VM-3320R

Installation, Operation and Maintenance Instructions

VIBRATORY FEEDERS
HOPPER TRANSITION AND INSTALLATION GUIDE

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506–1402 U.S.A.
WORLD AUTHORITY IN SEPARATION TECHNOLOGIES

Introduction

This manual outlines proven and generally effective means to properly supply bulk material to Eriez Vibratory Feeders.

Careful attention to hopper transitions helps insure peak feeder performance and feeder size selection. The information in this manual is offered as a guide only as materials may respond differently to hoppers and bulk storage. It is the responsibility of the hopper transition designer to insure the hopper is suitable for the specific application. Eriez Manufacturing is not in any manner responsible for hoppers or transitions supplied by others.

If there are any other questions or comments about this manual, please contact Eriez Manufacturing at (814) 835-6000 or Eriez@Eriez.com.

⚠ CAUTION

Safety labels must be affixed to this product. Should the safety label(s) be damaged, dislodged or removed, contact Eriez for replacement.

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Installation

BASE MOUNTED FEEDERS

Base mounted feeders (Figure 1) are generally mounted directly to either a concrete base or fabricated steel structure. Isolation of vibration is either with steel coil springs or rubber isolators.

Care must be taken that the vibrating feeder does not make contact with any rigid structure such as hopper bottom, skirt boards, or foundation, or damage may occur, or full amplitude may not be achieved. When mounting make sure the springs are vertical so maximum isolation is achieved and springs do not move horizontally.

If mounted on a fabricated structure make sure the structural frequency is not near the operating frequency of the feeder. If the structure is vibrating as the feeder operates, feeder capacity will be reduced and structure failure may occur. Care must be taken to use isolation springs with sufficient stiffness to support both the static load of the material and the feeder and both the dynamic vertical and horizontal loads. If a spring is collapsed (one coil touching another) contact Eriez Magnetics service department. Both dynamic and static loading specifications can be provided by Eriez Engineering as required.

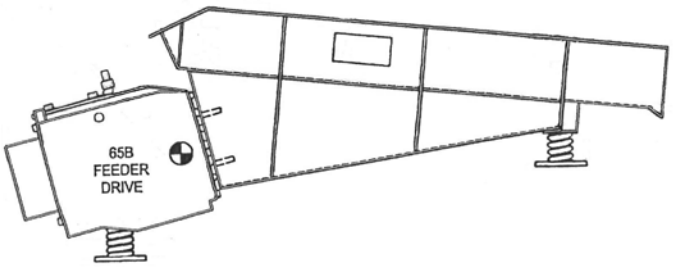


FIGURE 1
Base Mounted Feeder

SUSPENSION MOUNTED FEEDERS

Suspension mounted feeders are normally either suspended from the hopper or other support structure with pre-stretched wire rope of the appropriate size. Refer the chart of recommended cable sizes for each model of Eriez Heavy Duty Electromagnet Feeders and Figures 2 and 3. Consult Eriez for the correct wire rope size for our mechanical feeders as the weight of the units vary.

Feeder Model	Rear Suspension	Max Safe Working Loads	Front Suspension	Max Safe Working Loads
52A	3/8" cable	1.0 ton	1/4" cable	.045 ton
58B	3/8" cable	1.0 ton	1/4" cable	0.45 ton
62B	3/8" cable	1.0 ton	1/4" cable	0.45 ton
65B	3/8" cable	1.0 ton	1/4" cable	0.45 ton
70B	3/8" cable	1.0 ton	5/16" cable	0.75 ton
75B	3/8" cable	1.0 ton	5/16" cable	0.75 ton
85B	1/2" cable	1.70 ton	3/8" cable	1.0 ton
98B	1/2" cable	1.70 ton	3/8" cable	1.0 ton
105B	1/2" cable	1.70 ton	1/2" cable	1.0 ton
115B	3/4" cable	3.75 ton	5/8" cable	1.70 ton

TABLE 1
Cable Size for Suspension of Eriez
Heavy Duty Electromagnetic Feeders

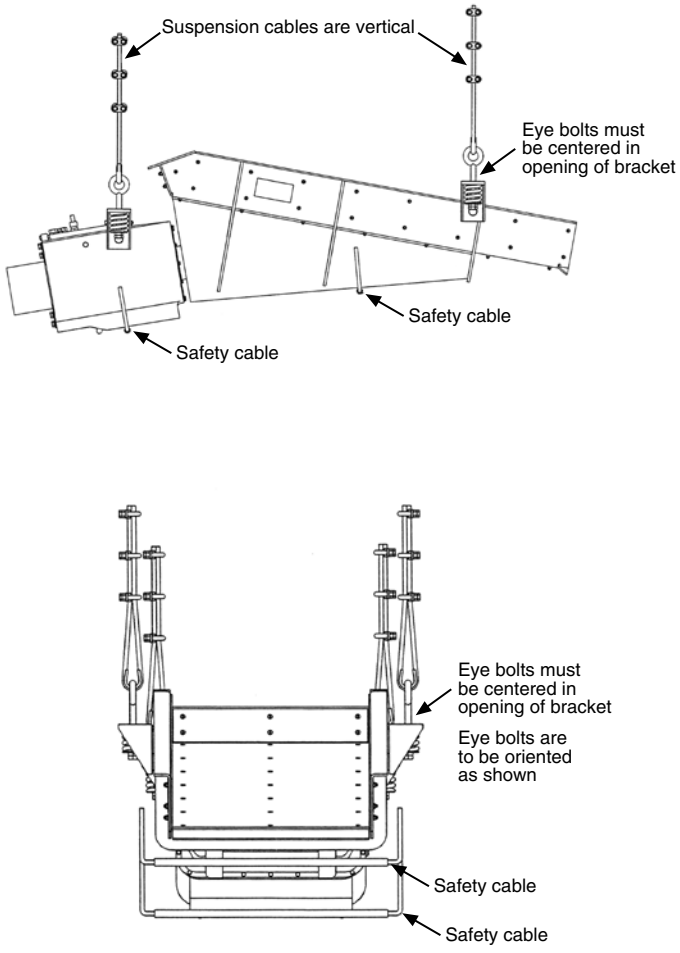


FIGURE 2
Suspension Mounted Feeder

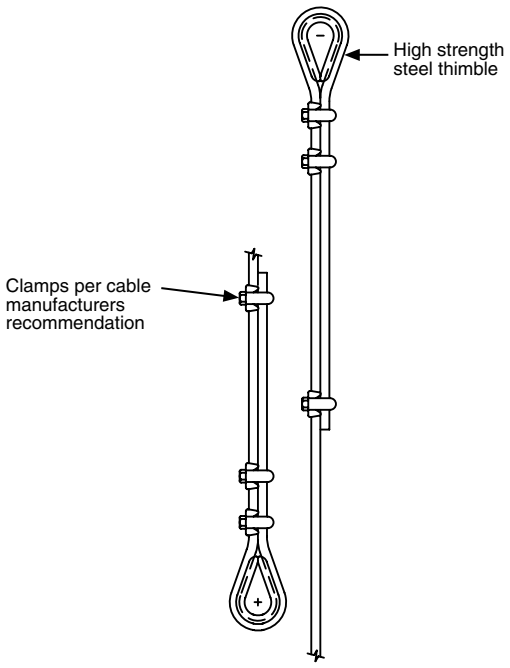


FIGURE 3
Minimum cable length recommended is 24"

Drop forged clips and heavy duty wire rope thimbles should be used per their manufacture's recommendations. Eriez does not recommend using turn-buckles or rods for suspension mounting for safety reasons. Rods and turn-buckles may also vibrate excessively and affect feeder performance. Cables should be vertical with suspension eyebolts centered in the bracket as shown in Figure 2. A safety cable should always be used both around the feeder tray and drive unit to keep them from falling should the suspension cables or brackets fail. Figure 2.

Again, care must be taken that suspension eyes do not rub against their mounting brackets or damage can occur. Also isolation springs must not be fully collapsed under loaded conditions.

Estimated Vibratory Feeder Capacity

The capacity of a vibratory feeder is given by:

$$C = \frac{W \times B \times D \times FR}{k}$$

Where	English	Metric
C= Capacity	TPH	MTPH
W= Tray width	inches	mm
B= Material burden depth	inches	mm
D= Density	lb/ft^3	g/cm^3
FR= Feed Rate	ft/min	m/min
K= Constant	4,800	16,700

General flow velocities (v) are Eriez “B” model electromagnetic feeders with tray at 10° downslope = 35 ft/minute. Eriez HVF Mechanical feeders at 10° downslope = 50 ft/minute. Reduce “FR” by 2% for every degree less that 10° downslope.

For more precise feed velocities or various materials refer to material feeding characteristics charts VCC 3020 available from your Eriez Representatives.

NOTE: The maximum material burden depth in a feeder tray with hopper "skirt boards" is one-half the tray width. For a tube tray the maximum burden depth is one-half the tray diameter.

Hopper Design for Optimum Performance

When designing a new hopper or modifying an existing one for use with an Eriez feeder, care must be taken to adhere to certain guidelines to achieve the desired feed rate and minimize the risk of bridging, arching or ratholing of material in the hopper. Along with proper hopper design, feed rate (FR) is dependent on material characteristic such as particle size, size distribution, and moisture content. Rated capabilities require ideal conditions.

The main portion of the hopper, the section receiving and/or storing the majority of material will have sloped walls so the materials move toward the outlet freely. If sloped hopper walls are used they must be steeper than the angle of repose of the material being stored or the hopper will not self empty. Refer to figure 4 for proper and improper hopper design.

Hopper Design for Optimum Performance *(cont.)*

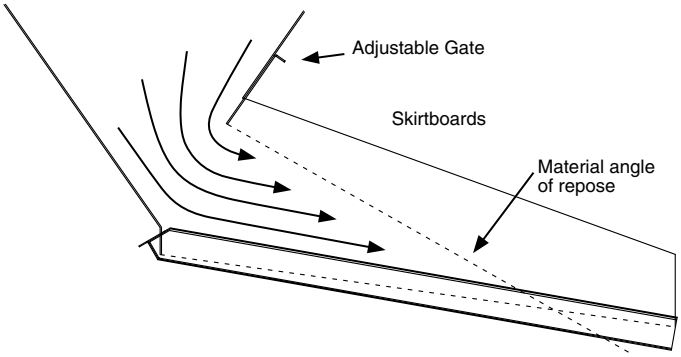


FIGURE 4A
Uniform material flow. Proper throat opening.
Proper hopper wall angles.
Most efficient feeder selection.

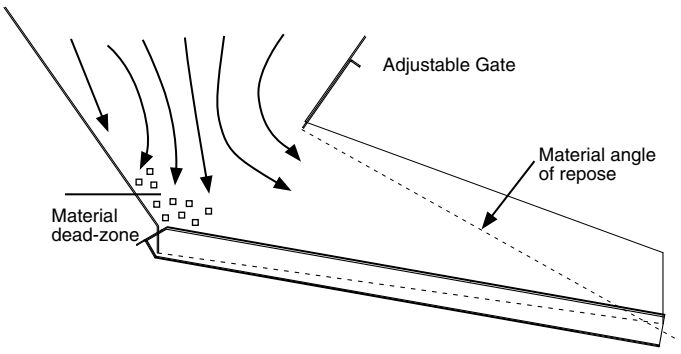


FIGURE 4B
Non-uniform material flow. Excessive throat.
Excessive material load. Longer tray required.
Reduced capacity.

With sloped walls a flow aid such as vibrators may be required to keep the materials free flowing. Vertical hopper walls put excessive head load on the feeder and promote uneven flow.

Importance of Hopper Transition Section

The hoppers transition section, the part of the structure between the main hopper and the feeder plays a very significant role in obtaining the rated capacity of the feeder. An improperly designed hopper or transition can reduce feeder capacities by as much as 30%.

The bottom of the hopper for example should be almost as wide as the feeder tray to provide full width feeding.

THROAT OPENING
For random sized materials the throat opening (T) should be 2-1/2–3 times the largest size particle size, for near sized material the hopper throat opening (T) should be at least 3 times the largest particle size. The throat opening should never exceed 30% of the tray length or excessive material head loading may occur and over power the feeder's ability to move the material. Excessive material head load may result in feeder damage and reduced flow capacity.

GATE HEIGHT
The gate height (H) should increase proportionally to the particle size and the depth of flow (measured at the end of the tray) required to deliver the desired feed rate. Generally speaking, the gate height should be at least twice the size of the largest particle.

Make sure that with the hopper slide gate at full open the angle of repose of the material being fed reaches 0 on the tray at least 6" before the end of the feeder tray. If not material will continue to flow off the tray even with the feeder shut off. During operation the gate height should be 1.2–1.5 times the depth of material burden depth (B) needed to meet capacity requirements. Refer to Figure 5.

Uniform flow patterns also require (H) to be 1-2 times (2x preferred) the throat dimension (T). When (H) becomes less than T, material flow patterns are not uniform and may result in dead zones where little or no flow occurs.

CLEARANCE

It is critical that 1" (25mm) minimum clearance between feeder tray, hopper transition and all other structures be maintained. Insure adequate clearance with feeder and hopper in both empty and full condition. Refer to Figure 7.

HOPPER WALLS

There is a natural tendency for feeders to draw material from the front portion of the hopper. However a properly designed hopper will cause material to also flow from the rear of the feeder trough creating a uniform flow pattern.

The rear wall of a hoppers transition section should be quite steep. A slope of 60° or more will help assure flow of material along the rear wall surface. In contrast, the slope of the front wall may be more shallow. An angle of 5-15° less than the rear wall are generally acceptable. Figure 4A illustrates a properly designed hopper which promotes good material flow while minimizing material load on the feeder. Figure 4B illustrates an improperly designed hopper transition.

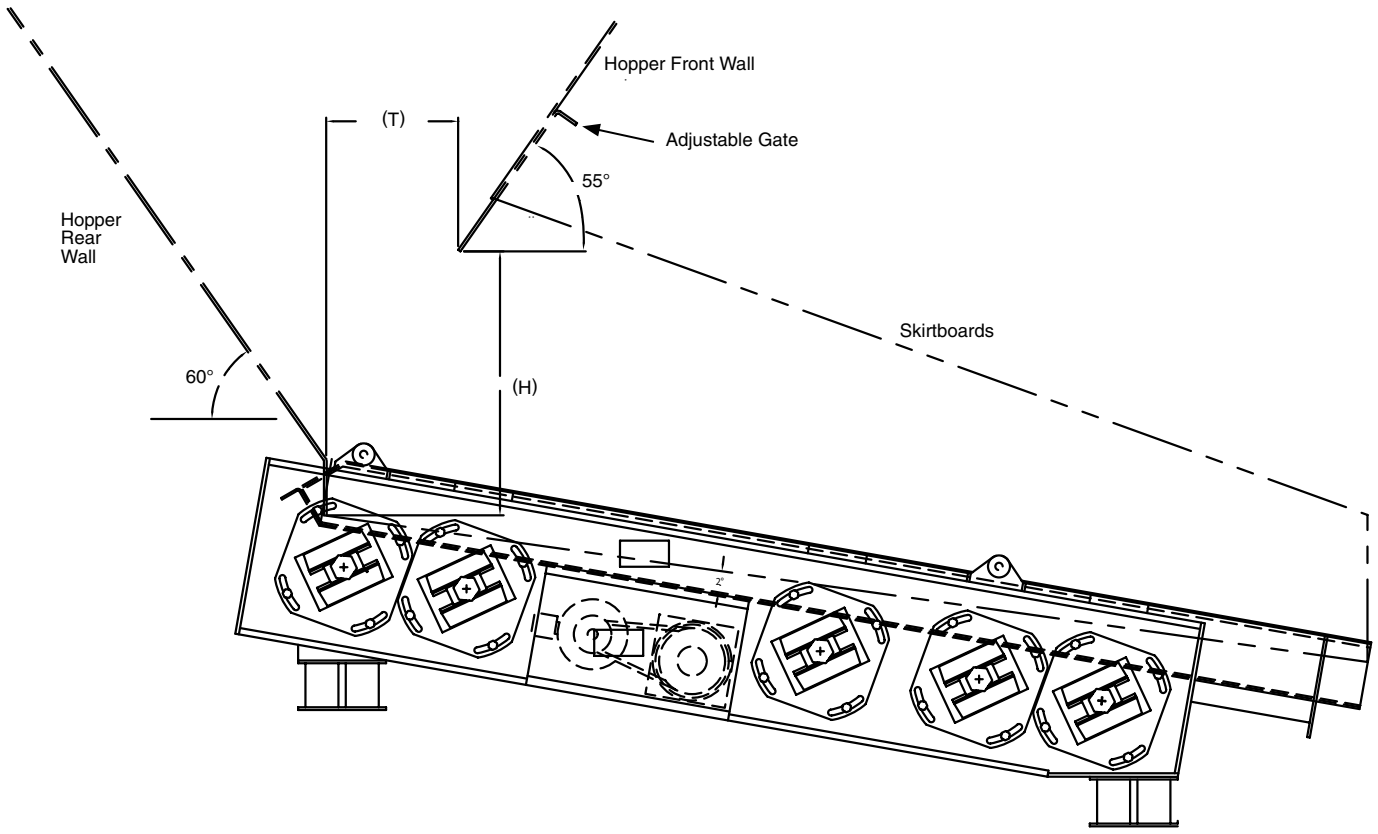


FIGURE 5
Eriez HVF Mechanical Feeder Base Mount

Installation of Skirtboards

To obtain the rated capacity of Eriez “B” feeders or HV mechanical feeders, a burden depth deeper than the feeder sides must be carried in the feeder. To contain the material and prevent spill over, skirtboards should be installed on both sides of the gate opening and extend to the end of the trough.

Skirtboards are nearly always required in installations where the feeder pan is given a downslope. By more than 20% with a 10° downslope. A rule of thumb is with each degree of downslope, the capacity is increased by 2%. A minimum of 1" clearance must be maintained between skirtboards and the feeder tray. Movement must not be restricted by rigid attachment to wear by structures. Refer to Figure 6.

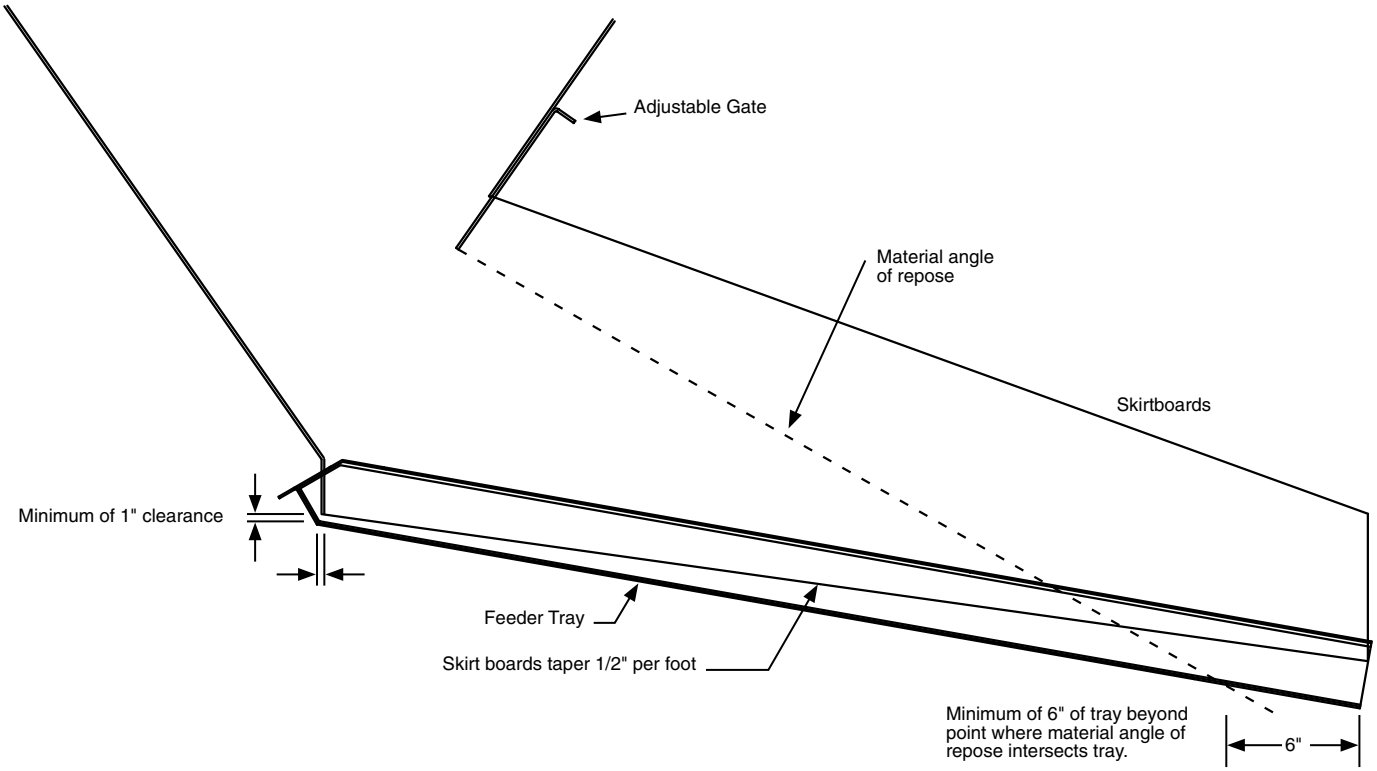


FIGURE 6

Typical Hopper Transitions for Heavy Duty Feeders

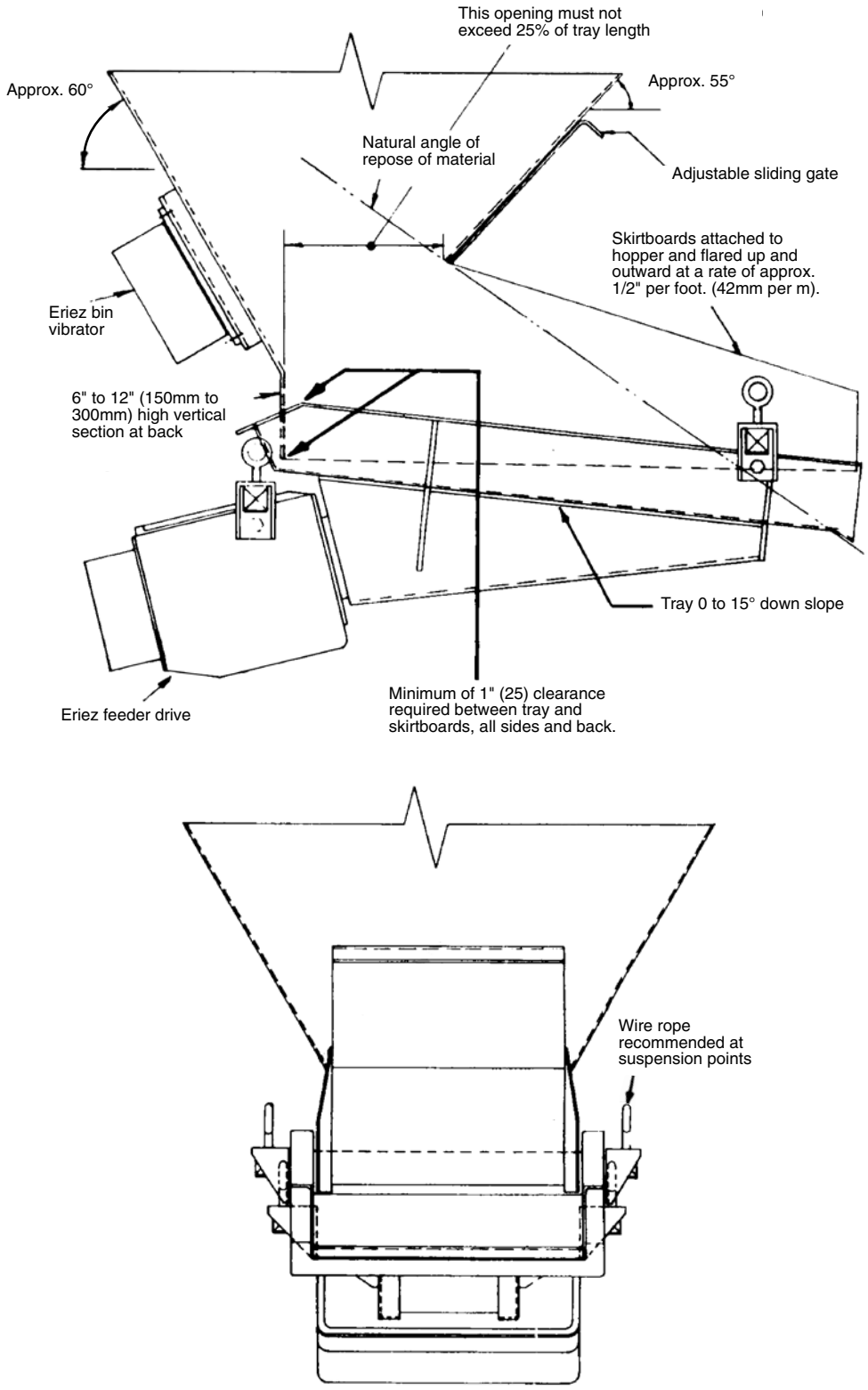
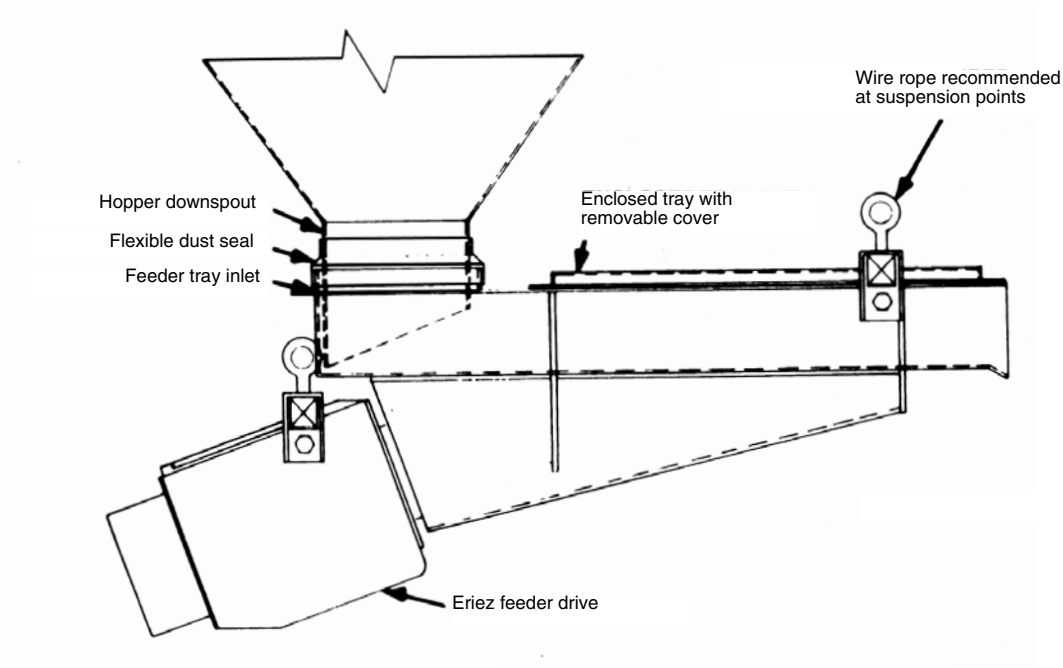


FIGURE 7
Typical Hopper And Skirtboard Installation

Typical Hopper Transitions for Heavy Duty Feeders *(cont.)*



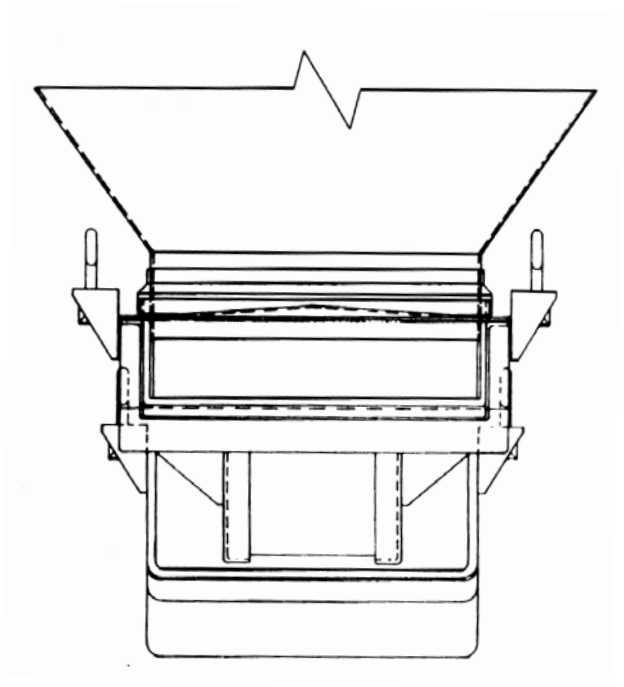


FIGURE 8
Typical Hopper With Enclosed Tray Installation

Typical Hopper Transitions for Compact Feeders–A, C, HDC

FEEDERS WITH TUBULAR OR COVERED TRAYS
Eriez tubular or covered feeders are typically used when feeding dusty materials or materials that emit noxious fumes so the feeder needs to be sealed.

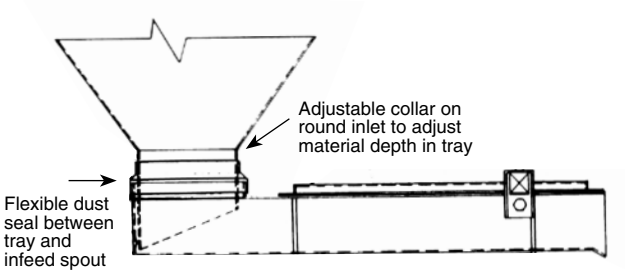


FIGURE 9

For A and C feeders there should be at least a 1/4" clearance between the tube feeding into the tube tray and the tube tray inlet. With the HDC feeders the clearance should be 1/2".

FEEDERS WITH FLAT BOTTOM TRAYS
Hopper transition should be designed to minimize the head load placed on the feeder. Ideally the bottom of the hopper should be designed so when the Adjustable Slide Gate is completely lowered, the material flow will be completely shut off.

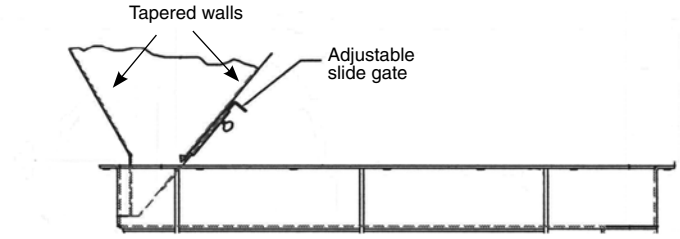


FIGURE 10

The tapered walls should be approximately 60° from horizontal so material flows freely. There should be a minimum of 1/4" clearance from the rear wall and bottom and 1/8" from the side walls. This should be increased to 3/8" all around clearance for HDC models.

However, since Eriez A, C, and HDC feeders are designed to compensate for head load, the hopper opening can be up to 30% of the tray length for materials weighing up to 100 PCF. A vertical front wall with an adjustable slide gate to regulate the material depth in the tray is recommended.

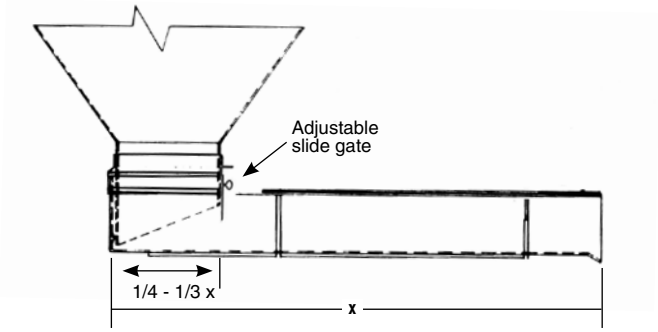


FIGURE 11

The bottom of the hopper inlet should be tapered upward 2-3° so material does not "bind" between it and the tray bottom. In place of an adjustable slide gate, a complete adjustable collar can be used. For the A and C feeders there should be a minimum of 1/8" clearance from the size walls and 1/4" clearance from the rear wall and front opening for the HDC there should be 3/8" clearance from all surfaces.

Note: Fine Materials that "flush" or become fluid-like may require an alternative hopper transition design.

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