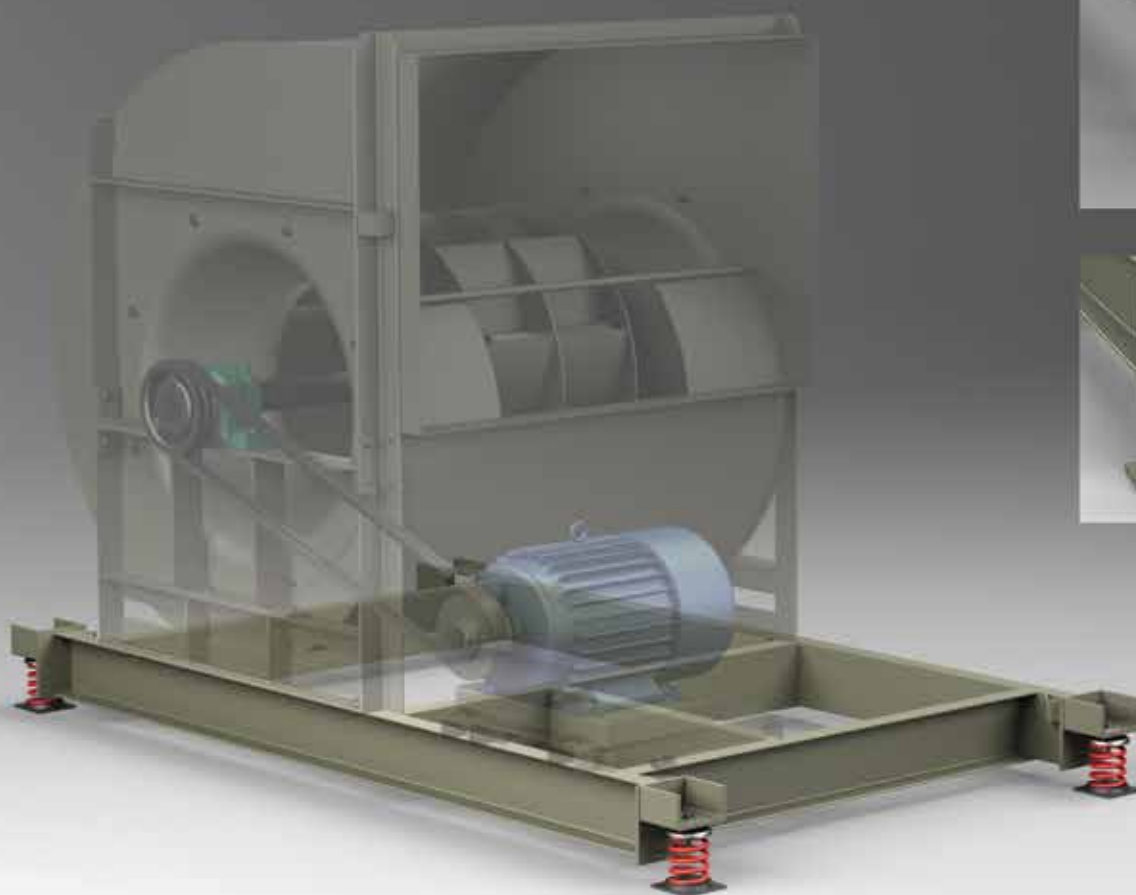


Mounting Bases and Vibration Isolation for Utility, Centrifugal, Industrial, and Plenum Fans

- Rubber Mounts
- Free-Standing Spring
- Restrained Spring
- Vibration Mounting Bases



Mounting Bases and Vibration Isolation

This catalog outlines the types of bases and isolators as offered by Greenheck for use with both utility and centrifugal fans. The use of isolation equipment is more important than ever when considering the trends towards lighter construction of modern buildings and the increasing use of mechanical equipment. In addition, the fact that building owners and occupants are more sensitive to vibration related problems makes proper selection and installation of isolation equipment extremely important.

The advantages of buying fan and isolation equipment directly from Greenheck include proper selection and identification of isolators, assembled fan and base packages, final vibration test and trim balancing of the fan on the isolation base.

Included in this catalog are easy to use selection guides and typical specifications. For more complete selection criteria, refer to the latest ASHRAE Handbook, HVAC Applications - Sound and Vibration Control.

Shown below are typical examples of different isolation equipment used with centrifugal fans.

Utility fans are typically mounted on mounting rails incorporating either neoprene or spring mounts.

Fan shown is a model USF series

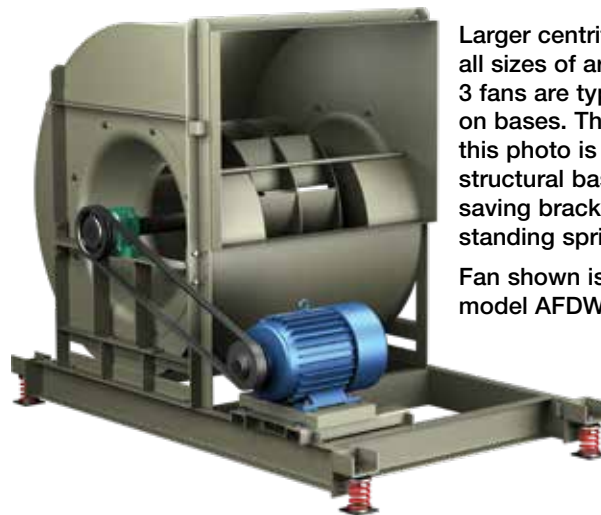


Utility and smaller centrifugal fans can be directly mounted on isolators.

Fan shown is a model USF series

Belt drive plenum fans are typically mounted on structural bases and shipped as a packaged unit including motor and drives.

Fan shown is model APH



Larger centrifugal fans and all sizes of arrangement 1 or 3 fans are typically mounted on bases. The fan shown in this photo is mounted on a structural base with height saving brackets and free standing springs.

Fan shown is model AFDW

Benefits of Greenheck Supplied Bases

Availability of detailed and accurate mounting dimensions is extremely important. Greenheck's fan selection software CAPS® provides submittal drawings base information.

In addition, to complete dimensional information, the submittal includes isolator location and identification (see letters A, B, C, D).

The isolators will be packaged and color coded for identification. The isolator package ships loose (not mounted).

Most fans with bases can ship completely assembled and tested

Most Greenheck fans that are ordered with motors, drives, guards, and bases can be assembled tested and shipped as a complete package.

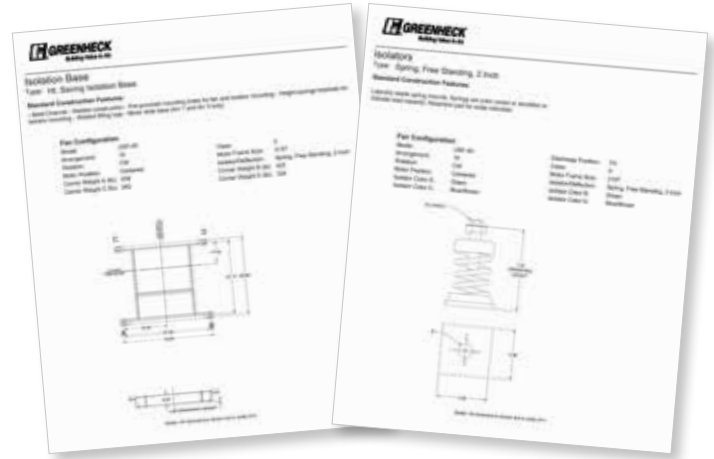
For limitations on sizes that can be shipped assembled, see information below.

Benefits:

- Installation time and costs are reduced.
- Motors and drives are installed and aligned for smooth operation.
- Guards and accessories are installed.
- Vibration testing of the entire fan package (excluding utility fans) is performed.
- Belt drive fans are tested for maximum allowable vibration of 0.15 in/sec-peak (filter in). Vibration readings are taken at each bearing in the horizontal, vertical and axial direction. These vibration signatures become part of the fan's permanent records and are available on request.

Mounting Limitations and Guidelines

- Fan and base must be ordered through Greenheck.
- Centrifugal fans up to size 54 in. and industrial fans up to size 29 in. (40 in. diameter wheel) will be mounted to steel base as standard. *(For fans to ship loose, factory must be notified. This will incur additional shipping costs.)*
- Consult Greenheck for mounting larger sizes.
- Mounting larger sizes may require additional shipping costs.
- Hardware and assembly instructions are included for bases shipped loose.



An example of images from CAPS® for a USF, arrangement 10 fan with the motor in the centered position.

Typical Vibration Signature

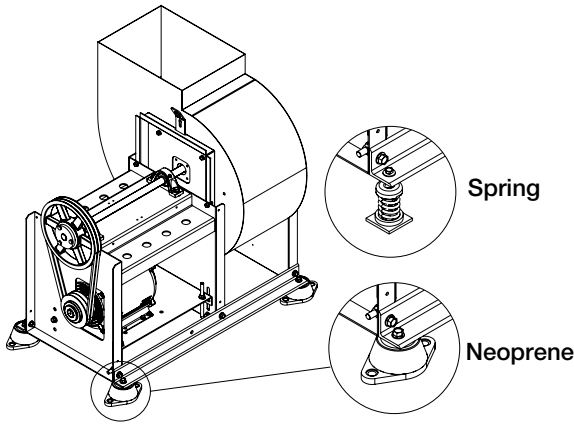
Copy of signatures are kept on file and available upon request.



Assembled Fan Package on Vibration Test Stand

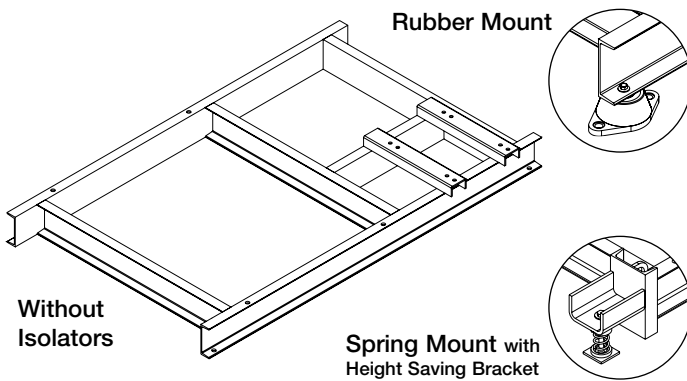
An arrangement 10 fan with the motor mounted beneath the drive frame is pictured.

The mounting options shown on this page (type A and B) relate to the Selection Guide for Vibration Isolation as published in the latest ASHRAE applications handbook, HVAC Applications-Sound and Vibration Control.



Direct Mount - Type A

No base required. Isolators are attached directly to equipment. Direct isolation can be used if equipment is unitary and rigid without the use of additional support. Direct isolation is not recommended for equipment having large overhung loads (e.g. motors on arrangement 9 fans). If there is any doubt that equipment can be supported directly on isolators, use rails, bases or consult the factory.



Isolation Bases - Type B2

Isolation steel bases consist of formed steel members welded into a rigid one piece base. Motor slide rails are included where applicable. Bases are required for all arrangement 1 and 3 fans with independently mounted motors (MOB). Isolation bases are available without isolators, with rubber mounts or with spring mounts. Isolation bases with spring mounts can incorporate height saving brackets.

Shown below are the various types of isolators available from Greenheck. The appearance will vary based on application and isolator manufacturer. Seismic applications will require isolators to be sized by a third party. Greenheck will not provide isolators for this application.



Rubber Mounts - Type 2

Neoprene mountings consist of a steel top plate and base plate completely embedded in colored (oil-resistant) neoprene for easy identification of capacity. Neoprene mountings are furnished with a tapped hole in the center. This enables the equipment to be bolted securely to the rubber mount.

Suggested area of use indoors. Not recommended for outdoor use.



Free-Standing Open Spring Mounts - Type 3

Free-standing spring isolators are unboxed laterally stable steel springs. They provide a minimum horizontal stiffness of 0.8 times the rated vertical stiffness and provide an additional 50% overload capacity. These isolators are equipped with a top mounted adjusting bolt and an acoustical non-skid base. Springs are coded or identified to indicate load capacity.

Suggested area of use indoors. Not recommended for outdoor use.

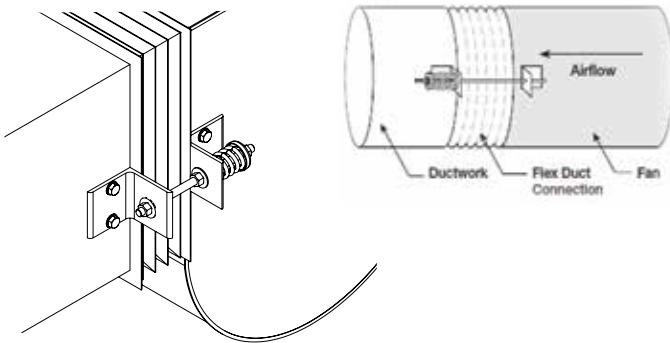


Restrained Spring Mounts - Type 4A

Restrained spring isolators consist of laterally stable, free-standing springs assembled into a steel housing. These assemblies are designed for vertical and horizontal motion restraint. Springs provide 50% overload capacity and are color coded or identified to indicate load capacity. Restrained spring mounts are recommended for equipment subject to wind loading or large torquing forces. They are also used for equipment subject to large weight changes such as swingout fans.

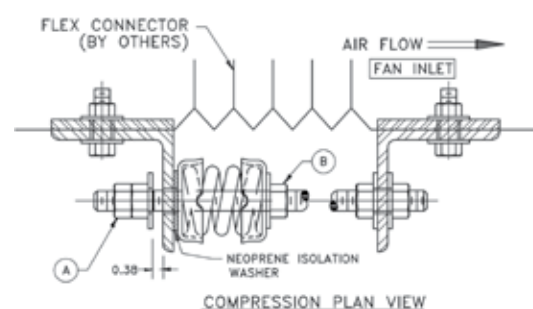
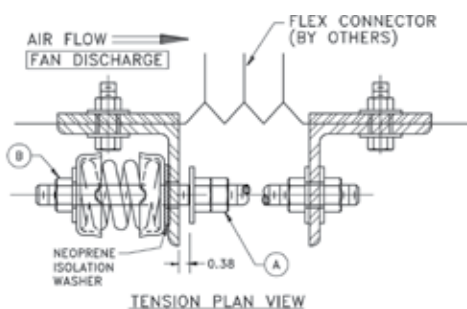
Suggested area of use indoors and outdoors. Can be used for both indoor or outdoor applications.

In addition to structural bases and isolators, your application may require thrust restraints as shown below.



Thrust Restraints - Type 5

Thrust restraints, similar to spring mounts or hangers, are installed in pairs to resist reaction forces caused by air pressure. Thrust restraints are recommended where thrust exceeds approximately 10% of equipment weight. Thrust restraints should be selected with the same deflection requirements as spring isolators.



Installation Instructions

1. Install vibration isolation system (hangers, floor mounts, or base with isolators) per manufacturer's instruction. Level equipment prior to installation of thrust restraints.
2. Install one set of thrust restraint brackets, springs and hardware on each side of the unit at the discharge outlet (for thrust in tension) or at the inlet (for thrust in compression). Note that thrust restraints must be located along centerlines of discharge or inlet. Maintain correct orientation with respect to direction of airflow.
3. The bracket opposite the fan must be attached to a structural component that will withstand the fan thrust.
4. Before startup of fan, adjust nuts for $\frac{3}{8}$ inch (10 mm) clearance by preloading the spring. The $\frac{3}{8}$ inch (10 mm) gap between nut "A" and the bracket will prevent excessive movement of the fan during start-up.
5. The preloading of the spring is designed to provide a counteractive force opposite in direction to the fan thrust but slightly less in magnitude. After start-up the fan thrust being greater than the restraining force will cause the fan to move in the direction opposite that of the airflow.
6. After start-up and after the entire air distribution system has been balanced, a final adjustment should be made to nut "B" so that the gap from nut "A" to the bracket is $\frac{3}{8}$ inch (10 mm) as shown.

The most important part of selecting the proper isolator is determining the deflection required. The following examples will help guide you to selecting the proper isolator.

Example 1:

If deflection is already specified, use that number for isolator selection process. Select isolator type based on required deflection and application as shown in Chart 1.

NOTE:

- Deflections of 1- and 2-inch will be assumed as nominal.
- It is critical that deflection or efficiencies specified as minimum be stated as minimum on quotes and orders.
- When selecting an isolator, nominal deflection must be greater than minimum deflection.

Chart 1

Deflection	Applications	Isolator Type
up to ¼ in.	Indoor Wheel Sizes 49 in. or less where 0.3 in. or less deflection is required	Single Deflection Rubber Mount
up to ½ in.		Double Deflection Rubber Mount
1 in., 2 in.,	Indoor	Free Standing Spring Mounts
1 in., 2 in.,	Indoor/Outdoor Fans subject to wind loading or torquing forces	Restrained Spring Mounts

Example 2:

If isolator efficiency is specified, calculate the deflection required based on the fan RPM or motor RPM *whichever is lower*. The criteria shown in the sample below is illustrated in Chart 2 for approximate deflection. To calculate the deflection accurately use the following equation:

$$Deflection = \left[\frac{188 \sqrt{100/(100-E)+1}}{RPM} \right]^2$$

e.g. 95% Efficiency, 700 Fan RPM, 1800 motor RPM

$$\left[\frac{188 \sqrt{100/(100-95)+1}}{700} \right]^2 = 1.51 \text{ in.}$$

In this example, select 2 inch deflection isolator

Note: These equations assume that the fan is installed on an extremely stiff foundation.

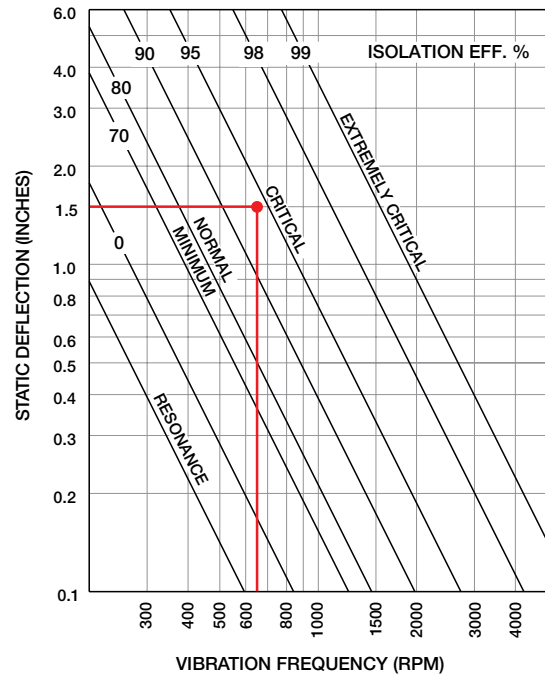


Chart 2

Example 3:

If no deflection or isolator efficiency is specified, then use the efficiencies shown in Chart 3 and calculate deflection as shown in Example 2.

**NOTE: Assumes that the fan is installed on an extremely stiff foundation*

Application	Efficiency*
Minimum	70-80%
Normal	80-90%
Critical	90-95%
Extremely Critical	95-99%

Chart 3

For further information on calculating deflection required, see ASHRAE Selection Guide for Vibration Isolation. This is especially important for critical and above grade applications.

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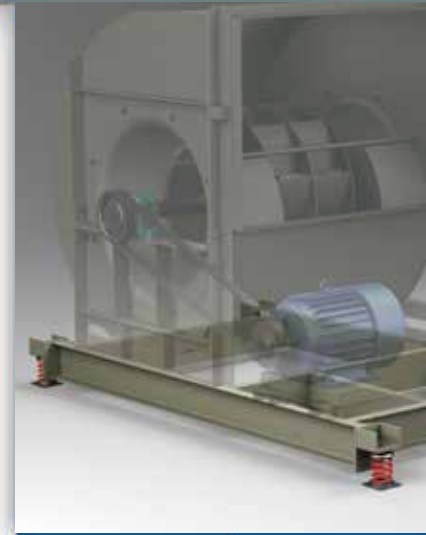


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