

Liquid Eductors For Handling Dry Solids

- **NO MOVING PARTS**
- **SIMPLE THREE PIECE CONSTRUCTION**
- **BOTH MIXES AND PUMPS**

Schutte & Koerting's Liquid Eductors for Handling Dry Solids are extremely versatile, capable of effectively handling a wide range of materials that typically cause problems in mechanical feed devices. These Eductors use pressure liquid only for motive power and both mix and pump.

S&K's liquid eductors have no moving parts and consist of a simple, three-piece construction. Requiring practically no maintenance during its service if "washed down" periodically, S&K's Liquid Eductors for Handling Dry Solids are surprisingly low in initial cost and upkeep.

Liquid Eductors can easily be made from any workable corrosion-resistant material.

No other mixing or pumping device offers all these advantages.



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FIG. 267 SOLIDS/LIQUID MIXING EDUCTORS

For In-Line Mixing and Transfer Of Granular Solids and Liquid

The Type 267 Solids/Liquid Mixing Eductor is a hopper-equipped jet ejector designed to entrain and mix granular solids or slurries with liquid and discharge the mixture to a receptacle or transfer it to a desired location. Originally developed to mix drilling mud for oil industry applications, these devices have proved to be so effective and versatile that they are being applied to increasing numbers in diverse industries including the food, chemical processing, pharmaceutical, glass, power, and others.

The unit consists of a body, nozzle, and hopper. All threaded components of the same size are interchangeable regardless of the material (nonmetallic bodies and nozzles are cemented together). Four support brackets are provided as shown. As shown in Table 2 on page 2, a variety of materials are available. In addition to those noted, any workable material can be supplied on special order.

In operation, liquid under pressure issues through a converging nozzle in the eductor and produces a high velocity jet. This creates a suction in the body of the eductor and causes the suction material to be drawn into the eductor and entrained by liquid.

Both the motive liquid and the entrained material are intimately mixed in the throat of the eductor and are discharged against back pressure. Table 3 on page 2 shows the estimated capacities and water consumptions for Solids/Liquid Mixing Eductors.

Contact Schutte and Koerting for any other required information, including prices.

Table 1. Sizes and Dimensions of Fig. 267 Solids/Liquid Mixing Eductors

Size in Inches	Dimensions in Inches							Approx. Wgt. In Lbs.
	A	B	C	D	E	F	G	
1	1	3/4	1 1/2	4 3/16	42	24	9	32
1 1/2	1 1/2	1	2	6 1/2	41 1/2	24	9	34
2	2	1 1/4	2 1/4	7 5/8	41	24	9	36
2 1/2	2 1/2	1 1/2	2 11/16	9 1/4	41 1/4	24	9	42
3	3	2	3 1/8	11 1/4	40 3/4	24	9	50

Table 2. Available Materials (Stocked)

Size in Inches	Material - Bodies and Nozzles					(Nozzle Only) Monel
	Cast Iron	Bronze	316 SST.	Kynar	PVC	
1	♦	♦	♦	♦		♦
1 1/2	♦	♦	♦		♦	♦
2	♦	♦	♦		♦	♦
2 1/2	♦	♦				♦
3	♦	♦			♦	♦

Note: Hoppers with threaded connections are supplied in these materials in all sizes - Steel, *316 Stainless Steel, PVC.
* STOCKED IN 1", 1 1/2" AND 2" SIZE.

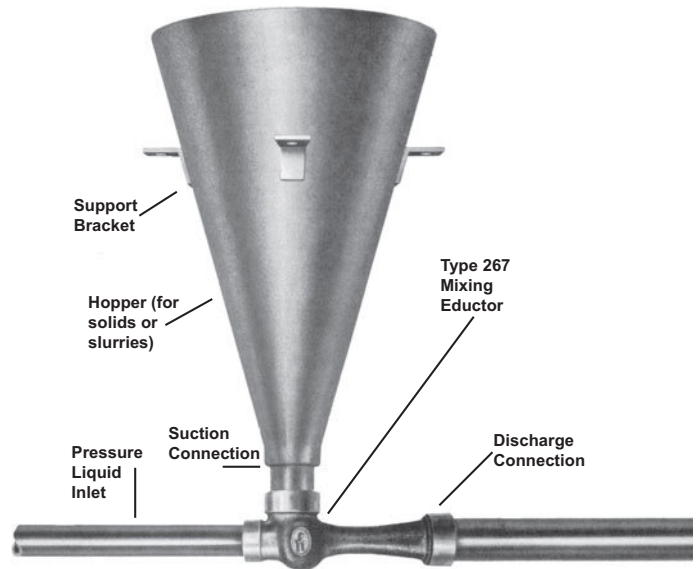


Fig. 1 S&K Fig. 267 Solids/Liquid Mixing Eductor. This simple, but effective, in-line mixing and pumping device is comprised of only three separable parts, namely: a body, nozzle, and a hopper for funneling granular solids or slurries into the eductor suction connection.

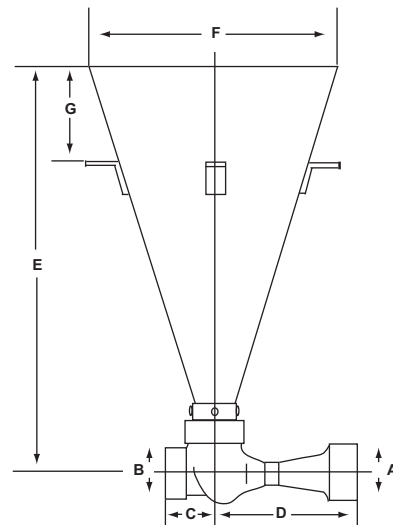


Table 3. Estimated Entrainment Capacities for 1" Size Eductor, Fig. 267.

(For capacities for other sizes, multiply by factor given in table of relative capacities, below.)

Motive Pressure psig	30	40	50	60	70	80	90	100
Entrainment, cu. ft. per hr. Of Granular Solids	2.5	7.0	14	17	19	21	22	23
Motive Flow, gpm	6.1	7.0	7.9	8.6	9.2	9.9	10.5	11.1

NOTE: Above based on 5 psig discharge pressure

Table 4. Relative Capacities

Size, in Inches	1	1 1/2	2	2 1/2	3
Capacity Ratio	1.0	2.89	4.0	6.25	9.0

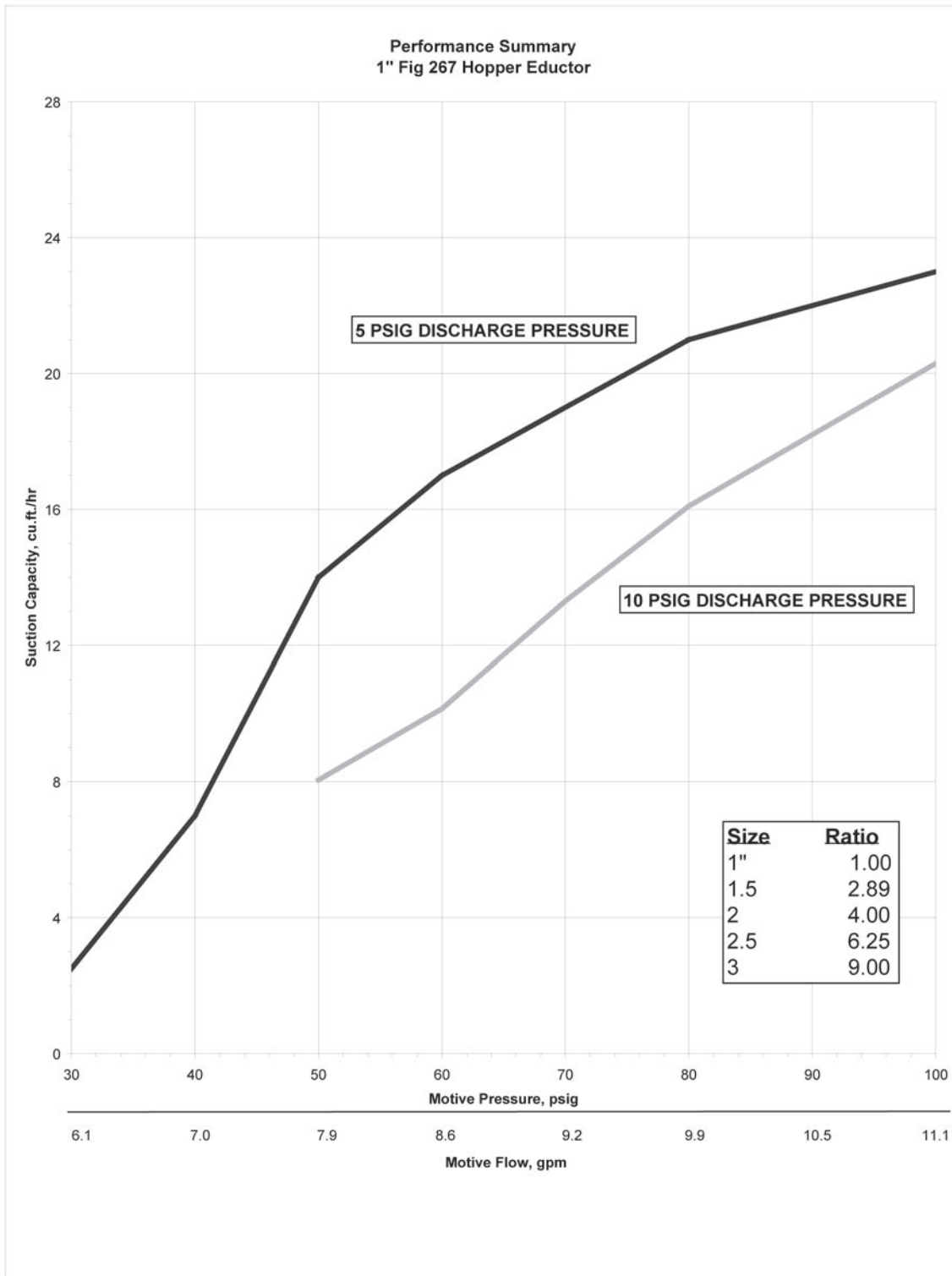


FIG. 254 HOPPER TYPE EDUCTOR

APPLICATION

S&K Fig. 254 Hopper Type Eductors are made for handling slurries or dry solids in granular form and are used extensively for ejecting sludges from tank bottoms, for pumping sand from filter beds and for washing and conveying granular materials.

CONSTRUCTION

Standard Fig. 254 Eductors are made in cast iron and have hardened steel nozzles and throat bushings. Special materials are also available on order. The nozzle and throat are both easily replaced.

Standard sizes include 1½", 2", 3", 4" and 6", while larger sizes of special construction can be made to order to meet exact requirements. Pressure and discharge connections can be fitted for hose when maximum portability is desired. The handles and supporting feet are optional equipment.

OPERATION

Agitating jets keep the material from adhering to the sides of the hopper and keep it moving down into the eductor. Pressure water, passing through the eductor nozzle, entrains the sand, sludge or other materials and discharges into the piping system. Under normal operating conditions, the pressure should be 4 times the discharge head and the eductor should handle from 1 to 3 lbs. of sand per gallon of water. It will handle equivalent volumes of other materials.

Table 5. Sizes and Dimensions of S&K Hopper Type Eductors, Fig. 254

Size in Inches	Connection in Inches		Dimensions in Inches			
	Discharge	Pressure	A	B	C	D
1 1/2	1 1/2	1 1/2	13 5/8	11 1/2	18	15 1/4
2	2	2	14 1/2	13 3/4	21	17 3/4
3	3	2 1/2	17 3/4	17 1/2	23 3/8	19 3/4
4	4	4	18	24 1/4	24	19 1/2
6	6	6	26	34 1/2	36	26

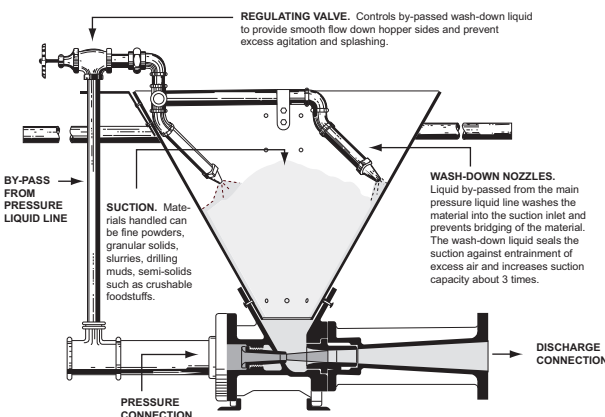
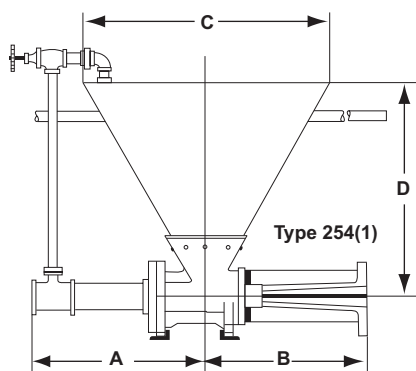


Fig. 254-A. Sectional view of Hopper Type Eductor. Note that pressure water is bypassed from the pressure line to the eductor wash-down nozzles in the eductor hopper. The liquid issuing from the wash-down nozzles washes the material down into the hopper and prevents bridging of the material. Also, the wash-down of the liquid seals the suction against entrainment of excess quantities of air and, thus, increases suction capacity approximately three times. The wash-down nozzles are large and a regulating valve is provided so that the jet velocity can be reduced to provide smooth flow down the hopper sides and prevent excess agitation and splashing. If wash-down liquid cannot be used, the capacities shown in Table 6 will have to be divided by approximately three.

Table 6. Suction Capacities and Water Consumption of 1.5" S&K Hopper Type Eductor, Fig. 254

Operating Water Pressure psi Gauge	30	40	50	60
Suction Capacity Cu. Ft. per Hr.	13	36	72	90
Maximum Discharge Pressure psi Gauge	14	17	18	20
Motive Water Consumption gpm*	35	40	45	50

*Based on using approximately 10% motive water through wash-down nozzles. Note: Fig. 254 Eductors are built on special order for specific operating conditions. The table above is indicative only of what can be accomplished under certain conditions. For capacity characteristics for your operation, please contact our engineers.

Table 7. Typical Materials Handled By S&K Fig. 254 Eductors (Many others not listed)

Material	Approx. Bulk Density Lbs. Per cu. ft.
Borax	50-55
Charcoal	18-28
Dietemaceous Earth	10-20
Lime, Pebble	56
Line, Powdered	32-40
Mesh	60-65
Fly Ash	35-40
Resin	67
Salt, Granulated	45-51
Salt, Rock	70-80
Sand, Damp	75-85
Sand, Dry	90-100
Sawdust, Dry	13
Sode Ash, Light	20-35
Sodium Nitrate, Dry	80
Sulphur, Powdered	50-60
Wheat	48
Zinc Oxide, Powdered, Dry	10-35

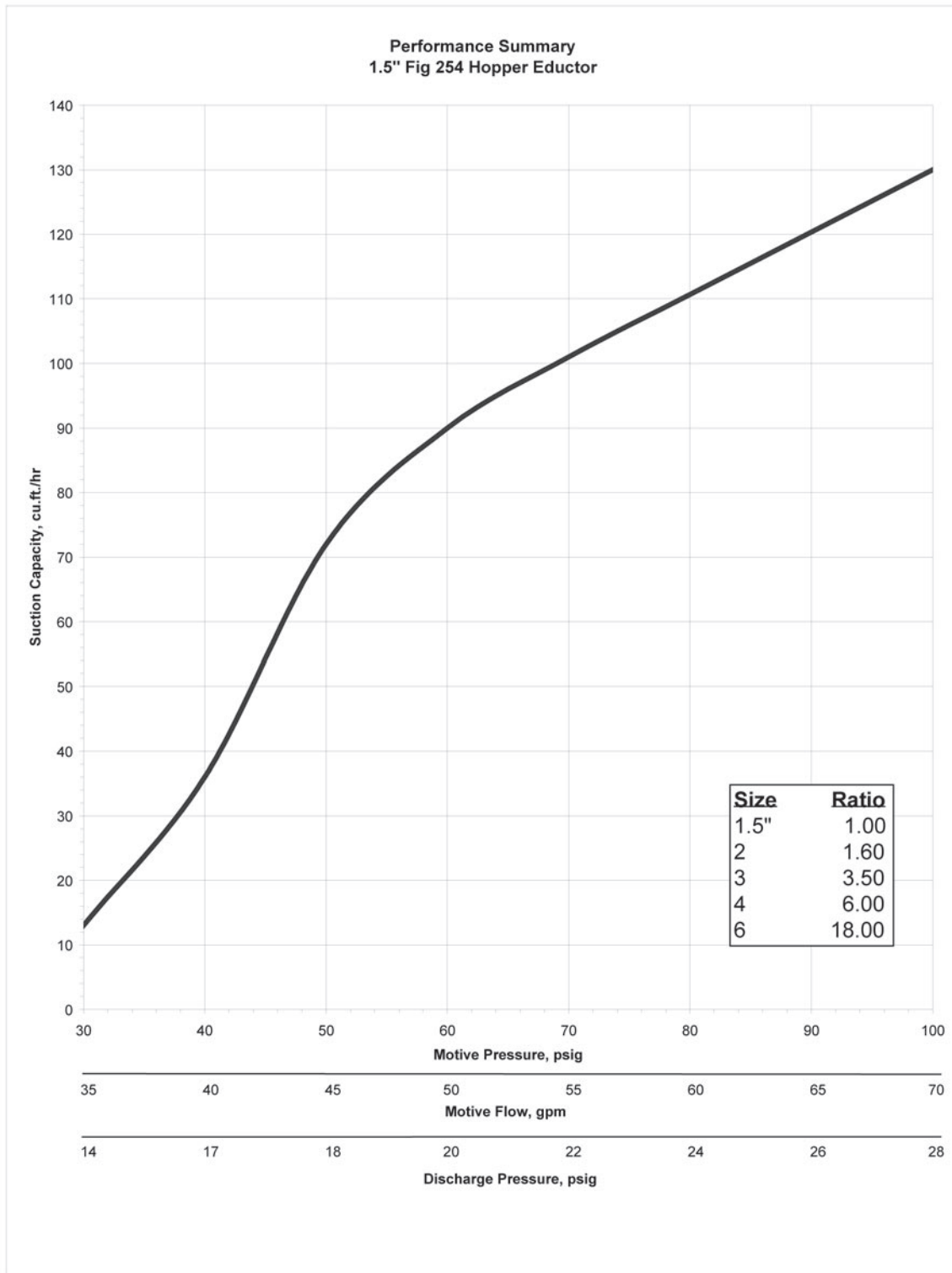
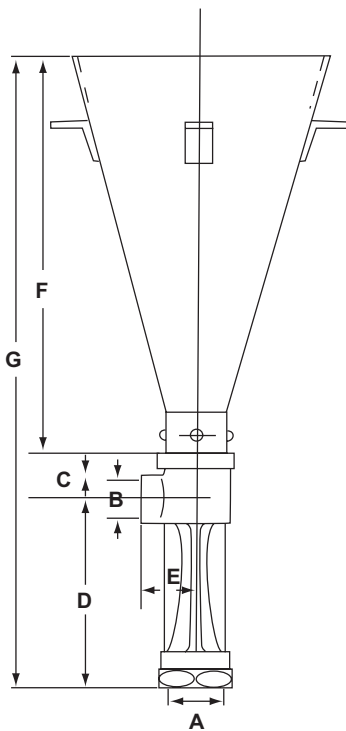


FIG. 227 SOLIDS MIXING EDUCTOR

Furnished with a stainless steel funnel, the eductor can be made of any machinable material. Bronze units up to and including 3" and cast iron units up to and including 4" sizes are available from stock. Prices, delivery or a sectional outline drawing 67-XS-081-J will be furnished on request. Stainless steel funnels are stocked in 1¼", 1½" and 2" sizes.

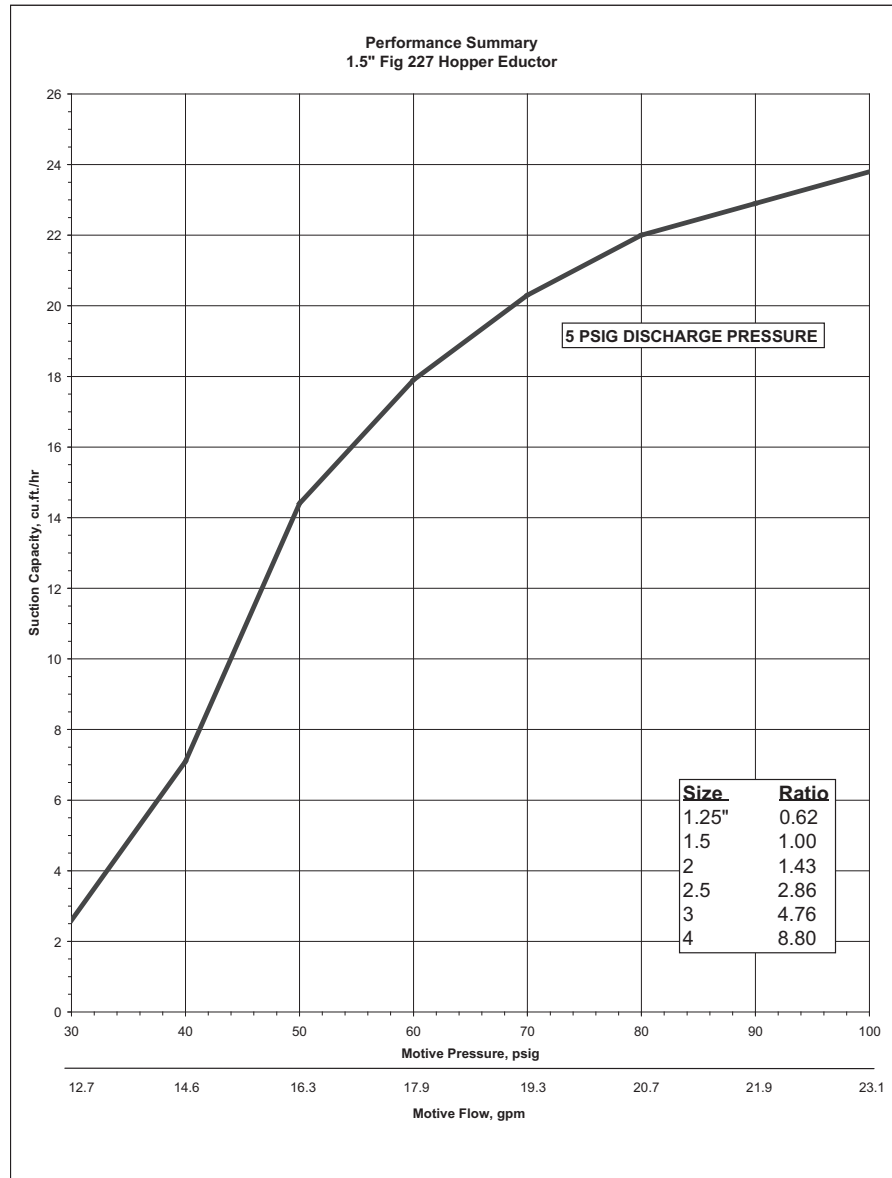
Size (In Inches)	Cap. Ratio
1 1/4	0.62
1 1/2	1.00
2	1.43
2 1/2	2.86
3	4.76
4	8.80



Estimated Capacities for 1-1/2" Fig. 227 Mixing Eductor

Motive Pressure, psig	30	40	50	60	70	80	90	100
Entrainment, cu. ft./hr	2.6	7.1	14.4	17.9	20.3	22.0	22.9	23.8
Motive Flow, GPM	12.7	14.6	16.3	17.9	19.3	20.7	21.9	23.1

5 PSIG Discharge Pressure (max.)



Sizes and Dimensions of Fig. 227 Hopper-Equipped Eductor

Dimensions in Inches							Wgt. (Lbs)
A	B	C	D	E	F	G	
1 1/4	3/4	1 9/16	6 7/16	1 13/16	39 5/8	47 5/8	31
1 1/2	3/4	2	8 13/16	2	39 1/4	50	36
2	1	2 1/2	9 1/8	2 1/4	38 1/2	49 7/8	45
2 1/2	1 1/4	2 3/4	11 1/4	2 3/8	37 7/8	51 7/8	51
3	1 1/2	3 1/16	13 5/16	2 3/4	37	53 3/8	58
4	2	3 5/8	17 1/16	3 3/16	35 1/2	56 3/16	70

Bulk Density Chart

Material	Average Wt. Per Cu. Ft., Pounds	Angle of Repose
Acid Phosphate, fertilizer	60	-
Air, 60°F - 14.7 PSIA	0.0765	-
Alfalfa, ground	16	45° & Up
Alum, lumpy	50.60	30 - 45°
Alum, pulverized	45.50	30 - 45°
Alumina	60	30 - 45°
Aluminum, solid mass	165	-
Aluminum, Oxide	70-120	Up to 30°
Ammonium Sulfate	45-60	-
Apples	40	-
Asbestos, shredded	20-25	45° & Up
Asbestos, solid	153	-
Asbestos Brake Lining, molded	178	-
Asbestos Brake Lining, woven	110	-
Ash, American White, dry (wood)	38	-
Ashes, dry	35-40	45° & Up
Ashes, wet	45-50	45° & Up
Ashes, gas producer, saturated	78	-
Ashes, soft coal	35-45	40°
Asphalt, crushed	45	30 - 45°
Asphaltum	87.3	-
Bagasse	7.5	45° & Up
Bakelite, powder	30-40	45° & Up
Bakelite, molded	82-88	-
Baking Powder	40-50	30 - 45°
Bark, wood, refuse	10-20	45° & Up
Barley	38	Up to 30°
Baryte, crushed	180	-
Basalt	184	-
Batch, glass	90-100	30 - 45°
Bauxite, crushed	75-85	30 - 45°
Beans, castor, whole	36	Up to 30°
Beans, cocoa	37	-
Beans, navy	48-54	Up to 30°
Beans, soy	45	Up to 30°
Beets	45	-
Bentonite, crude	34-40	45° & Up
Bones, pulverized	50-60	-
Borax, fine	50-55	30 - 45°
Bran	16	30 - 45°
Brass, cast	519	-
Brass, rolled	534	-
Brewers Grain	25-30	45° & Up
Brick, best pressed	150	-
Brick, common hard	125	-
Brick, fire	137	-
Brick, soft inferior	100	-
Brickwork, fine	140	-
Bronze, copper 8, tin 1	546	-
Buckwheat	40-42	Up to 30°
Calcium Carbide	70-80	30 - 45°
Carbon, black pellets	25	Up to 30°

Material	Average Wt. Per Cu. Ft., Pounds	Angle of Repose
Carbon, powder	4-6	-
Carbon, solid	134	-
Cedar, red	35	-
Cement, bulk	75-85	-
Cement, clinker	75-95	-
Cement, Portland (376 lbs. Net per bar.)	90-100	30 - 45°
Cement, slurry	90	-
Cement, mortar, Portland 1:2-1/2	135	-
Chalk, lumpy	82-95	45° & Up
Chalk, fine	65-75	45° & Up
Chalk, solid	156	-
Charcoal, wood	15-30	-
Cherry wood, dry	42	-
Chestnut wood, dry	41.2	-
Chocolate, powder	40	-
Chromium ore	125-140	30 - 45°
Cinders, (coal, ashes and clinkers)	40	25 - 40°
Clay, potter's dry	100-120	-
Clay, dry in lumps	65	25 - 45°
Coal, Anthracite, solid	94	-
Coal, Anthracite, loose	52-57	30 - 45°
Coal, Bituminous, solid	84	-
Coal, Bituminous, loose or slack	43-50	30 - 45°
Cocoa Nibs	35-40	30 - 45°
Cocoanut, meal	32	-
Cocoanut, shredded	20-25	45° & Up
Coffee, fresh beans	30-40	30 - 45°
Coffee, roasted beans	22-30	Up to 30°
Coke, loose	23-32	30 - 45°
Coke, pulverized	25-35	45° & Up
Coke, petroleum calcined	35-45	30 - 45°
Concrete, cinder with Portland cement	112	-
Concrete, gravel & sand with Portland cement	150	-
Copper Ore	120-150	30 - 45°
Copper, cast	542	-
Copper, rolled	556	-
Cork, solid	15	-
Cork, ground	5-15	45° & Up
Corn, on cob	45	-
Corn, shelled	45	Up to 30°
Corn, grits	40-45	30 - 45°
Cottonseed, dry, de-linted	35	30 - 45°
Cottonseed, dry, not de-linted	18-25	45° & Up
Cottonseed cake, lumpy	40-45	30 - 45°
Cottonseed, hulls	12	45° & Up

Material	Average Wt. Per Cu. Ft., Pounds	Angle of Repose
Cottonseed, meal	35-40	30 - 45°
Cottonseed, meats	40	30 - 45°
Cryolite	90-110	30 - 45°
Cullet	80-120	30 - 45°
Culm	45-50	-
Cypress	29	-
Dolomite, solid	181	-
Dolomite, pulverized	46	-
Dolomite, lumpy	90-100	30 - 45°
Earth, common dry	70-80	30 - 45°
Earth, moist	75-85	30 - 45°
Earth, fullers dry	30-35	23°
Elm, dry	35	-
Feldspar, solid	160	-
Feldspar, lumps	85-95	-
Feldspar, dust	75-80	45°
Fibre, hard	87	-
Fir	24-33	-
Fish, scrap	40-50	-
Fish, meal	35-40	45° & Up
Flaxseed, whole	45	Up to 30°
Flour, wheat	35-40	45° & Up
Fluorspar, solid	200	-
Fluorspar, lumps	80-110	45° & Up
Fluorspar, dust	80-95	45° & Up
Foundry, refuse	60-80	-
Foundry, sand, loose	80-90	-
Foundry, sand, rammed	100-110	-
Garbage, average	30	-
Glass, window or plate	161	-
Glass, batch	90-100	30 - 45°
Glass, broken	80-100	-
Glue, animal, flaked	35	-
Glue, vegetable, powdered	40	-
Gluten, meal	39	30 - 45°
Granite, solid	150-170	-
Granite, lumps	96	30 - 45°
Graphite, flake	40	30 - 45°
Gravel, dry, round or sharp	90-100	30 - 40°
Gravel, wet	100-120	-
Greenstone, crushed, loose	107	-
Gypsum, solid	142	-
Gypsum, lumps	90-100	30 - 45°
Gypsum, ground	75-80	-
Gypsum, pulverized	60-80	45° & Up
Hay, loose	5	-
Hay, pressed	24	-
Hemlock, dry	25	-
Hickory, dry	53	-
Hops, moist	35	45° & Up
Ice, solid	57.4	-
Ice, crushed	35-40	Up to 30°
Ilmenite	144	30 - 45°

Material	Average Wt. Per Cu. Ft., Pounds	Angle of Repose
Iron Ore	120-180	-
Iron, cast gray	450	-
Iron, cast ductile	444	-
Iron, wrought	480	-
Iron, borings	130-20	-
Lead, commercial	710	-
Lead, red	230	-
Lead Ore, crushed	180-270	-
Lead, white pigment	250-260	-
Lignite, air dried	45-55	30 - 45°
Lignum Vitae, dry	41-83	-
Lime, briquettes	60	-
Lime, burned pebble	53-56	45° & Up
Lime, quick, crushed	64	-
Lime, hydrated	20-40	30 - 45°
Limestone, solid	165	-
Limestone, loose	100	-
Limestone, pulverized	85-90	45° & Up
Linseed, whole	45-50	Up to 30°
Linseed, meal	28-40	30 - 45°
Locust, dry	44	-
Magnesite, solid	188	-
Magnesium, solid	109	-
Magnesium, Sulfate, crystal	70	-
Mahogany, Spanish, dry	53	-
Mahogany, Honduras, dry	35	-
Malt	20-22	30 - 45°
Manganese, solid	475	-
Manganese Ore	125-140	-
Manganese Oxide	120	-
Manure	25	-
Maple, dry	49	-
Marble, crushed	90-95	30 - 45°
Marl	79	30 - 45°
Masonry, granite or limestone	165	-
Mercury, 32°F	849	-
Mica, solid	181	-
Mica, ground	75-80	30 - 45°
Milk, malted	25-35	45° & Up
Milk, powdered	28	45° & Up
Molybdenum Ore, powdered	107	-
Mortar, wet	150	-
Oak, live, dry	59	-
Oak, red	32-45	-
Oats	26-28	32°
Oats, rolled	19	30 - 45°
Oil Cake	48-50	-
Oil, linseed	58.8	-
Oil, petroleum	55	-
Oyster Shells, ground	53	30 - 45°
Paper, writing and wrapping	65-90	-
Paraffine	45	-

Material	Average Wt. Per Cu. Ft., Pounds	Angle of Repose
Peanuts, shelled	35-45	30 - 45°
Peanuts, not shelled	15-20	30 - 45°
Pebbles	90-100	-
Petroleum, coke	35-45	-
Phosphate, rock	200	30 - 45°
Phosphate, sand	90-100	30 - 45°
Pine, White, dry	26	-
Pine, Yellow, Northern, dry	34	-
Pine, Yellow, Southern, dry	45	-
Pitch	72	-
Potash	80	-
Potassium Chloride	120-130	30 - 45°
Potatoes, white	48	-
Pumice, ground	40-45	45° & Up
Pyrites, pellets	120-130	30 - 45°
Quartz, solid	165	-
Quartz, lumps	95-100	-
Quartz, sand	70-80	-
Redwood, California, dry	26-30	-
Resin, synthetic, crushed	30-40	-
Rice, hulled and polished	45-48	Up to 30°
Rice, rough	36	30 - 45°
Rice Grits	42-45	30 - 45°
Rip-rap	80-105	-
Rosin	67	-
Rubber, caoutchouc	59	-
Rubber, manufactured	95	-
Rubber, Scrap (ground)	25-35	45° & Up
Rye	42-45	Up to 30°
Salt cake	80-95	30 - 45°
Salt, course	45-55	30 - 45°
Salt, fine	70-80	30 - 45°
Salt peter	70-80	30 - 45°
Sand, wet	110-130	45° & Up
Sand, dry	90-110	34°
Sand, loose, foundry	80-100	30 - 45°
Sand, rammed	100-110	-
Sand, voids full of water	110-130	15 - 30°
Sandstone, quarried and piled	82-86	-
Sawdust	10-25	-
Scale, rolling mill	125-160	-
Sewage, sludge	40-50	-
Shales, solid	162	-
Shales, broken	85-100	30 - 45°
Silica, flour	80	-
Slag, solid	160-180	-
Slag, furnace, granulated	60-65	30 - 45°
Slag, Birmingham	80-95	-

Material	Average Wt. Per Cu. Ft., Pounds	Angle of Repose
Slate, solid	165-175	-
Slate, fine ground	80-90	30 - 45°
Slate, flakes	70-85	-
Snow, fresh fallen	5-12	-
Snow, compacted by rain	15-50	-
Soap, solid	50	-
Soap, flakes	5-15	30 - 45°
Soap, powder	20-25	30 - 45°
Soda, Ash, heavy	55-65	30 - 45°
Soda Ash, light	20-35	30 - 45°
Sodium Aluminate, ground	72	-
Sodium Nitrate, ground	70-80	-
Soybeans, whole	45-50	Up to 30°
Spruce, California, dry	28	-
Starch, powdered	25-45	-
Steel, solid	489.6	-
Steel, chips	100-150	30 - 45°
Steel, turnings	60-120	45° & Up
Sugar, brown	45	-
Sugar, powdered	45-55	-
Sugar, granulated	50-55	30 - 45°
Sugar, raw cane	55-65	45° & Up
Sugarbeet Pulp, dry	12-15	-
Sugarbeet Pulp, wet	24-45	-
Sugarcane, knifed	15-18	45° & Up
Sulphur, solid	125	-
Sulphur, lumps	80-85	30 - 45°
Sulphur, dust	50-70	30 - 45°
Sycamore, dry	37	-
Talc, solid	165-170	-
Talc, granulated	50-65	-
Tanbark, ground	55	-
Tankage	50-70	-
Tar	69-75	-
Tin, cast	459	-
Tobacco, scraps	15-25	45° & Up
Tobacco, stems	16-25	45° & Up
Traprock, compact	187	-
Traprock, crushed	95-110	30 - 45°
Turf	20-30	-
Walnut, black, dry	38-42	-
Water, pure	62.4	-
Water, sea	64.08	-
Wheat	48	28°
Wheat, cracked	40-45	30 - 45°
Wood Chips	10-30	45° & Up
Wood Flour	16-35	-
Zinc, calcines	75-80	30 - 45°
Zinc, cast	443	-
Zinc Ore, granular	160	-
Zinc Oxide	10-35	45° & Up