### VIBRATORS FOR HOPPERS, BINS AND CHUTES

#### A. Installation

A single vibrator will normally provide the necessary force to move materials from most hoppers and bins. For the single vibrator installation, consult the vibrator model required. It is essential to provide a separate transmission line above and below the vibrator location. It is also important to position the vibrator. Stiff hoppers, hoppers mounted 90°, and/or vibration will also reinforce the hopper wall as well.

#### B. Moisture Content

Moisture content of the material to be moved is also important. The moisture content is 5% or more, it is advisable to use the next size vibrator or two vibrators.

#### C. Force Output Adjustments

All vibrators provide a range of adjustability in their force output. Air vibrators can be adjusted with a variety of pressure regulators or by adjusting the spring tension. Servo-electric vibrators with electric or hydraulic vibrators. For piston vibrators, the adjustment is in the form of valves, filters, or other means of controlling the stroke of the vibrator. The result will be a change in material output. Lower hopper contents, or vibrator over sizing, will reduce the vibrators used. The next size non-impact vibrators should be used, for continuous operation.

#### D. Non-Impact Adjustments

There is a reduction in vibration intensity in the non-impact type vibrators (air cushioned piston, rotary electric, turbine and ball) over the impact type vibrators. For piston vibrators, the adjustment is in the form of valves, filters, or other means of controlling the stroke of the vibrator. The result will be a change in material output. Lower hopper contents, or vibrator over sizing, will reduce the vibrators used. The next size non-impact vibrators should be used, for continuous operation.

### SIZING GUIDE FOR AIR AND ELECTRIC POWERED VIBRATORS

#### F. Noise Levels

Noise level of vibrators varies with the type. A general ranking of loudest to quietest is as follows: impact, ball, air, cushioned, rotary, electric and turbine.

#### E. Operation Effectiveness

A short burst of vibration is more effective than continuous vibration. Do not operate vibrators against closed hopper gates or valves.

### AIR VIBRATOR SIZING CHART FOR BINS AND HOPPERS

<table>
<thead>
<tr>
<th>Bin Capacity (lbs)</th>
<th>Vibrator Type</th>
<th>Motor Size</th>
<th>Drive Type</th>
<th>Frequency (Hz)</th>
<th>Force (lbs)</th>
<th>Material Density (lbs/cu ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 lbs max.</td>
<td>90 M T</td>
<td>3.2 mm</td>
<td>3 HP</td>
<td>50</td>
<td>25.4 m m</td>
<td>1400 VAC</td>
</tr>
<tr>
<td>2000 lbs max.</td>
<td>200 M T</td>
<td>6.4 mm</td>
<td>5 HP</td>
<td>60</td>
<td>38.1 m m</td>
<td>1800 VAC</td>
</tr>
<tr>
<td>5000 lbs max.</td>
<td>300 M T</td>
<td>9.6 mm</td>
<td>7.5 HP</td>
<td>70</td>
<td>51.0 m m</td>
<td>2200 VAC</td>
</tr>
<tr>
<td>10,000 lbs max.</td>
<td>500 M T</td>
<td>12.7 mm</td>
<td>10 HP</td>
<td>80</td>
<td>63.5 m m</td>
<td>2600 VAC</td>
</tr>
</tbody>
</table>

- **Note:** This chart is intended to provide a general guide for selecting the appropriate vibrator for your specific application. For more detailed information, consult the manufacturer's specifications or contact Jamieson Equipment Company for assistance.
II. Rotary Electric Selection

The sizing of rotary electric vibrators is based on the ratio of material weight in the sloped wall section to the force output of the vibrator. For the majority of applications, the ratio should be one pound of vibratory force for every ten pounds of material in the sloped wall section of the hopper.

The 3600 RPM rotary electric vibrator units are used for the majority of applications and are well suited for materials which are in the "free flowing" to "difficult to flow" range. For particularly stubborn materials, the 1800 RPM units will provide greater amplitude than a 3600 RPM unit of the same force output. When selecting an 1800 RPM rotary electric vibrator, use the chart to determine the proper size 3600 RPM vibrator, then select the 1800 RPM unit which develops the same force output.

To determine the weight of material in the sloped wall section, multiply the bulk density of the product by the volume (in cubic feet) of the hopper section.

To calculate the volume of a conical hopper:
\[1.0472 \times \text{vertical height} \times [R^2 + (R \times r) + r^2] = \text{Volume},\]
where R is the radius of the cone at the transition point and r is the radius of the cone at the discharge.

To calculate the volume of a rectangular or square hopper:
\[\frac{\text{Vertical height}}{3} \times (B + (B \times b))^{1/2} + b = \text{volume where} \]
B is the area at the transition point and b is the area at the discharge.

Most bin or hopper applications will require only one RE rotary electric vibrator. Cleveland Vibrator Company recommends mounting the single drive, locating the unit at a point on the sloped wall section that is 1/3 the height of the wall.

Applications involved with particularly stubborn material or hoppers larger than 100 ton capacity may require two or more vibrators. The recommended mounting is shown in figures 2 and 3. Normally, not more than three rotary electric vibrators would ever be required on a hopper or bin.