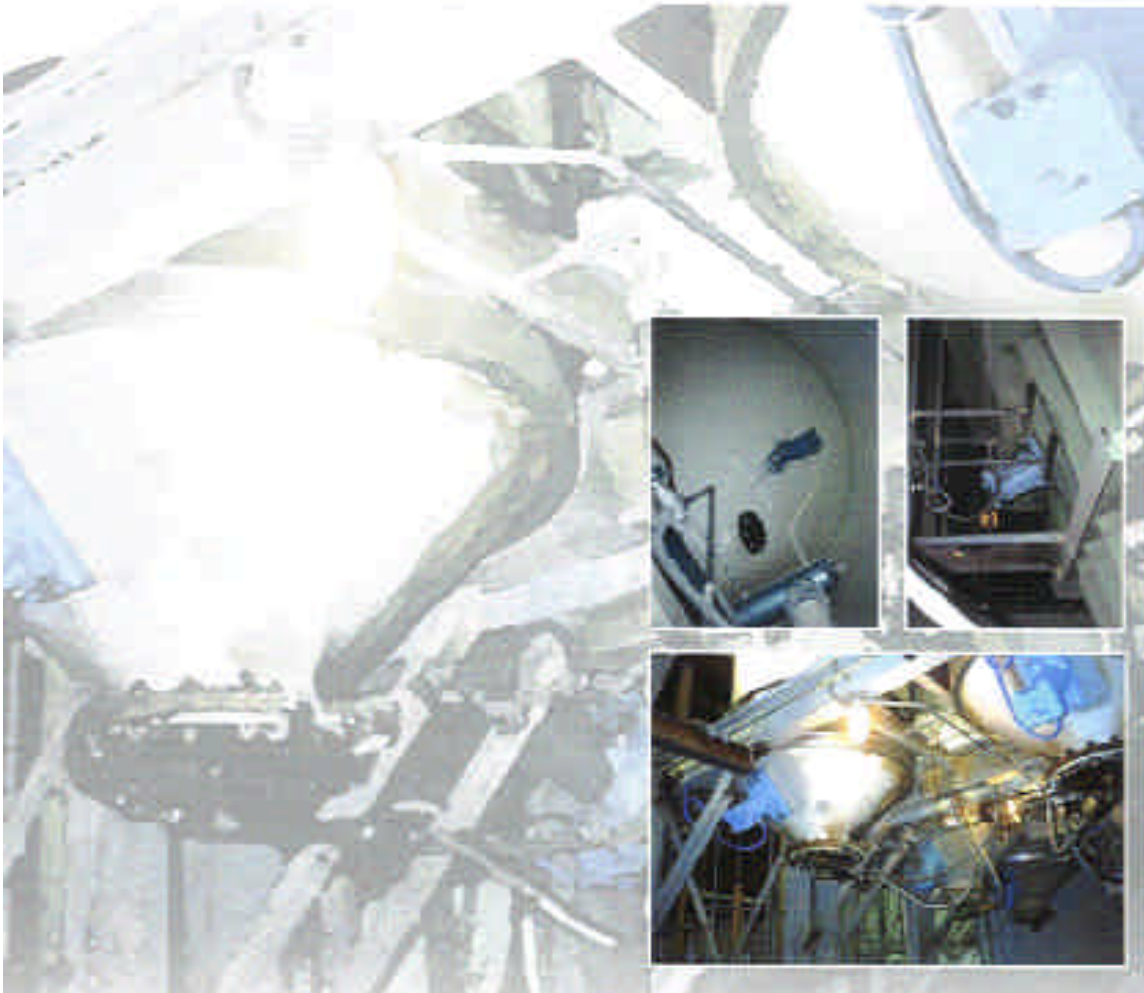


# **HOPPER VIBRATORS**



## Why use pneumatic piston vibrators?

**Linear Vibration** – The forces generated by **NAVCO** pneumatic piston vibrators are linear, so they may be directed and concentrated in the problem area. In addition, no damaging shear forces are applied to the mounting bracket or storage vessel.

**High Amplitude, Low Frequency** – The high-energy impulse vibration generated by **NAVCO** pneumatic piston vibrators is effective in reducing the strength of bulk materials and the sliding friction between the material and the bin wall. This is accomplished without approaching potentially damaging resonant frequencies.

**Low Cost** – **NAVCO** Pneumatic piston vibrators can solve virtually any bulk material flow problem at a fraction of the cost of equally or less effective alternative solutions.

**Low Maintenance** – When installed and operated properly, **NAVCO** pneumatic piston vibrators provide years of effective performance.



**BH on a coal bunker**



**BH on a hopper**



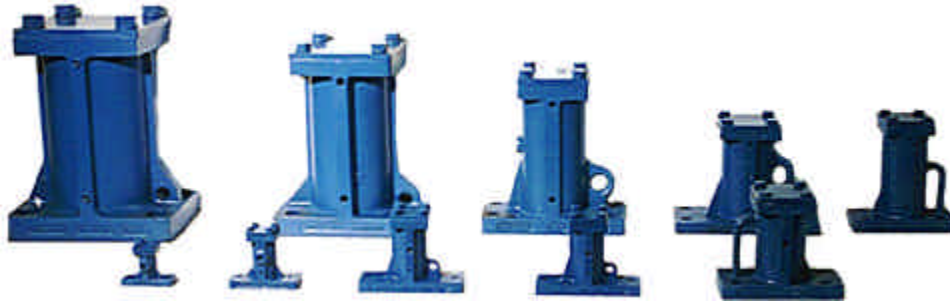
**BH installation close-up showing airline accessories**

## Why use NAVCO vibrators?

**NAVCO** has been solving bulk material flow problems using pneumatic piston vibrators since 1955. Incorporating the most advanced manufacturing techniques, quality control, and bulk solids flow technology, **NAVCO** provides effective solutions utilizing reliable field proven equipment.

**NAVCO** has technically oriented stocking distributors in major cities throughout North America who provide local inventory and knowledgeable personal service. **NAVCO** offers more than just vibrators. We offer solutions to material flow problems – and we stand behind them!





## Sizes

**NAVCO** BH Series Vibrators are available in ten different piston sizes to handle virtually any bulk material flow problem. Each size is offered in three distinct types of operation:

- Impacting (IGO)
- Air Cushioned (SGO)
- Timed Impact (IGT)

Impacting units deliver a high-energy impulse with each stroke of the piston. The Impacting model is the most effective of the three in eliminating difficult flow problems.

The Air Cushioned units trap a cushion of air at the base of the piston, eliminating the impact. Although the Air Cushioned models are quieter, a larger size is normally required.

Timed Impact models deliver a single high-energy impulse triggered by the output of a timer or other controlling device. Timed Impact units are particularly effective in applications where dry materials adhere to vessel walls.

## Sizing Vibrators for the application

Although there are numerous factors to consider in designing a flow aid system, there are “rules of thumb” for vibrator sizing. The two primary considerations are the hopper size and the wall thickness. The chart in **figure 1** will help in preliminary vibrator sizing. For large, unusual, or particularly difficult applications, please contact **NAVCO**.

VIBRATOR SIZE	BH 1	BH 1 1/4	BH 1 5/8	BH 2	BH 3	BH 3 Long	BH 4	BH 5	BH 6	BH 8
HOPPER CAPACITY	0–3 ft <sup>3</sup>	3–7 ft <sup>3</sup>	7–20 ft <sup>3</sup>	20–50 ft <sup>3</sup>	5–20 ton	20–50 ton	50–100 ton	100–300 ton	300–1000 ton	800–1500 ton
WALL THICKNESS	1/16–1/8	1/16–1/8	3/16–1/4	3/16–1/4	1/4–3/8	1/4–3/8	3/8–1/2	3/8–1/2	3/8–1/2	1/2–3/4

*Figure 1*

## Special Applications

**NAVCO** BH Vibrators are available with several options for a variety of special operating conditions.

**Tapped Exhaust** – For dusty, corrosive, underwater, or sanitary applications, tapped exhaust ports are available to protect the vibrator or to remove the exhaust from an area.

**Internal Spring** – When a vibrator is operated with the piston in a horizontal orientation, a spring is recommended for instantaneous starting.

**Internal Teflon Coating** – Teflon coating is recommended for highly corrosive or abrasive atmospheres.

---

## Airline Accessories

**Filter, Regulator, Lubricator** – Pneumatic piston vibrators require a clean, dry, lubricated air supply to provide the optimum operation and service life.

**Solenoid Valve** – Vibration is most effective when it is intermittent and when it is applied only when required. Solenoid valves control the vibrators electrically, and allow integration into the existing process.

**Manual Valve** – Flexible hose assemblies with close fitting N.P.T. fittings should be used to make the direct connection to the vibrator.

**Electronic Timer** – Timers may be integrated into the vibrator control logic to allow intermittent vibration when the process requires it.

**Pneumatic Timer** – In applications where electricity is not available or allowable, a pneumatic timer may be used to provide intermittent operation.

**Exhaust Protector** – In corrosive or abrasive atmospheres, exhaust protectors may be used in vibrators with tapped exhaust ports to prevent internal contamination of the vibrator.

**Safety Cable** – Safety cables are recommended for all overhead vibrator installations.

## Mounting Options





# NAVCO Bin Mapping

*Vibration is effective in solving bulk material flow problems for several reasons.*

There are two fundamental bulk material flow problems that are responsible for most applications of flow aid equipment in industry: Bridging and Ratholing – NAVCO Pneumatic Piston Vibrators are effective in solving both of these problems.

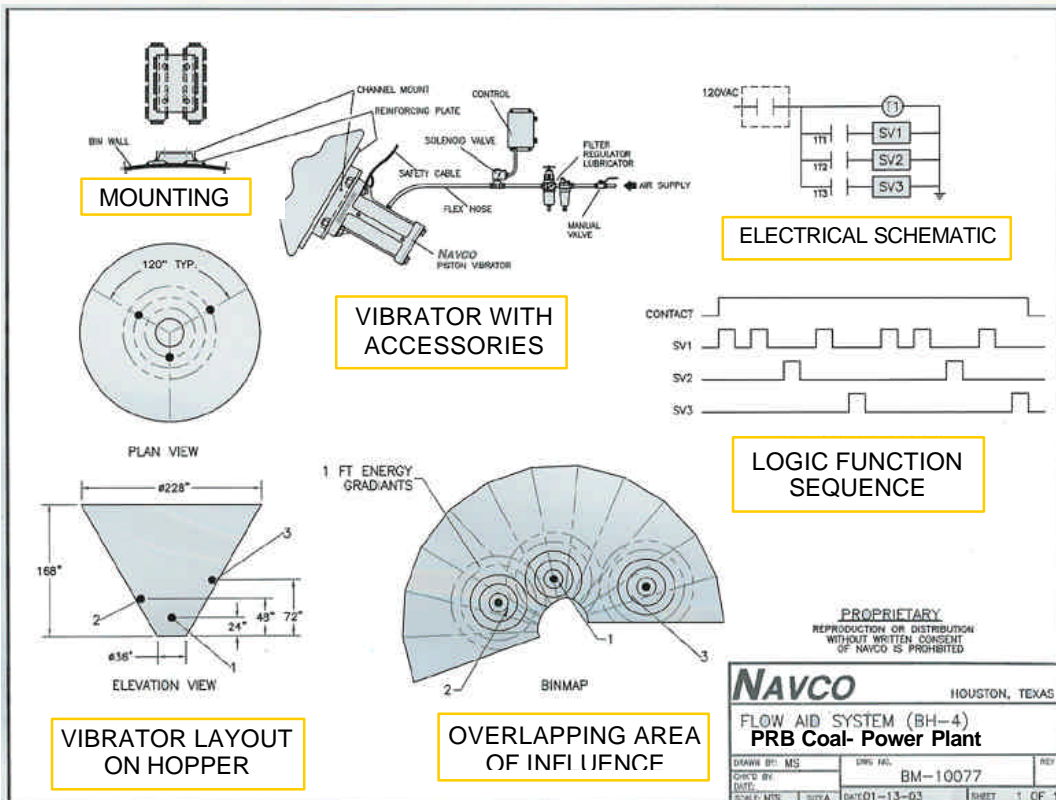
Bridging of material occurs when the cohesive strength of the bulk material is sufficient to form a bridge of material capable of supporting the column of material above it. Ratholing occurs when the sliding friction between the material and the vessel wall slows the flow of material in the outer perimeter of the vessel. The innermost material is able to flow through the central flow channel, and the outer material is restricted. Vibration, when applied properly, reduces the cohesive strength of the bulk materials and reduces sliding friction, thus eliminating the two major bulk material flow problems.

When an external vibrator is applied, the energy is transmitted through the vessel wall and the bulk material. The pattern and distance through which energy is transmitted is referred to as the "area of influence" of the vibrator.

The unique NAVCO Bin Map approach involves a detailed evaluation of the storage vessel and the bulk material. Based on a variety of factors including bulk density, particle size, moisture content, temperature, vessel size and shape, and material of construction, NAVCO pneumatic piston vibrators are sized for the application and their areas of influence are determined. The vibrators are then located on the vessel so that the areas of influence overlap, and they are controlled through a sequence to facilitate the optimum flow pattern and minimize utility consumption.

*The result is an effective solution to virtually any bulk material flow problem at a low initial and operating cost.*

**NAVCO'S UNIQUE SCIENTIFIC APPROACH TO APPLIED VIBRATION**



Typical Bin Map Engineering Drawing