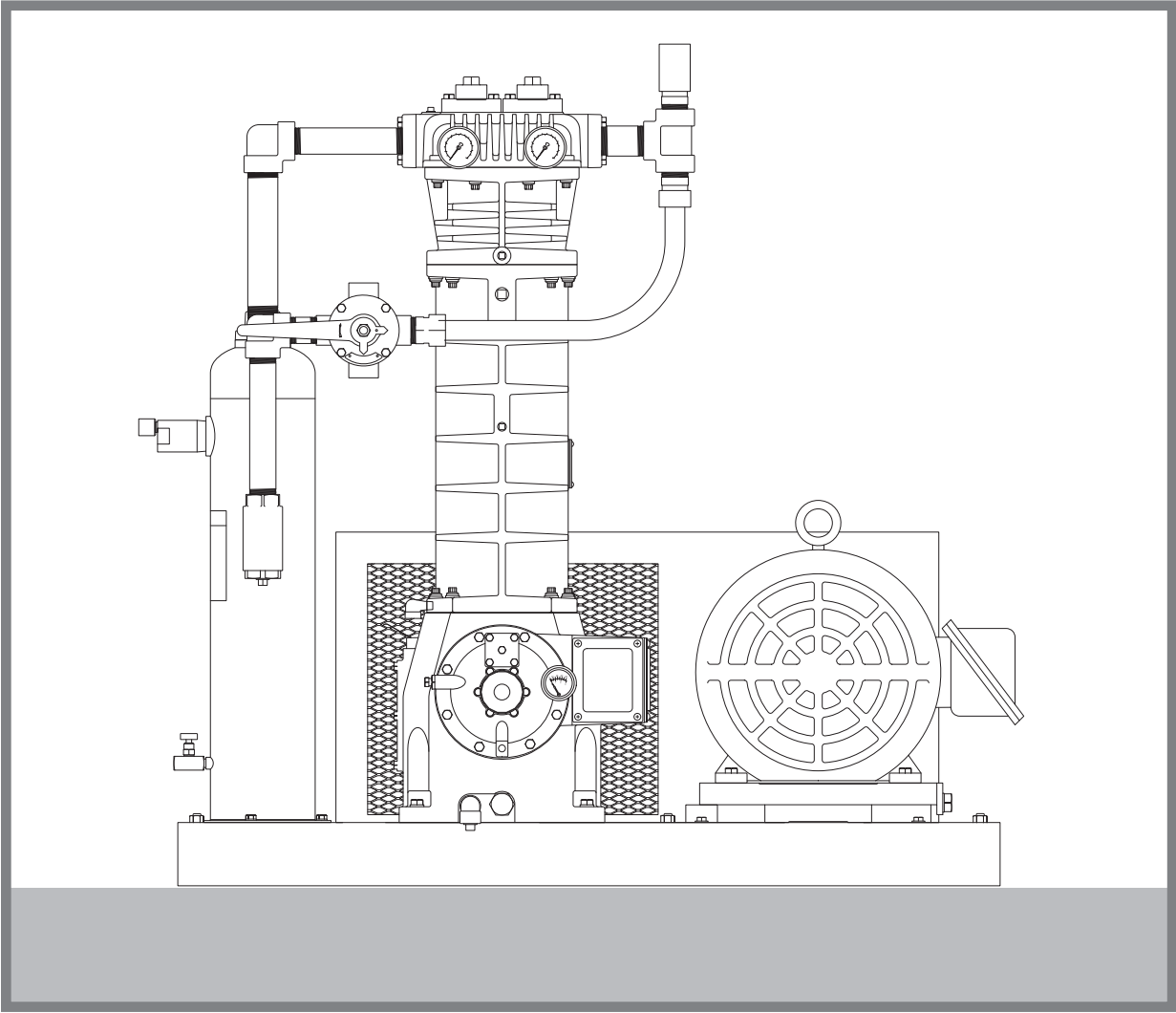


Important Instructions

Compressor Foundation Design



Solutions beyond products...



Compressor Foundation Design Considerations

Before you begin, you should know there are three primary factors that cause vibration and noise within a compressor mounting. Both factors are inherent in the compressor design and must be considered when selecting a proper mounting location and foundation for your compressor.

- 1) **Reciprocating Design:** The reciprocating design of Corken compressors produces inherent vibration that must be taken into account when designing an adequate compressor foundation. Most all issues arising from excessive compressor vibration (e.g., broken anchor bolts) relate to an inadequate baseplate design, inadequate concrete foundation and inadequate structural steel base and/or inadequate piping supports.
- 2) **Vertical Compressors:** Vertical reciprocating compressors, in which one piston goes up while the other goes down, produce unbalanced forces that inherently result in vibration and tend to rock the machines back and forth about a horizontal axis through the center of gravity. This is particularly a factor on Corken's larger vertical machines (Models 591, 691, 791 and 891). These compressors have more mass in the moving parts and are taller which raises the center of gravity, and therefore vibrate more than smaller machines. It is imperative to properly secure any vertical compressor and the baseplate or structural steel base/skid to which it is mounted. Even though the 791 and 891 are double-acting compressors, their size necessitates the same type of mounting as the other large compressors.
- 3) **Horizontal Compressors:** Corken's horizontal compressors (Models HG600) have horizontally-opposed piston movement and are generally double acting so that they inherently run more smoothly than comparable vertical compressors. However, there are still forces in horizontal compressors that tend to rock them back and forth about a vertical axis through the center of gravity. For this reason, and because of their relatively large size, Corken horizontal compressors should be mounted in the same manner as the larger vertical machines as described in these instructions.

Listed below are other factors that amplify the magnitude of any vibration present and must be considered when selecting a proper mounting location and foundation for your compressor.

- 1) Size of compressor (larger compressors generally vibrate more)
- 2) Speed of compressor
- 3) Use of undersized flywheel
- 4) Height of the compressor (D- and T-style designs are taller compressors)
- 5) Engine drives
- 6) Baseplate or structural steel skid deflection
- 7) Improper anchor bolt selection or unsecured anchor bolts

Noise

Many factors affect the noise level generated by a compressor installation. Several of these, including motor noise, piping vibration, foundation/skid design, and surrounding structures are outside Corken's control. The use of sufficient pipe supports, flexible hoses, and proper baseplate/skid support will all reduce noise. Thus, Corken can not guarantee a particular noise level from our compressors. However, noise levels from a properly installed Corken compressor typically do not exceed 85dBa at three feet.

Noise testing is not available from the Corken factory. It would not be a reliable indicator of noise generated in the field once all the variables are established.

Vibration

Compressor users sometimes experience excessive vibration from their compressors. All reciprocating compressors like Corken's will create some vibration. It is an unavoidable consequence of the reciprocating motion of the internal parts of the compressor. The compressor itself is essentially a solid piece of iron and does not "flex". Thus, if the top of the compressor is moving, it is because the bottom is moving. Basically, the baseplate or skid deflects slightly and "allows" the compressor to vibrate.

The most common causes of vibration are loose or inadequate anchor bolts, or insufficient support under the baseplate. All bolts should be tight including the bolts that fasten the compressor to the baseplate, and the baseplate to the foundation. The compressor's baseplate should be secured along the full length on each side and not at the ends only.

Small Corken vertical compressors (models 91, 151, 191, 291, 351, 391 and 491) do fine with the baseplate mounted directly to a solid reinforced concrete foundation. However, as already noted, special attention should be given to the larger vertical compressors (models 591, 691, 791 and 891). The larger vertical compressors require a very firm foundation due to their vertical height. The HG600 series is a horizontal balanced-opposed compressor, but we recommend using the foundation guidelines for larger compressors.

Proper Foundation Design

The foundation design is the end-user's responsibility. Local soil conditions can affect the foundation design. Generally speaking, the larger the foundation, the less likely you are to have vibration or shaking problems. As a rule of thumb, when preparing the foundation, the mounting slab should be 8 to 10 inches thick with the overall length and width 4 inches longer and wider on each side of the baseplate.

Grouting the Baseplate

Grouting the baseplate helps reduce vibration on the larger compressors (models 591, 691, 791, 891 and HG600). Sometimes, the baseplate or skid itself flexes and allows the compressor to vibrate. On the large compressors (model 591 and up), Corken welds gussets/webs to the underside of the baseplate to help prevent vibration.

Proper Anchor Bolt Selection

Permanent anchor bolts such as J- and I-bolts should be of sufficient size, strength and quantity and embedded in the concrete. Expansion bolts should not be used. All-thread is too soft for a proper anchor bolt and should never be used. All anchor bolts must be tightened on a routine basis. All anchor bolt holes in the baseplate should be used.

Proper Flywheel Selection Installation

Corken's standard flywheel is sufficient for most applications. However, certain conditions require an optional oversize flywheel. An undersized flywheel will cause vibration. In some instances, an improperly installed flywheel or V-belt drive will result in vibration. In addition, an uneven load caused by a damaged compressor valve can cause vibration. Problems inside the compressor that cause vibration generally also cause knocking, high temperatures, and reduced capacity.

Isolation Devices

Some Corken customers have used vibration isolating rubber pads or springs with mixed results. Sometimes they work and other times they do not. Vibration isolating springs generally do not work and can actually magnify the problem. Corken's recommendation is to bolt the compressor down as solidly as possible to a properly installed concrete foundation as mentioned above.

Proper Piping Supports

The compressor **must not** support any significant piping weight; therefore, the piping must be fully supported. The use of flexible connections to the compressor is highly recommended. Rigid, unsupported piping combined with a poor foundation will result in severe vibration problems. In order to reduce pipe vibration induced by the compressor, flex hoses should be installed in the piping on either side of the compressor. These should be oriented vertically – **not horizontally** – as shown in Illustration 13. Pipe vibration can also be caused by the pulsating flow of gas inside the pipes. The pulsating flow is normal and to be expected from a piston type compressor. If this is a problem, it can generally be corrected with pipe supports or pulsation dampeners. In Corken's size range, generally, a small vessel in the piping is all that is required to act as a pulsation dampener.

As mentioned previously, a properly engineered foundation should be installed before placing the new compressor into service. The illustrations on the following pages show some basic guidelines for designing a proper foundation and installing a baseplate or skid. The mounting variations shown are guidelines only.

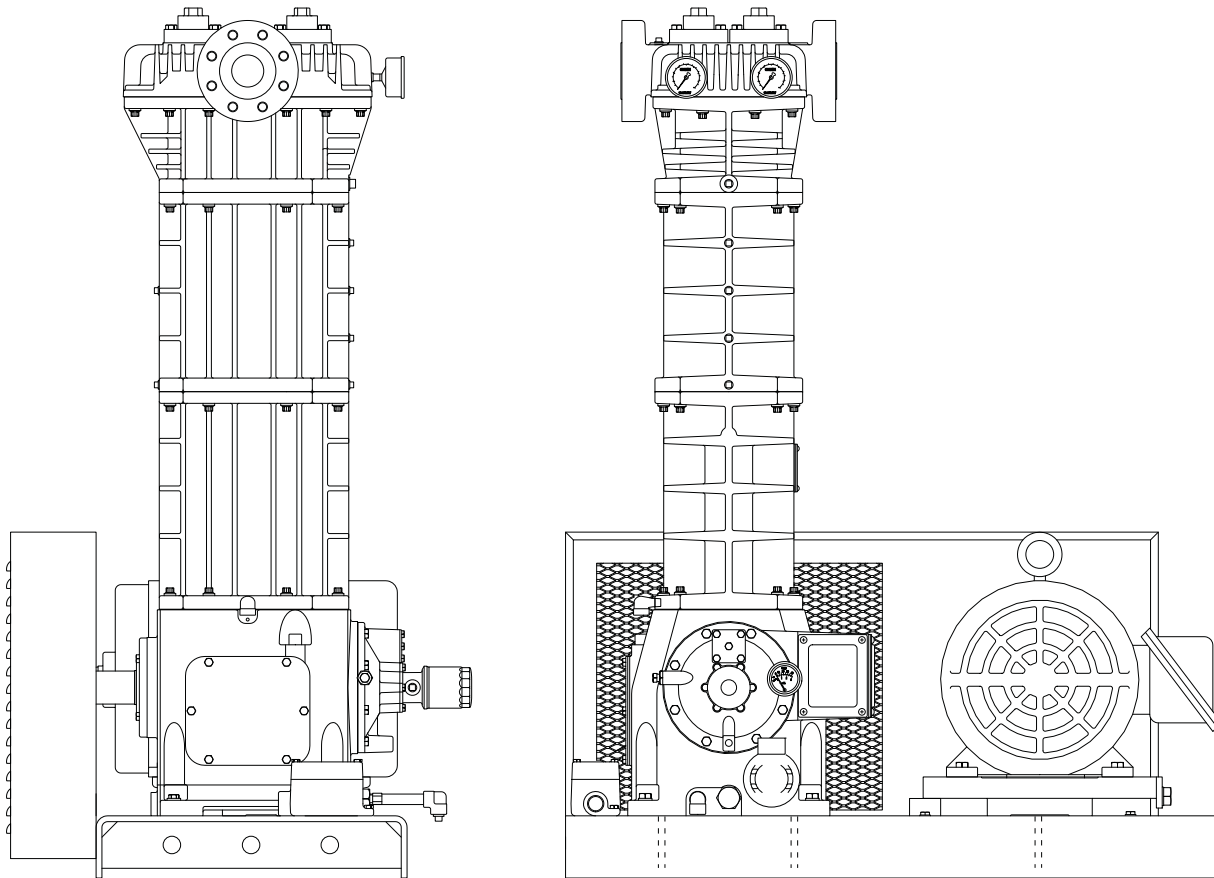
NOTE: A special baseplate is required on some of the illustrations. Any proposed isolation mounting arrangement **must** be properly engineered. Failure to do so will most likely increase the severity of the problem.

If you have any questions concerning the compressor foundation for your installation, please do not hesitate to contact Corken.

Specifications for Baseplate and Skid Mountings

Formed Steel Baseplate Specifications

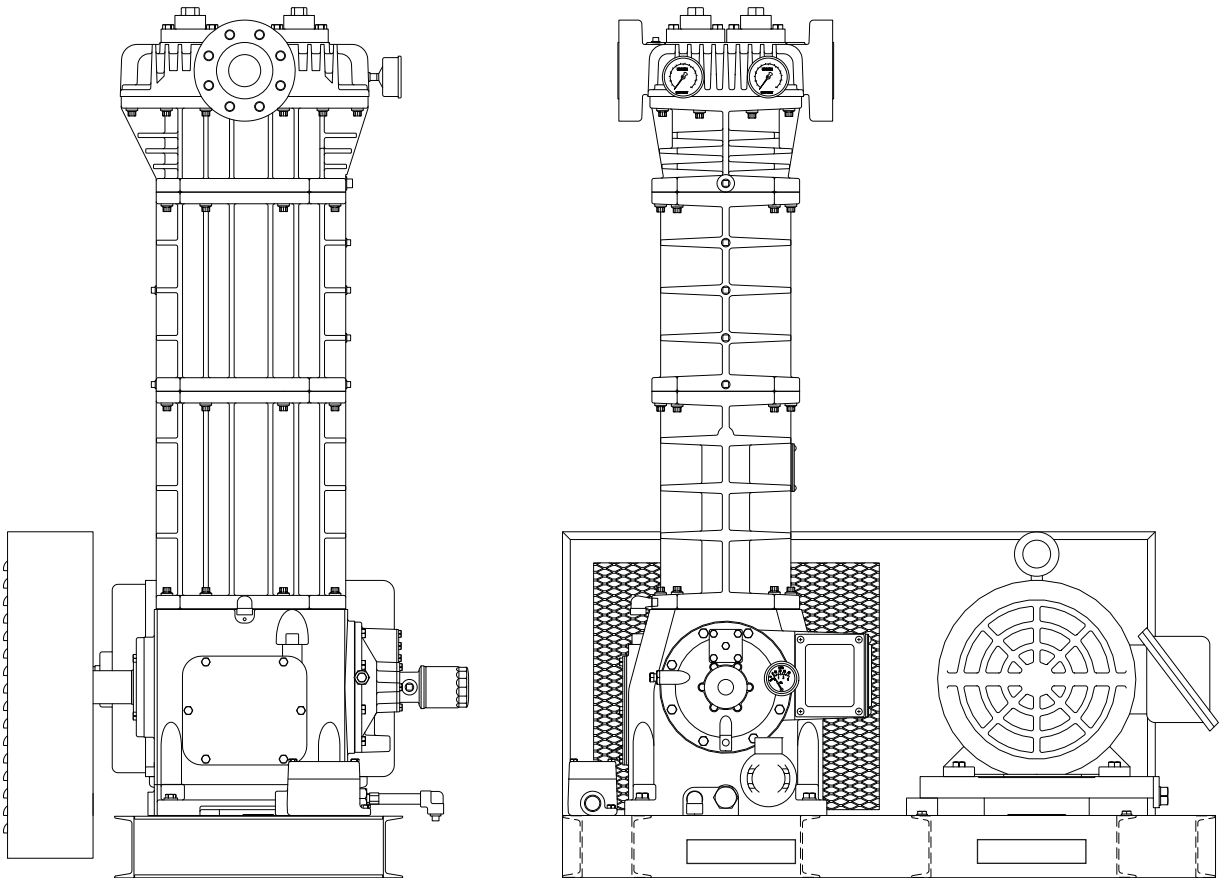
- 1) Baseplate thickness should be at least 3/8 inches (1 cm).
- 2) Maximum height of baseplate is 4 inches (10 cm).
- 3) Maximum width should not exceed 26 inches (66 cm).
- 4) Welded internal stiffening gussets/webs must be used on models 591 thru 891 or if the width of the baseplate exceeds 18 inches (46 cm).
 - a. Two gussets/webs under the compressor.
 - b. One gusset/web under an electric motor and two under an engine.
 - c. Gussets/webs should be welded to the top and each side of the baseplate.
 - d. More gussets/webs is always better than not having enough.
- 5) Baseplate must be mounted to a concrete foundation or welded to a structural steel skid and should never be mounted on the ground/soil.
- 6) Mounting bolt holes should be located on the top of each side of the baseplate.
 - a. The spacing between each bolt hole should not exceed 26 inches (66 cm).



Formed Steel Baseplate Configuration

Structural Steel Skid Specifications

- 1) You may use top plates as needed; however, the compressor must be placed directly over the main beams. See illustrations 10, 11 and 12 on the following pages.
- 2) Forklift slots are acceptable.
- 3) Acceptable types of construction are C-section beams, I-beams or wide-flange I-beams.
 - a. When placing the skid on the soil, I-beams or wide-flange I-beam construction should be used.
 - i. Filling the skid with concrete is recommended when placing the I-beam or wide-flange construction on the soil.
- 4) Mounting bolt holes should be located at the bottom flange of the beam and run along each side.
 - a. The spacing between each bolt hole should not exceed 26 inches (66 cm).



Structural Steel Skid Configuration

Illustration 1 Foundation—Ground Level

Your concrete foundation should be 8 to 10 inches deep and larger than the compressor baseplate. Length and width should be 4 inches longer and wider. Proper depth is necessary for adequate bolting and stability. The foundation should also be slightly above ground or grade level as shown.

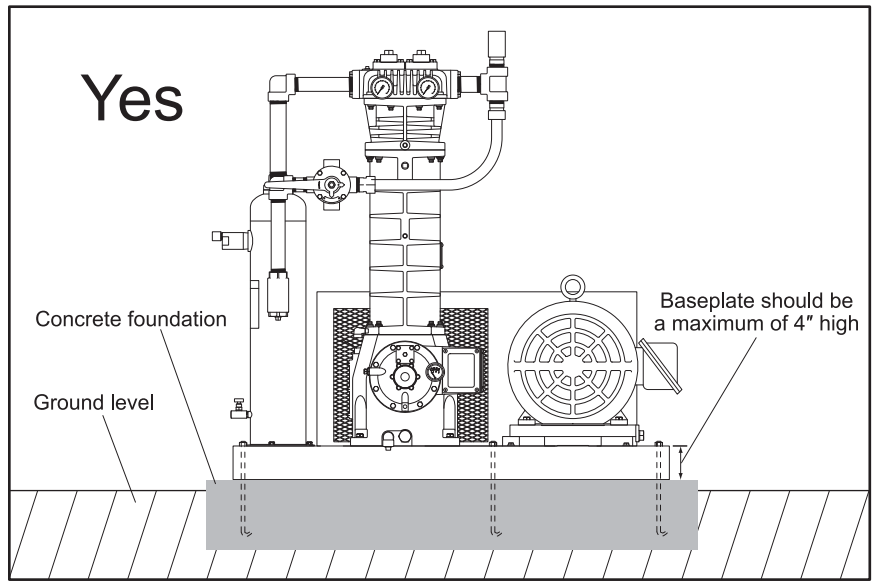


Illustration 2 Foundation—Floor Level

If the existing floor is not thick enough to support the compressor mounting, cut out the existing floor and mount a separate foundation directly on the ground. The top of the foundation should be slightly above floor level and 8 to 10 inches deep as shown.

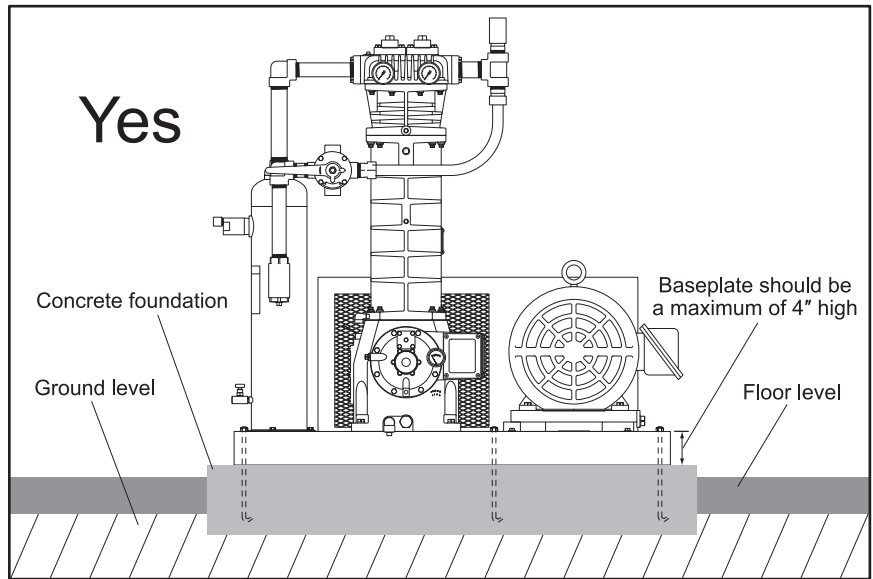


Illustration 3 Foundation—Floor Level

Anchors or lags with a shallow foundation will pull loose. Be sure the existing floor is solid. Note: Special consideration should be given to compressors mounted on suspended floors.

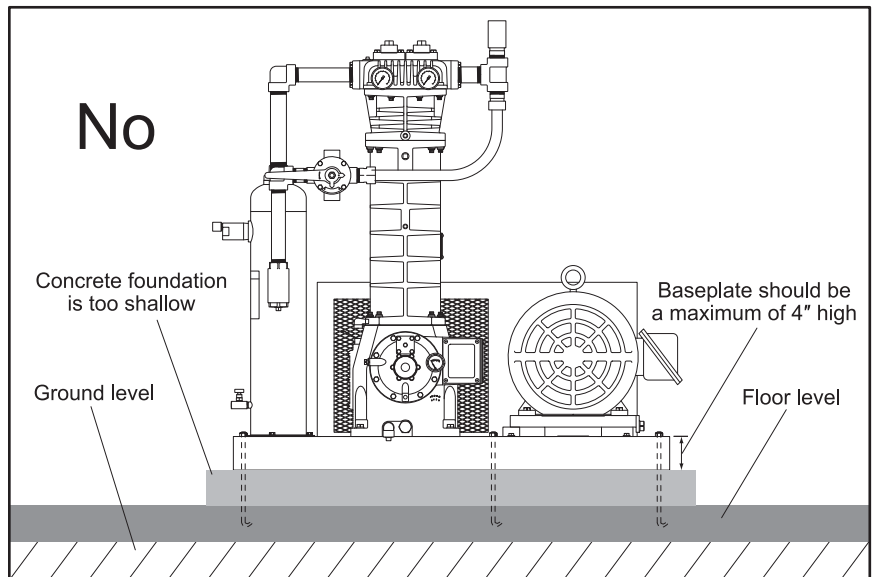


Illustration 4 Proper Anchoring

Permanent anchor bolts embedded in the concrete foundation is a very good installation method. Grouting the baseplate to the concrete foundation is highly recommended.

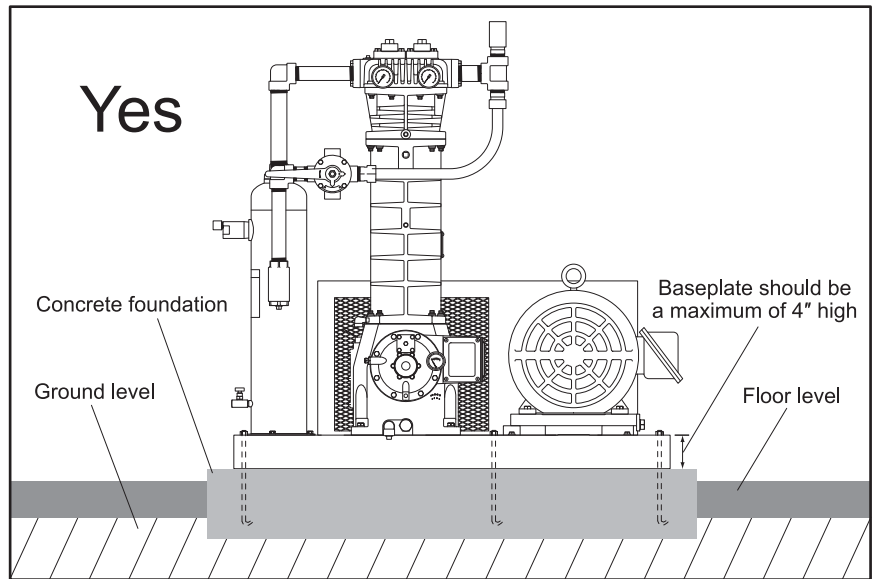


Illustration 5 Mounting Baseplate—Concrete

The concrete foundation must support the entire length of the baseplate on each side. Some shims may be required for unlevel foundations. The baseplate should be a maximum of 4 inches high while the foundation should be 8 to 10 inches deep. **Grouting the baseplate to the concrete foundation is highly recommended** for the small compressors (91, 151, 191, 291, 351, 391 & 491) and is **required** for the large compressors (591, 691, 791, 891 and HG600).

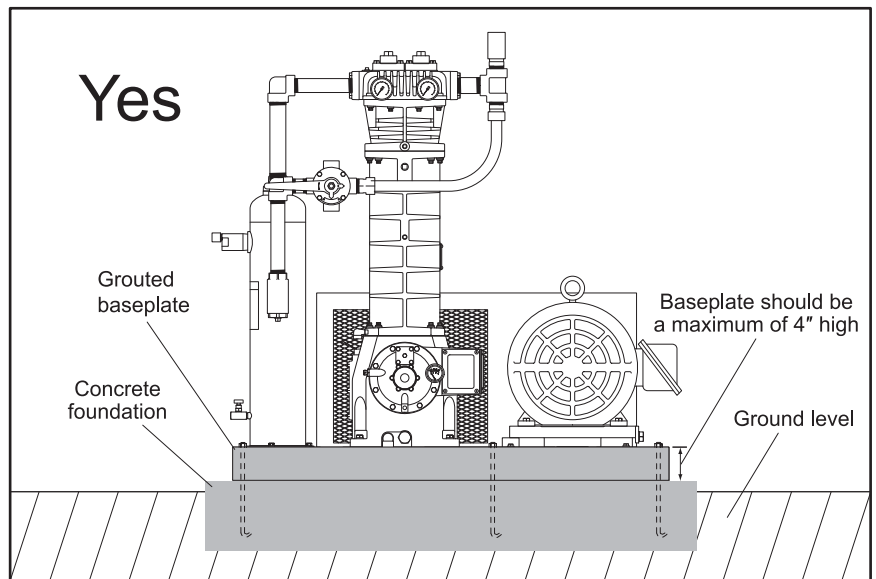


Illustration 6 Mounting Baseplate—Concrete and Shims

Do not suspend baseplate with spacers or shims that allow support at the anchor bolts only. **The baseplate should not be suspended in the air.**

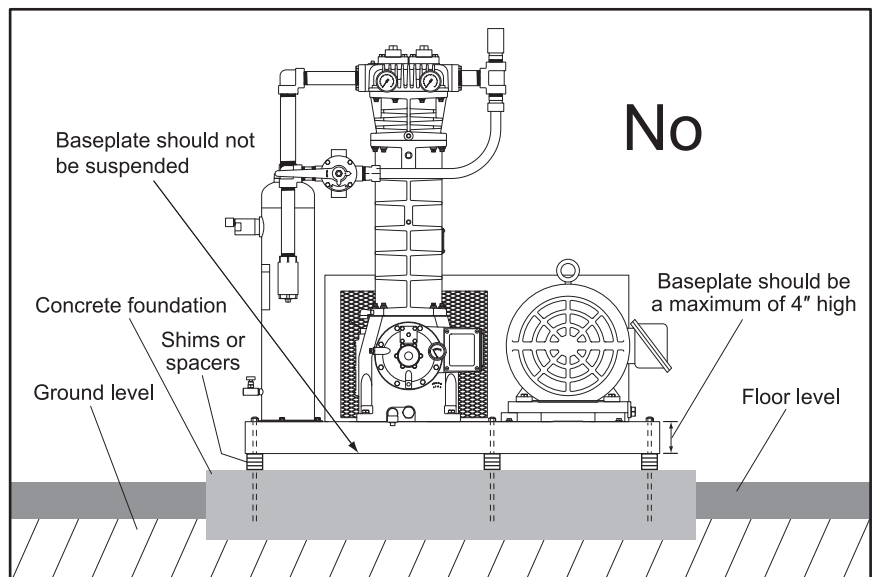


Illustration 7
Mounting Baseplate—Concrete and Rubber Mounts

Rubber mounts or pads have mixed results and generally are not recommended. At times they can magnify the vibration. **The baseplate should not be suspended in the air.**

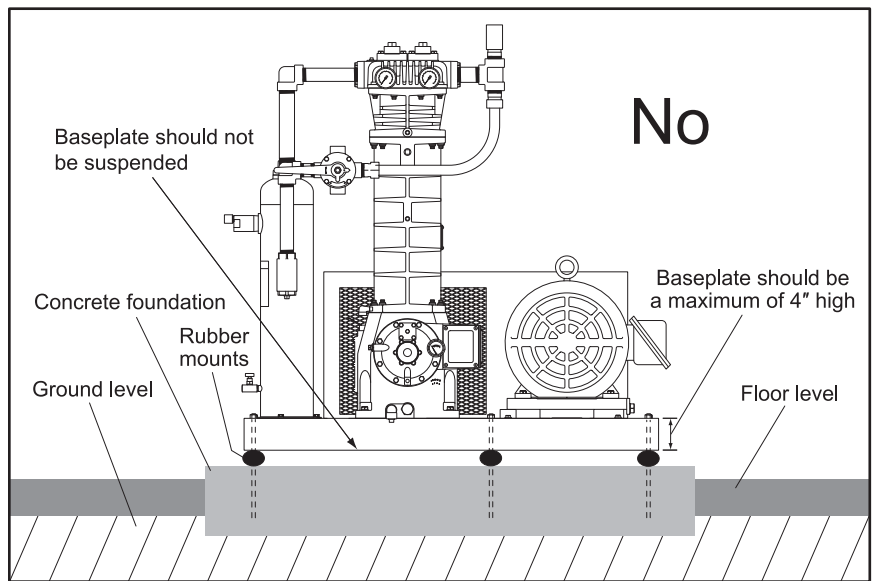


Illustration 8
Mounting Baseplate—Concrete and Welded Anchor Bolt Tabs

Do not weld anchor bolt tabs to the side of the baseplate. If the tabs should extend beyond the bottom edge of the baseplate, the baseplate will not be able to rest firmly against the foundation and vibration will occur. Each side of the baseplate must be **fully** supported by the foundation.

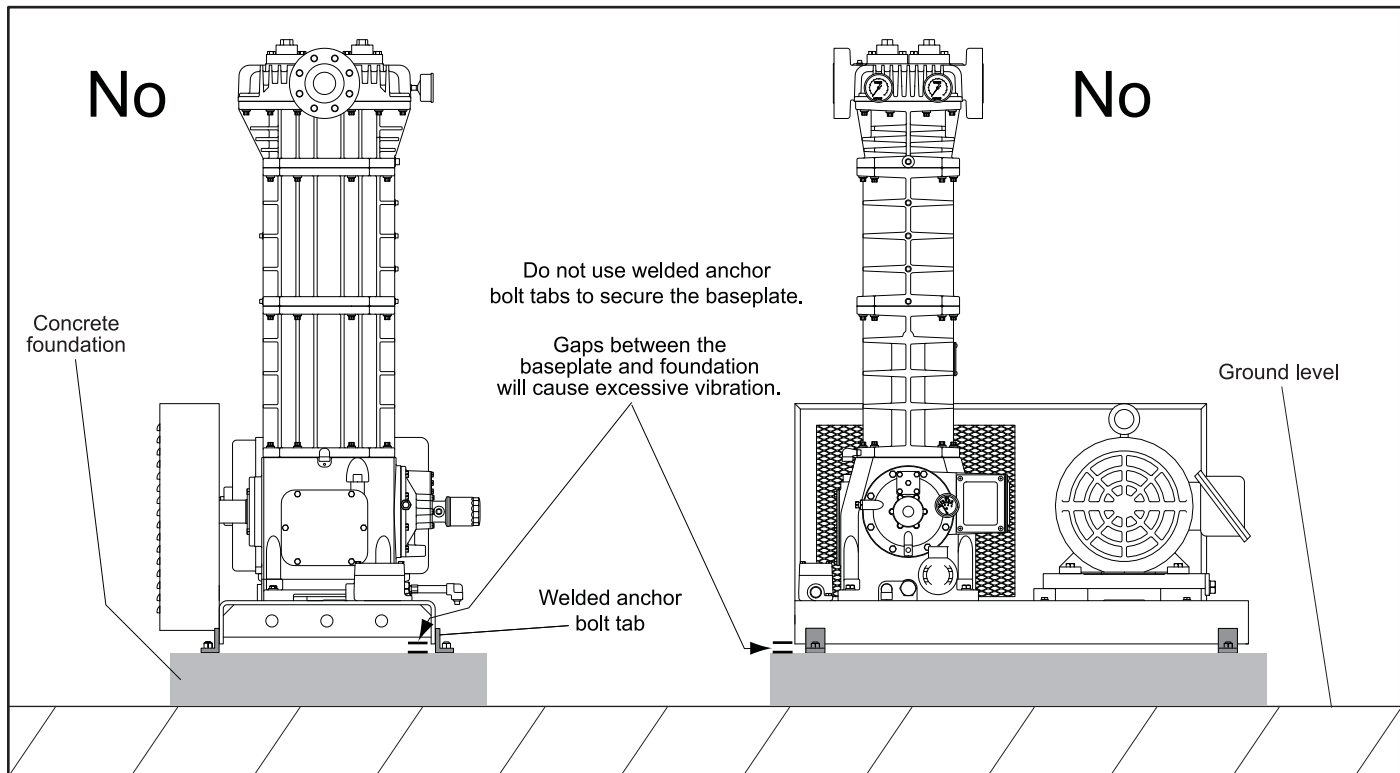


Illustration 9
Mounting Baseplate—Suspended

Note: A special rigid baseplate is required for this type of mounting. Installing mounts at the compressor's center of gravity is effective on smaller compressors (models 91, 151, 191, 291, 351, 391 and 491).

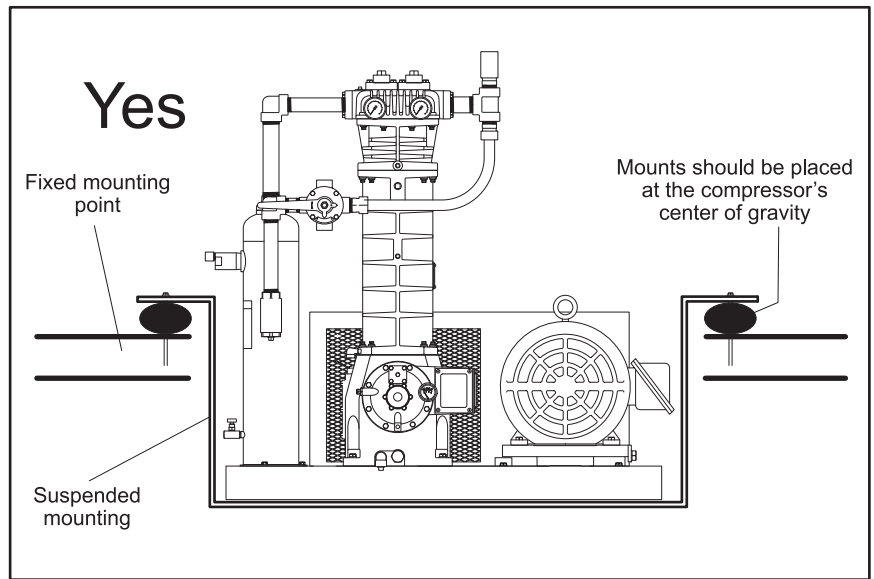


Illustration 10
Mounting Baseplate—Concrete and Steel Mounting Base

Do not mount the compressor baseplate across beams without center support as shown. **The baseplate should not be suspended in the air.** For a proper installation, the baseplate should be fully supported on each long side of the baseplate.

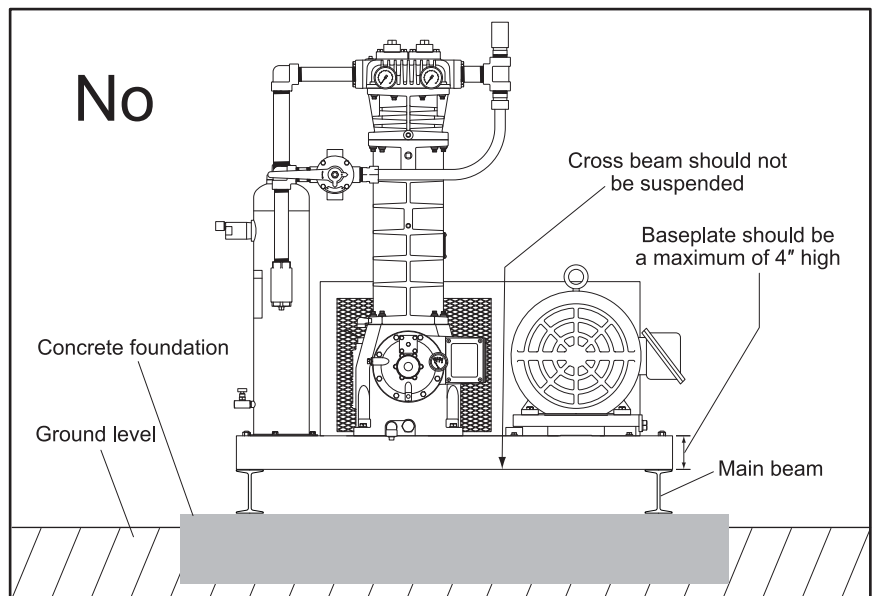


Illustration 11
Mounting Baseplate—Concrete and Steel Mounting Base

When mounting to a skid or structural steel base, do not mount the compressor baseplate to suspended beams or angle iron as shown. All main beams and cross beams should mount **flush** to the concrete foundation.

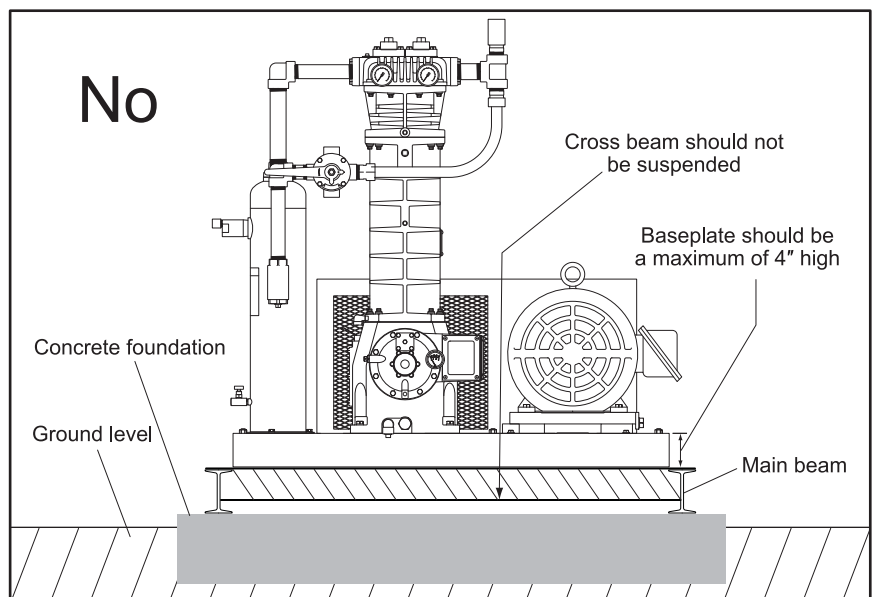


Illustration 12
Mounting Baseplate—Concrete and Steel Mounting Base

Mount the compressor baseplate on the main beams or channels of the steel mounting base. This will give support to the long sides of the baseplate. NOTE: Crossbeams should be the same height as the main beams. The baseplate should be welded to the steel mounting base directly over the vertical web of the main support beam.

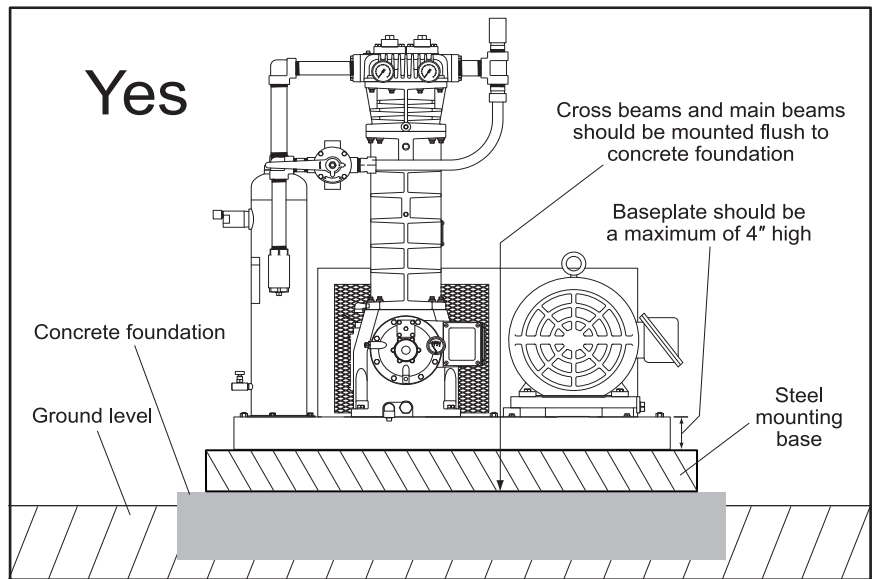


Illustration 13
Flexible Connections and Piping Supports

The compressor **must not** support any significant piping weight. The piping must be properly supported. The use of flexible connections at the compressor is highly recommended. Flexible connections must be mounted vertically—not horizontally—as shown. Rigid, unsupported piping combined with an inadequate foundation will result in severe vibration problems.

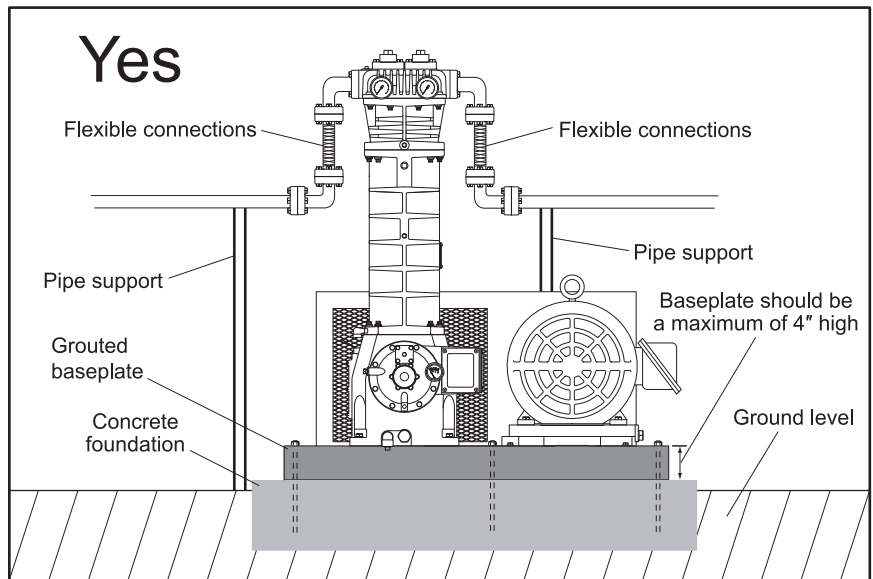
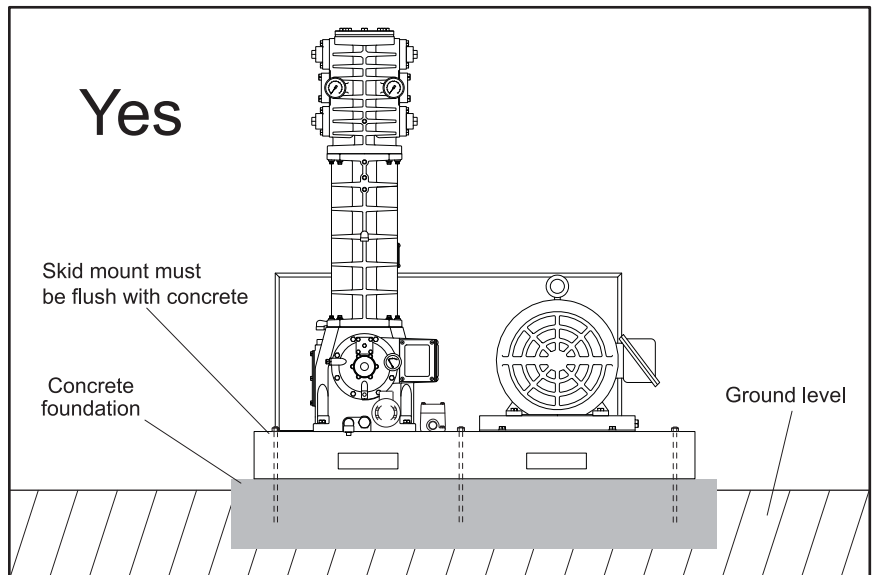


Illustration 14
Mounting Steel Base/Skid to a Concrete Foundation

A steel mounting base/skid should be mounted flush to the concrete base as shown.





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