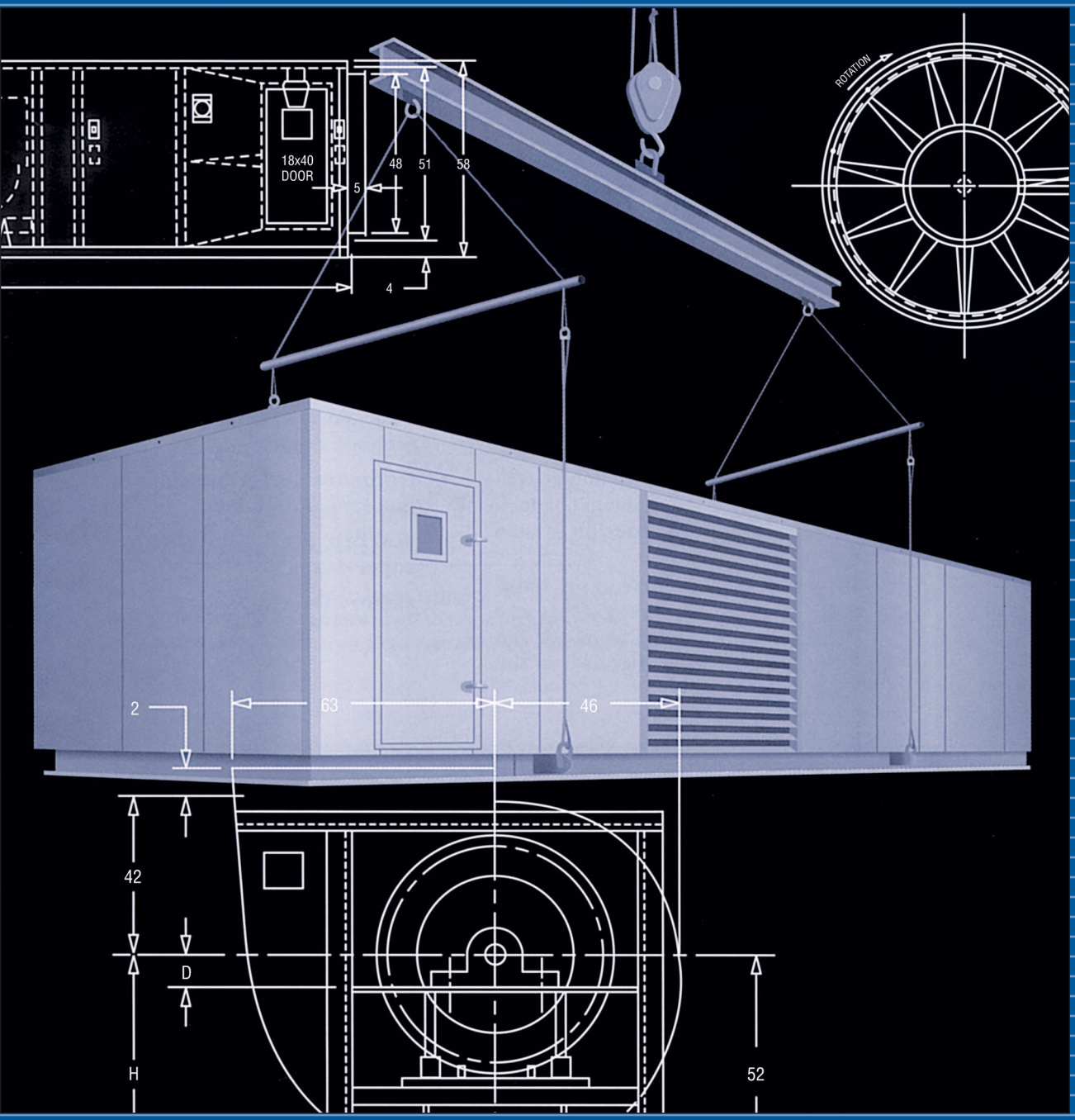
Bulletin **C6200**
MAY 2013

Buffalo
Air Handling

Big Buffalo



Custom Applications

Buffalo Air Handling
Big Buffalo

The historic strength of Buffalo Air Handling is the custom designed air handling equipment that controls the indoor environment of some of the world's most prominent buildings. Helping you improve the environment in which we live and work is Buffalo Air Handling's most important job.

Big Buffalo is the most efficient way to factory fabricate large air handling systems for today's sophisticated buildings. With an almost unlimited range of capacities, pressures, and component arrangements to choose from, you can design the most economically sized air handling system to meet your HVAC requirements.

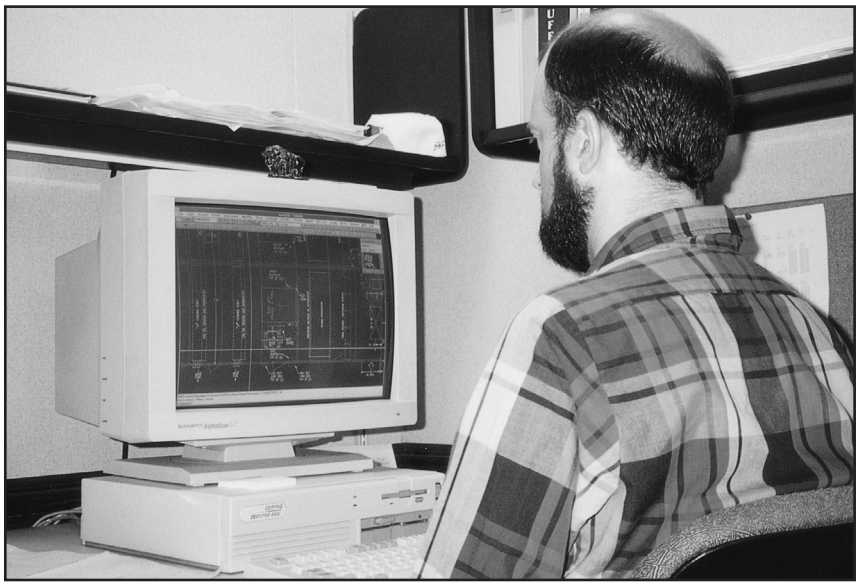
This bulletin is a thought starter on how to put Big Buffalo to work for you, illustrating several equipment arrangements and construction features. Also, included in this bulletin are typical air handling unit guideline specifications to assist in creating your own specifications.

Utilize the experience of a Buffalo Sales Engineer as you review these Big Buffalo air handling systems. As graduate engineers, schooled in the fundamentals of psychrometrics and air flow, they are anxious to share with you their practical experience in the application of these versatile air handling systems.

The backbone of a Big Buffalo system is the heavy gauge double-wall panel mounted on a welded structural steel channel base. Basic casing design consists of 2" or 4" double-wall G90 mill galvanized steel panels; 14 gauge outer and 20 gauge inner, with 2" or 4" – 3lb/ft^3 fiberglass insulation. Stainless steel or aluminum double-wall construction is available.

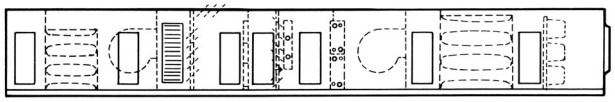
All three members of the building team – owner, engineer, and contractor – benefit from our Big Buffalo equipment because of the following features:

- **Reduced time in design and field installation**
- **Single-source system responsibility; a manufacturer who designs, builds, and guarantees its own casing, and channel base, along with the performance of the fans and coils**
- **Standardization of component construction**
- **Controlled uniform quality during manufacturing**
- **Built-in serviceability**
- **Reduced operating and maintenance costs**
- **Optimum performance from quality components**
- **Startup and installation supervision**
- **Factory performance, sound, vibration and leakage testing; substantiates the validation procedures required by many owners**

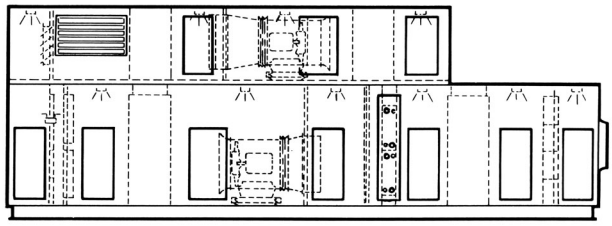


Buffalo Air Handling's Engineering Design Department can provide detailed drawings in 2D and 3D formats, which can be electronically submitted to the customer

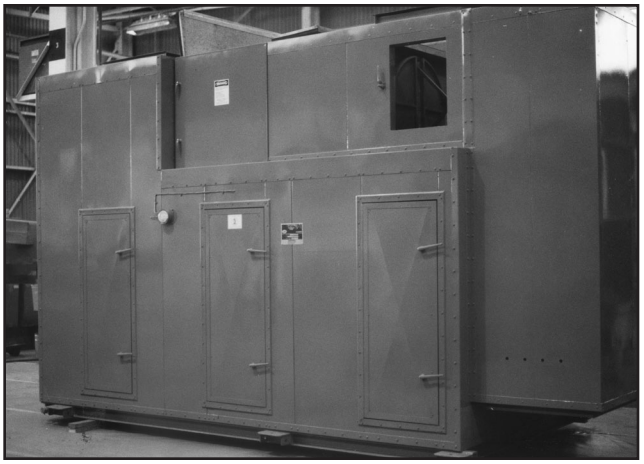
Typical Systems



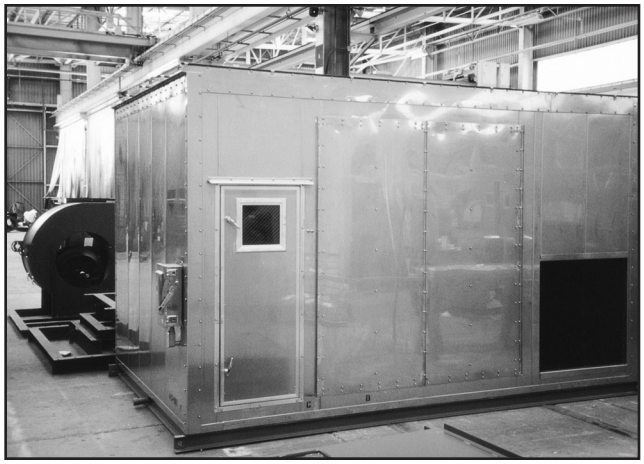
This roof-mounted variable volume central station cabinet contains centrifugal supply and return fans, economizer section, sound attenuation, and high efficiency filtration. The application is for a hospital operating room.



The advantage of factory built equipment is Buffalo Air Handling's complete unit assembly prior to shipment, which reduces field installation time and expense.



Specific clean room requirements were incorporated into a compact design with low vibration axial fans. Direct drive plenum fans have also been utilized for clean room applications.



This all stainless steel unit was supplied to a pharmaceutical facility. The fan was also constructed of stainless steel.

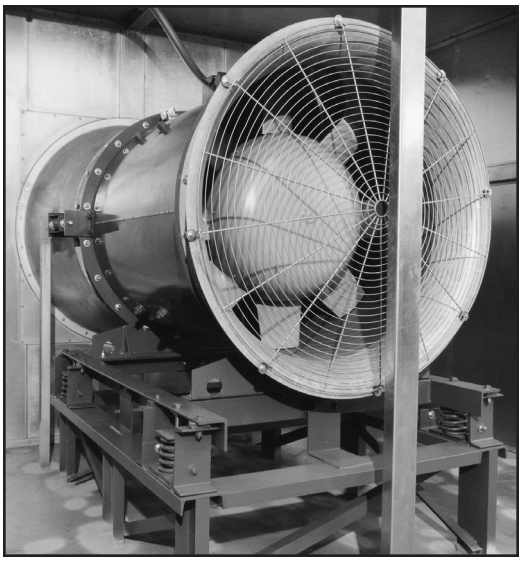
Fan Features

This fan section is the heart of a Big Buffalo air handling system. Buffalo Air Handling guarantees the performance on all centrifugal, plenum and axial fans used in our Big Buffalo air handling cabinets.

Applications requiring a centrifugal double inlet fan are provided with a reliable flat backward inclined or airfoil fan. The flat backward inclined or airfoil shaped blades produce non-overloading performance characteristics. The fan bearings are designed for a minimum L10 life of 40,000 hours (80,000 hours, L10 life optional). Axial flow fan applications use fans with adjustable-pitch blades at rest or inflight.

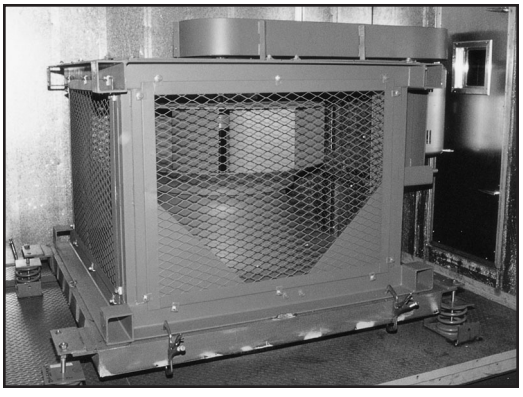
Plenum fans can be provided for return fan applications and where multiple discharges are required.

Fans combined with variable frequency drives provide the most energy efficient air handling system. Factory installation assures single source responsibility.

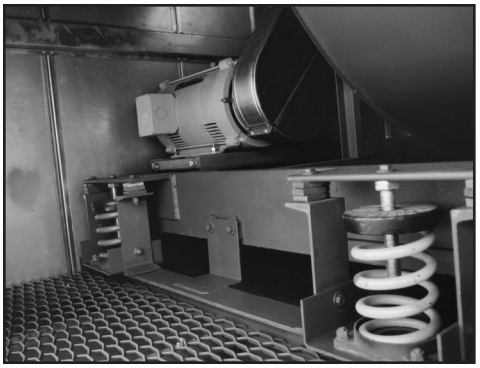


Axial flow fans with adjustable blades are frequently specified where space is at a premium. Mixed flow fans can be provided.

Internal vibration on an all-welded structural steel channel base is essential for reliable fan performance. High pressure and critical applications may require an inertia vibration base where concrete is field installed. A heavy-duty flexible connection between the fan and unit casing is provided for internally isolated fans.



Plenum fans can be efficiently selected for return fan applications where space is critical.



The fan, motor and drive are mounted on a heavy all-welded structural steel vibration isolation base with isolators properly selected for specified vibration efficiency.

Component Features

Heating and cooling coils in our Big Buffalo air handling systems are manufactured by Aerofin. As an option, Buffalo Air Handling can provide installation for alternate coil manufacturers.

Aerofin heating, cooling and heat recovery coils are provided in both plate and helically wound fin designs in either aluminum or copper. Tube wall thickness varies from 0.020" to 0.049", as required for the application. Fin thicknesses from 0.0075" to 0.010" are most commonly specified. Features such as individually drainable headers, removable headers, and stainless steel casings are frequently specified.

Aeromix integral face-and-bypass coils are available for maximum freeze protection in 100% outside air applications.

Steam coils with either 5/8" or 1" O.D. tubes in a variety of fin spacings provide even leaving air temperatures over a wide range of modulation.

Rotary heat wheels, heat pipes, and glycol run-around coils can be provided for heat recovery systems.

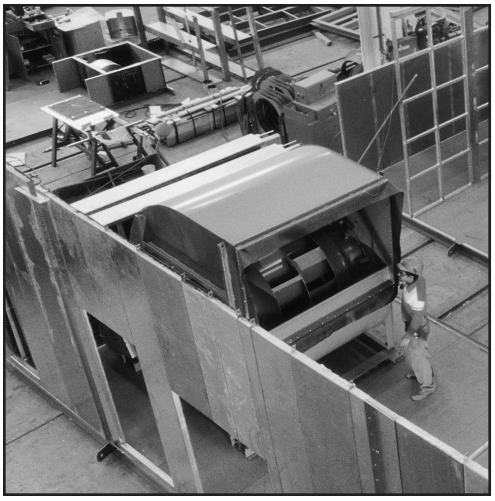
System components, such as inlet louvers, dampers, blenders, filters, sound attenuators, humidifiers, desiccant dehumidifiers and access plenums, are provided as specified.

Buffalo Air Handling's revolutionary "Aerofil" provides low cost, low maintenance evaporative cooling or humidification for year-round operation.

Independent coil support racks can be provided to permit individual removal of heating or cooling coils. Cooling coils stacked two or more high have individual extended drain troughs and downspouts to properly drain condensation.

Buffalo Air Handling provides all-welded, patented, triple-sloped, IAQ stainless steel drain pans downstream of the cooling coils.

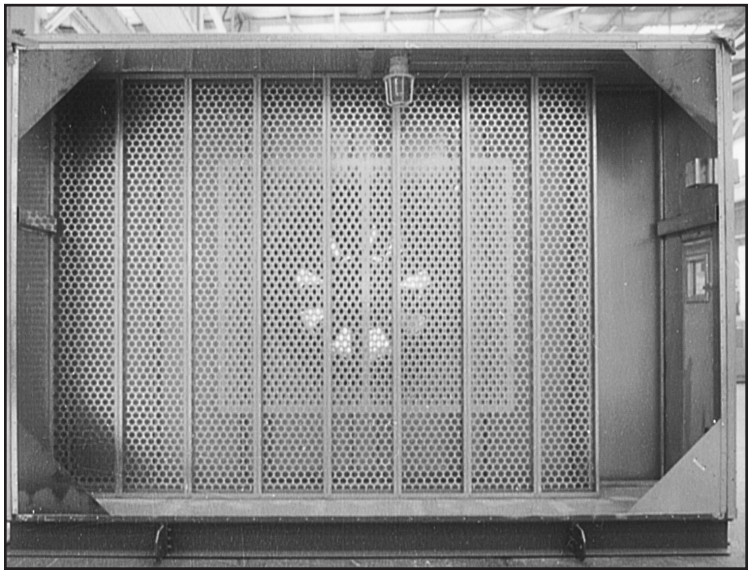
Construction Features



Double-wall heavy gauge galvanized steel construction using 14 gauge outer and 20 gauge inner panel is standard. Perforated inner wall construction of galvanized steel or aluminum are available as options. Special applications for operating pressures to 30" WG can also be provided.

All units are constructed on a welded structural steel channel base with a heavy gauge floor sheet to support internal components. Also shown are perimeter angles for ease of joining unit sections together in the field.

Accessibility can be designed into units where inspection, maintenance and service is required. Double-wall flush-mounted doors are designed to open opposite the unit's operating pressure.



Illustrated is a full height, full width distribution plate that reduces pressure drops by 50% or greater when compared to conventional diffusers.

Sound control is extremely important with high pressure systems. Big Buffalo double-wall panels have been tested by an independent laboratory and have the following certified sound transmission loss characteristics:

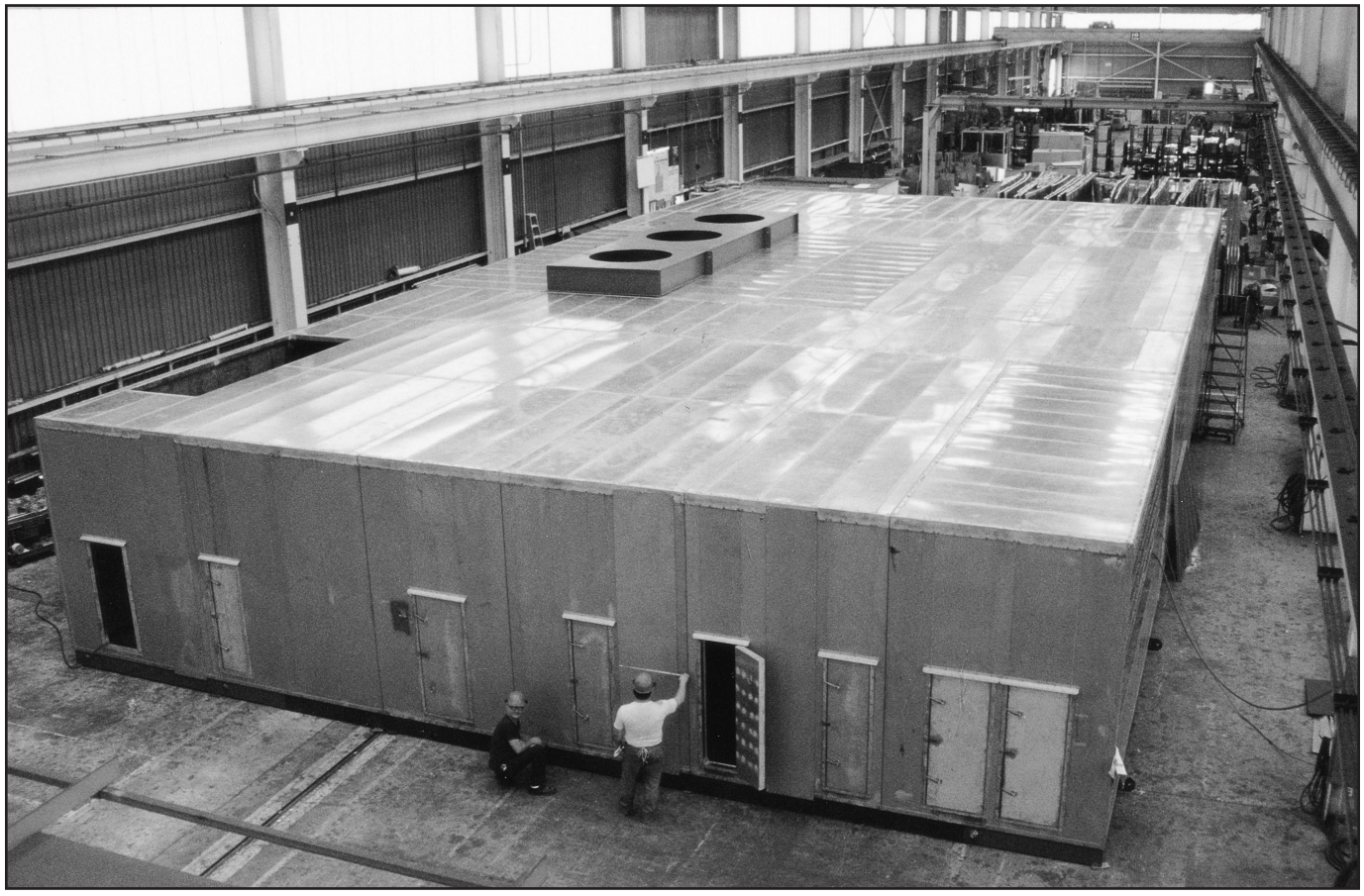
Perforated inner panel construction for sound absorption is often specified for supply and return fan sections.

Buffalo Air Handling can provide sound power levels at inlet/discharge opening(s) and casing radiated values.

Octave Band Analysis of Sound Transmission Loss in dB (2" Panels)

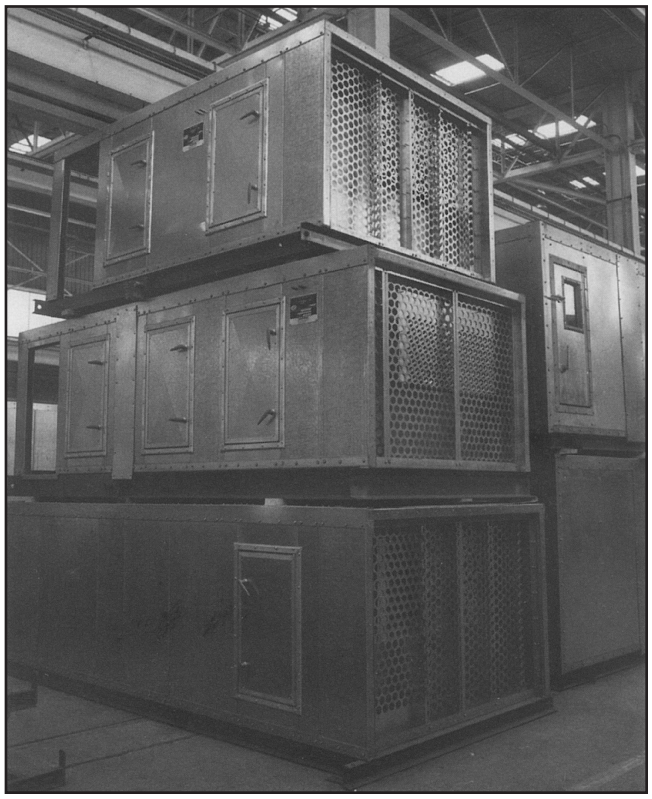
Octave Band	**2**	**3**	**4**	**5**	**6**	**7**
Solid Inner Panel (14 GA/20GA/3lb/ft^3)	25	39	48	54	58	58
Perforated Inner Panel (14 GA/20GA/3lb/ft^3)	21	25	34	44	51	53

Illustrated is a bank of sound attenuators.

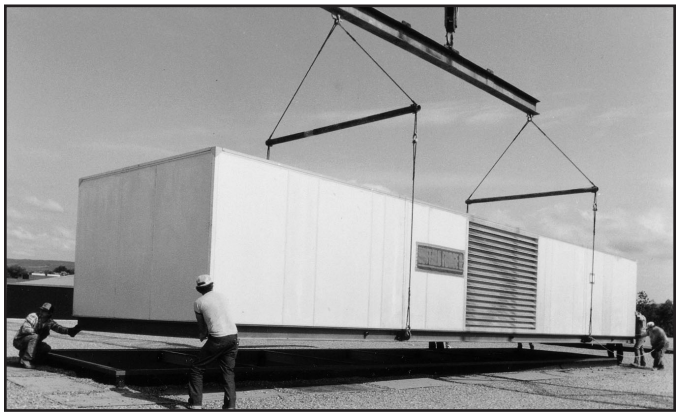


Buffalo Air Handling has the facility and capability to manufacture large air handling units.

Unit Features

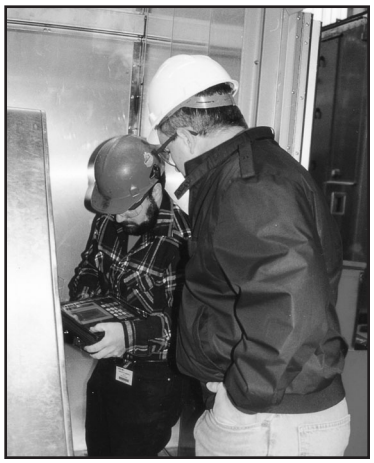


Buffalo Air Handling provides units that will withstand heavy loading.



Units are completely fabricated and pre-assembled at the factory to ensure proper fit when joined in the field. These units are shipped in large modules requiring the least amount of field assembly and installation time.

All units, or unit sections, are shrink wrapped and tarped prior to shipment to protect the equipment from wear and tear during transportation.



Buffalo Air Handling Service Representatives are available to assist in the start-up, erection and testing of your equipment.

Removable lifting lugs are provided as an option on all sections for convenient rigging at the job site.

Big Buffalo Air Handling Unit Specifications

1. GENERAL

1.1 Provide factory assembled air handling units, complete with all components as specified herein. Each unit shall include all components, installed at the factory. Field fabrication of units and their components will not be accepted. All units shall be inspected and factory run tested to insure structural integrity prior to shipment. Each unit, or unit section, shall be shrink wrapped in plastic prior to shipment

2. PRODUCT

2.1 Basis of design is ***Buffalo Air Handling***.

3. UNIT CONSTRUCTION

3.1 **Walls and roof** shall be constructed of 2" thick, "double wall," self supporting, acoustical thermal panels. All additional panel supports shall be constructed of galvanized steel. Carbon steel shall not be used in the panel support framing system. Outer wall and roof panels shall be constructed of minimum 14 gauge G90 galvanized steel sheet. Exterior walls shall be flush with no external standing flanges. The inner wall shall be minimum 20 gauge perforated aluminum, except in the cooling coil sections, where inner wall shall be solid 20 gauge 304 stainless steel. The insulation shall be 2" - 3 lb/ft^3 density fiberglass and shall be full 2" thick throughout the unit height and width.

Casing panels shall be rated for sound transmission loss in accordance with ASTM E413 and shall be minimum values:

Octave Band (Hz)	2	3	4	5	6	7
Transmission Loss (dB)	21	25	34	44	51	53

Provide floor, roof and side perimeter angles located inside units at shipping splits to allow for field bolting of sections. Unit manufacturer to provide necessary hardware, tape sealer, and caulk required to field join and seal the sections.

3.2 **Doors** shall be provided as indicated on the contract drawings to provide adequate access to each unit component. Doors to be 2" thick insulated solid double wall panel construction. Doors under 2" nominal thickness are not acceptable. Each door will be provided with a double pane viewing port (deadlite). Doors will be minimum 24" x 60" and shall open against the section's operating pressure. Provide doors with two (2) chrome plated Ventlok Model 310 latches, operable from either side of door. Door opening will be fully gasketed with extruded gasket fitted into retainer slots in the door panel and frame. Door frames are to be aluminum with the exterior side of the door flush with the unit. Access doors shall have been tested in an independent laboratory in accordance with ASTM E283.

Each access section is to be provided with a marine light having impact resistant plastic globe and wire guard. The light shall be wired to a switch with an indicating light, located on the outside of the unit near the access door. The switch shall be similar to the Hubbell Model 1201PL with a protective dust cover. Marine light shall be similar to the Crouse Hinds Model VX11F-126. Fluorescent light fixtures are an available option.

3.3 The **unit floor** is to be constructed of a minimum 3/16" thick steel, epoxy mastic coated, welded to a 6" - 8.2 lb/ft structural full perimeter channel base. Tubular or formed channel steel shall not be used as the perimeter base. Where sections of the floor join together, the joints shall be welded and caulked. Immediately beneath the floor, there shall be insulation. The insulation will be further protected by a 20 gauge galvanized steel cover sheet on the underside of the channel base. Additional cross members shall be provided to support the internal components. The unit base is to be provided with lifting lugs, minimum four (4) per section.

The **unit base** shall be prime coated with an epoxy mastic. In cooling coil sections, the floor shall be recessed and constructed as a continuously welded positively sloping 12 gauge 304 stainless steel drain pan with a minimum depth of 4" at the drain. The drain pan shall be insulated with 2" insulation and a 20 gauge galvanized steel coversheet.

3.4 Downstream of the fan in a blow-through application shall be a full height and full width 16 gauge galvanized steel **distribution plate**. This plate shall contain 50% free area over the entire cross-sectional area of the unit except at the fan discharge area. This area shall be a 25% free area over an area 1.4 times the fan discharge width and 1.2 times the fan discharge height.

4. FACTORY INSTALLED COMPONENTS

4.1 **Centrifugal fans** shall be non-overloading, double width - double inlet (DWDI), backward inclined airfoil bladed for sizes 30" or larger. Fan diameters under 30" shall be backward inclined bladed. Manufacturer's fan ratings shall be based upon tests performed in strict accordance with AMCA Standard 210. Fans must carry the seal authorized by AMCA, indicating that the ratings are certified by the organization and are a member in good standing with AMCA. Fans not meeting this criteria will not be accepted.

Fan housing shall be constructed of hot-rolled carbon steel, continuously welded and adequately braced with structural steel for rigidity. Provide access door in the fan scroll complete with quick-opening latches for fan inspection and a fan scroll drain.

Fan shafts are to be solid, ground and polished, carbon steel, machined to close tolerances, keyed to the fan wheel. Coat the fan shaft with a rust inhibitor after machining.

Fan bearings are to be horizontally split, pillow block, foot mounted bearings with a minimum L-10 life of 80,000 hours at maximum operating conditions. Bearings are to be mounted on the integral fan scroll bracing. Extend the fan bearing lubrication lines to an easily accessible location on the unit.

The fan and motor are to be mounted on all-welded structural steel, prime coated, internal isolation base with springs selected to provide 97% isolation efficiency. Each spring shall be unhoused, free-standing type, welded to a base plate with a 1/4" thick ribbed neoprene sound deadening pad and leveling bolt. Base plates shall be mounted on two threaded studs welded to unit floor for ease of spring replacement. The outlet of the fan is to be separated from the unit casing by means of a factory installed flexible connection.

The drive motor is to be provided on a 2-screw NEMA slide rail base to allow proper adjustment of belt tension. Provide a four-sided OSHA belt guard having sides of galvanized steel and expanded metal face with 2 openings for tachometer readings. Provide adjustable V-belt drives for motors 15 HP and below and fixed V-belt drives for motors 20 HP and above. Drives shall be selected for 100% of motor horsepower with minimum 1.3 drive selection service factor.

4.2 **Centrifugal plenum (unhoused) fans** shall meet the requirements for centrifugal fans (Section 4.1). Plenum fans shall be furnished with an open-mesh protective enclosure screen. The fan shall carry the AMCA seal.

4.3 **Cooling and hot water heating coils** shall be constructed with 5/8" O.D. copper tubes with minimum 0.035" tube wall thickness. Fins shall be 0.010" thick aluminum. Coil casing shall be minimum 16 gauge galvanized steel for heating applications and 304 stainless steel for cooling applications. Headers shall be non-ferrous barrels with vents and drain connections. Coil connections are to extend through the casing wall by the unit manufacturer. All coils shall be ARI certified.

Each coil section shall be provided with an individual coil support rack, where the coils are stacked more than one high to allow for easy removal of a lower coil without disturbing the upper coil(s). Where individual coil support racks are utilized, provide an intermediate drain pan with a trough and downspout at each end. Coil support racks, intermediate drain pans and downspouts shall be constructed of 304 stainless steel material.

Steam heating coils shall be steam distributing type and constructed with 1" x 0.035" copper outer tubes and 5/8" x 0.020" copper inner distributing tubes. Fins shall be 0.010" aluminum and the headers shall be non-ferrous. Casings shall be 16 gauge galvanized steel.

4.4 **Pre-filters** shall be 2" deep and shall not have less than 15 pleats per linear foot, with an average effective media area of 4.6 square ft. per 1.0 square ft. of filter face area. Filters shall be UL 900, Class 2 listed, and provide 30% efficiency per ASHRAE Standard 52 test method using atmospheric dust.

Final filters shall be high efficiency, replaceable filter type, constructed of a fine-fiber all-glass medium. Filters shall have individual pleats and have a minimum depth of 12". The final filters shall be UL 900, Class 2 listed, 85% efficiency per ASHRAE Standard 52.

Both pre-filters and final filters shall be face-load mounted and properly sealed to prevent air bypass in a 16 gauge galvanized steel holding frame with clips. Each filter bank shall be furnished with a Dwyer 2002 magnehelic gauge to measure the filter pressure drop, with two static pressure tips and vent valves. The gauge shall be factory-mounted on the exterior of the unit.

4.5 **Dampers** shall be low leakage airfoil bladed dampers. Frames shall be constructed of extruded aluminum hat channel with mounting flanges on both sides of the damper frame. Blades shall be airfoil type extruded aluminum with integral structural reinforcing tube running full length of each blade. Blade edge seal shall be extruded vinyl double-edge design. Bearings shall be non-corrosive two piece molded synthetic. Linkage shall be concealed in the frame. Damper actuators shall be furnished by air temperature contractor.

4.6 **Louvers** shall be a stationary drainable type with drain gutter in each blade and downspout in each jamb and mullion. Frames shall be 6" deep and constructed of 0.10" wall thick 6063T5 extruded aluminum.

4.7 **Sound attenuators** shall be constructed of 18 gauge galvanized steel outer casing and 24 gauge galvanized perforated steel. Sound attenuator performance, including attenuators with fiberglass cloth and mylar encapsulated media, must have been substantiated by laboratory testing in accordance with ASTM E477 and so certified.

5. TESTING

5.1 Each unit shall be factory-run tested with unit fully assembled. Fan vibration readings shall be taken in accordance with ANSI S2.19 grade G6.3. Maximum fan vibration measured on fan bearings shall not exceed 0.16 inch per second (IPS).

5.2 Each unit shall be fully factory assembled and leakage tested as follows:

a. Unit openings are to be closed off and sealed. If applicable, a close-off plate shall be installed between the positive and negative sections. A test fan is ducted to the unit and set at the test pressure.

b. The test pressure is 1.25 times the operating static pressure within the section. The test pressure shall not exceed 1.1 times the fan shut-off pressure.

c. Air leakage into or from the section shall be determined by use of a calibrated orifice plate mounted within the interconnecting ductwork between the test fan and the section.

d. Total leakage for all sections shall not exceed 1% of the unit CFM capacity, or 50 CFM, whichever is greater.

5.3 Each air handling unit shall be fully assembled and have a witnessed factory performance test as follows:

a. Unit fan performance shall be taken for two testing points, one each on either side of the point of rating.

b. A test duct shall be mounted to the inlet. The duct is to be sized to produce an average velocity between 2,500 and 3,500 feet per minute. The unit discharge will be throttled to produce the test static pressure. The test static pressure is the static pressure across the fan bulkhead.

c. Air flow capacity at each test pressure shall be calculated by multiplying the root mean square velocity pressure, converted to velocity at standard conditions, by the test duct area. Motor voltage, current and power factor shall be recorded for each test point. Motor horsepower, including v-belt drive loss, will be calculated by using the motor manufacturer's guaranteed minimum efficiency.

d. A test fan performance curve shall be drawn between the two performance points, parallel to the fan manufacturer's performance curve. The test performance curve shall pass within +/-2.5% of the static pressure, +/-5% of the CFM and +/-5% of the brake horsepower (net, less drive loss) point of rating to be deemed correct.

Due to ongoing product improvements, we reserve the right to change system specifications and construction without notice.

Buffalo
Air Handling

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