¼ X 4¼-40	1	6	10	5.40	1300	1010	900	790	690
		2W	6	10	10.20	2450	1910	1690	1490	1390
		2H	12	16	8.10	1940	1510	1340	118	1030
	1¼S-4¼ X 4¼-48	1	6	10	6.00	1440	1120	990	880	760
		2W	6	10	11.00	2640	2060	1820	1610	1400
		2H	12	16	8.70	2080	1620	1440	1270	1100

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

+Contact factory when ordering 1¼" copper, 1" steel and 1¼" steel elements to ensure proper fit up inside the enclosure.

IMPORTANT RATING INFORMATION

Guaranteed ratings based on:

- Installation at height shown. (Lower heights are not recommended; for greater heights refer to Table 1 on page 19.)
- Entering air temperature of 65°F. (For other temperatures, refer to Table 2 or Table 3 on page 19.)
- Steam at nominal 1 (actual 0.9) psig and 215°F. (For other conditions, refer to Table 2 on page 19.)
- Water average temperature (°F) shown and velocity of 3 fps or more. (For lower velocities, see Figure 1 on page 20.)

Figure 1 on page 20 depicts the interrelations of water velocities, flow rates, pressure drops, and temperature drops with respect to total Btu requirements for all four tube diameters. Linear expansion of steel and copper finned tube with temperature is shown in Figure 4 on page 21.

GUARANTEED RATINGS

In btu/hr per active (finned) lineal foot of tube at entering air temperature of 65° F

PBG/PIBG

PEDESTAL

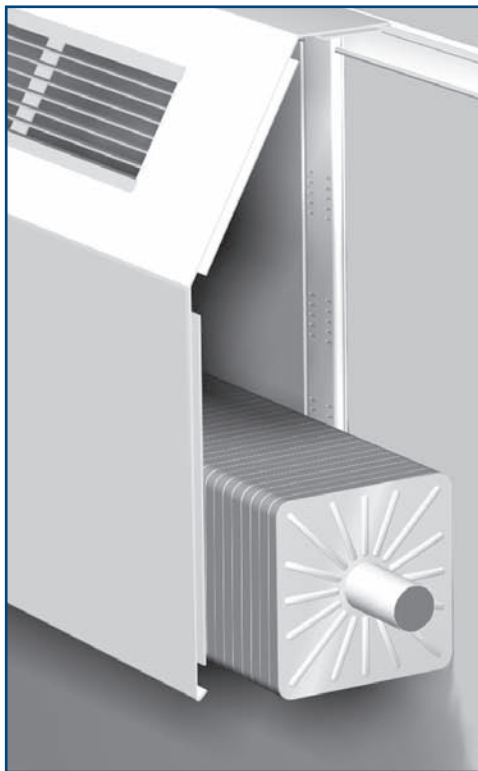
FINNED TUBE MODEL	Rows Of Finned Tube (On 6-inch Centers)	Enclosure Height (in inches)	Recommended Minimum Installed Height (in inches)	EDR* (ft²/ft)	STEAM HEAT	HOT WATER HEAT				
					215° Factor of 1.00	190° Factor of 0.78	180° Factor of 0.69	170° Factor of 0.61	160° Factor of 0.53	

COPPER FINNED TUBING

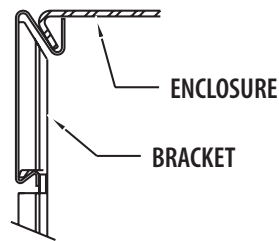
3/4" DIA. COPPER	3/4 C-2 3/4 X 4-32	1	6	10	3.70	900	700	620	550	480
		2W	6	10	7.00	1680	1310	1150	1020	890
		2H	12	16	6.70	1610	1260	1110	980	850
	3/4 C-2 3/4 X 4-40	1	6	10	4.00	970	760	670	590	510
		2W	6	10	7.40	1770	1380	1220	1080	940
		2H	12	16	7.10	1710	1330	1180	1040	910
	3/4 C-2 3/4 X 4-48	1	6	10	4.30	1040	810	720	630	550
		2W	6	10	7.90	1890	1470	1300	1150	1000
		2H	12	16	7.50	1790	1400	1240	1090	950
1" DIA. COPPER	1C-2 3/4 X 4-32	1	6	10	3.70	890	690	610	540	470
		2W	6	10	6.90	1660	1290	1150	1010	880
		2H	12	16	6.60	1570	1220	1080	960	830
	1C-2 3/4 X 4-40	1	6	10	4.00	960	750	660	590	510
		2W	6	10	7.30	1750	1370	1210	1070	930
		2H	12	16	6.90	1660	1290	1150	1010	880
	1C-2 3/4 X 4-48	1	6	10	4.30	1030	800	710	630	550
		2W	6	10	7.80	1870	1460	1290	1140	990
		2H	12	16	7.20	1730	1350	1190	1060	920
1 1/4" DIA. COPPER	1 1/4 C-2 3/4 X 4-32	1	6	10	3.70	890	690	610	540	470
		2W	6	10	6.90	1660	1290	1150	1010	880
		2H	12	16	6.60	1590	1240	110	970	840
	1 1/4 C-2 3/4 X 4-40	1	6	10	4.00	960	750	660	590	510
		2W	6	10	7.30	1750	1370	1210	1070	930
		2H	12	16	7.10	1710	1330	1180	1040	910
	1 1/4 C-2 3/4 X 4-48	1	6	10	4.20	1010	790	700	620	540
		2W	6	10	7.70	1850	1440	1280	1130	980
		2H	12	16	7.20	1730	1350	1190	1060	920
3/4" DIA. COPPER	3/4 C-4 1/4 X 4 1/4 -32	1	6	10	5.10	1230	960	850	750	650
		2W	6	10	9.60	2300	1790	1590	1400	1220
		2H	12	16	9.40	2260	1760	1560	1380	1200
	3/4 C-4 1/4 X 4 1/4 -40	1	6	10	5.80	1380	1080	950	840	730
		2W	6	10	10.50	2520	1970	1740	1540	1340
		2H	12	16	10.05	2410	1880	1600	1470	1280
	3/4 C-4 1/4 X 4 1/4 -48	1	6	10	6.90	1650	1290	1140	1010	880
		2W	6	10	12.70	3040	2370	2100	1850	1610
		2H	12	16	10.30	2470	1930	1700	1510	1310
1" DIA. COPPER	1C-4 1/4 X 4 1/4 -32	1	6	10	5.10	1210	940	830	740	640
		2W	6	10	9.40	2250	1760	1550	1370	1190
		2H	12	16	9.30	2220	1730	1530	1360	1180
	1C-4 1/4 X 4 1/4 -40	1	6	10	5.70	1350	1050	930	820	720
		2W	6	10	10.30	2470	1930	1700	1510	1310
		2H	12	16	9.80	2360	1840	1630	1440	1250
	1C-4 1/4 X 4 1/4 -48	1	6	10	6.80	1620	1260	1120	990	860
		2W	6	10	12.40	2980	2320	2060	1820	1580
		2H	12	16	10.09	2420	1890	1670	1480	1280
1 1/4" DIA. COPPER	1 1/4 C-4 1/4 X 4 1/4 -32	1	6	10	5.00	1200	940	830	730	640
		2W	6	10	9.30	2230	1740	1540	1360	1180
		2H	12	16	9.10	2180	1700	1500	1330	1160
	1 1/4 C-4 1/4 X 4 1/4 -40	1	6	10	5.60	1340	1050	930	820	710
		2W	6	10	10.20	2450	1910	1690	1490	1300
		2H	12	16	9.70	2330	1820	1610	1420	1230
	1 1/4 C-4 1/4 X 4 1/4 -48	1	6	10	6.70	1610	1260	1110	980	850
		2W	6	10	12.3	2950	2300	2040	1800	1560
		2H	12	16	9.90	2380	1860	1640	1450	1260

*EDR - Equivalent Direct Radiation area (for steam heat) per active (finned) lineal foot of tube.

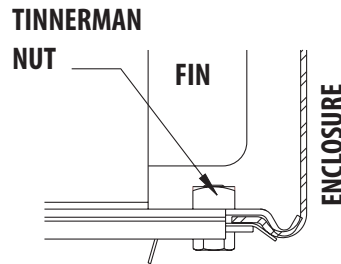
For important ratings information regarding above charts, see page 15.



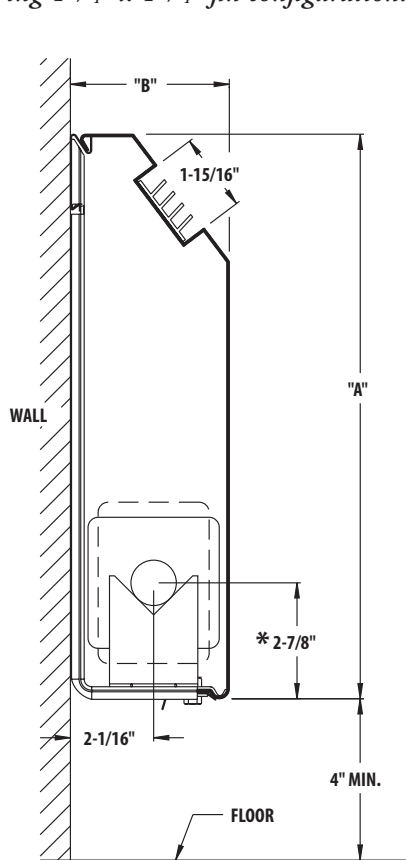
Cutaway view of SIBG5 enclosure showing 4 1/4" x 4 1/4" fin configuration.



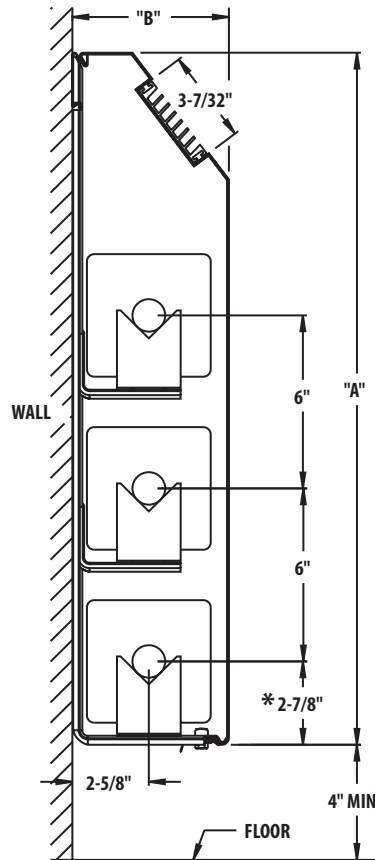
MOUNTING CHANNEL DETAIL



POSITIVE LOCKING BOTTOM MOUNTING CLIP DETAIL



* CENTERLINES ARE BASED ON 1" COPPER TUBE



* CENTERLINES ARE BASED ON 1" COPPER TUBE

** For ratings use FS equivalent

SIBG3					SIBG5				
PIPE SIZE		FIN SIZE	A	B	PIPE SIZE		FIN SIZE	A	B
STEEL	COPPER				STEEL	COPPER			
N/A	3/4", 1", 1 1/4"	2 3/4" X 4"	8"	3 15/16"	N/A	1", 1 1/4"	2 3/4" X 4"	14"	
1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	11"	14"	1", 1 1/4"	3/4", 1", 1 1/4"	3 1/4" X 3 1/4"	20"	5 3/8"
					1", 1 1/4", 2"	3/4", 1", 1 1/4"	4 1/4" X 4 1/4"	24"	

SBG/SIBG SLOPE TOP

APPLICATION:

Rittling's Slope Top Bargrille Enclosures provide strong contemporary styling and high output. Available in both standard (5 3/8" depth) and low profile (3 15/16" depth) models.

ENCLOSURE:

- 14- to 18-gauge CRS, phosphatized with painted finish.
- 1-foot to 8-foot lengths in 6-inch increments.
- Powder coated finish in decorator colors available.
- Available in 18-gauge and 16-gauge stainless steel.
- 8-inch, 11-inch, 14-inch, (3-15/16" depth), 20-inch or 24-inch (5-3/8" depth) standard heights.
- Custom heights from 6 inches to 36 inches available.

GRILLE:

- SBG - Standard aluminum extrusion, etched finishes, pencilproof.
- SIBG - Heavy-duty aluminum extrusion, R-204 clear anodized finish, 15° grille deflection, pencilproof.

ELEMENT:

- Steel or copper/aluminum.
- 1-foot to 12-foot lengths in 6-inch increments. (10-foot maximum length for steel.)
- Galvanized fins .032 inches thick, aluminum fins .016 inches thick.

MOUNTING:

- Mounting channel
- Optional 20-gauge Galvannealed steel (18-gauge available) full back panel.
- Urethane gasket for air seal available.

HANGERS:

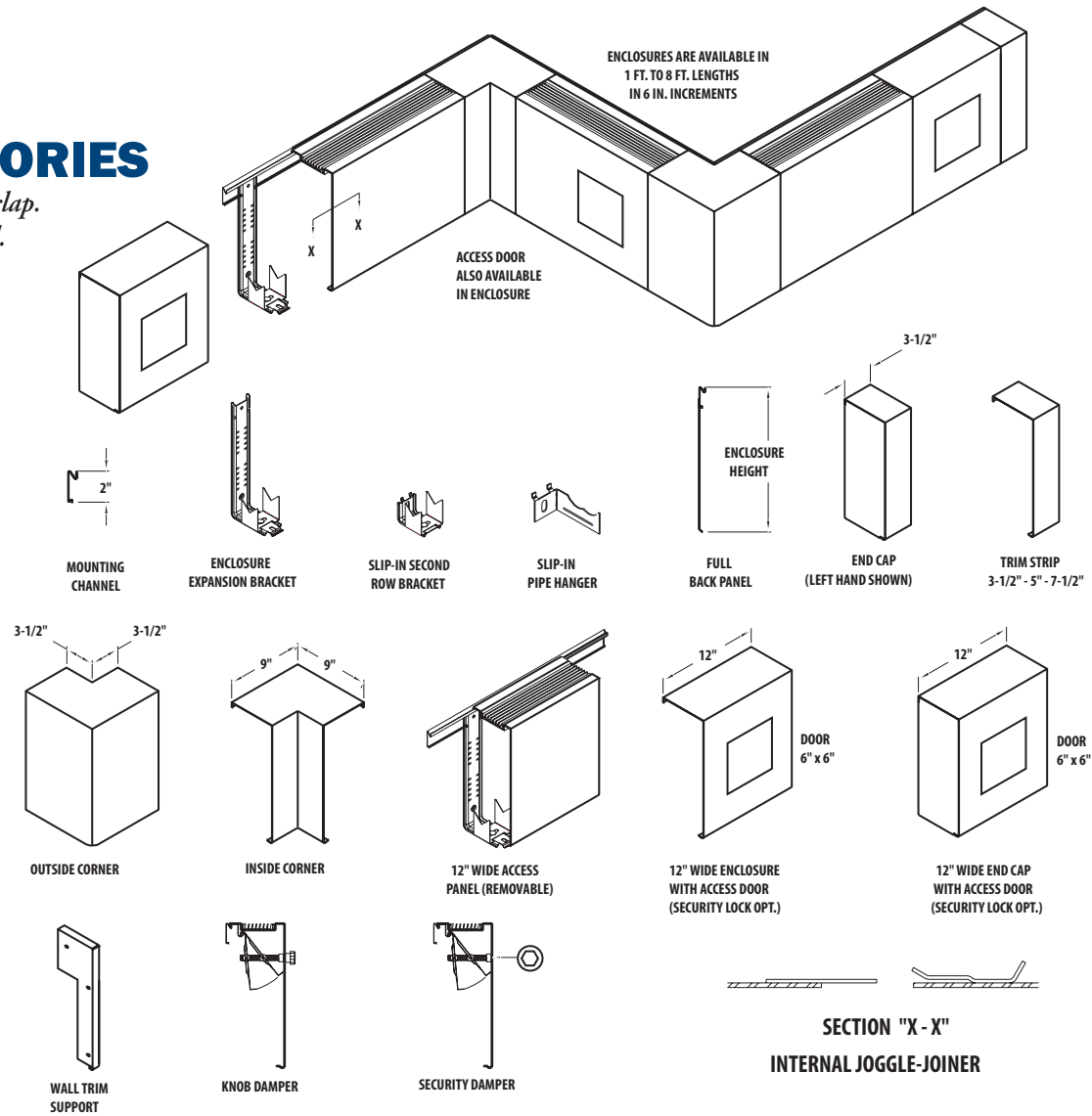
- Self-gauging, snap fit, expansion cradle with positive-locking, bottom-mounting clip provide easy installation as well as security.
- 16-gauge Galvannealed steel.
- Slide cradle will accommodate 1 3/4 -inch linear expansion for quiet operation.

JOINTS:

- Internal joggle joiners provide hairline joints without any external fasteners.

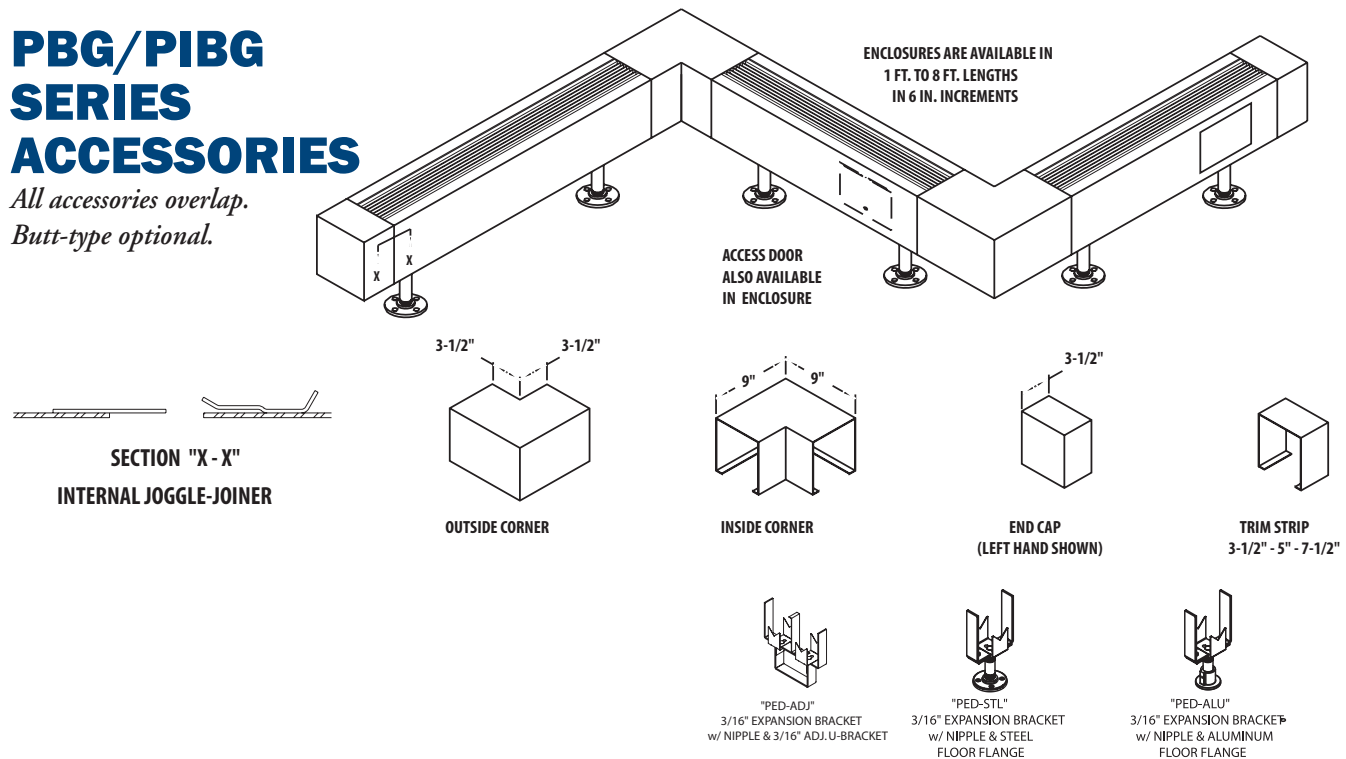
BG/IBG SERIES ACCESSORIES

All accessories overlap.
Butt-type optional.



PBG/PIBG SERIES ACCESSORIES

All accessories overlap.
Butt-type optional.



Dover High School
Dover, NH

Equipment Cuts
Convectors





Convectors

STEAM AND HOT WATER RADIATION

Convectors



Sterling Convectors are engineered for both forced hot water and two-pipe steam heating system installation with heating elements of lightweight non-ferrous construction. They are available in (7) basic types to meet a wide range of heating applications in institutional buildings, hospitals, hotels, office buildings, schools, apartments and other structures. A variety of cabinet enclosure styles permits the selection of an attractive and functional installation to blend with any building interior — modern or traditional.

Designed for maximum flexibility of installation arrangement, Sterling Convectors are available in free-standing, semi-recessed, wall hung and fully recessed models. Enclosures are formed from heavy-gauge steel, and finished in prime coat for complete protection against corrosion during shipment and providing a base for final finish to meet architectural requirements after installation.

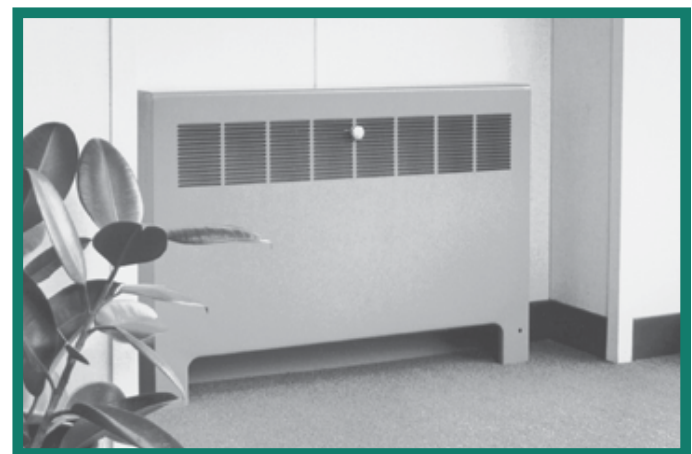
All of Sterling's commercial hydronic products are made from recycled materials. Material recycled contents can be obtained from your local Sterling representative or by viewing the www.sterlingheat.com website. Sterling is a participating member of USGBC-LEEDS.

End Pockets — End pockets may be provided at each or either end of Sterling institutional convectors to protect and conceal valves, traps and piping. A left-hand end pocket is illustrated. The liner is extended and a baffle welded to the back of the liner. The cabinet front is extended and grille is offset in length to line up with heating element. Length of end pocket is determined by using a standard element. Specify right or left hand. Available in 4" increments only. One end pocket only on 64" long units. No end pockets available on SR-A or RF-A 64" units.

Note: Fronts and liners increase in length but the coil length remains the same.

Access Doors — Access Doors (4 1/4" square) may be provided in the front panel of the convectors for inspection or operation of valves, traps, or air vents. These doors are hinged on top. Concealed 1/4 turn locking device is provided with an Allen-head operator. Access doors are available in the standard locations illustrated. For units 24" or less in height, not all positions are available, consult factory. No access doors available in 14" high units. See table 5 on page 12 for derating factors.

Heating Elements — Heating elements are available in three nominal depths - 4" with 2-tube element, 6" with 3-tube element, 8" with 4-tube element. Fins of .010" aluminum have integral



collars to assure uniform spacing. Tubes are mechanically expanded into collars to permit maximum heat transfer. Both headers are cast brass with single - 3/4" NPT tappings. A dual top and bottom 3/4" tapped header is available. This option allows for supply and return piping to come from the top or bottom. Combined with the standard single header, piping direction is no longer a problem. Heating element assembly is protected by formed shield plates front and back running the entire length of element, and supported in enclosure by a welded bracket to eliminate strain on piping or element.

Convectors

Tamper-Resistant Fasteners — Our Convectors are provided with friction fit slip joiners. Hex Head Locks, to fasten fronts securely may be provided on special applications.

Concealed Fasteners — are available with Hex-head operator. Head of operator recessed 1/8" inside cabinet. Fastener engages keeper, spot welded to inside of liner.

Damper — The assembly consists of a triple lead screw and a heavy gauge damper blade, flanged top and bottom for additional rigidity, that covers the entire louvered area of the enclosure.

Damper assemblies are available with either a knob operator or a tamper resistant operator which is simply operated with a hex key. The later is particularly valuable in school or institutional work where only supervisory operation is desired.

Institutional convectors are specially constructed to satisfy the requirements of strength and safety demanded by institutional building application.

Heavy Gauge Steel — To withstand the abuse often received on this type of application, institutional convectors are available in heavy gauge steel upon specific request. (Front and back available in 18, 16 and 14 gauge)

Non-Standard Sizes — Sizes other than standard can be provided for institutional buildings. Please consult factory with requirements.

Perforated Outlet and/or Inlet — Consult factory for unit styles offered with 14-gauge perforated front panels.



Standard Fastener for Recessed Units



**Knob Operated
Damper Option**



**Institutional
Damper Operator**

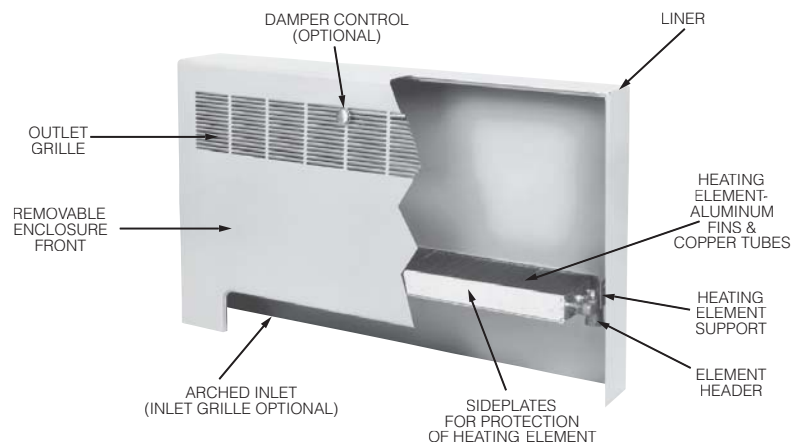
Dual Inlet Header — Allows piping from either top or bottom.

Insulation — 1/2" thick fiber-glass insulation is available on convector backs, or sides and tops for special application. (Top does not apply to sloping models)

Special Finish — All our Convectors are thoroughly cleaned after fabrication and provided with a high quality baked enamel prime coat paint. As an option, cabinet may be finished in one of the standard Convector colors also in baked enamel.

ENCLOSURES

Features of enclosure construction are shown below. Note that the element support provides a simple and inexpensive means of leveling the heating element or giving it an appropriate pitch for steam installation. Enclosures are formed steel with front of 18-gauge, back and sides of 20-gauge thickness. Enclosure fronts are separate and fastened by friction fit slip joiners at sides of the front piece. Back, top and sides are an integral welded structure in all models, except wall hung slope top model, which has top integral with front. Design details of individual units are shown on succeeding pages.



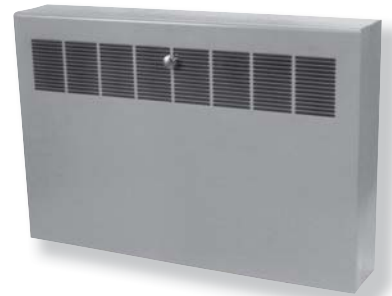
FS-A/FSG-A

Type FS-A: The type FS-A Free-Standing Cabinet Enclosure is designed to be used exposed and fitted flush against the wall. Readily installed without alteration of wall interior, the FS-A enclosure is frequently used for system modernization where it is desirable to avoid the expense of recessing the unit in the wall. Arched inlet shown is standard. Unit may be provided with integral inlet grille, (FSG-A). See page 14.



W-A

Type W-A: The W-A Convector is a completely exposed wall hung unit with flat top. Outlet grille is in the face of the enclosure. Enclosure front wraps around unit and fastens to sides of cabinet with clips. Air inlet is through open bottom of unit enclosure. See page 15.



SR-A/SRG-A

Type SR-A Semi-Recessed: Cabinet design is similar to FS-A model. Enclosure projects only 2 1/4" from wall. Complete unit includes enclosure, front panel with outlet grille and arched inlet opening, heating element. Front panel is easily removed for cleaning or access to heating element. Unit may be provided with integral inlet grille, (SRG-A). See page 16.



PW-A/PWG-A

Type PW-A: This is a partially recessed unit with rounded flange front and venetian type air outlet grille, standard for wall mounting as illustrated. Cabinet extends only 2 1/4" from wall. Enclosure front fastens and screw to brackets on unit liner installed in wall recess. Air inlet is through open bottom of unit (PW-A). Unit may be provided with integral inlet grille, (PWG-A). See page 17.





SF-A/SFG-A

Type SF-A: The Type SF-A Free-Standing Cabinet Enclosure is designed to be used exposed and fitted flush against the wall. Readily installed without alteration of wall interior, the SF-A enclosure is frequently used for system modernization where it is desirable to avoid the expense of recessing the unit in the wall. Arched inlet shown is standard. Unit may be provided with integral inlet grille, (SFG-A). See page 18. (SFG-A available in stainless steel, consult factory).



SW-A

Type SW-A: This model is fully exposed wall hung with outlet grille located in sloping top. Enclosure wraps around unit and fastens to sides with clips. Air inlet is through open bottom of unit. Slope of top is 30°. See page 15. Consult factory for availability with stainless steel.



RF-A/RFG-A AND FWG-A

Type RF-A: Designed to be fully recessed within the wall. The flanged edge metal front contains the outlet grille and inlet opening and is fastened by screws. It is easily removable for heating element access. The standard unit is arranged for floor mounting with arched inlet opening, (RF-A). Unit may be provided with integral inlet grille (RFG-A shown).

Type FWG-A unit is similar, but for wall mounting with integral inlet grille. All units extend 13/16" from wall. See pages 19 & 20. Consult factory for availability of FWG-A and RGF-A models in stainless steel.