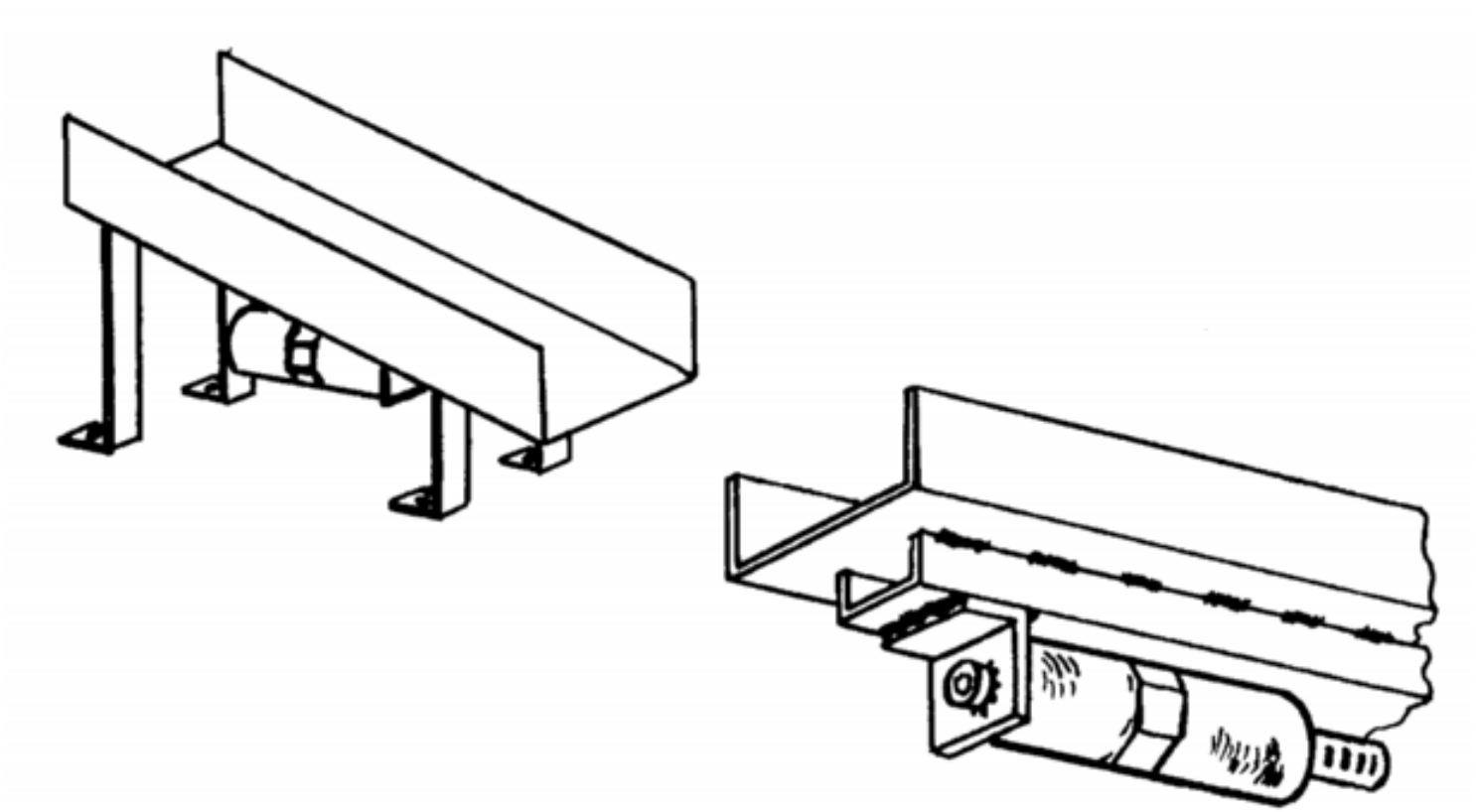
ON-LINE MANUAL
Mounting

3. Where and how to attach the vibrator

3.1. Linear Piston Vibrators

These vibrators are used mainly for feeding applications. The most common feeder forms are channels, chutes and spiral chute feed hoppers. Piston vibrators are not recommended for emptying bins and hoppers since they produce impacting energy that moves bin walls back and forth which can cause oil canning problems as greater force is needed to make material flow. The impact and the force may cause structural damage to the bin also. The FP-series are non-impacting.

3.3.1. Chutes



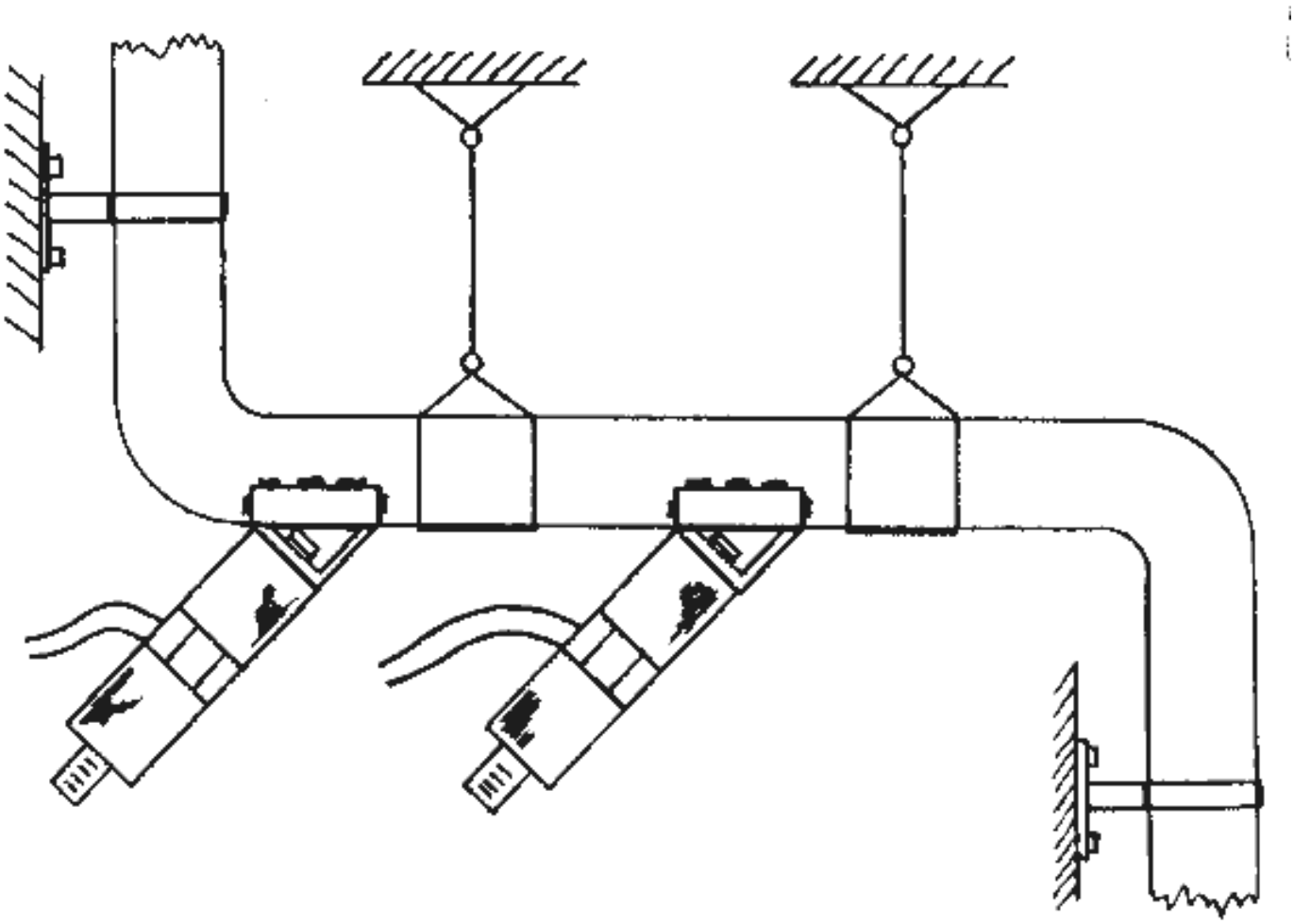
Chutes

Feeding materials in chutes consists mainly of aiding gravity's natural force, since chutes, in most cases, are mounted with a downward slope. To allow the vibrator to function properly, the chute should be suspended on laminated iron springs, fiber springs or rubber elements. The vibration direction should be horizontal only.

Make sure the vibrator is mounted rigidly to the chute. If the chute base is not stiff enough the vibrator should be mounted

on a stiffening channel or U-shaped iron running the full length of the chute.

3.1.2. Channels and tubes



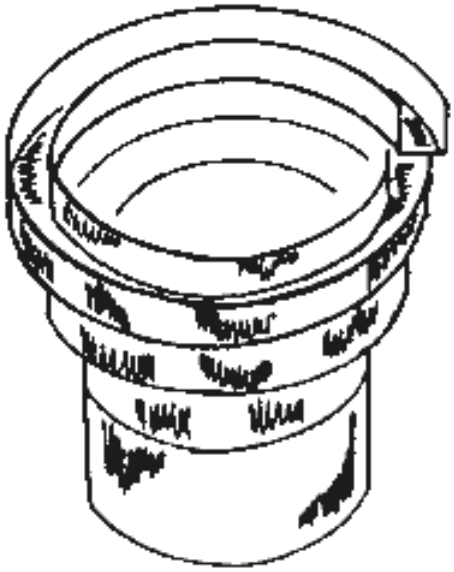
Channel

Channels or tubes like the one shown above are used to feed fine materials such as chemical powder, flour, or sugar between silos and production machines. The advantage is that the material does not come in contact with anything other than the channel which can be made out of chemical resistant material. This satisfied regulations regarding cleanliness and non-contamination in food and pharmaceutical industries.

The vibrators are mounted with a 45° angle which causes the powder material to be pushed forward. If necessary additional transversal rib elements can be fixed in the channel, so even upward slope does not hinder the feeding.

It is important to insure that the channel is stiff but not mounted too rigidly. It is possible to use several piston vibrators in line if the channel is long, but they have to be of the same type and model so that they will operate at the same frequency and phase assuming the channel is stiff. The channel itself can be stiffened by welding a small channel with heavy wall thickness to the outside of the channel or tube. Please note that the ends of such stiffener channels must not be welded for the first 3mm.

3.1.3. Spiral chute feed hoppers



Spiral chute feed hopper

Spiral chute feed hoppers are used whenever small bulky parts have to be feed automatically into machines. They often include a system to position parts in a certain way when they are fed into the machine.

Normally, spiral chute feed hoppers are driven by electrical, rotary or electromagnetic vibrators. Pneumatic piston vibrators are advantageous for saving space while keeping high vibration power.

The spiral chute should be mounted on laminated springs or rubber elements. Two vibrators should be mounted opposite each other to get an imaginary vertical fulcrum. The exact mounting angle of the vibrators must be obtained by practical tests, but an angle of 45° to the chute base line is normally a good value.

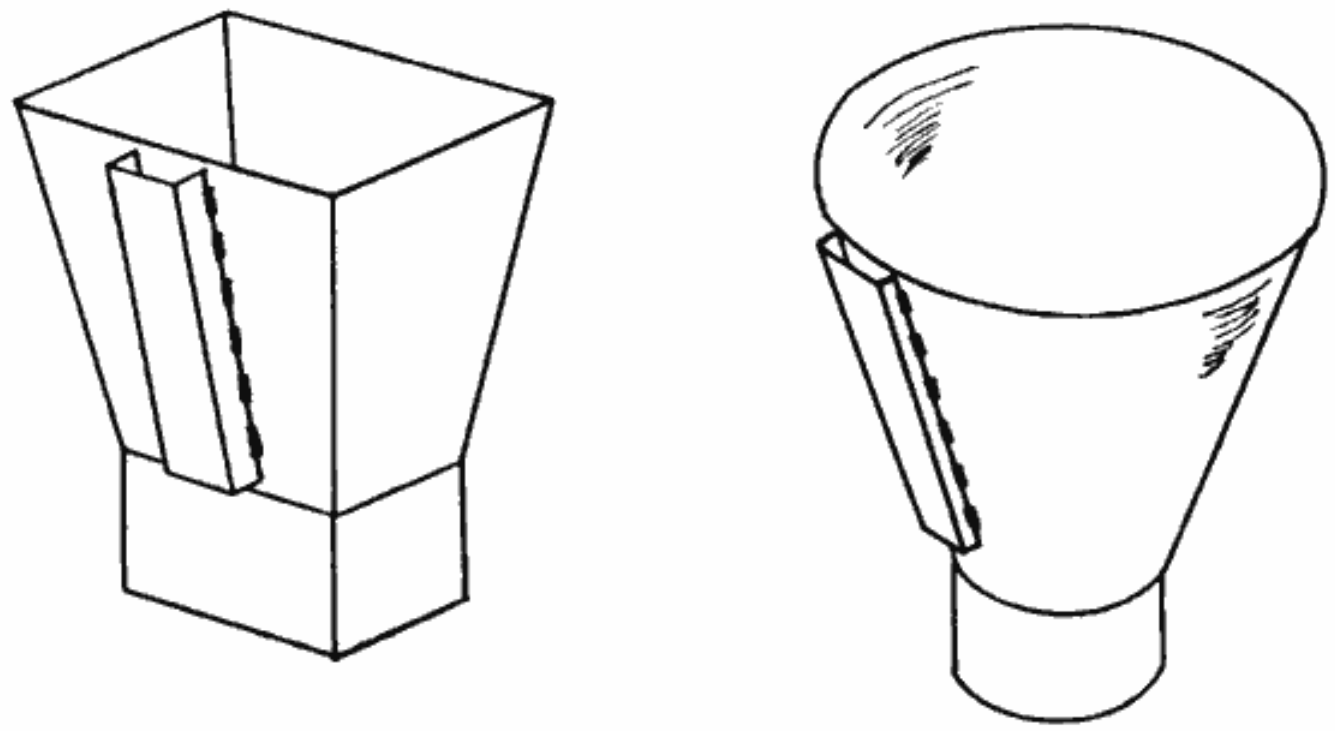
3.2. Rotary Vibrators

Rotary vibrators produce a sinusoidal vibration. This type of vibrator is much more efficient in bringing materials into resonance than the linear vibrators. The frequency of a rotary vibrator can be adjusted in a wide range by using a pressure or flow regulator.

Rotary vibrators are used mainly to separate or compact materials. One common application is emptying bins, silos, and hoppers. The function of the vibrator in separation applications is to separate clogged material to free it. Once it is freed it moves downward by the force of gravity.

Rotary vibrators can be used for feeding materials similarly to linear ones. Since piston vibrators do not create strong forces, larger rotary vibrators are commonly used for feeding heavier materials like gravel in chutes and for screening materials which respond better to sinusoidal vibrations than impact vibrations.

Linear vibrators are not effective in compacting concrete. The unidirection motion will compact when moving forward and separate while moving backwards. To compact concrete two types of rotary vibrators are used, namely, internal and external vibrators. Internal vibrators are sometimes called poker vibrators. That are dipped into concrete, and a needle containing a rotary mass is driven electrically, pneumatically or with a flexible shaft by an engine into the concrete. These poker vibrators are used for building or bridge construction wherever larger areas are to be compacted. They may also be used in wall, pilon, or tunnel construction, but external vibrators placed on the outside moulding form are recommended for these situations.



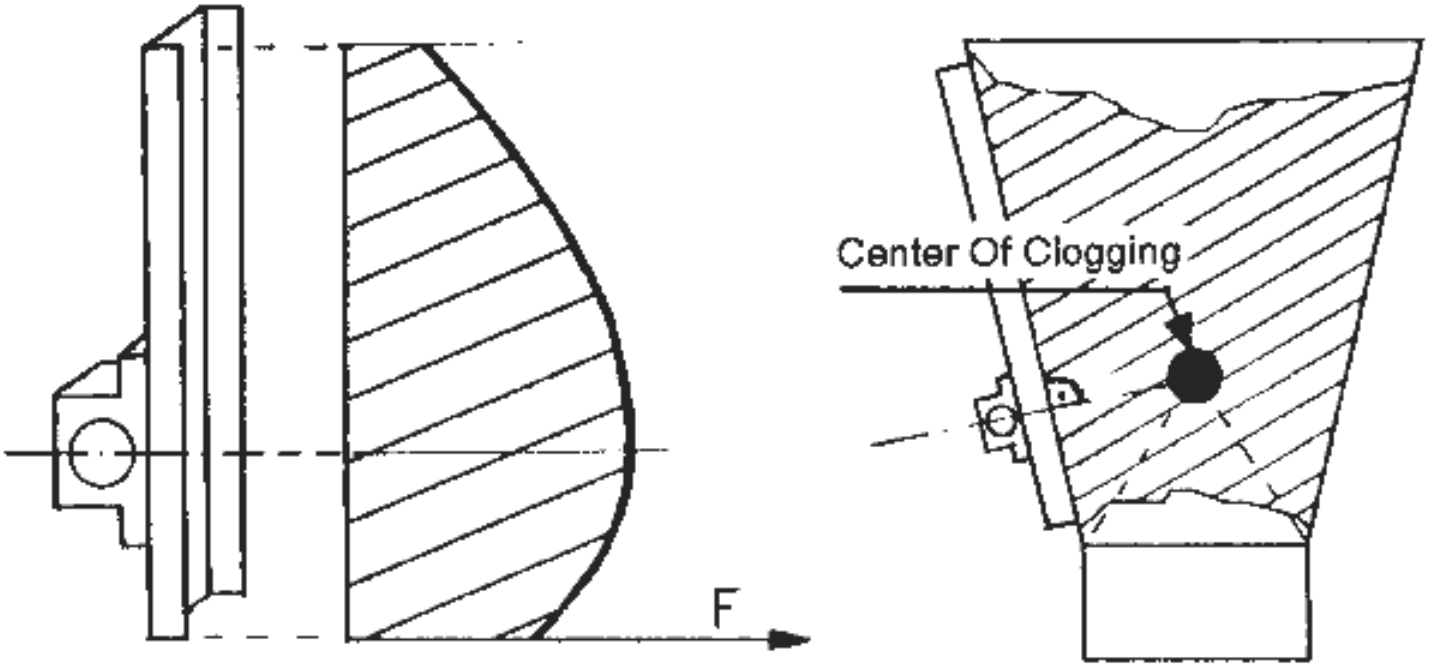
Using a channel iron

3.2.1. Mounting on bins and hoppers

Using a channel iron that is stich welded vertically is the best way to transfer as much as possible vibration energy into the material inside the bin. The channel should be placed on the symmetrical axis of the larger side of a four-cornered bin. Take care that no frame structure moves closer than half of the length of the channel iron to the channel iron because it would absorb most of the vibration energy and could also lead to damage of the frame structure.

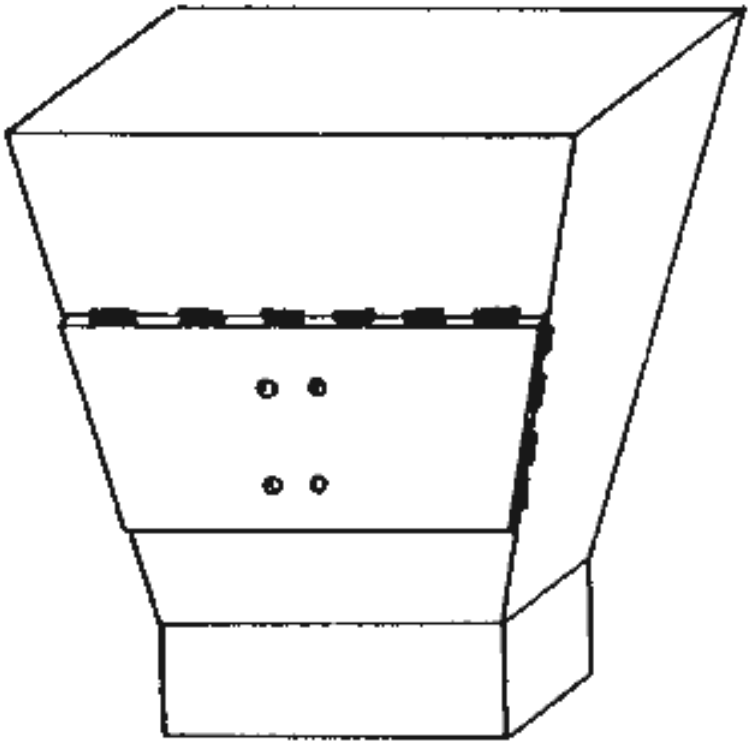
The channel works as stiffener so that the vibrating power is spread over the full length of the channel. Of course the vibrating power at the ends of the channel is less than the power near the vibrator. The vibration waves are pushed away in a 90° angle to the channel's length, so the optimal place for the vibrator is on the imaginary line connecting the channel iron to the center of clogging.

If the center of clogging is unknown, practical experiences indicated that a good mounting site is at about 1/3 of the height of the bin or hopper.



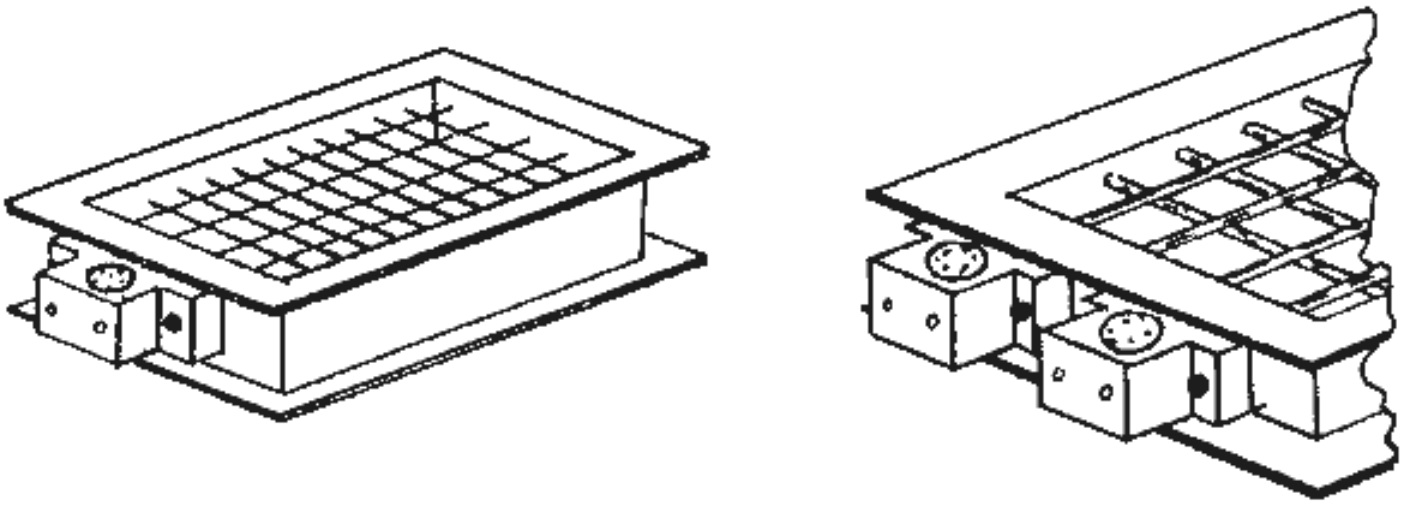
Vibrating power on a channel / center of clogging

Instead of a channel iron a plate can be welded to the bin to assure enough stiffness to spread the vibrating energy throughout the bin or hopper. Because of their thickness, area and weight a certain amount of vibrating energy is therefore wasted to vibrate the plate itself.



Using a plate

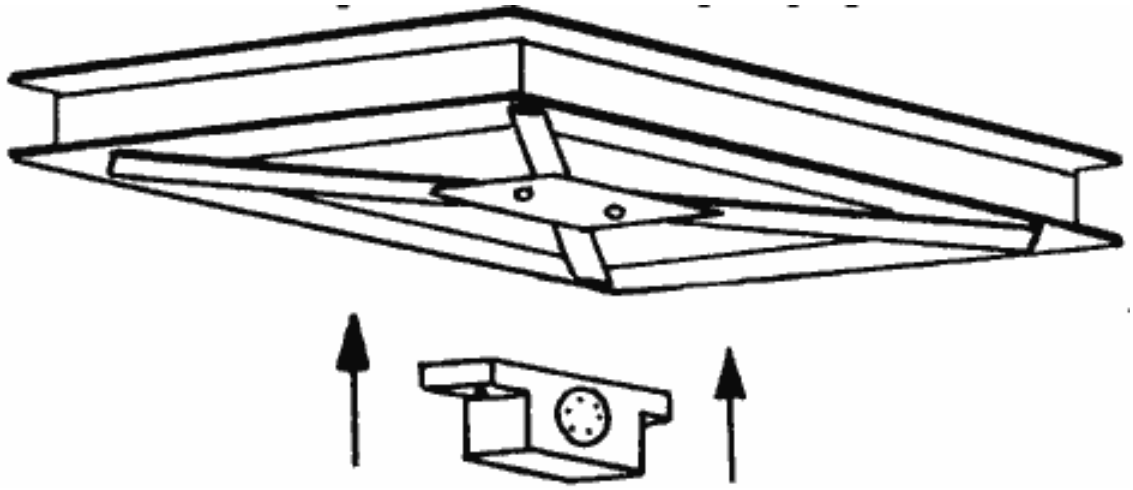
3.2.2. Mounting on screens



Mounting on a screen

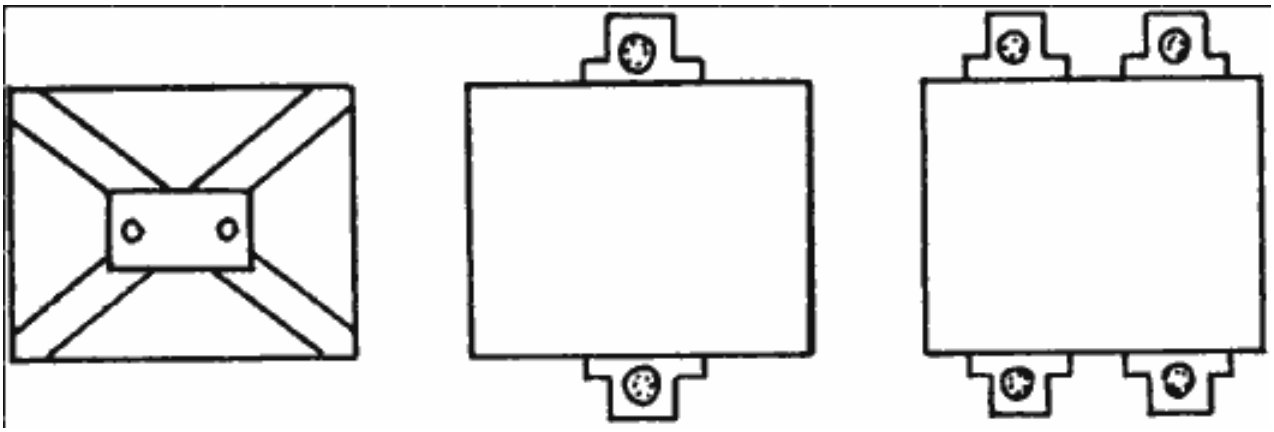
As mentioned earlier, screens are very similar to chutes. Screens may be activated by a vibrator mounted on the smaller edge or in the center. Often, when screening heavier material like gravel one single vibrator is not powerful enough. Under such circumstances two units can be mounted very close to each other. They will immediately synchronize and double the vibrating power. Take care that the frame is stiff enough. If it is not, the rigidity can be increased by using channel (U- or H-type) irons and a vibrator mounted in the center as in the following figure.

The screen must be mounted on springs or rubber elements so that the vibration energy is not absorbed by the screening machinery's structure. Make sure the air pressure tube and connection to the vibrator cannot be mechanically harmed. When mounted outdoors, please refer to paragraph 6.1.4.



Increasing the rigidity of a screen (bottom view)

3.2.3. Mounting on a concrete mold

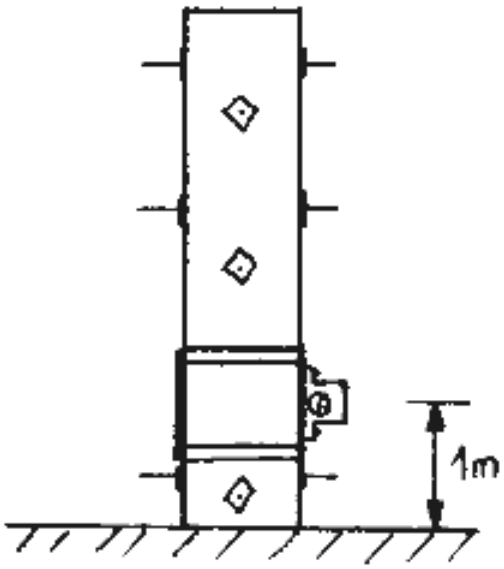


Mounting on a concrete mold (bottom view)

As with bins, the use of a channel iron or plate is recommended to spread the vibration energy when mounting on a concrete mold. If the mold is extremely small (less than 50 by 50 cm / 20 by 20 inches) the vibrator may be placed in the center under the mold. If it is larger, one of three configuration is recommended: one vibrator only, two vibrators mounted opposite each other on the longer sides of the mold, or four vibrators with two mounted opposite each other on the longer sides of the mold.

Like the screens, pneumatic vibrators mounted on molds will synchronize immediately after they begin to vibrate. The mold should be mounted on rubber elements or laminated springs, but also fixed in a fairly rigid position so the mold will not continue to swing or vibrate after the vibrator's energy is cut.

3.2.4. Mounting on a concrete form



Mounting on a pilon form

Under normal circumstances the wooden or iron form plates of concrete pilons are sufficiently stiff to mount a vibrator since the square area is relatively small. It is best to place the vibrator relatively close to the bottom of the pilon, around a height of 1 m. This guarantees that the lower portion of the pilon will be vibrated correctly. The upper part can move relatively freely, and the reinforcing steel in the pilon will transfer the vibration energy upwards. Even for pilons of up to 4 m in height, one single vibrator is absolutely sufficient. It can be attached with clamps.

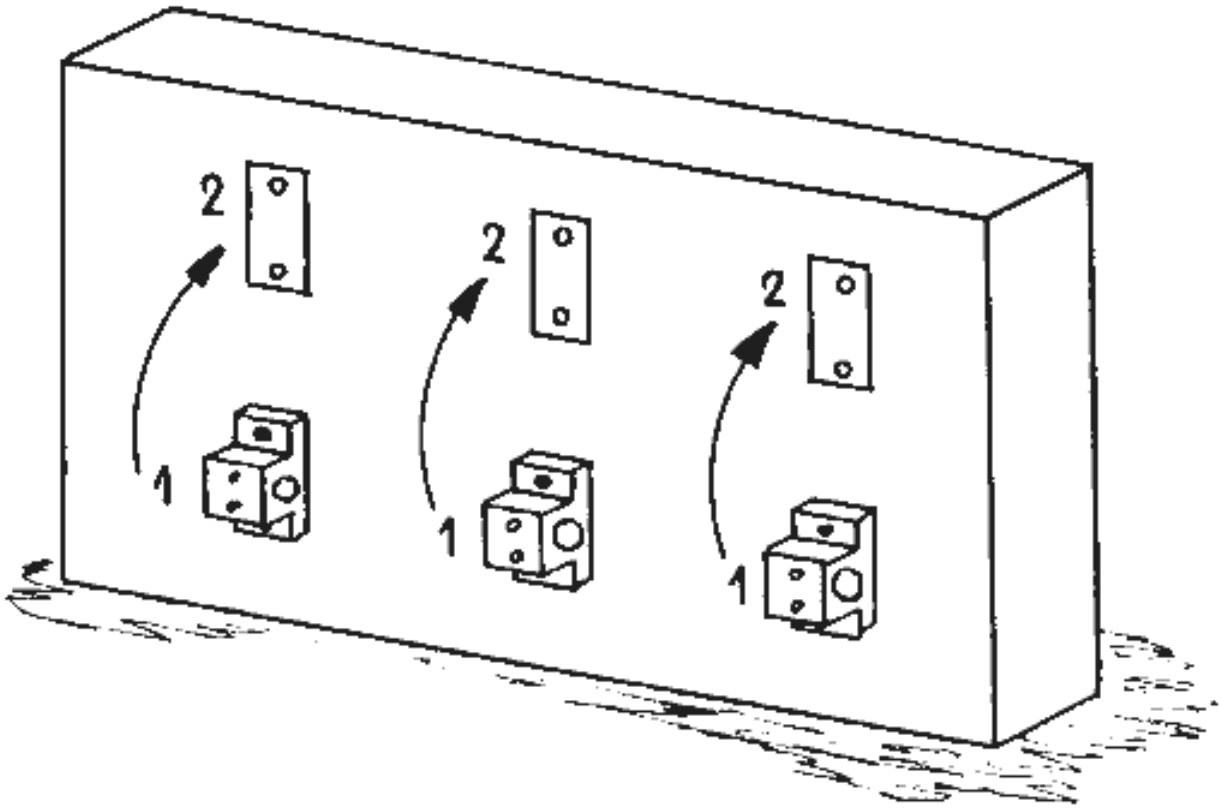
For longer pilons, instead of using two or more vibrators, the first few meters should be vibrated as it is poured.

Subsquently, every few meters, the poured concrete should be vibrated separately until the pilon is completed.

The time of vibration varies according to the viscosity of the concrete and the additives used .

Unlike pilon forms, concrete forms for walls are generally not very stiff. Hence, the vibrating energy may not be spread very well using only one vibrator. Instead of using only one vibrator to cover a given area, several have to be used. They may be smaller accordingly.

The wall should be vibrated piece by piece (portions of 1 to 2 m in height at maximum).



Mounting on a wall form

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