ANEXO 01: Tablas de Selección Faja Transportadora

TABLA I CARACTERISTICAS DE MATERIAL

Material	Peso promedio lb/pies³	Peso promedio tonne/m³	Angulo de sobrecarga (grados)	Máxima inclinación recomendada de transporte (grados)
Acero, Desperdicios	75–150	1·2–2·4	20	18
Almidón	37	0·6	10	12
Alumbre	50	0·8	25	22
Alumina	55	0·9	10	12
Amianto metalífero o roca	80	1·3	20	18
Amianto picado	23	0·37	30	30
Arcilla, calcinada	90	1·44	25	22
Arcilla esquistosa, quebrada	95	1·5	10	18
Arcilla esquistosa triturada	88	1·4	25	22
Arcilla, seca. afinada	110	1·76	20	22
Arcilla, seca. apelmazada	68	1·1	20	20
Arena de fundición, núcleos viejos de arena, etc.	85	1·36	25	20
Arena, fundición, desperdicios	95	1·5	25	22
Arena, fundición, procesada	85	1·36	30	24
Arena, loma, mojada	120	1·9	30	22
Arena, loma, seca	100	1·6	20	18
Arena, núcleo	65	1·04	25	26
Arena, sílice, seca	95	1·5	10	12
Argamasa, mojada	150	2·4	20	20
Arroz	40	0·65	5	8
Aserrín	12	0·2	25	22
Asfalto	82	1·3	30	30
Astillas de palo	20	0·32	30	27
Avena	26	0·42	10	10
Azucar, granulado	52	0·83	10	15
Azucar, virgen, en bruto, caña	60	0·96	20	22
Bagazo	8	0·13	30	30
Baritas, polvo	130	2·1	10	15
Barrenados de hierro, de taller	125	2·0	30	22
Bauxita, minada	85	1·36	20	17
Bauxita, molida, seca	68	1·1	20	18
Bauxita, triturada, 3 pulg.	80	1·3	20	20
Bórax	55	0·9	20	20
Cacahuetes, descascarados	40	0·65	10	8
Cacahuetes, en cáscaras	17	0·27	10	8
Cal, guijarros	55	0·9	10	17
Cal, hidratada	38	0·6	25	21
Cal, molida, ⅛ pulg. y menor	62	1·0	30	23
Caliza, para agricultura, ⅛ pulg. y menor	—	0·9	—	—
Caolín, tierra de loza, de 3 pulg. y menor	63	1·0	20	19
Carbón, antracita, ½ pulg. y menor	60	0·96	20	18
Carbón, antracita, tamaño mayor de ½ pulg.	57	—	10	16
Carbón, bituminoso, de malla 50 y menor	52	0·83	30	24
Carbón, bituminoso, minado, cisco de ½ pulg. y menor	47	0·75	25	22
Carbón, bituminoso, minado de tamaño regular, cortado	50	0·8	20	16
Carbón, bituminoso, minado estado original	50	0·8	25	18
Carbón de madera	22	0·35	25	22
Carbón, lignito	47	0·75	25	22
Carborundo, 3 pulg.	100	1·6	10	15
Carburo de calcio	75	1·2	20	18
Caucho, perdigones	52	0·8	20	22
Caucho, regenerado	28	0·45	20	18
Cemento, escorias	85	1·36	25	18
Cemento, Portland	94	1·5	25	20
Cemento, Portland aerizado	67	1·06	5	10
Cenizas, carbón, mojadas	47	0·75	25	25
Cenizas, carbón, secas	37	0·6	25	23
Cenizas, prod. gas, mojadas	75	1·2	30	28
Cenizas, volantes	43	0·7	30	23
Centeno	44	0·7	10	8
Cieno de cloacas	45	0·7	10	15
Cinc, mineral, tostado	110	1·76	25	25
Cinc, mineral, triturado	160	2·6	25	22
Cloruro de amonio	50	0·8	10	10
Cloruro de magnesio	33	0·53	30	23
Coque, brisa, ventolina ¼ pulg. y menor	30	0·48	20	22
Coque, petroleo, calcinado	40	0·64	20	20
Coque, suelto	30	0·48	30	18
Corteza de palos, escoria	15	0·24	30	27
Cuarzo	85	1·36	10	15
Escoria, fundición, granular, mojada	95	1·5	30	22
Escoria, fundición, granular, seca	62	1·0	10	15
Escoria, horno alto, triturada	85	1·36	10	10

Material	Peso promedio lb/pies³	Peso promedio tonne/m³	Angulo de sobrecarga (grados)	Máxima inclinación recomendada de transporte (grados)
Feldespato	90	1·44	25	17
Fosfato ácido	60	0·96	10	13
Fosfato de sodio	57	0·9	10	16
Fosfato, molido triple, super, fertilizador	52	0·84	30	30
Fosfato, roca, pulverizada	60	0·96	25	25
Fosfato, roca, quebrado. seco	80	1·3	10	14
Fosfato triple super	52	0·8	20	20
Grafito, copos	40	0·65	10	15
Granito, roto, pedazos 3 pulg.	90	1·44	10	18
Grano de cebada	38	0·6	10	12
Granos, destilería, gastados, secos	30	0·48	10	15
Grava, guijarros	95	1·52	10	12
Grava, guijo, como minado	95	1·52	25	20
Grava, guijo, seca, aguda	95	1·52	20	16
Greda	80	1·3	10	17
Guisantes, arvejas, secos	47	0·75	5	8
Habas de cacao	35	0·56	10	12
Habas, habichuelas, judías	45	0·7	5	7
Harina de huesos	57	0·9	20	25
Harina de linaza	27	0·43	20	20
Litargirio pulverizado (óxido de plomo)	225	3·6	10	15
Harina de maíz o de trigo	40	0·65	20	22
Harina de trigo	38	0·6	30	21
Hielo, triturado	40	0·65	5	5
Hollín, perdigones	22	0·35	5	5
Hollín, polvo	6	0·1	10	12
Hormigón, abatimiento de 4 pulg.	130	2·1	10	22
Hormigón, abatimiento de 6 pulg.	130	2·1	10	12
Huesos	37	0·6	20	17
Jabón, granulas	20	0·32	10	12
Jabón, virutas	20	0·32	10	18
Ladrillos	110	1·76	30	27
Lignito, secado por aire	50	0·8	10	18
Maíz, descascarados	45	0·7	10	10
Maíz, espigas	56	0·9	25	18
Maíz milo	56	0·9	5	8
Mármol, triturado ½ pulg. y menos	87	1·4	10	15
Mica, copos	20	0·32	5	8
Mica, molida	14	0·22	20	23
Mica, pulverizada	14	0·22	10	15
Mineral ilmenita	150	2·4	10	18
Mineral de cobre	135	2·17	20	20
Mineral de cromo	130	2·1	10	17
Mineral de hierro	100	1·6	20	18
Mineral de hierro, triturado	140	2·25	20	20
Mineral de manganeso	135	2·15	25	20
Mineral de potasa	80	1·3	10	15
Mineral de sulfatos de níquel y cobalto	80–150	1·3–2·4	10	20
Minerales de plomo	235	3·8	10	15
Molibdenita, polvo	105	1·7	20	25
Nitrato de amonio	45	0·7	25	23
Nitrato de sodio	75	1·2	10	11
Nogal, Cáscaras, trituradas	40	0·65	20	20
Nueces catechu	35	0·56	30	22
Orujos de cerveza (residuos insolubles) mojados	58	0·9	30	27
Orujos de cerveza (residuos insolubles) secos	28	0·45	30	27
Oxidos de plomo	60–150	1·0–2·4	25	20
Partidas de vidrio	90	1·44	10	22
Piedra arenisca, quebrada	90	1·44	20	20
Piedra pómez, ½ pulg. y menor	42	0·67	30	22
Piritas, hierro, pedazos 2–3 pulg.	140	2·25	20	17
Piritas, perdigones	125	2·0	10	15
Pizarra	85	1·36	20	18
Remolacha, pulpa, mojada	37	0·6	30	25
Remolcha, pulpa, seca	14	0·22	30	25
Remolachas, enteras	48	0·75	20	20
Rescoldos, carbón	40	0·65	20	20
Rescoldos de carbón, horno alto	57	0·9	20	18
Roca, triturada	135	2·15	20	18
Sal, común, seca, fina	75	1·2	10	11
Sal, común, seca, tosca	47	0·75	10	20
Salvado, Afrecho	18	0·3	10	12
Semilla de grano de linaza	45	0·7	10	12
Soja, enteras	48	0·77	10	14
Soja, partidas	35	0·56	20	18
Sosa calcinada, briquetas	50	0·8	10	7
Sosa calcinada, ligera	27	0·43	25	22
Sosa calcinada, pesada	60	0·96	20	18
Sulfato de aluminio	54	0·9	20	17
Sulfato de amonio, granular	50	0·8	10	10
Sulfato de cobre	80	1·3	20	17
Sulfato de magnesio	70	1·1	10	15
Sulfato de manganeso	70	1·1	10	15

Bulk material classifications

Classification of materials

A classification of materials has been established to facilitate consideration of all the factors which affect their handling by conveyors. This classification is given in Table 1. With it, any bulk material can be classified according to its characteristics. Reference is made to these classifications in the engineering or selection of material for many Link-Belt conveyors, indicating thereby the materials which can be handled, the resulting capacities, specifications, etc.

Many materials which are commonly handled in bulk are listed in Table 2 with their classifications and weights. The classifications listed are given as a guide and are correct under ordinary conditions. Consideration should be given to materials that assume different characteristics under different conditions of processing, atmosphere, age or storage. Materials not appearing in this list can be classified by comparison with similar materials or by using the classifications in Table 1.

Example

Cracked wheat is fine, Class B; free flowing, Class 2; non-abrasive, Class 6; and contains explosive dust, Class S; making its classification B26S.

Table 1 · Material class description

	Material characteristic	Class
Size	Very fine—100 mesh and under	A
	Fine—½-inch mesh and under	B
	Granular—½-inch and under	C
	Lumpy—containing lumps over ½ inch	D
	Irregular—baling fibrous, stringy, or the like	H
Flowability	Very free flowing—angle of repose up to 30°	1
	Free flowing—angle of repose 30° to 45°	2
	Sluggish—angle of repose 45° and up	3
Abrasiveness	Nonabrasive	6
	Mildly abrasive	7
	Very abrasive	8
Other characteristics	Contaminable, affecting use or saleability	K
	Hygroscopic	L
	Highly corrosive	N
	Mildly corrosive	P
	Gives off dust or fumes harmful to life	R
	Contains explosive dust	S
	Degradable, affecting use or saleability	T
	Very light and fluffy	W
	Interlocks or mats to resist digging	X
	Aerates and becomes fluid	Y
	Packs under pressure	Z

Table 2 · Material classes and weights

Material	Average weight per cubic foot pounds △	Class ■
Adipic acid	45	A26LP
Alfalfa meal	17	B37W
Almonds, broken or whole	28-30	C27T
Alum, fine	45-50	B26
Alum, lumpy	50-60	D26
Alumina	60	B28
Aluminate jell	45	B27
Aluminum chips	7-15	H36X
Aluminum hydrate	18	C26
Aluminum ore, see bauxite		
Aluminum oxide	67-120	A17Y
Aluminum silicate	49	B26
Ammonium chloride, crystalline	52	B26
Ammonium nitrate	45	▲
Ammonium sulphate	45-58	▲
Antimony powder		B27
Apple pomace, dry	15	C37W
Arsenate of lead, see lead arsenate		
Arsenic, pulverized	30	▲
Arsenic oxide	100-120	▲
Asbestos ore or rock	81	C28R
Asbestos shred	20-25	H37WX
Ashes, coal, dry, ½" and under	35-40	C37
Ashes, coal, dry, 3" and under	35-40	D37
Ashes, coal, wet, ½" and under	45-50	C37PZ
Ashes, coal, wet, 3" and under	45-50	D37PZ
Asphalt, crushed, ½" and under	45	C26
Bagasse	7-10	H36WXZ
Bakelite, fine	30-40	A36
Baking powder	41	A26
Barite	180	D28
Barium carbonate	72	A37
Bark, wood, refuse	10-20	H37X
Barley	38	B18S
Barytes, see barite		
Bauxite, crushed, 3" and under	75-85	D28
Beans, castor, whole	36	C16
Beans, castor, meal		B26
Beans, navy, dry	48	C16
Beans, navy, steeped	60	C26
Bentonite, crude	34-40	D37Z
Bentonite, 100 mesh and under	50-60	A27Y
Benzine hexachloride	56	A36R
Bicarbonate of soda	41	A26
Blood, dried	35-45	D37
Bluestone, see copper sulphate		
Bones	35-50	▲
Boneblack, 100 mesh and under	20-25	A27
Bonechar, ½" and under	27-40	B27
Bonemeal	55-60	B27
Borate of lime		A26
Borax, fine	53	B26
Boric acid, fine	35	B26
Bran	16-20	B26SW
Bread crumbs		B26T
Brewer's grain, spent, dry	25-30	C36
Brewer's grain, spent, wet	55-60	C36P
Bronze chips	30-50	B38
Buckwheat	40-42	B16S
Calcium carbide	70-80	D27
Calcium lactate	26-29	D36TZ
Calcium oxide, see lime		
Carbon black, pelletized	20-25	B16TZ
Carbon black powder	4-6	▲
Carborundum, 3" and under	100	D28
Casein	36	B27
Cashew nuts	32-37	D37
Cast iron chips	130-200	C37
Cement, Portland	85-95	A27Y
Cement clinker	75-80	D28
Chalk, lumpy	85-90	D37Z
Chalk, 100 mesh and under	70-75	A37YZ
Charcoal	18-25	D37T
Cheese, grated	22-24	B26WZ

■ These classes represent observations under general conditions. Specific conditions may vary due to manufacturing processes and handling. Refer to Table 1 above for class description.

△ Weights of material, loose or slightly agitated. Weights are usually different when materials are settled or packed as in bins or containers.

▲ Class may vary considerably due to conditions. Consult Link-Belt for information.

Table 2 · Material classes and weights (continued)

Material	Average weight per cubic foot pounds △	Class ⊞
Chocolate press cake	40-45	D27
Chrome ore	125-140	C28
Cinders, blast furnace	57	D38
Cinders, coal	40	D28
Clay, see also bentonite, diatomaceous earth, fullers earth, kaolin and marl		
Clay, calcined	80	B28R
Clay, fine dry	100-120	▲
Clay, lumpy, loose	60-75	▲
Clover seed	48	B16S
Coal, anthracite	60	C27P
Coal, anthracite, river or culm, ½" and under	60	B37P
Coal, bituminous, mined, 50 mesh and under	50	B36P
Coal, bituminous, mined, run of mine	50	D26P
Coal, bituminous, mined, sized	50	D26PT
Coal, bituminous, mined, slack, ½" and under	50	C36P
Coal, bituminous, stripping, not cleaned	50	D37P
Coal char	24	B27SY
Cocoa beans	30-40	C27T
Cocoa nibs	35	C27
Cocoa powder	30-35	A36Z
Cocoanut, shredded	20-22	H36
Coffee, chaff	20	B26WY
Coffee, green bean	32	C26T
Coffee, ground	25	B26
Coffee, roasted bean	22-26	C16
Coffee, soluble	19	B26KLT
Coke, loose	23-32	D38TX
Coke, petroleum, calcined	35-45	D28X
Coke breeze, ½" and under	25-35	C38
Compost	28	H36N
Copper ore	120-150	D28
Copper sulphate		D26
Copperas, see ferrous sulphate		
Copra, lumpy	22	D26
Copra cake, lumpy	25-30	D26
Copra cake, ground	40-45	B26
Copra meal	40-45	B26
Cork, fine ground	12-15	B36WY
Cork, granulated	12-15	C36
Corn, cracked	45-50	C26
Corn, seed	45	C16ST
Corn, shelled	45	C16S
Corn germs	21	B26
Corn grits	40-45	B26
Corn sugar	31	B26
Cornmeal	38-40	B26
Cottonseed, dry, de-linted	35	C26
Cottonseed, dry, not de-linted	18-25	C36
Cottonseed cake, lumpy	40-45	D26
Cottonseed flakes	20-25	▲
Cottonseed hulls	12	B36W
Cottonseed meal	35-40	B26
Cottonseed meats	40	B26
Cracklings, crushed, 3" and under	40-50	D36
Cryolite	110	D27
Cullet	80-120	D28
Detergent, see soap detergent		
Diatomaceous earth	11-14	A28YZ
Dicalcium phosphate	43	A36
Disodium phosphate	25-31	B27PT
Dolomite, lumpy	90-100	D27
Ekonite, crushed, ½" and under	65-70	C26
Egg powder	16	▲
Epsom salts	40-50	B26
Face powder, see talcum powder		
Feldspar, ground, ½" and under	65-70	B27
Feldspar, powdered	75	A37
Ferrous sulphate	50-75	C27
Fish meal	35-40	B36
Fish scrap	40-50	H36
Flaxseed	45	B16S
Flaxseed cake, expeller	48-50	D26
Flaxseed meal	25	B26
Flour, wheat	35-40	A36K
Flue dust, boiler house, dry	35-45	A18Y
Fluorspar	82	C37
Fly ash, dry, see flue dust		
Fuller's earth, oil filter, burned	40	B28
Fuller's earth, oil filter, raw	35-40	B27
Fuller's earth, oil filter, spent	60-65	▲
Garbage, green	30	▲
Gelatin, granulated	32	C26T
Gilsonite	37	C27PS
Glass batch	90-100	D28
Glue, ground, ½" and under	40	B27
Glue, pearl	40	C16
Gluten meal	40	B26
Grains, distillery, spent, dry	30	H26W
Graphite, flake	40	C26
Graphite, flour	28	A16Y
Granite, broken	95-100	D28
Grape pomace	15-20	C37W
Grass seed	10-12	B26SW
Gravel, screened	90-100	D27
Gypsum, calcined, ½" and under	55-60	C27
Gypsum, calcined, powdered	60-80	A37
Gypsum, raw, 1" and under	90-100	D27
Hominy	37	C26
Hops, spent, dry	35	H36
Hops, spent, wet	50-55	H36P
Ice, crushed	35-45	D16
Ilmenite ore	140	B28
Iron ore	125-150	▲
Iron sulphate, see ferrous sulphate		
Kaolin clay, 3" and under	163	D27
Kaolin talc, 100 mesh and under	42-56	A37
Lactose	32	A26KZ
Lamp black, see carbon black		
Lead arsenate	72	B36R
Lignite, air dried	45-55	D26
Lignite, raw	40-45	▲
Lime, ground, ⅛" and under	60	B36Z
Lime, hydrated, ½" and under	40	B26YZ
Lime, hydrated, pulverized	32-40	A26YZ
Lime, pebble	53-56	D36
Limestone, agricultural, ½" and under	68	B27
Limestone, crushed	85-90	D27
Limestone dust	75	A37Y
Linseed, see flaxseed		
Litharge, see lead oxide		
Lithopone	45-50	A26Y
Magnesium chloride	33	C36
Maize, see corn		
Malt, dry ground ½" and under	22	B26SW
Malt, dry whole	27-30	C26S
Malt, wet or green	60-65	C36
Malt meal	36-40	B26
Manganese dioxide	80	▲
Manganese ore	125-140	▲

⊞ These classes represent observations under general conditions. Specific conditions may vary due to manufacturing processes and handling. Refer to Table 1, page 563, for class description.

△ Weights of material, loose or slightly agitated. Weights are usually different when materials are settled or packed as in bins or containers.

▲ Class may vary considerably due to conditions. Consult Link Belt for information.

Bulk material classifications

Table 2 · Material classes and weights (continued)

Material	Average weight per cubic foot pounds △	Class ▣
Manganese sulphate	70	C28
Marble, crushed, ½" and under	90-95	D28
Marl	80	D27
Meat, ground	50-55	▲
Meat, scraps	40	H37X
Mica, ground	13-15	B27
Mica, pulverized	13-15	A27Y
Mica flakes	17-22	B17WY
Milk, dried flake	5-6	B26K
Milk, malted	30-35	A36KZ
Milk, whole, powdered	20	B36KLZ
Monosodium phosphate	50	B27
Muriate of potash	77	B28
Mustard seed	45	B16S
Naphthalene flakes	45	▲
Niacin	35	B27
Nickel-cobalt sulphate ore	70-80	▲
Oats	26	C16S
Oats, rolled	19	C26SW
Orange peel, dry	15	H36
Oxalic acid crystals	60	B36L
Oyster shells, ground under ½"	53	C27
Oyster shells, whole		D27X
Paper pulp, 10% consistency	63-50	▲
Paper pulp, 20% consistency	25-30	▲
Paper pulp, 30% consistency	10-15	▲
Peanuts, in shells	15-20	D26T
Peanuts, shelled	35-45	C26T
Peat, dried	45-50	C16ST
Phosphate rock	75-85	D27
Phosphate sand	90-100	B28
Plaster of Paris, see gypsum, calcined, powdered		
Polystyrene beads	40	B26
Potassium carbonate	51	B27
Potassium chloride, pellets	120-130	C27P
Potassium nitrate	76	C17P
Potassium sulphate	42-48	B377
Pumice, ½" and under	42-45	B38
Pyrites, pellets	120-130	C27
Rice, hulled or polished	45-48	B16
Rice, rough	36	B26S
Rice bran, see bran		
Rice grits	42-45	B26
Rouge powder		A38Y
Rubber, hard, ground, see ebonite		
Rubber, pelletized	50-55	D36
Rubber, reclaim	25-30	D36
Rye	44	B16S
Salicylic acid	29	B26L
Salt, common, dry course	45-50	C27PL
Salt, common, dry fine	70-80	B27PL
Salt cake, dry coarse	85	D27
Salt cake, dry pulverized	65-85	B27
Saltpeter	80	B26S
Sand, bank, damp	110-130	B38
Sand, bank, dry	90-110	B28
Sand, foundry, prepared	90	B38
Sand, foundry, shakeout	90	D28
Sand, silica, dry	90-100	B18
Sawdust	10-13	▲
Sesame seed	27	B27
Shale, crushed	85-90	C27
Shellac, powdered or granulated	31	B26K
Silica gel	45	B28
Slag, furnace, granular	60-65	C28
Slag, furnace, lumpy	160-180	D38X
Slate, crushed, ½" and under	80-90	C27
Slate, ground, ½" and under	82	B27
Soap beads or granules		B26T
Soap chips	15-25	C26T
Soap detergents	15-50	▲
Soap flakes	5-15	B26T
Soap powder	20-25	B26
Soapstone talc, fine	40-50	A37Z
Soda ash, heavy	55-65	B27
Soda ash, light	20-35	A27W
Sodium bicarbonate, see bicarbonate of soda		
Sodium nitrate	70-80	▲
Sodium phosphate, see monosodium phosphate, disodium phosphate, trisodium phosphate		
Sodium sulphate, see saltcake		
Sorghum seed	47-52	B27
Soybeans, cracked	30-40	C27S
Soybeans, whole	45-50	G17S
Soybean cake, over ½"	40-43	D26
Soybean flakes, raw	20-26	C26W
Soybean flakes, spent	18-20	C26W
Soybean flour	27	▲
Soybean meal, cold	40	B26
Soybean meal, hot	40	B26P
Starch	25-50	▲
Steel chips, crushed	100-150	D28
Steel turnings	75-150	H38X
Stone, see gravel or limestone		
Sugar, granulated	50-55	B26KT
Sugar, powdered	50-60	▲
Sugar, raw, cane	55-65	B36Z
Sugar, wet, beet	55-65	B36Z
Sugar beet, pulp, dry	12-15	▲
Sugar beet, pulp, wet	25-45	▲
Sugar cane, knifed	15-18	H36X
Sulphur, crushed, ½" and under	50-60	C26S
Sulphur, 3" and under	80-85	D26S
Sulphur, powdered	50-60	B26SY
Taconite, pellets	116-130	D28T
Talcum powder	40-60	A27Y
Tanbark, ground	35	▲
Tankage	60-70	▲
Timothy seed	36	B26SW
Titanium sponge	60-70	H38
Tobacco leaves, dry	12-14	H36TX
Tobacco scraps	15-25	D36W
Tobacco snuff	30	B36TY
Tobacco stems	15	H36X
Traprock, crushed	105-110	D28X
Trisodium phosphate	60	B27
Triple super phosphate	50-55	D2ZNR
Tung nut meats, crushed	25	D26
Vermiculite, expanded	16	Q37W
Vermiculite ore	80	D27
Walnut shells, crushed	35-40	B28
Wheat	45-48	C16S
Wheat, cracked	40-45	B26S
Wheat germ	28	B26
Wood bark, see bark		
Wood chips	10-30	H36WX
Wood flour	16-36	▲
Zinc concentrate residue	75-80	B28
Zinc ore, crushed	160	▲
Zinc oxide, heavy	30-35	A36Z
Zinc oxide, light	10-15	A36WZ

▣ These classes represent observations under general conditions. Specific conditions may vary due to manufacturing processes and handling. Refer to Table 1, page 563, for class description.

△ Weights of material, loose or slightly agitated. Weights are usually different when materials are settled or packed as in bins or containers.

▲ Class may vary considerably due to conditions. Consult Link-Belt for information.

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B • Belt conveyors with respect to materials handled

Since materials being transported by a belt conveyor are carried on the conveyor belt, such characteristics as packing, abrasiveness, etc., are of less importance than if the material were dragged or pushed along a stationary trough.

Therefore, belt conveyors will transport almost all kinds of bulk materials. However, belt conveyors do have limitations imposed by a few materials characteristics, some of which are:

Stickiness—Sticky materials vary widely in the amounts that will adhere to the belt or that will build up on idlers, pulleys and chutes. Few materials are so sticky that a high percentage will not discharge from a conveyor belt. Many sticky materials may be handled successfully if chutes, cleaning devices, idlers, pulleys, belts and belt speeds are properly designed or selected to insure dependable operation. Consult Link-Belt if in doubt about any material.

Temperature—When temperature of material carried exceeds 150° F., heat resisting belts are usually required.

Deterioration of a belt is somewhat in proportion to temperature, although a hot, coarse material such as lump coke is apt to be less [illegible] aging to a belt than a closely packed material of the same temperature.

Belt conveyors have been used to carry very hot castings or even occasional incandescent lumps when mixed in sand or other fine materials. However, when temperatures reach 250°-300° F., the economics of a belt conveyor should be compared with other types of conveyors.

Special consideration should be given the design of the entire installation when hot materials are handled.

Chemical reaction—Some oils, chemicals, fats and acids may be injurious to some belts, idlers and pulleys. Neoprene or other belt covers can be obtained and the idlers and pulleys can be made of or coated with several kinds of substances to resist corrosion or chemical reaction.

Large lumps—The size of the largest lumps, and the percentage of the total volume represented by the largest lumps, are two of the factors that determine the minimum width of the belt as shown in Table 6, page 146. It may be found advantageous to crush the largest lumps if they require a very much greater width of belt than would otherwise be necessary. As shown in Table 14, page 156, the rated tension of some belts is determined by size and weight of lumps.

C • Angles of Incline

The angle of inclination at which a belt conveyor will convey a specific bulk material depends upon such characteristics as its size consist, shape of lumps, moisture content, angle of repose and flowability. Design factors which affect the behavior of materials on an inclined belt include belt speed, whether material is ascending or descending, how fully the belt is loaded, and whether it is loaded continuously, uniformly and centrally.

When the incline is too steep, some part of the bed of material may slide, flow or roll back, resulting in spillage. Also, when belt is too steep, large lumps or spherical pelletized material may become dislodged from the bed of fines, either near the side of belt or when the bed "falls out" at the end of feed. For large lumps this condition is aggravated when belt is carrying less than about 60% of its normal cross sectional load. Also large, heavy lumps that are thus dislodged, [illegible] all back and bounce, creating a safety hazard.

All of these conditions, except the "fall outs," are improved if belt can be loaded on a horizontal or low angle run before it curves up to steeper incline.

Table 1, page 142, shows conservative maximum angles at which belt conveyors will carry materials at their rated capacities, even at high speeds and when loaded intermittently. However, better and safer operating conditions will result from inclines less than these maximums, particularly when handling materials containing lumps larger than 4".

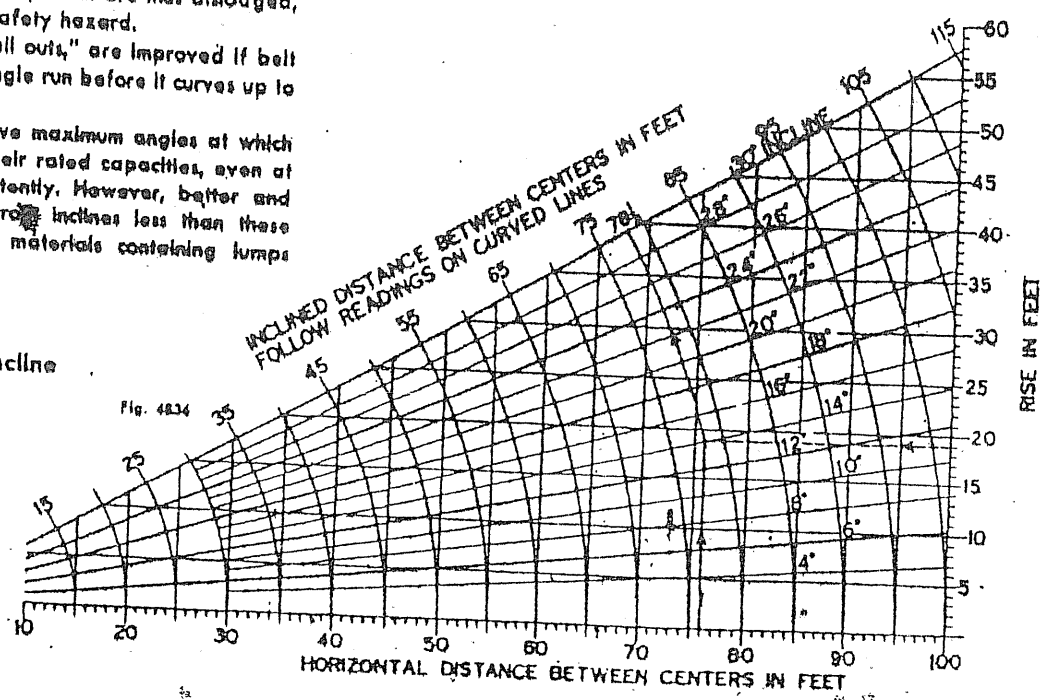
The angle of decline for descending conveyors may be the same as for ascending conveyors when sluggish materials like damp earth are handled, but the angle should be somewhat less for lumpy materials and those having lower angles of repose. However, the combination of angle of decline and speed of belt may not be as critical when a descending conveyor is to discharge to a stockpile or into a bin where the effects of possible avalanching will not create a cleanup problem.

From Chart A the angle of incline and length of the inclined portion of a conveyor may be obtained when the horizontal length and rise of the inclined portion is known.

Chart A • Angle and length of incline

Example • Belt conveyor with 152 foot horizontal distance and 38-foot rise.

To use the chart for this example, divide the figures by 2, giving 76 feet and 19 ft. The intersection of a vertical line from 76-foot horizontal length, with a horizontal line from a 19-foot rise, would occur at a point corresponding approximately, to the 14° line, to a radius of 78½ feet. Multiplying this by 2 results in an inclined length of 157 feet for the conveyor. The angle is 14° for either set of figures.



C • Angles of incline, continued

Table 1 • Maximum angle of incline.

Material carried △	Maximum angle of incline, degrees ▣	Material carried △	Maximum angle of incline, degrees ▣
Alumina, dry, free-flowing	18	Ore (see stone)	15 to 20
Beans, whole	8	Packages	15 to 25
Coal, anthracite	16	Pellets, depending on size, bed of material and concentricity (taconite, fertilizer, etc.)	5 to 15
Coal, bituminous, sized, lumps over 4 inches	15	Rock (see stone)	15 to 20
Coal, bituminous, sized, lumps 4 inches and under	16	Sand, very free-flowing □	15
Coal, bituminous, unsized	18	Sand, sluggish (moist) △	20
Coal, bituminous, fines, free-flowing ⊙	20	Sand, tempered foundry	24
Coal, bituminous, fines, sluggish △	22	Stone, sized, lumps over 4 inches	15
Coke, sized	17	Stone, sized, lumps 4 inches and under, over ½ inches	16
Coke, unsized	18	Stone, unsized, lumps over 4 inches	16
Coke, fines and breeze	20	Stone, unsized, lumps 4 inches and under, over ½ inches	18
Earth, free-flowing ⊙	20	Stone, fines ½ inch and under	20
Earth, sluggish △	22	Wood chips	27
Gravel, sized, washed	12		
Gravel, sized, unwashed	15		
Gravel, unsized	18		
Grain	15		

△ See footnote for Table 2, page 143, for definitions of sized, unsized and fine materials

▣ For ascending conveyors when uniformly loaded and with constant feed.

⊙ Angle of repose 30° to 45°

△ Angle of repose over 45°

□ Very wet or very dry, with angle of repose less than 30°

D • Belt width and speed

The best combination of belt width and speed depends upon capacity, angle of incline, belt tensions, lump size and other characteristics of the material to be handled. Due to the number and variations of these conditions, it is sometimes necessary to consider several tentative combinations of width and speed before establishing the final design.

The increasing need for handling higher capacities over longer distances has resulted in a trend toward higher belt speeds for conveyor systems. First cost is usually lower for a narrow, high-speed conveyor, but high speeds may create problems at loading points, at transfers, and on inclined portions. Often, lower over-all operating costs may be obtained with wider belts at lower speeds.

The conditions which influence selection of best width and speed are described below:

Speed—as limited by material handled

In conveying some materials, particularly mildly abrasive materials, it is usually found that the narrowest permissible belt at the highest permissible speed will be the most economical. However, with some materials and under certain conditions, slower speeds may prove more profitable. Some of the material characteristics and conditions which influence the speed of the belt are:

Light, fine, fluffy materials, such as soda ash and soap chips, should be carried at a speed slow enough to prevent them from being blown from the belt or their flow from being retarded due to windage or air resistance.

Fine, dry, dusty materials, such as pulverized coal, should be carried at a speed slow enough to minimize dusting.

Fragile materials should be carried slowly enough so that degradation harmful to the use or salability of the material will be minimized at the loading and unloading points.

Sluggish, damp materials, such as fine wet coal or wet sand that may have a tendency to stick or cling to the belt, should be carried at speeds high enough to provide a good discharge from the belt.

Hard, coarse, heavy, sharp and lagged materials, such as lumpy ore and stone, should travel at a moderate speed to minimize damage to the belt at the loading chutes.

Abrasive materials having relatively small size lumps may limit the speed of the belt by their degree of abrasiveness.

Granular, smooth surface materials, such as whole grains and beans and materials similar to wood chips and undelinted cotton seed, usually are carried at higher speeds than most other materials.

Width of belt, since higher speeds ordinarily are used for the wider belts.

Belt tensions sometimes determine speed of belt within the range limited by other factors. A higher speed with reduced cross sectional load may permit a more economical belt.

Type of chutes, trippers and loading and unloading devices are affected by both extremely high and low speeds.

Trajectory, which may not throw material far enough beyond head pulley or may throw it too far beyond. See Chart F, page 164.

Kind of carrying idlers, if other than ball or roller bearing, which may limit speed by type of bearings or diameter of rolls. Consult Link-Belt for the design of wider belts.

Table 2, page 143, shows speeds which present practice and experience indicate as the most practical and economical. They are to be used only as a general guide for consideration along with the many other factors for obtaining a well balanced design.

Loading Class—cross sectional area and volume as determined by material

A characteristic of the material that greatly influences belt conveyor capacity is its angle of repose or, as it is being conveyed on the belt, its angle of surcharge. Some fine materials, such as ore, sand and coal, may retain a high surcharge angle on the belt when they contain certain proportions of moisture and clay, but may slump to a lower angle when they are clean and dry. Fibrous materials usually have a high angle of surcharge.

(continued)

Engineering

D • Belt width and speed, continued

Table 3 shows Loading Classes A, B and C to denote the maximum surcharge angle and the cross sectional area at which some representative materials are normally carried on belts traveling over idler rolls.

The surcharge angle, in conjunction with the width of the belt, the shape of the trough of the belt, and the distance from the edges of the stream of material to the edges of the belt, determine the volume of material to be carried per linear foot of belt. Subsequent tables for calculating required speed of belt are based on these Loading Classes.

Although the volumes shown are conservative, they should not be exceeded, especially on inclined conveyors, without due consideration to flowability and size of lumps, speed and length of belt, and angle of inclines.

Table 2 • Maximum recommended belt speed as determined by material handled.

Material			Maximum recommended belt speed, feet per minute▲											
			Belt width, inches											
Characteristics		Material example	14	16	18	20	24	30	36	42	48	54	60	72	84
Maximum size lumps, sized or unsized □	Mildly abrasive	Coal, earth	300	300	400	400	450	500	550	600	600	650	650	650	650
	Very abrasive, not sharp	Bank gravel	300	300	400	400	450	500	550	550	600	600	600	600	600
	Very abrasive, sharp and jagged	Stone, ore	250	250	300	350	400	450	500	500	550	550	550	550	550
Half max. lumps, sized or unsized	Mildly abrasive	Coal, earth	300	300	400	400	500	600	650	700	700	700	700	700	700
	Very abrasive	Slag, coke, ore, stone, cullet	300	300	400	400	500	600	650	650	650	650	650	650	650
Flakes		Wood chips, bark, pulp	400	450	450	500	600	700	800	800	800	800	800	800	800
Granular, ⅛" to ½" lumps		Grain, coal, cottonseed, sand	400	450	450	500	600	700	800	800	800	800	800	800	800
Fines	Light, fluffy, dry, dusty	Soda ash, pulverized coal	220-250 feet per minute												
	Heavy	Cement, flue dust	250-300 feet per minute												
Fragile, where degradation is harmful		Coke, coal	200-250 feet per minute												
		Soap chips	150-200 feet per minute												

▲ Maximum for belts traveling horizontally on ball or roller bearing idlers. For picking belts, speed is usually 50 to 100 FPM. Belts with discharge plows should not travel faster than 200 FPM. A speed of at least 300 FPM should be maintained to assist discharge of materials tending to cling to belt, such as wet coal, wet sand, damp earth, dirty gravel.

□ **Unsized** means a uniform mixture of material in which not more than 10% are lumps ranging from maximum size to ½ maximum size, at least 15% are fines or lumps smaller than ⅛ maximum, and remaining 75% are lumps of any size smaller than ½ maximum.

Sized means a uniform mixture in which not more than 20% are lumps ranging from maximum size to ½ maximum size, and remaining 80% are lumps no larger than ½ maximum size and no smaller than ⅛ maximum size.

Table 3 • Loading Classes

Loading class	Maximum surcharge angle ▲	Comparative cross-sectional areas: 20-degree trough	45-degree trough	Flat belt	Material characteristics	Typical materials
A	5 degrees	Fig. 4842	Fig. 4842		Very free-flowing, having angle of repose of less than 30 degrees Semi-fluid or flat slump Very wet or very dry, small spherical or granular particles	Whole grain, whole beans, whole seeds, dry silica sand, cement, fly ash, mica flakes or wet concrete
B	20 degrees	Fig. 4843	Fig. 4843	Fig. 4843	Maintains angle of repose between 30 and 35 degrees Largest lumps permitted by width of belt as shown in Table 6, page 146	Coal, ashes, sand, gravel, earth, stone, ore, rock, lump lime, lump gypsum, coarse salt and cracked grains
C	30 degrees	Fig. 4844	Fig. 4844	Fig. 4844	Medium size lumps as shown in Table 6, page 146 Maintains angle of repose over 40 degrees Sluggish, fibrous, stringy, shredded, or flakes that cling together	Same as for loading Class B Wood chips, bark, shavings, bagasse, undelinted cotton seed, green malt, hops, shredded cane, shredded rubber, damp fines and tempered foundry sand

▲ Defined as the maximum cross-sectional surcharge angle at which material may be carried on belts traveling over belt idlers.

B • Belt width and speed, continued

Width and speed—as determined by capacity

The minimum width of belt to carry the required volume of material depends upon the speed at which the belt will travel and the permissible cross sectional area of the load on the belt.

The volume of material to be handled is usually expressed in terms of tons per hour, cubic feet per hour, cubic yards per hour, or bushels per hour. So that the conveyor will never be overloaded, the volume per hour must be the maximum rate or peak rate at which material will be handled at any moment and not the average per hour or the average as determined by hourly or daily requirements.

To insure that the volume will never be greater than planned, use surge bins with feeders unless the flow of material to the belt is regulated by some other method, such as by other conveyors, or by processing equipment.

Table 5, page 145, shows the permissible cross sectional areas of the load on the belt for various types of idlers and for the various loading classifications in terms of rate per hour of carrying material when speed of belt is one foot per minute and material is constantly and uniformly fed to the belt. These values, therefore, are 60 times the volume of material on one linear foot of belt.

Since the permissible speed of the belt varies with different conditions and different widths of belts, more than one calculation may be necessary to arrive at the proper combination of width and speed. When 20° idlers are used and the Loading Class is B or C, the speed of the belt may be determined from the tons per hour of material to be transported by interpolating from Table 4.

However, if other than 20° idlers and B or C loading are used, calculate the speed of the belt from the formula

$$S = \frac{V_1}{V_2}$$

where S = speed of belt, feet per minute, to carry maximum recommended cross sectional loading of belt
V_1 = peak rate per hour at which material will be handled
V_2 = rate per hour of carrying material at belt speed of one foot per minute, as found from Table 5, page 145.

If the minimum belt width resulting from the above formula will require a belt speed greater than permitted by Table 2, page 143, the width should be recalculated, and based on a V_2 value sufficient to reduce the speed of the belt within the recommended limits.

Table 4 • Capacities of belt conveyors using 20-degree idlers

Weight of material per cubic foot, pounds	Belt width, inches ■	Capacity, Loading Class B, short tons (2000 pounds) per hour⊙ — Belt speed, feet per minute ▲								Capacity, Loading Class C, short tons (2000 pounds) per hour⊙ — Belt speed, feet per minute ▲							
		100	200	300	400	500	600	700	800	100	200	300	400	500	600	700	800
50	14	16	32	48	65	...	...	...	...	16	32	48	65				
	16	21	42	63	84	105	...	...	...	23	46	69	92	115			
	18	27	54	81	108	135	...	...	...	31	63	94	126	157			
	20	34	67	101	135	168	...	...	...	39	79	118	158	197			
	24	50	100	150	200	250	300	...	...	60	120	180	240	300	360		
	30	81	162	243	324	405	486	567	...	97	194	291	389	485	582	680	
	36	117	235	352	470	587	704	822	940	147	295	442	590	737	884	1032	1180
	42	162	325	487	650	812	974	1137	1300	202	405	607	810	1012	1214	1417	1620
	48	220	440	660	880	1100	1320	1540	1760	275	550	825	1100	1375	1650	1925	2200
	54	285	570	855	1140	1425	1710	1995	2280	357	715	1072	1430	1787	2144	2500	2860
	60	360	720	1080	1440	1800	2160	2520	2880	450	900	1350	1880	2250	2700	3150	3600
	72	555	1110	1665	2220	2775	3330	3885	4440	690	1380	2070	2760	3450	4140	4830	5520
	84	775	1550	2325	3100	3875	4650	5425	6200	970	1940	2910	3880	4850	5820	6790	7760
100	14	32	64	96	129	...	...	...	...	32	64	96	129				
	16	42	84	126	168	210	...	...	...	46	92	138	184	230			
	18	54	108	162	216	270	...	...	...	63	126	189	252	315			
	20	67	135	202	270	337	...	...	...	79	158	237	316	295			
	24	100	200	300	400	500	600	...	...	120	240	360	480	600	720		
	30	162	324	486	648	810	972	1134	...	194	389	583	778	972	1166	1361	
	36	235	470	705	940	1175	1410	1645	1880	295	590	885	1180	1475	1770	2065	2360
	42	325	650	975	1300	1625	1950	2275	2600	405	810	1215	1620	2025	2430	2835	3240
	48	440	880	1320	1760	2200	2640	3080	3520	550	1100	1650	2200	2750	3300	3850	4400
	54	570	1140	1710	2280	2850	3420	3990	4560	715	1430	2145	2860	3575	4290	5005	5720
	60	720	1440	2160	2880	3600	4320	5040	5760	900	1800	2700	3600	4500	5400	6300	7200
	72	1110	2220	3330	4440	5550	6660	7770	8880	1380	2760	4140	5520	6900	8280	9660	11040
	84	1550	3100	4650	6200	7750	9300	10850	12400	1940	3880	5820	7760	9700	11640	13580	15520
150	14	48	96	144	192	...	...	...	...	48	96	144	192				
	16	62	124	186	248	...	...	...	...	68	136	204	272	340			
	18	80	160	240	320	400	...	...	...	94	188	282	376	470			
	20	102	204	306	408	510	...	...	...	118	236	354	472	590			
	24	150	300	450	600	750	900	...	...	180	360	540	720	900	1080		
	30	242	484	726	968	1210	1452	1694	...	290	582	872	1164	1454	1744	2036	2320
	36	352	704	1056	1408	1760	2112	2464	...	442	884	1326	1768	2210	2652	3094	3536
	42	486	972	1458	1944	2430	2916	3402	...	606	1214	1820	2428	3034	3640	4248	4848
	48	660	1320	1980	2640	3300	3960	4620	...	824	1650	2474	3300	4124	4948	5774	6592
	54	854	1708	2562	3416	4270	5124	5978	...	1070	2144	3214	4288	5358	6428	7502	8560
	60	1080	2160	3240	4320	5400	6480	7560	...	1350	2700	4050	5400	6750	8100	9450	10800
	72	1665	3330	4995	6660	8325	9990	11655	13320	2070	4140	6210	8280	10350	12420	14490	16560
	84	2325	4650	6975	9300	11625	13950	16275	18600	2910	5820	8730	11640	14550	17460	20370	23280

▲ Refer to Table 2, page 143 for maximum speeds
■ Refer to Table 6, page 146 for minimum width of belt for lump size.
⊙ Refer to Table 3, page 143 for determining Loading Class.

Engineering

D - Belt width and speed, continued

Usually, it is most economical to operate the narrowest permissible belt at its maximum allowable speed. However, when it is calculated that the permissible cross sectional loading at the maximum permissible speed will handle more than the required volume, it is usually best to maintain the cross sectional loading and select a speed sufficient to convey the required volume. The width and speed thus determined should be considered as tentative until belt tensions are established, as it may be necessary to increase the width to provide sufficient operating strength; or, it may be advantageous to operate the belt at a higher speed with reduced cross sectional loading to decrease the required tension. Another consideration which may be found later to influence the width and speed of the belt is the troughability of belt, as determined by its thickness to provide adequate strength.

Table 5 - Rate per hour of carrying material at belt speed of one foot per minute

Belt width, inches	Volume per hour for one foot per minute of belt speed, V_1								
	Cubic feet per hour△			Cubic yards per hour			Bushels per hour		
	Loading Class▲								
	A	B	C	A	B	C	A	B	C
Flat belt on idlers■									
14	.....	2.6	4.1	.....	0.09	.15	.....	2.1	3.2
16	.....	3.7	5.8	.....	.13	.21	.....	2.9	4.6
18	.....	5.3	8.5	.....	.19	.31	.....	4.2	6.8
20	.....	7.3	11.6	.....	.27	.43	.....	5.8	9.3
24	.....	11.9	18.9	.....	.44	.70	.....	9.6	15.2
30	.....	18.0	28.6	.....	.66	1.06	.....	14.4	23.0
36	.....	27.2	43.0	.....	1.00	1.59	.....	21.8	34.6
42	.....	38.2	60.6	.....	1.42	2.24	.....	30.7	48.7
48	.....	48.3	76.4	.....	1.78	2.83	.....	38.8	61.5
54	.....	59.2	94.7	.....	2.20	3.50	.....	47.6	76.0
60	.....	74.5	111.9	.....	2.75	4.12	.....	60.0	89.2
72	.....	107.0	157.0	.....	3.90	5.80	.....	85.0	125.0
84	.....	142.0	210.0	.....	5.20	7.70	.....	113.0	167.0
20-degree idlers■									
14	3.35	6.48	6.48	.13	.24	.24	2.70	5.20	5.2
16	5.04	8.40	9.20	.19	.31	.34	4.05	6.75	7.4
18	6.90	10.80	12.60	.25	.40	.46	5.55	8.70	10.1
20	8.85	13.50	15.80	.33	.50	.58	7.12	10.85	12.9
24	13.50	20.00	24.00	.50	.74	.89	10.85	16.10	19.3
30	22.60	32.40	38.90	.84	1.20	1.44	18.10	26.00	31.2
36	33.50	47.00	59.00	1.24	1.74	2.18	27.00	37.80	47.5
42	47.60	65.00	81.00	1.76	2.41	3.00	38.80	52.20	65.0
48	63.00	88.00	110.00	2.23	3.26	4.07	50.50	71.00	88.5
54	80.00	114.00	143.00	2.96	4.22	5.30	64.20	91.50	115.0
60	98.00	144.00	180.00	3.62	5.33	6.65	79.00	116.00	145.0
72	145.00	222.00	276.00	5.35	8.23	10.20	116.00	177.00	220.0
84	200.00	282.00	385.00	7.40	10.40	14.20	160.00	226.00	307.0
45-degree idlers with unequal length rolls■									
24	19.8	26.4	30.4	.74	.98	1.13	15.9	21.2	24.4
30	32.0	42.6	50.0	1.18	1.58	1.85	25.7	34.2	40.2
36	41.5	55.2	70.0	1.54	2.15	2.58	33.4	44.5	56.2
42	57.5	76.8	96.0	2.12	2.83	3.56	46.2	61.5	77.2
48	78.0	103.8	126.5	2.88	3.85	4.70	62.8	83.0	102.0
45-degree idlers with equal length rolls■									
24	22.0	28.7	33.0	.81	1.06	1.22	17.5	22.9	26.3
30	36.0	48.0	54.2	1.33	1.77	2.00	28.8	38.5	43.7
36	53.0	70.8	80.0	1.96	2.62	2.96	42.5	56.5	64.2
42	74.5	99.6	116.0	2.76	3.68	4.30	59.5	79.5	93.5
48	104.2	139.8	149.0	3.85	5.15	5.52	84.0	112.0	120.0
54	135.0	180.0	193.0	5.00	6.67	7.15	108.0	144.0	155.0
60	173.0	231.0	243.0	6.40	8.55	8.65	139.0	185.0	195.0
72	262.0	249.0	355.0	9.70	12.90	13.10	210.0	280.0	285.0

▲ Refer to Table 3, page 143, for determination of Loading Class.

■ Select idlers from pages 146 thru 150.

△ Cubic feet per hour = $\frac{\text{Tons per hour} \times \text{Pounds per ton}}{\text{Weight of material per cubic foot, pounds}}$

D · Belt width and speed, continued

Width—as determined by size of lumps

The size of lumps to be handled may determine the minimum belt width, particularly for low capacity conveyors or for inclines that approach the maximums.

When a small percentage of large lumps requires a substantially wider belt, special loading methods sometimes may be used to accommodate them. Also, under certain conditions, narrower belts may be used if occasional large lumps are confined by skirts, guards or safety covers.

Belts of ample width usually justify their first cost by subsequent savings in cleanup expense and improved safety, particularly on conveyors of moderate lengths. On very long conveyors or conveyor systems, it may be advisable to crush extremely large lumps or to screen them out and handle them separately.

Table 6 shows the best practice with respect to maximum size of lumps for belts of given widths without consideration of idler series or the strength of belt. Table 7 illustrates the influence of lump size on idler selection and Table 14, page 156, shows the necessity for considering lump size with respect to the strength of the belt.

Table 6 • Maximum recommended lump size for each width of belt on 20-degree idlers

Material class	Loading class ■	Maximum size of lumps○ — Belt width, inches											
		14	16	18	20	24	30	36	42	48	54	60	72	84
Unsized	B △	3	4	5	6	8	10	14	16	18	20	22	27	32
	B □						12	16	20	22	24	28	33	38
	C			1	1 ½	2	3	4	5	7	10	12	15	18
Sized	B △	2	2 ½	3	3 ½	4 ½	7	8	10	12	14	16	19	22
	C			½	¾	1	1 ½	2	2 ½	3 ½	5	6	7 ½	9

Unsized means a uniform mixture of material in which not more than 10% are lumps ranging from maximum size to ½ maximum size, at least 15% are fines or lumps smaller than ⅛ maximum, and remaining 75% are lumps of any size smaller than ½ maximum.

Sized means a uniform mixture in which not more than 20% are lumps ranging from maximum size to ½ maximum size, and remaining 80% are lumps no larger than ½ maximum size and no smaller than ⅛ maximum size.

■ Loading classes are explained in Table 3, page 143.

△ Based on free flow of material through skirt plates when the loading conditions and the distance between skirt plates are as recommended on page 162.

□ Based on special consideration being given to loading conditions of the belt and operation of the conveyor.

○ Size of lumps may determine series of belt idlers as shown in Table 7, and the rated belt tensions in Table 14, page 156.

E · Belt idler selection and spacing

The type and spacing of belt idlers influence the life of the idlers, the belt, and to a lesser extent the power requirement. Selection of the most satisfactory idler requires consideration of the material handled, capacity, and conditions of service.

Link-Belt makes an exceptionally broad range of types and sizes of belt idlers. Although some may appear to overlap, all are required to handle a wide variety of materials and to meet all of the needs of modern industry. The information herein is suitable for selecting idlers for most conditions of service. However, it may be advisable to consult Link-Belt for idler recommendations to meet unusual combinations of conditions.

The construction of Link-Belt idlers is described on page 175. Dimensions and weights are shown on pages 181-195.

A MAYOR SERIE, MAS ROBUSTA LA FACTA Y RESISTENTE
A CONDICIONES MAS EXTREMAS, RODAMIENTOS PESADOS, MAS CARGA

Table 7 • Maximum recommended lump size for each idler series

Type of belt idler	Idler series — SERIE	Material weight, pounds per cubic foot lb/ft³	Maximum recommended size of lumps, inches △ — Belt width, inches												
			14	16	18	20	24	30	36	42	48	54	60	72	84
20° troughed belt idlers	5000	35	3	4	5	5	6	6							
		50	3	4	5	5	5	5							
		100	3	4	4	4	4	4							
	6000	50	3	4	5	6	8	12	16						
		75	3	4	5	6	8	12	14						
		100	3	4	5	6	8	10	12						
	7000	50	...	...	5	6	8	12	16	20	20				
		100	...	...	5	6	8	12	14	16	16				
		150	...	...	5	6	8	10	12	14	14				
	8000	50	...	...	...	...	8	12	16	20	20	20	20		
		100	...	...	...	...	8	12	14	16	16	16	16		
		150	...	...	...	...	8	10	12	14	14				
	9000	100	...	...	...	...	...	...	16	20	22	24	28	33	38
		150	...	...	...	...	...	...	16	20	22	24	26	27	32
45° troughed belt idlers	6000 and 8000	Size and weight of lumps is usually limited by type of belt. Consult Link-Belt when material weighs more than 50 pounds per cubic foot.													
Flat belt idlers	5000, 6000, 7000, 8000, 9000	When used for materials other than fine or granular, the maximum size of lumps or objects depends upon their shape and weight, also the spacing of idlers, speed of belt and other considerations. Consult Link-Belt.													

△ Size of lumps may also be determined by width of belt (Table 6), or by belt tension and weight of material (Table 14, page 156). Other considerations include characteristics of material, Loading Class, speed of belt and loading conditions.

Engineering

E · Belt idler selection and spacing, continued

The TYPE of idler is determined by the function it performs, such as carrying the load, supporting the empty return belt, training the belt and cushioning the impact of loading. Selection of the type of carrying idler, whether flat belt, 20° or 45° troughed belt, usually is determined by the size, weight, quantity and lump size of material to be handled.

Several SERIES of each type of idler are made to meet widely differing operating conditions. Selection of the series is determined by such conditions as type and frequency of service, degree of abrasiveness in surrounding atmosphere, the weight per cubic foot of material, and the size of largest lumps to be handled, as well as loading and discharge conditions. Also, selection of the series is based on the speed, width and thickness of the belt.

The type and series of idlers for most conveyors may be selected on the basis of the operating conditions broadly described in Table 9. However, for unusual combinations of conditions, it may be more advantageous to use a lighter or heavier series than shown in the table. Thus, a lighter series may be satisfactory for handling heavy, granular materials on a temporary or infrequently used conveyor, whereas the same series would not be economical for continuous duty. Conversely, heavier idlers are more dependable and are often more economical for continuous duty when handling high capacities of lumpy material, even though it is of moderate weight.

Idler rolls are made in various diameters and of materials such as steel, gray iron and rubber tread. Larger diameters are desirable for high speed belts and for large lumps, as they should prolong life of both idler rolls and belts. Steel rolls are used for most materials, but gray iron is more satisfactory under certain corrosive conditions. Rubber tread rolls are used on carrying idlers to absorb impact, and on return idlers for sticky or corrosive materials.

The method of lubricating idler bearings is usually based upon the preference of purchaser's maintenance organization, and is influenced by operating conditions, accessibility of the idlers, and by the character and availability of labor. Three methods of lubrication are available in certain series of Link-Belt idlers:

1. Regreaseable in the field at each bearing with all grease pipes extended to one side where desired. This method is necessary for large idlers and wide belts, and usually is preferred for all but relatively narrow, moderately loaded conveyors.

2. Regreaseable in the field from one end, or "one-shot." This method is usually confined to light and medium duty idlers of moderate belt width.

3. Factory greased and sealed bearings are usually confined to conveyors of moderate widths for light or temporary duty.

Table 9, page 148, provides selection information with respect to both type and series. The maximum lump size for various idlers is shown on Table 7, page 146, but idler selection may be influenced also by the maximum lumps for belt width, Table 6, page 146, and by belt tension, Table 14, page 156.

The weight of revolving parts of various Link-Belt idlers is required to determine power requirements and belt tensions, and is shown in Table 10, page 150.

Belt idler spacing

The spacing of idlers along the conveyor belt is a very important factor in the over-all economy of the conveyor since the spacing greatly influences the life of both the belt and the idlers. Also, idler spacing may influence the required horsepower as well as the tension rating and cost of the belt.

If the distance between troughed belt idlers is too great, the belt will tend to sag excessively, causing spillage of material, decreased belt life, and increased power to drive the conveyor.

Idler spacing under skirt plates should be reduced to avoid wedging of material, as described further in this book under "Loading the Belt." Heavy, sharp lumps will cause more damage to high speed belts due to greater impact at the idlers when there is too much sag in the belt. The amount of belt tension required to prevent excessive sag is reduced by closer spacing of idlers as shown by Chart E, page 155.

Occasional large pieces imbedded in fines and centrally loaded on a belt traveling at slow speed are less severe on the idlers than the same size or smaller lumps without the cushioning effect of fines. Lumps not loaded centrally or traveling at high speed have a more destructive effect.

(continued on page 150)

Table 8 · Belt idler spacing for each idler type and series

Type of belt idler	Belt idler series	Material weight, pounds per cubic foot	Recommended average spacing of troughed belt idlers, feet A — Belt width, inches												
			14	16	18	20	24	30	36	42	48	54	60	72	84
20° troughed belt idlers	5000	35	5½	5½	5	5	4½	4½							
		50	5½	5	5	4½	4½	4							
		100	5	5	4½	4½	4	4							
	6000	50	5½	5	5	4½	4½	4½	4½						
		75	5	5	5	4½	4½	4	4						
		100	5	5	5	4½	4½	4	4						
	7000	50	...	...	5	5	5	4½	4½	4½	4				
		100	...	...	5	4½	4½	4	4	4	4				
		150	...	...	4	4	4	4	3½	3½					
	8000	50	...	...	...	...	5	4½	4½	4½	4	4	3½		
		100	...	...	...	...	4½	4	4	4	4	3½	3½		
		150	...	...	...	...	4	4	3½	3½					
	9000	100	...	...	...	...	...	...	4½	4½	4½	4	4	3½	3½
		150	...	...	...	...	...	...	4	4	4	4	4	3	3
45° troughed belt idlers	6000	35	...	...	...	...	5	5	5	4½	4½				
		50	...	...	...	...	4½	4½	4½	4½	4				
	8000	35	...	...	...	...	5½	5	5	5	4½	4½	4	4	
		50	...	...	...	...	5	4½	4½	4½	4	4	3½	3½	

A Return belt idler recommended spacing is 10 foot intervals for all belt widths and loading. Belt training idlers on the carrying and return runs, should be placed about 50 feet from each terminal or bend pulley and approximately 100 feet apart thereafter. Idler spacing at loading point should be reduced to prevent excessive s. g as covered on pages 155 and 162.

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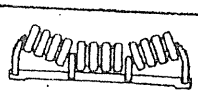
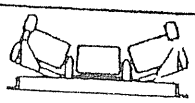
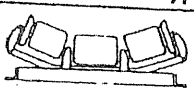
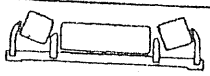
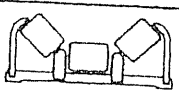
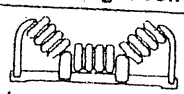
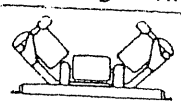
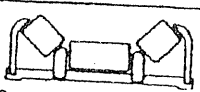
E • Belt idler selection and spacing, continued

Table 9 • Belt idler selection by type and series

Type of belt idler	Series	Available for belt widths, inches	Roll diameter, inches	Operating conditions
 20° troughed belt idler	5000	14-30	4	Carrying idler for intermittent operation, relatively low capacities and for lightweight materials of limited lump size.
	6000	14-36	4-5	Carrying idler for intermittent operation, medium capacities and for moderate weight, semi-abrasive materials containing lumps larger and heavier than those handled by Series 5000 idlers; or, for continuous operation when handling lightweight, fine materials.
	7000	18-48	5	Carrying idler for continuous operation, high capacities, and for heavier weight, abrasive materials where the size of lumps is limited by the width of belt.
	8000	24-60	6	Carrying idler for continuous operation, high capacities, and for heavier weight, abrasive materials where the size of lumps is limited by the width of belt. The stronger and heavier 6" diameter rolls give added life under more severe service, and are suitable for wider belts than Series 7000 idlers.
	9000	36-84	6-7	Carrying idler for continuous operation, highest capacities, and for the heaviest and coarsest materials.
 20° troughed belt rubber cushion idler	6000	14-36	5	Carrying idler used to protect the belt by absorbing impact under loading points, especially when large lumps and heavy materials are carried.
	7000	18-48	5	
	8000	24-60	6	
	9000	36-84	7	
 20° troughed belt training idler, positive action type	6000	14-36	4-5	Carrying idler used to train carrying belts which operate in one direction, and to protect edges of belt from injury due to misalignment.
	7000	18-48	5	
	8000	24-60	6	
	9000	36-84	6-7	
 20° troughed belt training idler, actuating disc type	7000	18-48	5	Carrying idlers used to train carrying belts which operate in both directions, and to protect edges of belt from injury due to misalignment.
	8000	24-60	6	
	9000	36-84	6-7	
 20° troughed belt picking and feeder conveyor idler	8000	24-60	5-6	Carrying idler used for picking, sorting and feeder conveyors.
	9000	36-84	6-7	
 45° troughed belt idler, equal length rolls	7000	24-48	5	Carrying idler for continuous service. This type carries maximum volume of material, limited only by the construction of the belt.
	8000	24-60	6	
 45° troughed belt rubber cushion idler, equal length rolls	8000	24-60	6	Carrying idler used to protect the belt by absorbing impact under loading points, especially when large lumps and heavy materials are carried.
 45° troughed belt training idler, positive action type, equal length rolls	7000	24-48	5	Carrying idler used to train carrying belts which operate in one direction, and to protect edges of belt from injury due to misalignment.
	8000	24-60	6	
 45° troughed belt idler, unequal length rolls	6000	24-48	4-5	Carrying idler for continuous operation, handling lightweight materials such as grain and wood chips in greater volume than 20° idlers.

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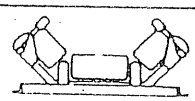
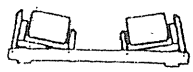
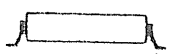
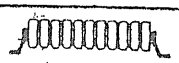
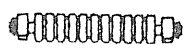
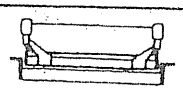
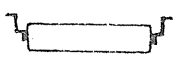
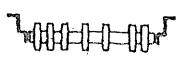
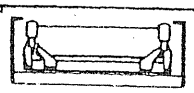
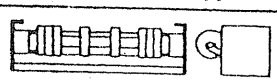
II · Belt idler selection and spacing, continued

Table 9 • Belt idler selection by type and series (continued)

Type of belt idler	Series	Available for belt widths, inches	Roll diameter, inches	Operating conditions
 **45° troughed belt training idler, positive action type, unequal length rolls**	6000	24-48	4-5	Carrying idler used to train carrying belts which operate in one direction, and to protect edges of belt from injury due to misalignment.
 **Variable troughed belt idler**	8000 9000	24-60 36-84	5-6 6-7	Carrying idler used to reduce edge tension in highly stressed belts during their transition from troughed idler to pulleys. Rolls are adjustable to desired belt contour.
 **Flat belt idler**	5000 6000 7000 8000 9000	14-30 14-36 18-48 24-60 36-84	4 4-5 5 6 6-7	Carrying idler used for bulk materials such as prepared foundry sand and undelinted cotton seed, where it is desirable to plow material off at one or more points. Also, used for pulpwood logs, packages, picking and sorting conveyors. Generally suitable for conditions of service of corresponding series of 20° idlers.
 **Flat belt rubber cushion idler, fixed shaft type**	8000 9000	24-60 36-84	6 7	Carrying idler used to protect the belt by absorbing impact at transfers and belt feeders.
 **Flat belt rubber cushion idler, live shaft type**	8000 9000	24-60 36-84	6 7	Carrying idler used to protect the belt by absorbing impact at transfers and belt feeders. For the heaviest type of service.
 **Flat belt training idler, positive action type**	6000 7000 8000	14-36 18-48 24-60	4-5 5 6	Carrying idler used to train carrying belts which operate in one direction, and to protect edges of belt from injury due to misalignment.
 **Return belt idler**	5000 6000 7000 8000 9000	14-30 14-36 18-48 24-60 36-84	4 4-5 5 6 6-7	Return idler used to carry empty return belts. Available with steel, gray iron or specially coated rolls.
 **Return belt rubber tread idler**	6000 7000 8000 9000	14-36 18-48 24-60 36-84	4-5 5 6 6	Return idler used to carry empty return belts where wet or sticky materials cling to belt or where resistance to corrosion and chemical attraction to iron or steel is required.
 **Return belt training idler, positive action type***	6000 7000 8000 9000	14-36 18-48 24-60 36-84	4-5 5 6 6-7	Return idler used to train return belts which operate in one direction, and to protect edges of belt from injury due to misalignment.
 **Return belt rubber tread training idler, caster-camber type***	8000 9000	24-60 36-84	6 6	Return idler used to train return belts which operate in one direction when handling materials that adhere to belt and build-up on metal rolls. Made only with rubber treads.
 **Return belt beater idler**	8000 9000	24-60 36-84	6 7	Return idler used to assist in removing excessive amounts of certain materials that have a tendency to cling to belt.

* For return belt training idlers for reversible belts consult Link-Belt.

Engineering

E • Belt idler selection and spacing, continued

Table 8, page 147, and the notes following it, show recommended average spacing of idlers based on judgment determined by many years of experience. It is intended to represent good practice for normal or average types of installations, but definite limitations cannot be tabled for the spacing of idlers for all conditions. In many cases it may be advisable to obtain a recommendation from Link-Belt, especially when large, heavy lumps are being carried, when there is a wide variance of tensions along the belt, and for conveyors having convex curves or unusual loading conditions.

Belt training idlers

It is important that the conveyor belt operates practically centrally with respect to its idlers to avoid damage to belt edges from rubbing against adjacent chutes or structures. To insure central operation the belt must be installed properly and the idlers, terminal pulleys and structures must be correctly aligned. Also, the material handled should be loaded centrally on the belt.

In addition to careful installation, it is necessary to provide means of training the belt in anticipation of subsequent variations in alignment and loading conditions. Some self-aligning effect of the carrying run may be obtained by installing the carrying idlers with a forward tilt in the direction of belt travel of **not more than 2°.** Tilted idlers should not be used on reversible conveyors. Also, tilted idlers may result in increased wear of belt cover and idler rolls when handling abrasive materials.

The best method of training the belt when misalignment is not excessive is with belt training idlers, which correct this condition automatically by training the belt to a central position. They are available in the various series shown in Table 9, pages 148-149. Belt training idlers are made for both carrying and return belts, and for those that travel in one direction or for reversible conveyors. Recommended spacing of belt training idlers is given in a footnote to Table 8, page 147.

Table 10 • Weight of revolving idler parts

Belt width, inches	Troughed belt idlers — Weight per belt idler, pounds												Flat belt and return belt idlers — Weight per idler, pounds											
	Series 5000	Series 6000			Series 7000		Series 8000			Series 9000			Series 5000	Series 6000			Series 7000		Series 8000			Series 9000		
	4" steel rolls	4" steel rolls	5" steel rolls	5" rubber cushion rolls	5" steel rolls	5" rubber cushion rolls	6" steel rolls	6" gray iron rolls	6" rubber cushion rolls	6" steel rolls	7" steel rolls	7" rubber cushion rolls	4" steel rolls	4" steel rolls	5" steel rolls	5" rubber tread rolls	5" steel rolls	5" rubber tread rolls	6" steel rolls	6" gray iron rolls	6" rubber tread rolls	6" steel rolls	7" steel rolls	6" rubber tread rolls
14	13	15	19	14	...	...	...	...	...	...	...	...												
16	15	17	20	15	...	...	...	...	...	...	...	...	12	12	15	11	...	...	...	...	...	...	...	...
18	16	18	22	17	25	20	...	...	...	...	...	...	13	14	16	12	...	...	...	...	...	...	...	...
20	17	19	24	19	28	23	...	...	...	...	...	...	14	16	18	13	22	17	...	...	...	...	...	...
24	20	22	27	22	32	27	41	64	57	...	...	...	15	17	20	14	24	18	...	...	...	...	...	...
30	23	26	32	27	36	31	48	76	68				17	19	23	15	28	20	36	59	24			
36	...	31	38	32	41	35	55	89	79	93	108	126	21	23	27	17	34	24	43	71	29			
42	...	...	...	...	46	40	64	103	93	106	122	141	...	27	31	19	40	28	50	83	33	86	96	64
48	...	...	...	...	52	48	71	115	104	118	136	156	...	...	...	...	46	32	57	96	37	98	110	69
54	...	...	...	...	...	...	78	128	116	131	150	171	...	...	...	...	52	36	65	108	42	111	124	75
60	...	...	...	...	...	...	86	140	125	143	164	186	...	...	...	...	...	...	72	121	46	123	138	81
72	...	...	...	...	...	...	...	...	...	168	192	216	...	...	...	...	...	...	79	133	51	135	152	87
84	...	...	...	...	...	...	...	...	...	193	220	246	...	...	...	...	...	...	...	...	...	160	178	100
																						185	204	109

F • Power requirements and belt tensions

The power required to drive a belt conveyor is a fundamentally important design consideration. It provides the basis for selecting the motor, controls and other drive components, as well as for calculating anticipated power consumption. It determines the tensions and strength of belt required, and influences belt cost and life, and occasionally its width. Also, the design of other mechanical and structural parts is affected by the forces which contribute to, or are the result of power requirements.

These various forces are described below, followed by the conventional symbols (page 154) and their definitions. Also, the relation of power to proper belt tension and belt selection is covered on this page. Examples of power calculations are shown on page 170.

Two methods of calculating power requirements are presented—the Graphical Method and the Analytical Method. Both are accurate within their defined limits. The Graphical Method is suitable for designing small, simple conveyors, or for closely approximating the power requirements of larger units. The Analytical Method is necessary for accurate results when designing long, high-capacity conveyors, or those with complex paths of travel.

There are two forces that determine the power requirements and belt tensions in any belt conveyor **after** it is running at a uniform speed, namely **frictional forces** and **gravitational forces.** A third, **inertia forces,** affects belt tension during acceleration and deceleration but has little influence on total power requirements.

FRICTIONAL FORCES are the forces required for moving the material and the belt horizontally and for turning all rotating parts driven by the conveyor belt. Frictional forces always oppose the movement of the belt, and equal the sum of the following constituent forces:

Total weight of moving material × friction factor of material.
Total weight of belt × friction factor of belt.
Total weight of revolving idler parts × friction factor of idlers.

Additional frictional forces that must be included at the drive shaft are the friction of conveyor terminal bearings, the friction of material on conveyor loading skirts and other minor power absorbing items. For conveyors of moderate lengths and paths of travel these forces may all be included by adding one empirical value, L_o. This term L_o represents a force resulting from adding theoretically 150-foot centers of loaded horizontal conveyor to the foot or receiving end of the actual conveyor. The L_o value of 150 feet is conservative for conveyors with ball or roller bearing idlers and sleeve bearings on terminal pulley shafts. If pulley shafts are equipped with ball or roller bearings, and good alignment and maintenance is assured, the L_o value may be reduced to 120 feet.

Table 12 – weight factors
BFGoodrich conveyor belt (lb. per in. per ft.)

Carcass weight factors*

Carcass	Number of Plies 3	4	5	6	7	8	9	10
Cotton								
32 oz.	.081	.108	.135	.162	.189	.216	.243	.270
35 oz.	.084	.112	.140	.168	.196	.224	.252	.280
Synthetic multiple ply (SMP)								
SMP35	.071	.095	.119	.142	.166	.190	.213	.237
SMP43	.072	.096	.120	.144	.168	.192	.216	.240
SMP50	.084	.112	.140	.167	.195	.223	.251	.279
SMP60	.085	.113	.141	.169	.197	.225	.254	.282
SMP70	.086	114	.143	.171	.200	.228	.257	.285
Polyester nylon (PN)								
PN90	.075	.100	.125	.150	.175	.200	.225	.250
PN120	.076	.101	.126	.151	.176	.202	.227	.252
PN155	.089	.119	.149	.178	.208	.238	.267	.297
PN195	.102	.136	.171	.205	.239	.273	.307	.341
PN240	.114	.152	.190	.228	.266	.304	.342	.380
Glass								
Glass	.063	084	.105	.125	.145	.170	.190	.210

Cover weight factors*

Cover Thickness	Factor	Cover Thickness	Factor
1/32	.016	9/32	.144
1/16	.032	5/16	.160
3/32	.048	11/32	.176
1/8	.064	3/8	.192
5/32	.080	13/32	.208
3/16	.096	7/16	.224
7/32	.112	15/32	.240
1/4	.128	1/2	.256
Consider breaker as part of cover thickness			

Multiwarp or Flexseal, PN110, PN150

	2	3	4	5	6
M	.068	.081	.108	.135	.162
H (Nylon)	.071	.083	.110	.138	.165
H (Polyester)	.066	.084	.112	.141	.169
XH	.088	.102	.136	.170	.204
XXH	.089	.103	.138	.172	.206
200	.094	.127	.169	.211	.253
PN110	NR	NR	.112	.140	.168
PN110 H	NR	.099	.132	.165	.198
PN150	NR	NR	.132	.165	.197
PN150 H	NR	.121	.162	.202	.242

NR — Not Recommended

*For estimated weight of MSHA compounds or neoprene adjust factors
By: 1.12 x carcass factor
1.16 x cover factor
For SCOF adjust factors
By: 1.05 x carcass factor
1.06 x cover factor

How to figure belt weight

Belt wt. lbs. per ft. equals
carcass weight factor
plus
cover weight factor
} X belt width, inches

Table 12A – Decimal and millimeter equivalents

Decimals	MM	Decimals	MM	Decimals	MM
1/64 — 0.015625	0.397	23/64 — .359375	9.128	11/16 — .6875	17.462
1/32 — .03125	0.794	9/32 — .3750	9.525	45/64 — .703125	17.859
3/64 — .046875	1.191	25/64 — .390625	9.922	23/32 — .71875	18.256
1/16 — .0625	1.588	13/32 — .40625	10.319	47/64 — .734375	18.653
5/64 — .078125	1.984	27/64 — .421875	10.716	3/4 — .7500	19.050
3/32 — .09375	2.381	7/16 — .4375	11.112	49/64 — .765625	19.447
7/64 — .109375	2.778	29/64 — .453125	11.509	25/32 — .78125	19.844
1/8 — .1250	3.175	15/32 — .46875	11.906	51/64 — .796875	20.241
9/64 — .140625	3.572	31/64 — .484375	12.303	13/16 — .8125	20.638
5/32 — .15625	3.969	1/2 — .5000	12.700	53/64 — .828125	21.034
11/64 — .171875	4.366	33/64 — .515625	13.097	27/32 — .84375	21.431
3/16 — .1875	4.762	17/32 — .53125	13.494	55/64 — .859375	21.828
13/64 — .203125	5.159	35/64 — .546875	13.891	7/8 — .8750	22.225
7/32 — .21875	5.556	9/16 — .5625	14.288	57/64 — .890625	22.622
15/64 — .234375	5.953	37/64 — .578125	14.684	29/32 — .90625	23.019
1/4 — .2500	6.350	19/32 — .59375	15.081	59/64 — .921875	23.416
17/64 — .265625	6.747	39/64 — .609375	15.478	15/16 — .9375	23.812
9/32 — .28125	7.144	5/8 — .6250	15.875	61/64 — .953125	24.209
19/64 — .296875	7.541	41/64 — .640625	16.272	31/32 — .96875	24.606
5/16 — .3125	7.938	21/32 — .65625	16.669	63/64 — .984375	25.003
21/64 — .328125	8.334	43/64 — .671875	17.066	1 — 1.000	25.400
11/32 — .34375	8.731				
1 mm = .03937"		.001" = .0254 mm			

TABLAS DE FAJAS DE TRANSPORTE

GOOD YEAR

TABLA 1 TENSIONES PERMISIBLES

ITEM	PLYLON 2110	PLYLON 3150	PLYLON 3150	PLYLON 315	PLYLON 420	PLYLON 525	PLYLON 630
UNION VELCANIZADA Y ATORNILLADA lb/pulg.ANCHO	210	210	315	315	420	525	630

ITEM	CLASIFICACION RMA PARA FAJAS DE MULTIPLES PLIEGUES									
	MP 35	MP 43	MP 50	MP 60	MP 70	MP 90	MP 120	MF 155	MP 195	MP 240
ALGODON *	32 oz	36 oz	42 oz							
ALGODON-NYLON	28HDNF	32 HDNF	36 HDNF	42 HDNF	48 HDNF					
RAYON +				H RAYON	X H RAYON					
RAYON-NYLON						HDRN 10	HRDN 20	HDRN 40	HDRN 50	HDRN 70
RENDIMIENTO NORMAL, UNION ATORNILLADA LIB/PULG.ANCHO/PLIEGUES	27	33	40	45	55	(-)	(-)	(-)	(-)	(-)
UNION VULCANIZADA - LIB/PULG. ANCHO/PLIEGUES.	35	43	50	60	70	90	120	155	195	240

* ALGODON 28 oz : 25 Lb/pulg.ancho/Pliegue - Unión Atornillada
: 33 Lb/Pulg.ancho/Pliegue - Unión Vulcanizada

\+ RAYON CON UNION ATORNILLADA : No es recomendable en condiciones extremadamente húmedas (faja sumergida, carga húmeda).

\- UNION ATORNILLADA: No es recomendada en fabricaciones arriba de MP 70.

HDNF

TABLAS DE FAJAS DE TRANSPORTE

GOOD YEAR

TABLA 1 TENSIONES PERMISIBLES

ITEM	PLYLON 2110	PLYLON 3150	PLYLON 3150	PLYLON 315	PLYLON 420	PLYLON 525	PLYLON 630
UNION VELCANIZADA Y ATORNILLADA lb/pulg.ANCHO	210	210	315	315	420	525	530

ITEM	CLASIFICACION RMA PARA FAJAS DE MULTIPLES PLIEGUES									
	MP 35	MP 43	MP 50	MP 60	MP 70	MP 90	MP 120	MP 155	MP 195	MP 240
ALGODON *	32 oz	36 oz	42 oz							
ALGODON-NYLON RAYON + RAYON-NYLON	28HDNF	32 HDNF	36 HDNF	42 HDNF H RAYON	48 HDNF X H RAYON	HDRN 10	HRDN 20	HDRN 40	HDRN 50	HDRN 70
RENDIMIENTO NORMAL, UNION ATORNILLADA LIB/PULG.ANCHO/PLIEGUES	27	33	40	45	55	(-)	(-)	(-)	(-)	(-)
UNION VULCANIZADA - LIB/PULG. ANCHO/PLIEGUES.	35	43	50	60	70	90	120	155	195	240

* ALGODON 28 oz : 25 Lb/pulg.ancho/Pliegue - Unión Atornillada
: 33 Lb/Pulg.ancho/Pliegue - Unión Vulcanizada

\+ RAYON CON UNION ATORNILLADA : No es recomendable en condiciones extremadamente húmedas (faja sumergida, carga húmeda).

\- UNION ATORNILLADA: No es recomendada en fabricaciones arriba de MP 70.

HDNF

T A B L A 3

MAXIMO NUMERO DE PLIEGUES EN ABARQUILLAMIENTO

ANCHO DE FAJA	GRUPO DE FABRICACION DE FAJA																					
	1			2			3			4			5			6			7		
	ANGULO DE RODILLO																					
(PULG.)	20°	30°	35°, 45°	20°	30°	35°, 45°	20°	30°	35°, 45°	20°	30°	35°, 45°	20°	30°	35°, 45°	20°	30°	35°, 45°	20°	30°	35°, 45°
12-14	4	NR	NR	4	NR	NR	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
16	4	NR	NR	4	NR	NR	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
18	5	4	NR	5	4	NR	5	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
20	5	5	NR	5	4	NR	5	4	NR	4	4	NR	4	4	NR	4	NR	NR	4	NR	NR
24	6	6	5	6	5	4	6	5	4	5	4	4	5	4	4	4	4	4	5	4	4
30	8	7	6	7	6	6	7	6	5	6	5	4	6	5	4	5	4	4	5	4	4
36		8	8	8	8	7	8	8	7	7	6	5	7	6	5	6	6	5	6	5	5
42					8			8		8	8	7	8	7	6	7	7	6	7	7	6
48												8		8	8	8	8	7	8	8	7
54																		8			8

NOTAS:

SOBRE 8 PLIEGUES NO SE CONSIDERA PRACTICABLE
NR = NO RECOMENDABLE

T A B L A 4

GUIA PARA SELECCION DE ESPESOR DE CUBIERTAS (PULGADAS)

TIEMPO DE CICLO 2L/S *	CALIDAD DE CUBIERTA	MATERIAL MODERADAMENTE ABRASIVO			MATERIAL ABRASIVO		
		TAMAÑO			TAMAÑO		
		HASTA 1"	1" a 5"	SOBRE 5"	HASTA 1"	1" a 5"	SOBRE 5"
HASTA 0.5	B	3/32-7/32	1/8-1/4	3/16-5/16	1/8-9/32	1/8-11/32	1/4-7/16
	S	1/16-5/32	3/32-3/16	1/8 -1/4	3/32-7/32	1/8-9/32	3/16-3/8
0.5 a 1.0	B	1/16-5/32	3/32-3/16	1/8-1/4	3/32-7/32	1/8-1/4	3/16-3/8
	S	1/16-1/8	3/32-5/32	1/8-7/32	1/16-5/32	3/32-3/16	1/8 -5/16
SOBRE 1.0	B	1/32-3/32	1/16-5/32	1/8-7/32	1/16-5/32	1/8-7/32	3/16-5/16
	S	1/32-3/32	1/16-1/8	3/32-3/16	1/16-1/8	3/32-5/32	1/8-1/4

TIEMPO DE CICLO 2 L/S	CALIDAD DE CUBIERTA	MATERIAL MUY ABRASIVO			MATERIAL EXTREMADAMENTE ABRASIVO		
		TAMAÑO			TAMAÑO		
		HASTA 1"	1" a 5"	SOBRE 5"	HASTA 1"	1"a 5"	SOBRE 5"
HASTA 0.5	B	1/8 -3/8	3/16-13/32	5/16-9/16	3/16-7/16	5/16-9/16	3/8 -5/8
	S	1/8 -9/32	1/8 -11/32	1/4 -1/2	1/8 -11/32	3/16-7/16	5/16-5/8
0.5 a 1.0	B	1/8 -5/16	3/16-3/8	1/4 -1/2	3/16-3/8	1/4 -1/2	5/16-9/16
	S	3/32-1/4	1/8 -9/32	3/16-13/32	1/8 -5/16	1/8 -3/8	1/4 -1/2
SOBRE 1.0	B	1/8 -7/32	1/8 -9/32	1/4 -3/8	1/8 -5/16	3/16-3/8	1/4 -1/2
	S	3/32-3/16	1/8 -7/32	3/16-5/16	1/8 -1/4	1/8 -9/32	3/16-3/8

* L : DISTANCIA ENTRE CENTROS (PIES)

S : VELOCIDAD DE LA FAJA (PIES/MIN.)

T A B L A 5

DIAMETRO MINIMO DE POLEAS (PULG.)

PORCENTAJE DE TENSION MAX	TIPO DE FAJA						
	PLYLON 2100	PLYLON 2210	PLYLON 3150	PLYLON 315	PLYLON 420	PLYLON 525	PLYLON 630
SOBRE 80	16	18	18	20	24	30	36
60 a 80	14	16	16	18	20	24	30
40 a 60	12	14	14	16	18	20	24
HASTA 40	10	12	12	14	16	18	20

N° PLIEGUES	TIPO DE FAJA: 28 HDNF y 32 HDNF, 28 oz y 32 oz H-RAYON — % TENSION MAXIMA				36 HDNF, 42 HDNF y 48 HDNF, 36 oz y 42 oz XH - RAYON, HDRN - 10,20 — % TENSION MAXIMA				HDRN - 40 — % TENSION MAXIMA				HDRN - 50, 70 — % TENSION MAXIMA			
	SOBRE 80	60 a 80	40 a 60	HASTA 40	SOBRE 80	60 a 80	40 a 60	HASTA 40	SOBRE 80	60 a 80	40 a 60	HASTA 40	SOBRE 80	60 a 80	40 a 60	HASTA 40
3	18	14	12	10	20	18	16	14	24	20	18	16				
4	20	18	16	14	24	20	18	16	30	24	20	18	36	30	24	20
5	30	24	18	16	30	24	20	18	36	30	24	20	42	36	30	24
6	36	30	24	20	36	30	24	20	42	36	30	24	48	36	30	30
7	36	30	30	24	42	36	30	24	48	42	36	30	54	42	36	30
8	42	36	30	24	48	42	36	30	54	48	42	36	60	48	42	36

DIAMETRO MINIMO DE POLEAS

PARA POLEAS MOTRICES EN TANDEM, USAR EL VALOR INMEDIATAMENTE SUPERIOR AL QUE INDICA LA TABLA

SOBRE 80% DE TENSION

TABLA 6

CAPACIDAD EN TENSION PARA FAJAS
DE MULTIPLES PLIEGUES

FABRICACION	DESIGNACION RMA*	CAPACIDAD lb/pulg ancho/Pliegue	
		En Granos	En Industria y Minería
28 oz	.....	27	
28 HDNF, 32 oz	MPE-27	31	
32 HDNF, 35 oz 32 oz	MPP-33	38	33
36 HDNF, 42 oz	MPE-40	46	40
42 HDNF	MPE-45	52	45
48 HDNF	.....	57	50
H Rayon	MPE-55	63	55
HDRN-10	.....	69	60
HORN-20	.....	75	65
HDRN-40	.....	90	80

* RMA: Rubber Manufacturers Association

TABLA 7

PESO APROXIMADO Y ESPESORES DE FAJAS

Fabricación	Peso Aproximado* lb/Pliegue/Pulg. Ancho/Pie Long.		Espesor aprox. por pliegue (Pulg)
	NEOPRENE	CAUCHO	
28 oz	0.0232	0.0231	0.052
32 oz	0.0257	0.0260	0.058
36 oz	0.0278	0.0271	0.062
42 oz	0.0313	0.0309	0.069
28 HDNF	0.0204	0.0200	0.047
32 HDNF	0.0217	0.0213	0.050
36 HDNF	0.0229	0.0219	0.052
42 HDNF	0.0260	0.0259	0.060
48 HDNF	0.0281	0.0281	0.064
4 Rayón	0.0284	0.0263	0.051
X H Rayón	0.0286	0.0265	0.053
HDRN - 10	0.0282	0.0261	0.054
HDRN - 20	0.0285	0.0263	0.056
HDRN - 40	0.0351	0.0329	0.070
HDRN - 50	0.0429	0.0406	0.076
HDRN - 70	0.0488	0.0465	0.087

* Se incluye el peso de la capa entre almas (De NEOPRENE ó CAUCHO)

W TEJIDO

PESO APROXIMADO DE CUBIERTAS

(lb/ Pulg. Ancho / Pie Long/ 1/32)

DEPENDE MERCADO

ESTILO B : 0.0165
ESTILO S : 0.0160

NEOPRENO + COMPUESTOS

TIPO DE RODILLOS

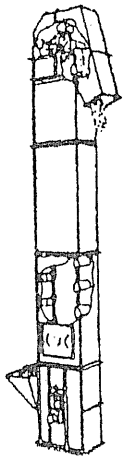
Letra	ϕ Rodillo	Ancho de Faja	Campo de Aplicación	Tipo de Rodamientos Lubricados de por Vida
A	4″	14 - 30″	• Operaciones intermitentes • Capacidades relativamente bajas • Tamaños limitados	Rodamientos de bolas
B	4″ ó 5″ de const. Especial más resistente y mejor mat.	16″ - 36″	• Operaciones intermitentes. • Capacidades medianas • Peso moderado del material • Material semi abrasivo conteniendo tamaños grandes y más pesados que "A" y para operaciones compuestas con materiales livianos o finos	Rodamientos de bolas
C	6″ ó 5″ (espec.)	18″ - 60″	• Operaciones continuas • Altas capacidades • Materiales pesados • Materiales abrasivos • Donde el tamaño de trozo es limitado por el ancho de la faja	Rodamientos de rodillos
D	6″ (espec.) ó 7″	36″ - 72″	• Operaciones continuas • Capacidades muy altas • Materiales pesados o grandes	Rodamientos de rodillos

FACTOR DE APLICACIÓN

Tipo de factor	Condiciones de operación		Factor	
			Material sin clasificar	Material clasificado
De servicio	Horas de servicio por día	.6	0.7	
		6 – 10	1.0	
		10 – 16	1.3	
		16 – 24	1.7	
De velocidad	Velocidad de la faja (pie/min)	200	0.8	
		200 – 400	0.9	
		400 – 600	1.0	
		600 – 800	1.1	
		800 – 1000	1.2	
De tamaño	Tamaño de los trozos más grandes	0 - 4″	1.0	1.3
		4″ - 6″	1.3	1.6
		6″ - 8″	1.7	2.0
		8″ - 10″	2.0	2.3
		10″ - 12″	2.3	2.7
		12″ - 14″	2.7	
		14″ - 16″	3.0	
		16″ - 18″	3.3	
		18″ - 20″	3.7	
		20″ - 22″	4.0	
		22″ - 24″	4.3	

ANEXO 02: Tablas de Selección Elevador de Cangilones

bucket elevators



Transfer of paraformaldehyde is accomplished by steel-encased bucket elevators, from belt conveyors between flaker, Roto-Louvre dryer, storage bins, pulverizer and bagging bins in chemical processing plant. Photo 34974

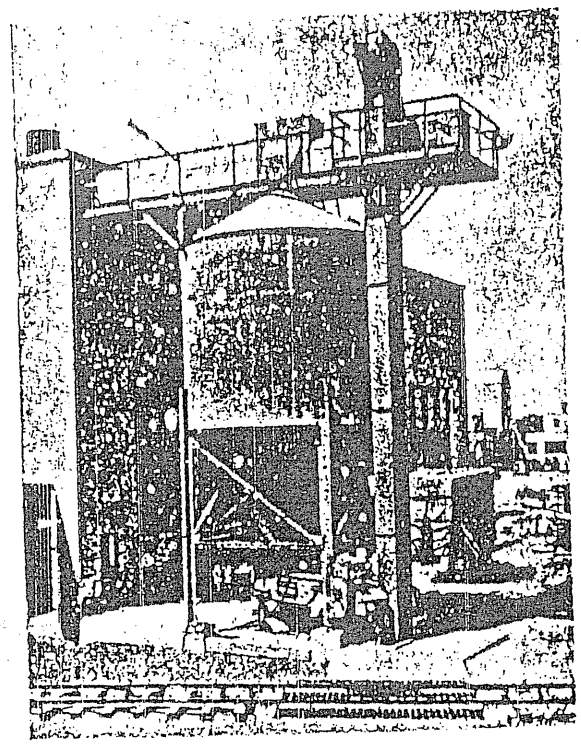
The typical bucket elevator consists of a series of buckets mounted on chain or belt operating over head and foot wheels. Takeups provide means to compensate for variations in length of chain or belt due to temperature changes, atmospheric conditions, or wear. A steel casing usually encloses the bucket line and the head and foot machinery. Certain types of elevators have open steel supporting frames in lieu of casings.

Link-Belt elevator buckets are made in a variety of shapes, weights and sizes, manufactured of steel, malleable iron, longer wearing Promal or alloy metals. The type of elevator and the material being handled determine the selection.

Chains for bucket elevators are of malleable iron, Promal or steel, used in single or double strands. Chain is used on elevators carrying heavy loads, hot materials or those which pack between the buckets and a belt. Rubber covered or treated fabric belts are used on elevators handling grains, cereals and many other dry, free-flowing or abrasive materials. The components comprising the head and foot machinery have been selected to best suit the service requirements of the individual elevator.

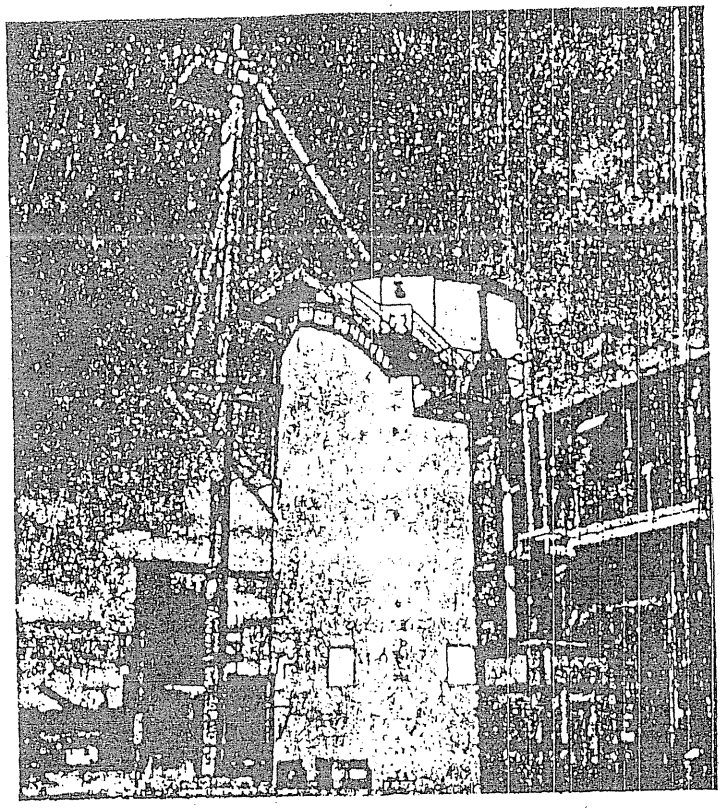
The selection of the proper type of bucket elevator depends largely on the capacity requirements and the characteristics of the material to be handled.

contents

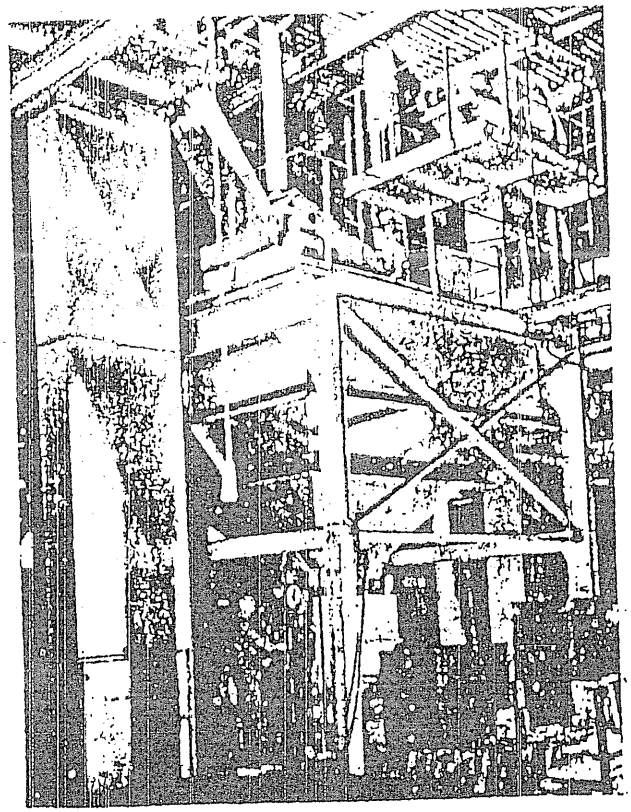


Coal is transported in controlled flow, by bucket elevator from track hopper to and from reserve storage bin to overhead belt conveyor for distribution to bunkers by belt tripper. Photo 35078

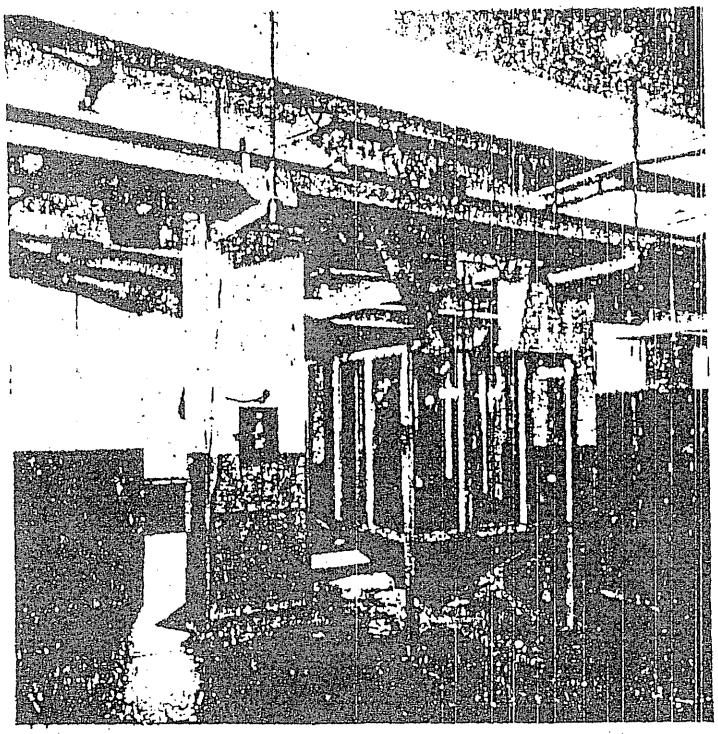
Installations



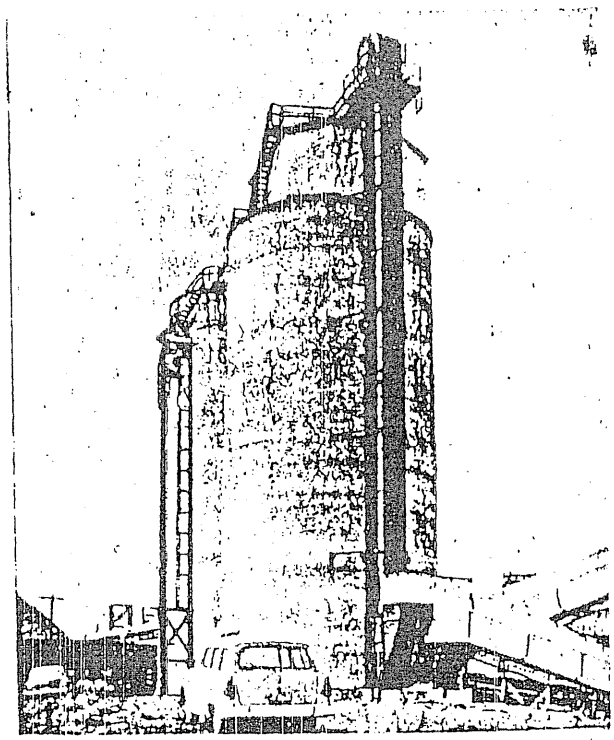
Conveying sulphur, at newsprint mill, from track hopper to storage silo and from silo to screw conveyor for delivery to weigh hopper is accomplished here by two dependable continuous bucket elevators. Photo 37636



Delivery of used shakeout sand to muller and prepared sand to overhead belt conveyor serving molder stations is efficiently accomplished by these two continuous bucket elevators in this brass foundry. Photo 38515



Tea is discharged from internal bucket elevator, through chutes to glass surge hopper and to overhead belt conveyor for distribution to other surge hoppers on same floor. Photo 35154



Wood chips are received from belt conveyor by this double leg centrifugal discharge bucket elevator and delivered to a distributing belt conveyor over silos. Photo 37962

Types

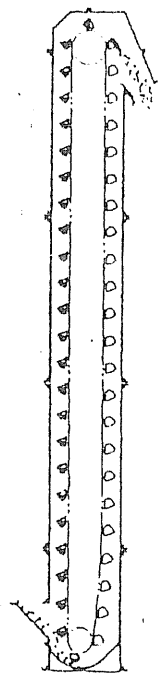


Fig. 4667
Centrifugal discharge bucket elevator

Centrifugal discharge bucket elevators

Elevators of this design predominate in the bulk handling of free-flowing, fine and loose materials with small to medium size lumps. Buckets, mounted at spaced intervals, are loaded by scooping up material from the boot or by feeding the material into them. Material is discharged by centrifugal action as the buckets pass over the head wheel. These elevators are made in several types and are suitable for many requirements.

Type 1 • Elevators of this type meet the service requirements of the majority of installations using centrifugal discharge elevators. The head shafts are fixed. The foot shaft takeups are of the screw type. Gravity takeups are available. Buckets are of malleable iron for use on chain or belt. Casings are of steel plate and angle construction.

Type 2 • These elevators are similar to Type 1 except that the head shafts are adjustable and the foot shafts are fixed to maintain the relation of buckets to the loading chute and curved bottom plate. They are preferred for handling food products, materials which tend to pack or build up in the bottom of the boot, and for materials having a considerable percentage of lumps.

Type 3 • Elevators of this type are especially suitable for light and moderate duty in the handling of nonabrasive free-flowing materials. They are furnished in a limited range of sizes and capacities. Head shafts are fixed and foot shafts have screw takeups. Malleable iron buckets are used with chain and steel buckets with belt. Casings are made of steel in the simplified flanged design.

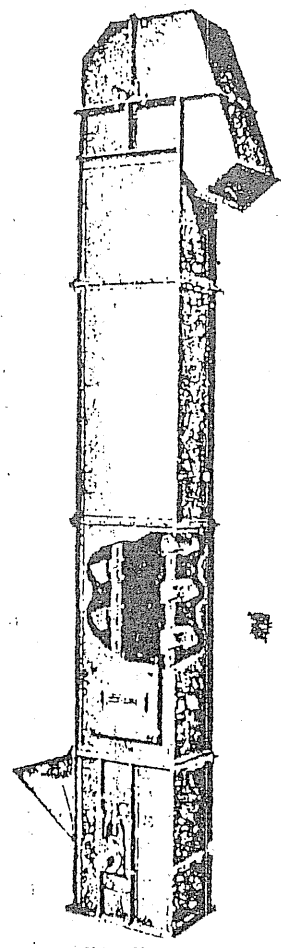


Photo 32499A
Type 1 bucket elevator

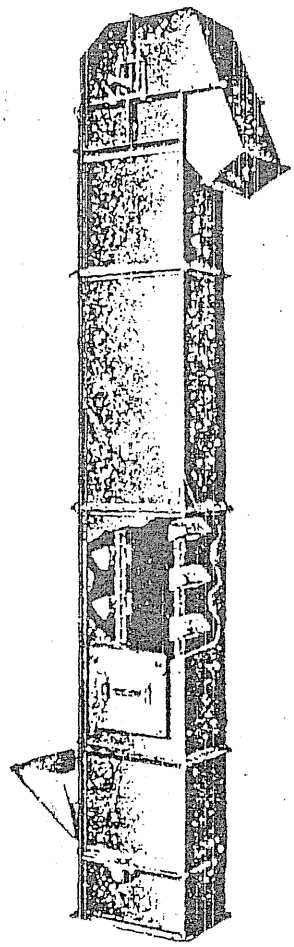


Photo 32500A
Type 2 bucket elevator

Photo 32501B
Type 3 bucket elevator

Types

Centrifugal discharge bucket elevators (continued)

Type 4 • These elevators are similar to Type 3 except that the head shafts are adjustable and the foot shafts are fixed to maintain the relation of buckets to the loading chute and bottom of boot. This type is preferred for handling food products, for materials having a tendency to pack or build up in the bottom of the boot, and for materials having a considerable percentage of lumps.

Type 5 • These elevators are designed and engineered to conform with general practice in the handling of grain. Head and foot shafts are provided with roller bearings. Takeups are of the gravity type except on elevators with centers under 50 feet which are of the screw type. Buckets are of steel and are mounted on a belt. Casings of steel are welded and dust tight. The curved hood is designed for proper discharge of the grain. The boot can be loaded from the front or back side or both. Venting of the head and boot sections is desirable to improve the pickup and discharge of materials.

Positive discharge bucket elevators

Elevators of this design operate successfully at low bucket speeds and are suitable for handling light, fluffy and fragile materials and those having a tendency to stick in the buckets. Buckets, mounted at spaced intervals, are loaded by scooping up material from the boot or by feeding the material into them. After passing over head wheels, the buckets are inverted over the discharge spout, thus providing a positive discharge of material.

Type 6 • This design conforms with the best practice for handling and discharging materials which are light, friable or sluggish. The head shafts are fixed. The foot shaft takeups are of the screw type. Gravity takeups are available. Buckets are of malleable iron mounted at intervals on double strands of chain. Casings are of steel plate and angle construction.

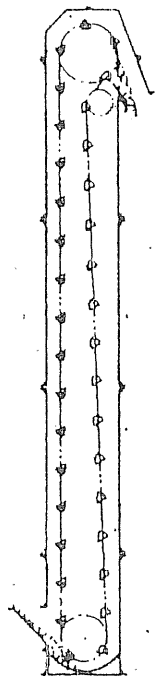


Fig. 4468
Positive discharge bucket elevator

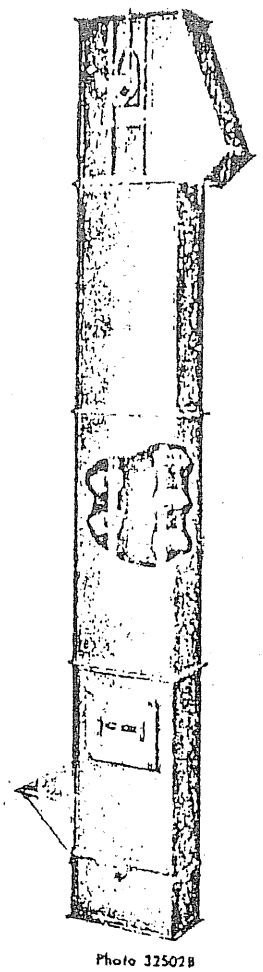


Photo 32502B
Type 4 bucket elevator

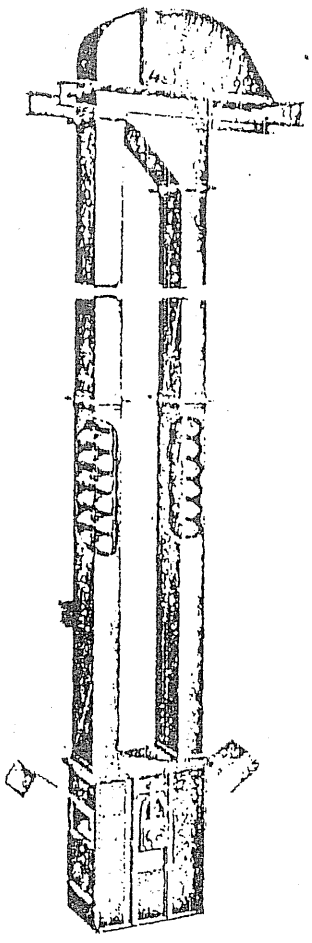


Photo 32503C

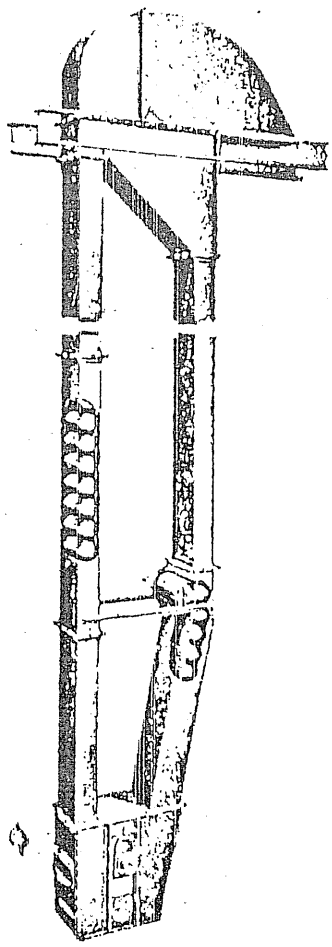


Photo 32511C
Type 5 bucket elevators

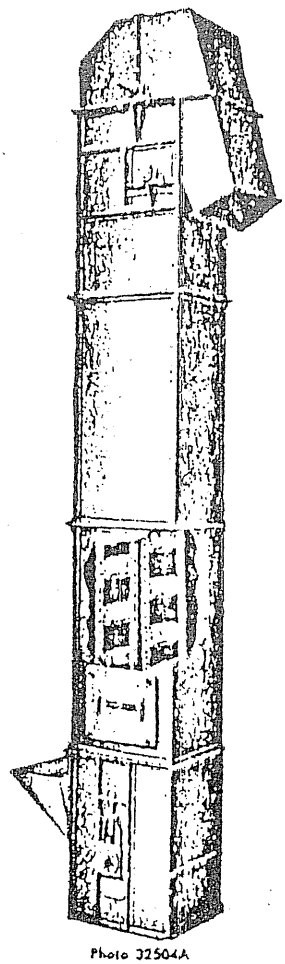


Photo 32504A
Type 6 bucket elevator

Types

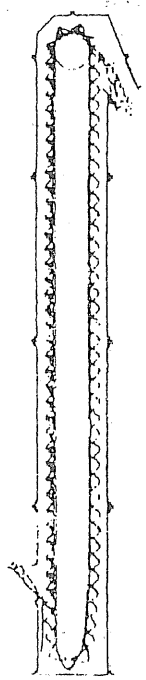


Fig. 4669
Continuous bucket elevator

Continuous bucket elevators

Elevators of this design are made in a number of types for handling many bulk materials ranging from light to heavy and from fines to large lumps. Buckets are spaced continuously and loaded by direct feeding, except for Type 8 elevator where material is scooped from the boot. Spillage between buckets is prevented by their close spacing. As buckets discharge, the material flows over the preceding bucket, whose front and projecting sides form a chute, to the discharge spout.

Type 7 · This elevator is the most frequently used of the continuous bucket design. The head shafts are fixed. The foot shaft takeups are of the screw type. Gravity takeups are available. Buckets are of steel and spaced continuously on a single strand of chain. Casings are of steel plate and angle construction. Material is fed to the buckets through a loading leg.

Type 8 · Elevators of this type are used for the handling of fine or crushed materials with lumps not exceeding ½ inch. These elevators are similar to Type 7, except that head shafts are adjustable and foot shafts are fixed, to maintain the relation of buckets to the loading chute and curved bottom plate. Buckets are loaded by scooping up material from the boot. When modified by the addition of a loading leg and a correspondingly higher inlet spout, this type elevator can also be used for handling lumpy materials.

Type 9 · Inclined elevators of this type are used for handling sand, gravel, stone and similar materials. Normally these elevators are furnished with structural steel frames, but without casings. Casings can be provided. The head shafts are fixed and foot shafts have screw takeups. Buckets are of steel and can be mounted on chain or belt.

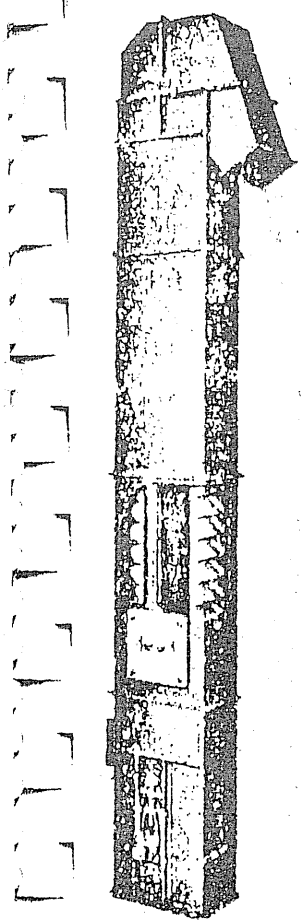


Photo 32505A
Type 7 bucket elevator

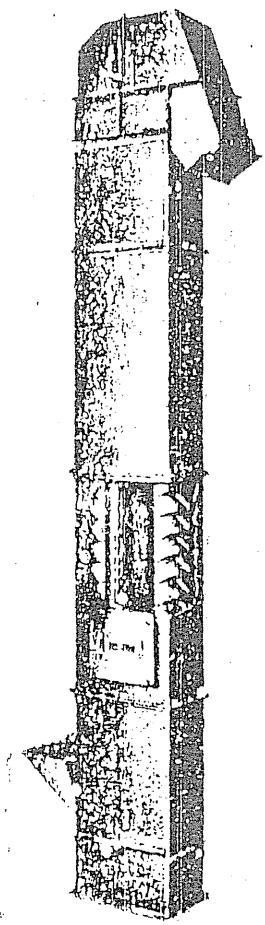


Photo 32506A
Type 8 bucket elevator

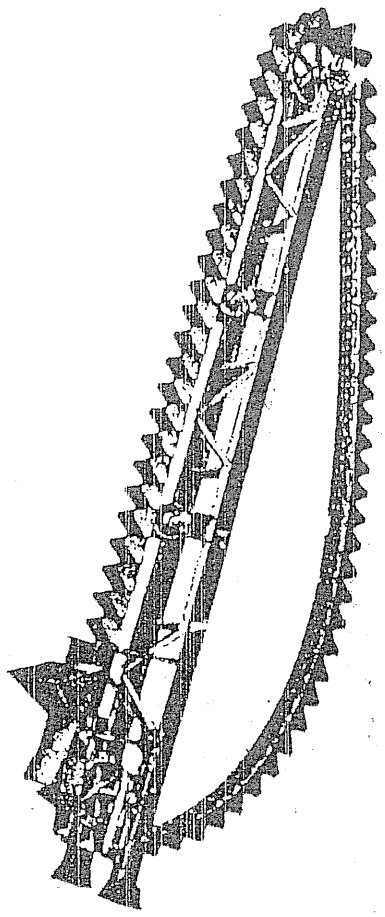


Photo 32559

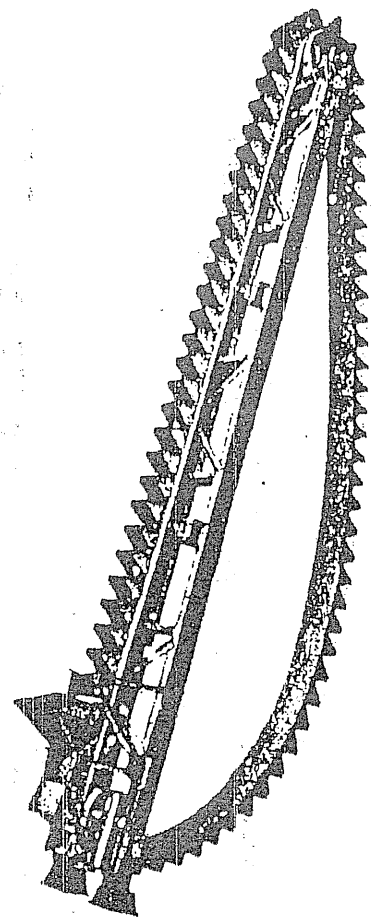


Photo 32560
Type 9 bucket elevators

Types

Continuous bucket elevators (continued)

Type 10 • This elevator is of the super-capacity type and used for handling friable, heavy or abrasive material ranging from fines to large lumps. The head shafts are fixed and the foot takeups are of the screw type. Gravity takeups are available. Continuous buckets are end-mounted between two strands of Class SS bushed roller chain. Material is fed to the buckets through a loading leg. Casings are of steel plate and angle construction. Inclined boots are recommended when handling sharp, wedge-shaped and shale-like materials.

Type 11 • These elevators are similar in design to Type 10, except for greater capacities and centers. Head terminal machinery and driving equipment are carried on independent supports. The foot takeups are of the screw type. Gravity takeups are available.

Internal discharge bucket elevators

Internal discharge elevators provide excellent means for the continuous, gentle handling in bulk of relatively small articles such as stampings, castings, plastic chips, pellets, bolts, nuts, rivets, granular chemicals, seeds, shelled nuts and similar materials. Buckets are internally loaded from a chute extending through either side of the casing. Discharge can be on either side of casing through a chute or directly to a conveyor.

Type 12 • This type of elevator operates at slow speeds and is suitable for handling free-flowing nonabrasive materials. The elevating medium consists of an endless series of overlapping inwardly-opening continuous buckets supported on double strands of steel roller chain. Movable guides in the lower section provide automatic adjustment for the chain and bucket line. Casings are of steel plate and angle construction.

Type 13 • These elevators are similar to Type 12, except that they are designed to operate at considerably higher speeds, resulting in greater capacities. Double head shafts, operating in fixed bearings provide a longer interval for bucket discharge.

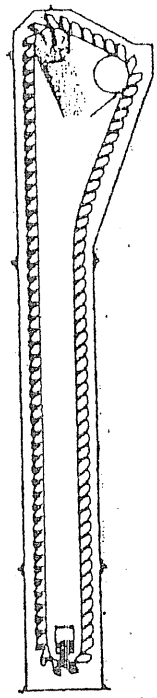


Fig. 4666
Internal discharge bucket elevator

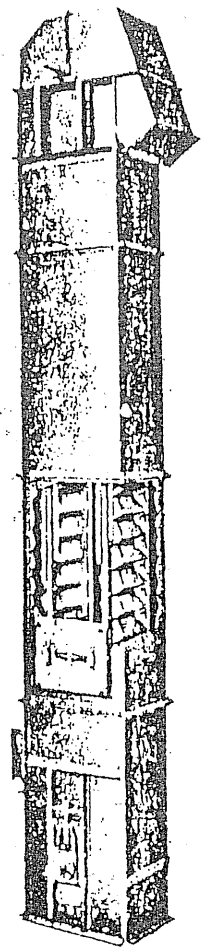


Photo 32507A
Type 10 bucket elevator

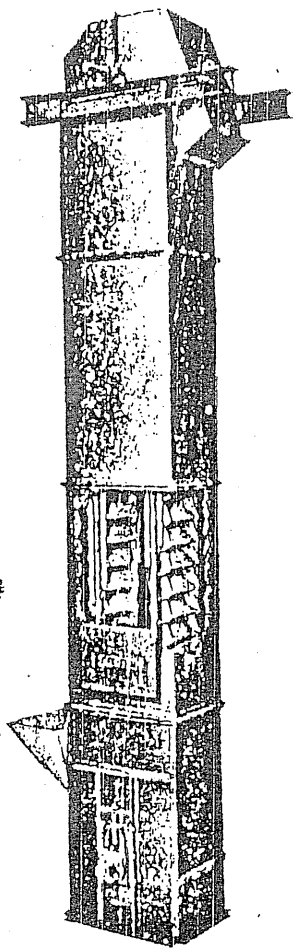


Photo 32508A
Type 11 bucket elevator

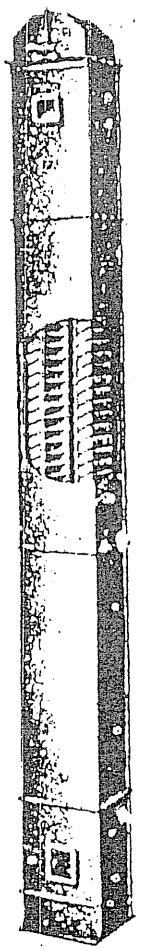


Photo 32509
Type 12 bucket elevator

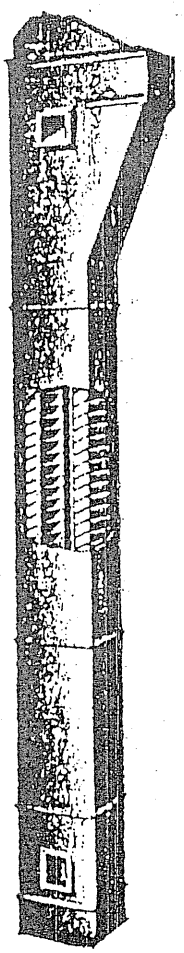


Photo 31510
Type 13 bucket elevator

Selection

Table 2 • Typical bulk materials handled by bucket elevators

Material	Average weight per cubic foot, pounds △	Elevator type ▲
Alfalfa meal	17	6, 7, 8
Almonds, broken	28-30	2, 7, 8
Almonds, whole	28-30	7
Alum, lumpy	50-60	2, 7
Alumina	60	7 ■
Aluminum chips	7-15	7
Aluminum ore (see bauxite)		
Aluminum oxide	67-120	7
Ammunition, small parts		12, 13
Ashes, coal, dry, 3 inch and under	35-40	2
Asphalt, crushed, ½ inch and under	45	1, 2, 7, 8
Bakelite, powdered	30-40	6, 7, 8
Baking powder	41	6, 7, 8
Barley	38	3 ■, 4 ■, 5 ■
Battery cases, flashlight		12, 13
Bauxite, crushed, 3 inch and under	75-85	1, 2, 7, 9, 10, 11
Beans, castor	36	1, 2, 3, 4, 7, 8
Beans, navy, dry	48	1, 2, 3, 4, 7, 8
Bentonite, crude	34-40	1, 2
Bentonite, 100 mesh and under	50-60	1, 2
Bolts, small		12, 13
Bones, crushed, ½ inch and under	35-40	1, 2, 7, 8
Bones, granulated or ground, ⅛ inch and under	50	1, 2, 7, 8
Bonemeal	55-60	1, 2
Borax, powdered	53	1, 2
Bran	16-20	1, 2, 3, 4
Brewer's grain, spent, dry	25-30	1, 2, 3, 4
Brewer's grain, spent, wet	55-60	1, 2
Buckwheat	40-42	3 ■, 4 ■, 5 ■
Calcium oxide (see lime)		
Carbon black, pelletized	20-25	7, 8
Carbon black powder, channel	4-6	6
Carbon black powder, furnace	4-6	6
Carborundum, 3 inch and under	100	7
Castings, small		12, 13
Cast iron borings	130-200	2, 7
Cement, Portland	65-85	1, 2, 7, 8
Cement, clinker	75-80	2, 7, 9, 10, 11
Chalk, crushed	85-90	1, 2, 7, 8
Chalk, pulverized, 100 mesh and under	70-75	7, 8
Charcoal	18-25	6, 7
Cinders, coal	40	2, 7
Clover seed	48	1, 2, 3, 4
Coal, anthracite, buckwheat 50 mesh to ⅛ inch	60	1, 2, 7, 8
Coal, anthracite, river coal and culm ½ inch and under	60	1, 2, 7, 8
Coal, bituminous, mined, fines, 50 mesh and under	50	7, 8
Coal, bituminous, mined, slack, ½ inch and under	50	1, 2, 7, 10, 11
Coal, bituminous, mined, sized, over ½ inch	50	7, 10, 11
Coal, bituminous, stripping, not cleaned, over ½ inch	50	1, 2, 7, 10, 11
Cocoa beans	30-40	1, 2, 7
Coffee, green bean	32	1, 2, 3, 4, 7, 8
Coffee, roasted bean	22-26	1, 2, 3, 4, 7, 8
Coke, loose	23-32	2 ■
Coke, petroleum, calcined	35-45	2 ■
Coke Breeze, ¼ inch and under	25-35	1 ■, 2 ■
Copra	22	1, 2, 3, 4, 7
Copra cake	25-30	1, 2, 3, 4, 7
Copra cake, ground	40-45	1, 2, 3, 4, 7, 8
Copra meal	40-45	1, 2, 3, 4, 7, 8
Cork, fine ground	12-15	6, 7, 8
Cork, granulated, ½ inch and under	12-15	6, 7, 8
Corn, cracked	45-50	1, 2, 3, 4
Corn, seed	45	12, 13
Corn, shelled	45	3 ■, 4 ■, 5 ■
Corn germs	21	1, 2, 3, 4
Corn grits	40-45	1, 2, 3, 4
Corn sugar	31	1, 2, 3, 4
Cornmeal	38-40	1, 2, 3, 4
Cottonseed, dry, de-linted	35	1 ■, 2 ■, 3 ■, 4 ■
Cottonseed, dry, with lint	18-25	1 ■, 2 ■, 3 ■, 4 ■
Cottonseed, cake, cracked	40-45	1, 2
Cottonseed hulls	12	7, 8
Cottonseed meal	35-40	1, 2, 3, 4
Cottonseed meats	40	1, 2, 3, 4
Cullet	80-120	2 ■
Dolomite, crushed	90-100	2, 7, 9, 10, 11
Ebonite, crushed, ½" and under	65-70	2, 6, 7, 8
Feldspar, ground, ⅛ inch and under	65-70	1, 2, 7
Feldspar, powdered, 100 mesh and under	75	6, 7, 8
Flaxseed	45	3 ■, 4 ■, 5 ■
Flaxseed cake, expeller	48-50	2
Flaxseed meal	25	1, 2, 3, 4
Flour, wheat	35-40	1 ■, 2 ■, 3 ■, 4 ■
Flue dust, boiler house, dry	35-45	7 □, 8 □
Fluorspar	82	1, 2, 7

▲ Chain recommended for all elevators, except those marked thus ■, where belts are recommended. To avoid damage to belt, provide foot shafts with welded steel slot pulleys where there is a tendency for material to pack between belt and pulley.

△ Weight of material loose or slightly agitated. This weight is generally less than that of settled or packed material, as in bins or containers.

□ Select an elevator having twice the capacity required.

Table 2 (continued) • Typical bulk materials handled by bucket elevators

Material	Average weight per cubic foot, pounds △	Elevator type ▲	Material	Average weight per cubic foot, pounds △	Elevator type ▲
Fuller's earth, burnt, oil refinery	40	1 ■, 2 ■	Pumice, ground, ½ inch and under	42-45	7
Fuller's earth, raw, oil refinery	35-40	1 ■, 2 ■	Rice, hulled or polished	45-48	3 ■, 4 ■, 5 ■, 12, 13
Glass batch	90-100	2 ■	Rice, rough	36	3 ■, 4 ■, 5 ■, 12, 13
Glue, ground, ½ inch and under	40	2	Rice bran, see Bran		
Glue, pearl	40	2	Rice grits	42-45	1, 2, 3, 4
Grains, distillery, spent, dry	30	1, 2, 3, 4	Rivets, small	....	12, 13
Granite, broken	95-100	7, 9, 10, 11	Rubber, ground, see Ebonite		
Grass seed	10-12	7, 8	Rye	44	3 ■, 4 ■, 5 ■
Gravel, screened	90-100	1, 2, 7, 9, 10, 11	Salt, dry, fine	70-80	2, 7, 8
Gypsum, calcined	55-60	1, 2, 7, 9, 10, 11	Salt, dry, coarse	45-50	2, 7, 8
Gypsum, crushed, 1 inch and under	90-100	1, 2, 7, 9, 10, 11	Salt cake, dry, coarse	85	2, 7, 8
Gypsum, powdered	60-80	1, 2, 7, 8	Salt cake, dry, pulverized	65-85	2, 7, 8
Hops, spent, dry	35	1, 2, 3, 4	Sand, damp bank	110-130	1 ■, 2 ■
Hops, spent, wet	50-55	1, 2	Sand, dry bank	90-110	1 ■, 2 ■
Ice, crushed	35-45	2, 7	Sand, dry silica ⊙	90-100	1 ■, 2 ■
Ilmenite ore	140	1, 2, 7, 9, 10, 11	Sand, foundry, prepared	90	1 ■, 2 ■
Lignite, air dried	45-55	1, 2, 7	Sand, foundry, shakeout	90	1 ■, 2 ■
Lime, ground, ½ inch and under	60	1, 2, 7, 8, 9, 10, 11	Shale, crushed	85-90	1 ■, 2 ■
Lime, hydrated	40	7, 9, 10, 11	Slag, furnace, granulated	60-65	7, 9, 10, 11
Lime, pebble	53-56	1, 2, 7, 9, 10, 11	Slate, crushed, ½ inch and under	80-90	2 ■, 7, 9, 10, 11
Lime, over ½ inch	53	7, 9, 10, 11	Slate, ground, ½ inch and under	82	1 ■, 2 ■
Limestone, agricultural, ½ inch and under	68	1, 2, 7, 9, 10, 11	Soap beads or granules	20	12, 13
Limestone, crushed	85-90	7, 9, 10, 11	Soap flakes	5-15	12, 13
Linseed, (see flaxseed)			Soda ash, light	20-35	7, 8
Linseed meal (see flaxseed meal)			Soda ash, heavy	55-65	1, 2, 7, 8
Maize	45	3 ■, 4 ■, 5 ■	Soybeans, cracked	30-40	1, 2, 3, 4
Malt, dry ground, ½ inch and under	22	1, 2, 3, 4	Soybeans, whole	45-50	3 ■, 4 ■, 5 ■
Malt, dry, whole	27-30	1, 2, 3, 4, 12, 13	Soybean cake, over ½ inch	40-43	2
Malt, wet or green	60-65	1, 2	Soybean flakes, raw	20-26	1, 2, 3, 4
Malt meal	36-40	1, 2, 3, 4	Soybean flour	27	1 ■, 2 ■, 3 ■, 4 ■
Marble, crushed, over ½ inch	90-95	7, 9, 10, 11	Soybean meal, cold	40	1, 2, 3, 4
Milk, dried flake	5-6	3, 4	Soybean meal, hot	40	1, 2, 3, 4
Milk, malted	30-35	3, 4	Stampings, metal, small	....	12, 13
Muriate of potash	77	1, 2, 7	Steel chips, crushed	100-150	7
Mustard seed	45	3, 4	Stone, crushed, see Gravel or Limestone		
Nuts, metal	....	12, 13	Sugar beet, pulp, dry	12-15	6, 7, 8
Oats	26	3 ■, 4 ■, 5 ■	Sugar beet, pulp, wet	25-45	7, 8
Oats, rolled	19	1, 2, 3, 4	Sugar, raw	55-65	1, 2
Oxalic acid crystals	60	1 ■, 2 ■	Tanbark, ground	55	1, 2
Peas, dried	45-50	12, 13	Timothy seed	36	7, 8
Peanuts, shelled	35-45	12, 13	Tung nuts, shelled	....	12, 13
Phosphate rock	75-85	2, 7, 9, 10, 11	Walnuts, shelled	....	12, 13
Phosphate sand	90-100	1 ■, 7	Wheat	45-48	3 ■, 4 ■, 5 ■
Plastics, chips	....	12, 13	Wheat, cracked	40-45	1, 2, 3, 4
Plastics, pellets	....	12, 13	Wheat germ	28	1, 2, 3, 4
Plastics, small castings	....	12, 13	Wood chips	12-20	1 ■, 2 ■

▲ Chain recommended for all elevators, except those marked thus ■, where belts are recommended. To avoid damage to belt, provide foot shafts with welded steel slat pulleys where there is a tendency for material to pack between belt and pulley.

⊙ If sand is hot, use special heat-resisting belts and insulating pads between buckets and belts.

△ Weight of material loose or slightly agitated. This weight is generally less than that of settled or packed material, as in bins or containers.

Selection

Table 3 • Tentative elevator selection

Elevator type	Maximum lump size, inches: Percentage of lumps: 100	10	Maximum capacity: Cubic feet per hour	Tons per hour — Material weight, pounds per cubic foot: 35	50	75	100	125	Bushels per hour	Maximum centers, feet □ — Material weight, pounds per cubic foot: 35	50	75	100	125	Pages
1	1¼	4	2000	35	50	75	100	...	...	80	80	80	00	...	318 thru 323
	1½	4½	3100	55	78	117	156	...	...	80	80	80	70	...	
2 ▲	1¼	4	2000	35	50	75	100	...	...	80	80	80	80	...	
	1½	4½	3100	55	78	117	156	...	...	00	80	80	70	...	
3	¾	3	700	10	17	...	...	...	545	40	40			...	324 thru 326
	1	3½	1100	16	28	...	...	...	880	50	50			...	
4 ▲	¾	3	700	10	17	...	...	...	545	40	40		...	...	
	1	3½	1100	16	28	...	...	...	880	50	50		...	...	
5 ■	⅓	⅓	8750	...	219	...	...	...	7000	...	200		...	...	327 thru 331
	⅓	⅓	11500	...	287	...	...	...	9200	...	200		...	...	
	⅓	⅓	14000	...	350	...	...	...	11200	...	200		...	...	
5 △	⅓	⅓	14750	...	369	...	...	...	11800	...	200		...	...	
	⅓	⅓	35000	...	875	...	...	...	28000	...	210		...	...	
	⅓	⅓	47500	...	1187	...	...	...	38000	...	210		...	...	
6	1¾	5	1400	24	34	52	69	...	...	80	80	80	80	...	332 thru 334
7	1	3	1300	23	32	49	65	...	...	70	70	70	70	...	335 thru 338
	1¼	4	1800	32	45	68	91	...	...	80	80	80	80	...	
	1½	4½	2350	41	58	88	117	...	...	80	80	80	70	...	
8 ▲	½	½	1300	23	32	49	65	...	...	70	70	70	70	...	
	½	½	1800	32	45	68	91	...	...	80	80	80	80	...	
	½	½	2350	41	58	88	117	...	...	80	80	80	70	...	
9	1	3	1500	...	...	...	75	95	...	..	..	80	80	...	339 thru 342
	1½	4½	2300	...	...	...	115	145	...	..	..	80	75	...	
	1½	5	2600	...	...	...	130	165	...	..	..	70	65	...	
	2	5	5000	...	....	...	250	310	.....	..	..	65	50	...	
10	2	6	2400	...	60	90	120	150	.....	..	85	70	55	45	343 thru 347
	2	6	2800	...	70	105	140	175	.....	..	75	60	50	40	
	2	6	3200	...	80	120	160	200	.....	..	75	55	45	35	
	2	6	3600	...	90	135	180	225	.....	..	65	50	40	30	
	2	6	4000	...	100	150	200	250	.....	..	60	45	35	30	
	3	8	5600	...	140	210	280	350	.....	..	75	65	55	45	
	3	8	6800	...	170	255	340	425	.....	..	60	55	45	40	
	3	8	8400	...	210	315	420	525	.....	..	55	50	40	30	
	3	8	10000	...	250	375	500	625	.....	..	50	45	35	30	
	3	8	12500	...	310	465	620	775	.....	..	40	35	25	20	
11	3	8	5600	...	140	210	280	350	.....	..	125	125	125	110	
	3	8	6800	...	170	255	340	425	.....	..	125	125	110	95	
	3	8	8400	...	210	315	420	525	.....	..	125	110	95	80	
	3	8	10000	...	250	375	500	625	.....	..	125	100	85	75	
	3	8	12400	...	310	465	620	775	.....	..	100	80	70	60	
12	¼	2½	200	3	5	...	...	...	.....	80	80	...	...	...	348 thru 350
	¾	2½	320	6	8	...	...	...	.....	60	60	...	...	...	
13	¾	2½	500	9	12	...	...	...	.....	80	80	...	...	...	
	¾	2½	800	14	14	...	...	...	.....	60	60	..	...	...	

▲ Elevators with fixed foot shafts. Recommended for feeder drives, handling food products, materials with a high percentage of lumps and materials which tend to pack. Curved bottom plates are also recommended.

■ Elevator with single row of buckets.
△ Elevator with double row of buckets.
□ For centers beyond those listed, consult Link-Belt.

Bulk material classifications

Classification of materials

A classification of materials has been established to facilitate consideration of all the factors which affect their handling by conveyors. This classification is given in Table 1. With it, any bulk material can be classified according to its characteristics. Reference is made to these classifications in the engineering or selection of material for many Link-Belt conveyors, indicating thereby the materials which can be handled, the resulting capacities, specifications, etc.

Many materials which are commonly handled in bulk are listed in Table 2 with their classifications and weights. The classifications listed are given as a guide and are correct under ordinary conditions. Consideration should be given to materials that assume different characteristics under different conditions of processing, atmosphere, age or storage. Materials not appearing in this list can be classified by comparison with similar materials or by using the classifications in Table 1.

Example

Cracked wheat is fine, Class B; free flowing, Class 2; non-abrasive, Class 6; and contains explosive dust, Class S; making its classification B26S.

Table 1 • Material class description

	Material characteristic	Class
Size	Very fine—100 mesh and under	A
	Fine—⅛-inch mesh and under	B
	Granular—½-inch and under	C
	Lumpy—containing lumps over ½ inch	D
	Irregular—being fibrous, stringy, or the like	H
Flowability	Very free flowing—angle of repose up to 30°	1
	Free flowing—angle of repose 30° to 45°	2
	Sluggish—angle of repose 45° and up	3
Abrasiveness	Nonabrasive	6
	Mildly abrasive	7
	Very abrasive	8
Other characteristics	Contaminable, affecting use or saleability	K
	Hygroscopic	L
	Highly corrosive	M
	Mildly corrosive	P
	Gives off dust or fumes harmful to life	R
	Contains explosive dust	S
	Degradable, affecting use or saleability	T
	Very light and fluffy	W
	Interlocks or mats to resist digging	X
	Aerates and becomes fluid	Y
	Packs under pressure	Z

Table 2 • Material classes and weights

Material	Average weight per cubic foot pounds △	Class ■
Adipic acid	45	A26LP
Alfalfa meal	17	B37W
Almonds, broken or whole	28-30	C27Y
Alum, fine	45-50	B26
Alum, lumpy	50-60	D26
Alumina	60	B28
Aluminate jell	45	B27
Aluminum chips	7-15	H56X
Aluminum hydrate	18	C26
Aluminum ore, see bauxite		
Aluminum oxide	67-120	A17Y
Aluminum silicate	49	B26
Ammonium chloride, crystalline	52	B26
Ammonium nitrate	45	▲
Ammonium sulphate	45-58	▲
Antimony powder		B27
Apple pomace, dry	15	C37W
Arsenate of lead, see lead arsenate		
Arsenic, pulverized	30	▲
Arsenic oxide	100-120	▲
Asbestos ore or rock	81	C28R
Asbestos shred	20-25	H37WZ
Ashes, coal, dry, ½" and under	35-40	C37
Ashes, coal, dry, 3" and under	35-40	D37
Ashes, coal, wet, ½" and under	45-50	C37PZ
Ashes, coal, wet, 3" and under	45-50	D37PZ
Asphalt, crushed, ½" and under	45	C26
Bagasse	7-10	H36WXZ
Bakelite, fine	30-40	A36
Baking powder	41	A26
Barite	180	D28
Barium carbonate	72	A37
Bark, wood, refuse	10-20	H37X
Barley	38	B16S
Baryte, see barite		
Bauxite, crushed, 3" and under	75-85	D28
Beans, castor, whole	36	C16
Beans, castor, meal		B26
Beans, navy, dry	48	C16
Beans, navy, steeped	60	C26
Bentonite, crude	34-40	D37Z
Bentonite, 100 mesh and under	50-60	A27Y
Benzine hexachloride	56	A36R
Bicarbonate of soda	41	A26
Blood, dried	35-45	D37
Bluestone, see copper sulphate		
Bones	35-50	▲
Boneblack, 100 mesh and under	20-25	A27
Bonechar, ⅛" and under	27-40	B27
Bonemeal	55-60	B27
Borate of lime		A26
Borax, fine	53	B26
Boric acid, fine	55	B26
Bran	16-20	B26SW
Bread crumbs		B26T
Brewer's grain, spent, dry	25-30	C36
Brewer's grain, spent, wet	55-60	C36P
Bronze chips	30-50	B38
Buckwheat	40-42	B16S
Calcium carbide	70-80	D27
Calcium lactate	26-29	D36TZ
Calcium oxide, see lime		
Carbon black, pelletized	20-25	B16TZ
Carbon black powder	4-6	▲
Carborundum, 3" and under	100	D28
Casein	36	B27
Cashew nuts	32-37	D37
Cast iron chips	130-200	C37
Cement, Portland	85-85	A27Y
Cement clinker	75-80	D28
Chalk, lumpy	85-90	D37Z
Chalk, 100 mesh and under	70-75	A37YZ
Charcoal	18-25	D37T
Cheese, grated	22-24	B26WZ

■ These classes represent observations under general conditions. Specific conditions may vary due to manufacturing processes and handling. Refer to Table 1 above for class description.

△ Weights of material, loose or slightly agitated. Weights are usually different when materials are settled or packed as in bins or containers.

▲ Class may vary considerably due to conditions. Consult Link-Belt for information.

Bulk material classifications

Table 2 · Material classes and weights (continued)

Material	Average weight per cubic foot pounds △	Class ■
Chocolate press cake	40-45	D27
Chrome ore	125-140	C28
Cinders, blast furnace	57	D38
Cinders, coal	40	D28
Clay, see also bentonite, diatomaceous earth, fullers earth, kaolin and marl	80	B28R
Clay, calcined	100-120	▲
Clay, fine dry	60-75	▲
Clay, lumpy, loose	48	B16S
Clover seed	60	C27P
Coal, anthracite	60	B37P
Coal, anthracite, river or culm, ½" and under	50	B36P
Coal, bituminous, mined, 50 mesh and under	50	D26P
Coal, bituminous, mined, run of mine	50	D26PT
Coal, bituminous, mined, sized	50	C36P
Coal, bituminous, mined, slack, ½" and under	50	D37P
Coal, bituminous, stripping, not cleaned	24	B27SY
Coal dust	30-40	C27T
Cocoa beans	35	C27
Cocoa nibs	30-35	A36Z
Cocoa powder	20-22	H36
Cocoanut, shredded	20	B26WY
Coffee, chaff	32	C26T
Coffee, green bean	25	B26
Coffee, ground	22-26	C18
Coffee, roasted bean	19	B26KLT
Coffee, soluble	23-32	D38TX
Coke, loose	35-45	D28X
Coke, petroleum, calcined	25-35	C38
Coke breeze, ¼" and under	28	H36N
Compost	120-150	D28
Copper ore		D26
Copper sulphate		
Copperas, see ferrous sulphate	22	D26
Copra, lumpy	25-30	D26
Copra cake, lumpy	40-45	B26
Copra cake, ground	40-45	B26
Copra meal	12-15	B36WY
Cork, fine ground	12-15	C36
Cork, granulated	45-50	C26
Corn, cracked	45	C16ST
Corn, seed	45	C16S
Corn, shelled	21	B26
Corn germs	40-45	B26
Corn grits	31	B26
Corn sugar	38-40	B26
Cornmeal	35	C26
Cottonseed, dry, de-linted	18-25	C36
Cottonseed, dry, not de-linted	40-45	D26
Cottonseed cake, lumpy	20-25	▲
Cottonseed flakes	12	B36W
Cottonseed hulls	35-40	B26
Cottonseed meal	40	B26
Cottonseed meats	40-50	D36
Cracklings, crushed, 3" and under	110	D27
Cryolite	80-120	D28
Cullet		
Detergent, see soap detergent	11-14	A28YZ
Diatomaceous earth	43	A36
Dicalcium phosphate	25-31	B27PT
Disodium phosphate	90-100	D27
Dolomite, lumpy	65-70	C26
Ebonite, crushed, ½" and under	16	▲
Egg powder	40-50	B26
Epsom salts		
Face powder, see talcum powder	65-70	B27
Feldspar, ¼" and under	75	A37
Feldspar, powdered	50-75	C27
Ferrous sulphate	35-40	B36
Fish meal	40-50	H36
Fish scrap	45	B16S
Flaxseed	48-50	D26
Flaxseed cake, expeller	75	B26
Flaxseed meal	35-40	A36K
Flour, wheat	35-45	A18Y
Flue dust, boiler house, dry	82	C37
Fluorspar		
Fly ash, dry, see flue dust	40	B28
Fuller's earth, oil filter, burned	35-40	D27
Fuller's earth, oil filter, raw	60-65	▲
Fuller's earth, oil filter, spent	30	▲
Garbage, green	32	C26T
Gelatin, granulated	37	C27PS
Gilsonite	90-100	D28
Glass frit	40	B27
Glue, ground, ½" and under	40	C16
Glue, pearl	40	B36
Gluten meal	30	H26W
Grains, distillery, spent, dry	40	C26
Graphite, flake	28	A16Y
Graphite, flour	95-100	D28
Granite, broken	15-20	C37W
Grape pomace	10-12	B26SW
Grass seed	90-100	D27
Gravel, screened	55-60	C27
Gypsum, calcined, ½" and under	60-80	A37
Gypsum, calcined, powdered	90-100	D27
Gypsum, raw, 1" and under	37	C26
Hominy	35	H36
Hops, spent, dry	50-55	H36P
Hops, spent, wet	35-45	D16
Ice, crushed	140	B28
Ilmenite ore	125-150	▲
Iron ore		
Iron sulphate, see ferrous sulphate	163	D27
Kaolin clay, 3" and under	42-56	A37
Kaolin talc, 100 mesh and under	32	A26KZ
Lactose		
Lamp black, see carbon black	72	B36R
Lead arsenate	45-55	D26
Lignite, air dried	40-45	▲
Lignite, raw	60	B36Z
Lime, ground, ¼" and under	40	B26Y
Lime, hydrated, ¼" and under	32-40	A26Y
Lime, hydrated, pulverized	53-56	D36
Lime, pebble	68	B27
Limestone, agricultural, ¼" and under	85-90	D27
Limestone, crushed	75	A37Y
Limestone dust		
Linseed, see flaxseed		
Litharge, see lead oxide	45-50	A26
Lithopone	33	C36
Magnesium chloride		
Maize, see corn	22	B26
Malt, dry ground, ½" and under	27-30	C26
Malt, dry whole	60-65	C36
Malt, wet or green	36-40	B26
Malt meal	80	
Manganese dioxide	125-140	
Manganese ore		

■ These classes represent observations under general conditions. Specific conditions may vary due to manufacturing processes and handling. Refer to Table 1, page 563, for class descriptions.

△ Weights of material, loose or slightly agitated. Weights are usually not when materials are settled or packed as in bins or containers.

▲ Class may vary considerably due to conditions. Consult Link Belt

Bulk material classifications

Table 2 • Material classes and weights (continued)

Material	Average weight per cubic foot pounds △	Class ■
Manganese sulphate	70	C28
Marble, crushed, ½" and under	90-95	D28
Marl	80	D27
Meat, ground	50-55	▲
Meal, scraps	40	H37X
Mica, ground	13-15	B27
Mica, pulverized	13-15	A27Y
Mica flakes	17-22	B17WY
Milk, dried flake	5-6	B26K
Milk, malted	30-35	A36KZ
Milk, whole, powdered	20	B36KLZ
Monosodium phosphate	50	B27
Muriate of potash	77	B28
Mustard seed	45	B16S
Naphthalene flakes	45	▲
Niacin	35	B27
Nickel-cobalt sulphate ore	70-80	▲
Oats	26	C16S
Oats, rolled	19	C26SW
Orange peel, dry	15	H36
Oxalic acid crystals	60	B36L
Oyster shells, ground under ½"	53	C27
Oyster shells, whole		D27X
Paper pulp, 10% consistency	45-50	▲
Paper pulp, 20% consistency	25-30	▲
Paper pulp, 30% consistency	10-15	▲
Peanuts, in shells	15-20	D26T
Peanuts, shelled	35-45	C26T
Peas, dried	45-50	C16ST
Phosphate rock	75-85	D27
Phosphate sand	90-100	B28
Plaster of Paris, see gypsum, calcined, powdered		
Polystyrene beads	40	B26
Potassium carbonate	51	B27
Potassium chloride, pellets	120-130	C27P
Potassium nitrate	76	C17P
Potassium sulphate	42-48	B377
Pumice, ⅛" and under	42-45	B38
Pyrites, pellets	120-130	C27
Rice, hulled or polished	45-48	B16
Rice, rough	36	B26S
Rice bran, see bran		
Rice grits	42-45	B26
Rouge powder		A38Y
Rubber, hard, ground, see ebonite		
Rubber, pelletized	50-55	D36
Rubber, reclaim	25-30	D36
Rye	44	B16S
Salicylic acid	29	B26L
Salt, common, dry course	45-50	C27PL
Salt, common, dry fine	70-80	D27PL
Salt cake, dry coarse	85	D27
Salt cake, dry pulverized	65-85	B27
Saltpeter	80	B26S
Sand, bank, damp	110-130	B38
Sand, bank, dry	90-110	B28
Sand, foundry, prepared	90	B38
Sand, foundry, shakeout	90	D28
Sand, silica, dry	90-100	B18
Sawdust	10-13	▲
Sesame seed	27	B27
Shale, crushed	85-90	C27
Shellac, powdered or granulated	31	B26K
Silica gel	45	B28
Slag, furnace, granular	60-65	C28
Slag, furnace, lumpy	160-180	D38X
Slate, crushed, ½" and under	80-90	C27
Slate, ground, ¼" and under	82	B27
Soap beads or granules		B26T
Soap chips	15-25	C26T
Soap detergents	15-50	▲
Soap flakes	5-15	B26T
Soap powder	20-25	B26
Soapstone talc, fine	40-50	A37Z
Soda ash, heavy	55-65	B27
Soda ash, light	20-35	A27W
Sodium bicarbonate, see bicarbonate of soda		
Sodium nitrate	70-80	▲
Sodium phosphate, see monosodium phosphate, disodium phosphate, trisodium phosphate		
Sodium sulphate, see saltcake		
Sorghum seed	47-52	B27
Soybeans, cracked	30-40	C27S
Soybeans, whole	45-50	G17S
Soybean cake, over ½"	40-43	D26
Soybean flakes, raw	20-26	C26W
Soybean flakes, spent	18-20	C26W
Soybean flour	27	▲
Soybean meal, cold	40	B26
Soybean meal, hot	40	B26P
Starch	25-50	▲
Steel chips, crushed	100-150	D28
Steel turnings	75-150	H38X
Stone, see gravel or limestone		
Sugar, granulated	50-55	B26KT
Sugar, powdered	50-60	▲
Sugar, raw, cane	55-65	B36Z
Sugar, wet, beet	55-65	B36Z
Sugar beet, pulp, dry	12-15	▲
Sugar beet, pulp, wet	25-45	▲
Sugar cane, knifed	15-18	H36X
Sulphur, crushed, ½" and under	50-60	C26S
Sulphur, 3" and under	80-85	D26S
Sulphur, powdered	50-60	B26SY
Taconite, pellets	116-130	D28T
Talcum powder	40-60	A27Y
Tanbark, ground	55	▲
Tankage	60-70	▲
Timothy seed	36	B26SW
Titanium sponge	60-70	H38
Tobacco leaves, dry	12-14	H36TX
Tobacco scraps	15-25	D36W
Tobacco snuff	30	B36TY
Tobacco stems	15	H36X
Traprock, crushed	105-110	D28X
Trisodium phosphate	60	B27
Triple super phosphate	50-55	D27NR
Tung nut meats, crushed	25	D26
Vermiculite, expanded	16	G37W
Vermiculite ore	80	D27
Walnut shells, crushed	35-40	B28
Wheat	45-48	C16S
Wheat, cracked	40-45	B26S
Wheat germ	28	B26
Wood bark, see bark		
Wood chips	10-30	H36WX
Wood flour	16-36	▲
Zinc concentrate residue	75-80	B28
Zinc ore, crushed	160	▲
Zinc oxide, heavy	30-35	A36Z
Zinc oxide, light	10-15	A36WZ

■ These classes represent observations under general conditions. Specific conditions may vary due to manufacturing processes and handling. Refer to Table 1, page 563, for class description.

△ Weights of material, loose or slightly agitated. Weights are usually different when materials are settled or packed as in bins or containers.

▲ Class may vary considerably due to conditions. Consult Link-Belt for information.

bucket elevators

The typical bucket elevator consists of a series of buckets mounted on chain or belt operating over head and foot wheels. Takeups provide means of compensating for variations in length of chain or belt due to temperature changes, atmospheric conditions or wear. Customary practice is to provide a casing, usually of steel, to enclose the bucket line and the head and foot terminals.

Link-Belt elevator buckets are made in a variety of shapes, weights and sizes, manufactured of steel, malleable iron, longer wearing Promal and also of alloy metals.

The selection of the proper type bucket elevator depends largely on the capacity required and the characteristics of the material to be handled. Complete selection information in Catalog 1000.

Centrifugal discharge bucket elevators

Elevators of this design are used for handling free-flowing, fine and loose bulk materials with small to medium size lumps. Buckets mounted at spaced intervals are loaded by scooping up material from the boot or by feeding the material into them. Material is discharged by centrifugal action as the buckets pass over the head wheel. These elevators are made in several designs and are suitable for many requirements.

Types 1 and 3 • These elevators are suitable for a great variety of installations. The head shafts are fixed, and the foot shafts have screw-type takeups. Buckets may operate on either chain or belt. Malleable iron buckets are standard in the Type 1; in the Type 3, steel buckets are used with belt and malleable iron with chain. Casings are made of steel plate and angle. Type 1 elevators meet general service requirements while the Type 3 are suitable for light to moderate duty in handling nonabrasive, free-flowing materials.

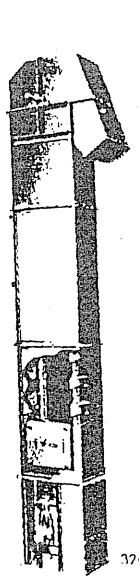
Types 2 and 4 • Elevators of these types have adjustable head shafts. The foot shafts are fixed to maintain the relation of buckets to the loading chute and the bottom of the boot. Both types are preferred for handling food products, lumpy substances, and materials that pack or build up in the bottom of the boot.

Type 5 • These elevators are designed and engineered to conform with general practice in the handling of grain. Head and foot shafts are provided with roller bearings. Takeups are of the gravity type except on elevators with centers under 50 feet, where they are of the screw type. Buckets are of steel, for use on belt. Casings of steel are welded and dust tight. The curved hood is designed for proper discharge of the grain. The boot can be loaded from the front or back side or both. Venting of the head and boot sections is desirable to improve the pickup and discharge of material.

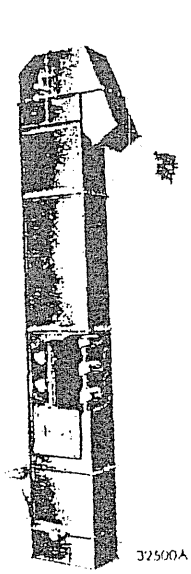
Types 14 and 15 • These elevators are built to meet the needs of industry for high capacities, such as are encountered in modern cement mill operation. Head shafts are supported on the casing by self-aligning roller bearing pillow blocks. The foot takeups are of the internal gravity type. Casings are of heavy steel plate and angle construction, sufficiently sturdy to support the load imposed by the head shaft. Buckets for the Type 14 elevator are the AC type and are available in malleable iron, Promal, and fabricated steel. Type 15 elevators have ACS buckets that are furnished in fabricated steel only. In both types the buckets are closely spaced on a single strand of steel bushed chain.

Positive discharge bucket elevators

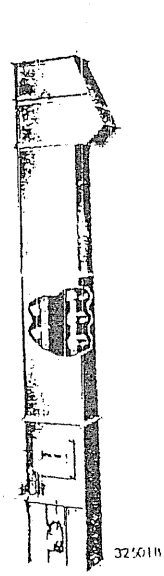
Elevators of this design operate successfully at low bucket speeds and are suitable for handling light, fluffy and fragile materials and those having a tendency to stick in the buckets. Buckets, mounted at spaced intervals, are loaded by scooping up material from the boot or by feeding the material into them. After passing over head wheels, the buckets are inverted over the discharge spout, thus providing a positive discharge of material.



Type 1



Type 2



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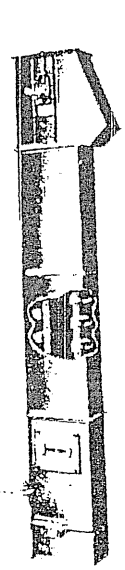

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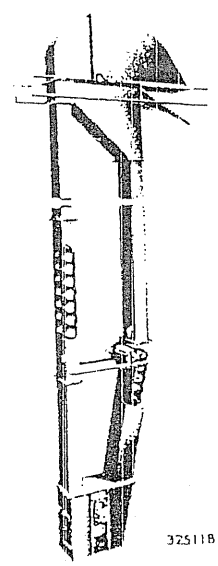

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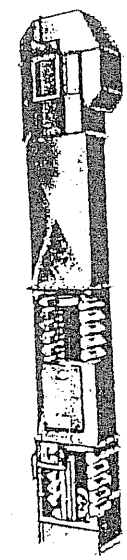
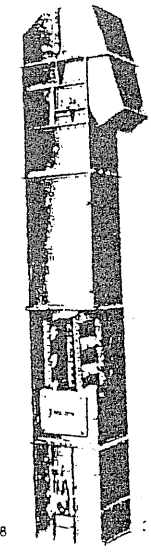


Types 14-15


Type 6

elevator buckets

Link-Belt elevator buckets are available in a variety of styles and sizes, in both formed steel and malleable iron. They are used in handling a wide range of bulk materials in centrifugal discharge and continuous bucket elevators. For increased wear-life when handling abrasive materials, malleable iron buckets can be furnished with Flint-Lip (hardened) digging lips.

Centrifugal discharge elevator buckets, in general, are used for handling most granular, free-flowing materials which can be readily scooped up and discharged easily by centrifugal action as the buckets pass over the head wheel of the elevator.

Continuous elevator buckets are used where higher capacities at lower speeds are desired or where the material handled is fragile or friable. The material is fed directly into the bucket and is discharged over the head wheel of the elevator onto the preceding bucket which acts as a chute, thus providing a clean, gentle discharge.

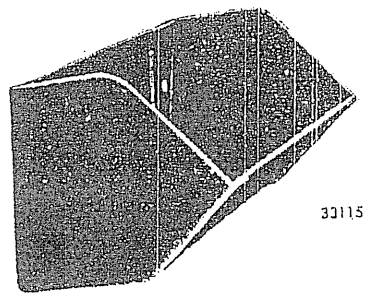
Style HS centrifugal discharge elevator buckets

Style HS centrifugal discharge elevator buckets are made of steel for mounting on belts and are designed to operate at moderate and high speeds. The low front lip and contour of the body are proportioned for maximum pick-up and the high bucket ends minimize spillage. The smooth interior permits quick, clean discharge.

The buckets are of formed and welded steel construction. The ends extend over the front and back plates for additional strength and rigidity. These extended ends fit into crimps in the back of the bucket to provide a reinforced and flat surface for belt contact. The tapered ends give the bucket body added strength and, at high speeds, decrease pick-up drag.

These buckets can also be furnished made of brass, copper, aluminum, Monel metal or galvanized steel.

Vented buckets, with air relief holes located in the bucket ends for handling flour and similar materials, can also be furnished.



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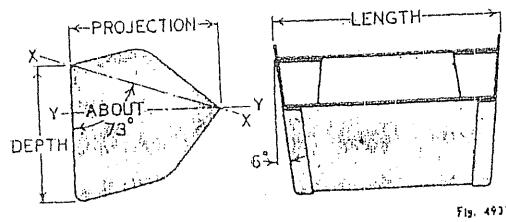


Fig. 4931

Nominal bucket size, inches ★	Actual bucket size, inches: Length	Projection	Depth	Weight, pounds	Gauge of steel	Capacity, cubic feet▲: Filled to line X-X	Filled to line Y-Y
3x3	3 3/32	3 3/16	3	.56	18	.0080	.0057
4x3	4 3/32	3 3/16	3	.66	18	.0111	.0080
5x3	5 3/32	3 3/16	3	.76	18	.0142	.0103
5x4	5 1/8	4 5/16	4	1.35	16	.0260	.0188
6x4	6 1/8	4 5/16	4	1.50	16	.0319	.0231
7x4	7 1/8	4 5/16	4	1.65	16	.0378	.0275
8x4	8 1/8	4 5/16	4	1.80	16	.0437	.0318
9x4	9 1/8	4 5/16	4	1.95	16	.0495	.0362
10x4	10 1/8	4 5/16	4	2.10	16	.0554	.0405
6x5	6 1/8	5 7/16	5	1.90	16	.0488	.0347
7x5	7 1/8	5 7/16	5	2.08	16	.0580	.0415
8x5	8 1/8	5 7/16	5	2.26	16	.0671	.0482
9x5	9 1/8	5 7/16	5	2.44	16	.0763	.0548
10x5	10 1/8	5 7/16	5	2.67	16	.0854	.0615
11x5	11 1/8	5 7/16	5	2.80	16	.0946	.0682
12x5	12 1/8	5 7/16	5	2.98	16	.1037	.0749
14x5	14 1/8	5 7/16	5	3.34	16	.1221	.0883
16x5	16 1/8	5 7/16	5	3.70	16	.1404	.1017

Have dimensions certified for installation purposes.

★ Boldface type indicates steel buckets normally carried in stock, both unpunched and punched for belt.

Nominal bucket size, inches ★	Actual bucket size, inches: Length	Projection	Depth	Weight, pounds	Gauge of steel	Capacity, cubic feet▲: Filled to line X-X	Filled to line Y-Y
8x6	8 1/8	6 9/16	5 13/16	3.10	16	.0974	.0705
9x6	9 1/8	6 9/16	5 13/16	3.30	16	.1110	.0804
10x6	10 1/8	6 9/16	5 13/16	3.50	16	.1244	.0904
11x6	11 1/8	6 9/16	5 13/16	3.70	16	.1379	.1004
12x6	12 1/8	6 9/16	5 13/16	3.90	16	.1514	.1103
14x6	14 1/8	6 9/16	5 13/16	4.30	16	.1783	.1303
15x6	15 1/8	6 9/16	5 13/16	4.50	16	.1919	.1402
16x6⊙	16 1/8	6 9/16	5 13/16	5.20	16	.2055	.1505
18x6⊙	18 1/8	6 9/16	5 13/16	5.60	16	.2323	.1702
20x6⊙	20 1/8	6 9/16	5 13/16	6.00	16	.2593	.1901
10x7	10 5/32	7 11/16	7	5.50	14	.1725	.1257
11x7	11 5/32	7 11/16	7	5.80	14	.1915	.1398
12x7	12 5/32	7 11/16	7	6.10	14	.2058	.1540
14x7	14 5/32	7 11/16	7	6.70	14	.2486	.1823
15x7	15 5/32	7 11/16	7	7.00	14	.2676	.1964
16x7⊙	16 5/32	7 11/16	7	7.80	14	.2866	.2105
18x7⊙	18 5/32	7 11/16	7	8.40	14	.3247	.2388
20x7⊙	20 5/32	7 11/16	7	9.00	14	.3627	.2671
22x7⊙	22 5/32	7 11/16	7	9.60	14	.4007	.2953
24x7⊙	24 5/32	7 11/16	7	10.20	14	.4387	.3237

▲ Actual capacity depends on angle of repose of material handled and inclination of elevator. To obtain capacity in cubic inches multiply by 1728.

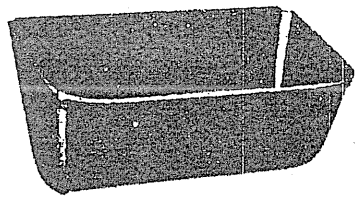
⊙ Furnished with steel center brace.

Salem centrifugal discharge elevator buckets

Salem centrifugal discharge elevator buckets are made of steel for mounting on belts. The contour of the body is proportioned for maximum pick-up. The smooth interior insures a free, clean discharge.

The buckets are of formed and welded steel construction. The ends are folded around the back for rigidity and to provide reinforcement for attachment to belt. Buckets made in the regular and medium gauges have reinforced lips as an integral part of the body.

These buckets can also be furnished made of brass, copper, aluminum, Monel metal, stainless steel or galvanized steel.



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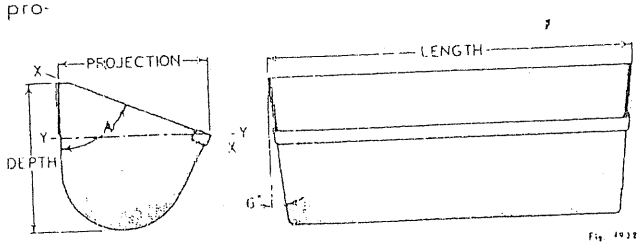


Fig. 1932

Nominal bucket, size inches	Actual bucket size, inches: Length	Projection	Depth	A, degrees	Regular gauge: Gauge of steel *	Regular gauge: Weight, pounds	Medium gauge: Gauge of steel *	Medium gauge: Weight, pounds	Heavy gauge ○: Gauge of steel *	Heavy gauge ○: Weight, pounds	Extra Heavy gauge ○: Gauge of steel *	Extra Heavy gauge ○: Weight, pounds	Capacity, cubic feet ▲: Filled to line X-X	Capacity, cubic feet ▲: Filled to line Y-Y
2 ½x2 ½	2 ½	2 5/16	2 3/8	70	20	.24							.0040	.0028
3x2 ½	3	2 5/16	2 3/8	70	20	.28							.0049	.0035
3x3	3	2 ¾	2 7/8	67	20	.33							.0070	.0047
3 ½x2 ½	3 ½	2 5/16	2 3/8	70	20	.32							.0058	.0041
3 ½x3	3 ½	2 ¾	2 7/8	67	20	.37							.0083	.0057
4x3	4	2 ¾	2 7/8	67	20	.41							.0097	.0067
4x3 ½	4	3 ¼	3 3/8	68	20	.50							.0134	.0094
4 ½x3	4 ½	2 ¾	2 7/8	67	20	.45							.0111	.0076
4 ½x3 ½	4 ½	3 ¼	3 3/8	68	20	.55							.0154	.0108
5x3 ½	5	3 ¼	3 3/8	68	20	.60			14	1.2			.0173	.0122
5x4	5	3 ¾	3 7/8	64	18	.82			14	1.3			.0219	.0140
5 ½x4	5 ½	3 ¾	3 7/8	64	18	.90			14	1.4			.0244	.0157
6x4	6	3 ¾	3 7/8	64	18	.98			14	1.8			.0269	.0173
7x4 ½	7	4 1/8	4 3/8	66	18	1.4	16	1.4	14	2.4	12	3.1	.0407	.0282
8x5	8	4 ½	5 1/8	62	18	1.6	16	1.8	14	2.7	12	3.4	.0570	.0343
9x5	9	4 ½	5 1/8	62	18	1.8	16	2.0			12	4.5	.0648	.0391
9x6	9	5 3/8	6	62	18	2.2	16	2.8					.0915	.0576
10x5	10	4 ½	5 1/8	62	18	2.0	16	2.4	14	3.0	12	3.7	.0727	.0440
10x5 ½	10	5 1/8	5 3/8	66	18	2.4	16	2.8	14	3.3	12	4.2	.0946	.0651
10x6	10	5 3/8	6	62	18	2.4	16	3.0	14	3.4	12	4.8	.1027	.0648
10x7	10	6 3/8	6 3/4	69	16	3.6							.1455	.1098
11x6	11	5 3/8	6	62	18	2.6	16	3.2	14	3.6	12	5.1	.1140	.0721
11x7	11	6 3/8	6 3/4	69	16	3.9					12	6.4	.1615	.1220
12x6	12	5 3/8	6	62	18	3.0	16	3.4	14	3.8	12	5.4	.1252	.0793
12x7	12	6 3/8	6 3/4	69	16	4.2			14	4.8	12	6.7	.1775	.1343
12x8	12	7 ¼	7 ½	67	16	5.1			14	5.4	12	6.3	.2217	.1537
13x6	13	5 3/8	6	62	16	3.4					12	5.7	.1364	.0865
13x7	13	6 3/8	6 3/4	69	16	4.5					12	7.0	.1935	.1465
14x6	14	5 3/8	6	62	16	3.7					12	6.1	.1476	.0937
14x7	14	6 3/8	6 3/4	69	16	4.8			14	5.7	12	7.3	.2095	.1588
14x8	14	7 ¼	7 ½	67	16	5.7			14	6.0	12	7.4	.2621	.1822
15x6	15	5 3/8	6	62	16	4.0							.1588	.1010
15x7	15	6 3/8	6 3/4	69	16	5.1							.2255	.1711
16x6	16	5 3/8	6	62	16	4.4					12	7.8	.1700	.1082
16x7	16	6 3/8	6 3/4	69	16	5.4			14	7.0	12	8.5	.2414	.1833
16x8	16	7 ¼	7 ½	67	16	6.4							.3024	.2107
18x6	18	5 3/8	6	62	16	5.1							.1924	.1226
18x7	18	6 3/8	6 3/4	69	16	6.0			14	8.0	12	9.6	.2734	.2078
18x8	18	7 ¼	7 ½	67	16	7.0							.3428	.2392
20x7	20	6 3/8	6 3/4	69	16	6.6					12	9.0	.3054	.2323
20x8	20	7 ¼	7 ½	67	16	7.7			14	9.0	12	10.7	.3830	.2677
22x8	22	7 ¼	7 ½	67	16	8.4			14	10.0	12	11.8	.4234	.2962
24x8	24	7 ¼	7 ½	67	16	9.0			14	11.0	12	13.0	.4638	.3247

Have dimensions certified for installation purposes.

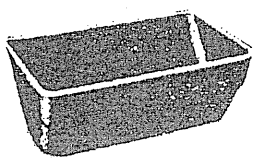
★ Boldface type indicates unpunched steel buckets normally carried in stock.

○ Furnished without reinforced lip

▲ Actual capacity depends on angle of repose of material handled and inclination of elevator

tyle AA centrifugal discharge elevator buckets

le AA centrifugal discharge elevator buckets are made of malleable iron mounting on chains or belts. Except for the three sizes indicated, they ve a thick, wide reinforced lip along the front edge and around the front ners for resistance to distortion when scooping up heavy or gritty ma- ials. For increased wear life when handling abrasive materials, buckets be furnished with hardened lips.



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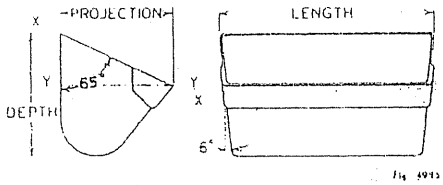
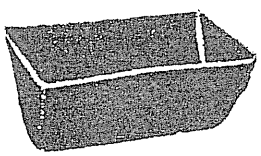


Fig. 4945

Bucket size, inches ★			Weight, pounds	Capacity, cubic feet▲	
Length	Projection	Depth		Filled to line X-X	Filled to line Y-Y
4	2 ¾	3 ○	1.0	.01	.006
5	3 ½	3 ¾ ○	1.5	.02	.012
6	4	4 ¼	2.7	.03	.018
7	4 ½	5 ○	3.1	.05	.030
8	5	5 ½	4.8	.07	.042
10	6	6 ¼	7.7	.12	.072
12	6	6 ¼	9.4	.14	.084
12	7	7 ¼	12.0	.19	.114
14	7	7 ¼	13.9	.23	.138
14	8	8 ½	18.5	.30	.180
16	7	7 ¼	15.9	.27	.162
16	8	8 ½	21.8	.34	.204
18	8	8 ½	23.5	.39	.234
18	10	10 ½	34.4	.61	.366
20	8	8 ½	25.7	.43	.258
24	8	8 ½	30.5	.51	.306

tyle AA-RB centrifugal discharge elevator buckets

le AA-RB centrifugal discharge elevator buckets are made of malleable n and are identical with Style AA buckets, except that the back edges e thicker to provide even greater resistance to distortion. The wide ging lip and the vertical reinforcing ribs on the front, enable these kets to withstand extra heavy service. For increased wear life when ndling abrasive materials, buckets can be furnished with hardened lips.



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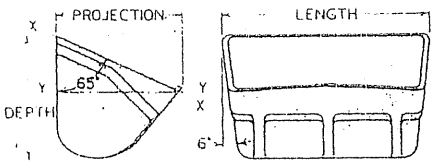
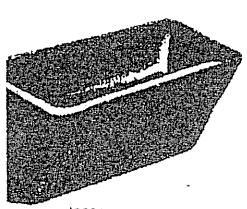


Fig. 4946

Bucket size, inches ★			Weight, pounds	Capacity, cubic feet▲	
Length	Projection	Depth		Filled to line X-X	Filled to line Y-Y
8	5	5 ½	5.3	.07	.042
10	6	6 ¼	8.5	.12	.072
12	6	6 ¼	10.4	.14	.084
12	7	7 ¼	13.8	.19	.114
14	7	7 ¼	16.0	.23	.138
14	8	8 ½	22.0	.30	.180
16	7	7 ¼	18.1	.27	.162
16	8	8 ½	25.4	.34	.204
18	8	8 ½	29.5	.39	.230

tyle AC centrifugal discharge elevator buckets

le AC centrifugal discharge elevator buckets are made of mal- ble iron for mounting on chain. They have a thick, wide reinforced along the front edge and around the front corners to increase istance to distortion. The high front of these buckets increases pacity, and the hooded backs permit closer bucket spacing. Air- ssure relief holes in the bottom of the buckets assure faster load- and unloading of free flowing materials, such as cement. For in- ased wear life when handling abrasive materials, buckets can be nished with hardened lips.



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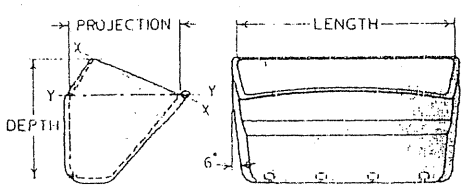


Fig. 6854

Bucket size, inches ★			Weight, pounds	Capacity, cubic feet▲	
Length	Projection	Depth		Filled to line X-X	Filled to line Y-Y
12	8	8 ½	28	.28	.21
16	8	8 ½	34	.38	.28
18	10	10 ½	52	.62	.49
24	10	10 ½	72	.85	.68
27	12	12 7/16 △	80	1.44	1.02

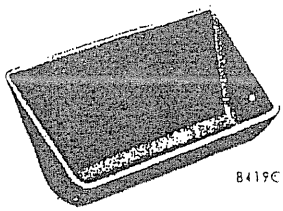
Above dimensions certified for installation purposes.
Boldface type indicates unpunched malleable iron buckets normally carried n stock. Buckets made of Promal, bronze, aluminum, malleable iron with hardened lip, or malleable iron with galvanized or granilized protective coating can be furnished.

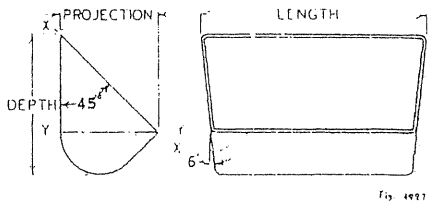
▲ Actual capacity depends on angle of repose of material handled and inclination of elevator.
△ Available in fabricated steel only.
○ These buckets, formerly known as Style A, do not have reinforced lips.

Style B centrifugal discharge elevator buckets

Style B centrifugal discharge elevator buckets are made of malleable iron for mounting on chains or belts. They are used on inclined bucket elevators for handling coarse materials. Their low front design insures a clean discharge at relatively low speeds.

The buckets are smooth, seamless and uniformly cast with reinforced corners for strength and durability. Being cast, they resist abrasive wear, corrosion and rust.



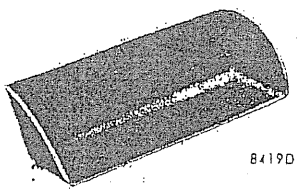


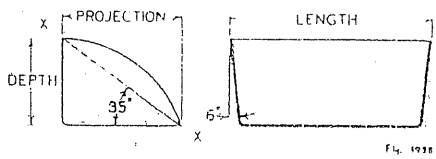
Bucket size, inches ■			Weight, pounds	Capacity, cubic feet ▲	
Length	Projection	Depth		Filled to line X-X	Filled to line Y-Y
7	3 ½	5	2.2	.03	.005
8	3 ½	5	2.3	.04	.011
10	4	5 ½	4.0	.06	.014
12	5 ½	7 ½	6.5	.14	.035
16	6 ½	9	13.5	.24	.044

Style C centrifugal discharge elevator buckets

Style C centrifugal discharge elevator buckets are made of malleable iron for mounting on chains or belts. They are designed to handle finely pulverized or wet materials that would stick or pack in buckets of other styles.

The buckets are smooth, seamless and uniformly cast with reinforced corners for strength and durability. Being cast, they resist abrasive wear, corrosion and rust.



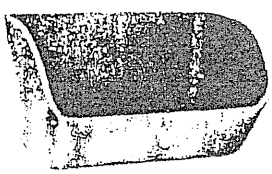


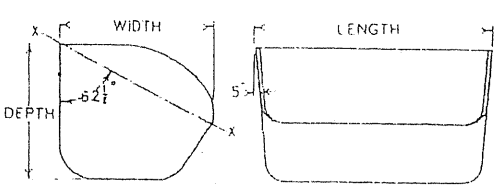
Bucket size, inches ■			Weight, pounds	Capacity cubic feet, filled to line X-X ▲
Length	Projection	Depth		
6	4 ½	4	2.0	.026
8	4 ½	4	2.8	.035
10	5	4	4.0	.052
12	5	4	4.8	.061
14	7	5 ½	8.5	.138
16	7	5 ½	10.5	.158

Style SC centrifugal discharge elevator buckets

Style SC centrifugal discharge elevator buckets are made of malleable iron for mounting on chains or belts. They are suitable for handling dry or relatively wet materials at greater capacity than possible with Style AA or Style C buckets.

The buckets are smooth, seamless and uniformly cast. Being cast, they resist abrasive wear, corrosion and rust.





Bucket size, inches ★			Weight, pounds	Capacity cubic feet, filled to line X-X ▲
Length	Projection	Depth		
8	6	5	5.6	.086
10	8	7	11.8	.180
12	8	7	14.2	.230
14	8	7	16.4	.269
16	8	7	18.9	.300

Have dimensions certified for installation purposes.

★ Boldface type indicates unpunched malleable iron buckets normally carried in stock. Buckets made of Promal, bronze, aluminum, malleable iron with hardened lips, or malleable iron with galvanized or granitized protective coating can be furnished.

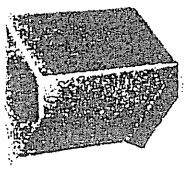
■ Unpunched malleable iron buckets normally furnished. Buckets made of Promal, bronze, aluminum, malleable iron with hardened lips, or malleable iron with galvanized or granitized protective coating can be furnished.

▲ Actual capacity depends on angle of repose of material handled and inclination of elevator.

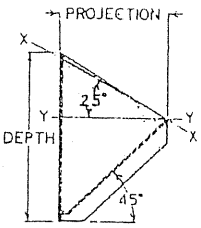
ityle HF continuous elevator buckets

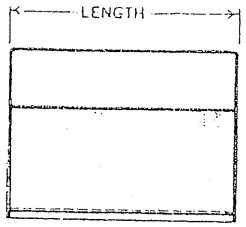
yle HF continuous elevator buckets are made of welded steel for ounting on chains or belts. They have high fronts and are propor-oned for high capacity. The smooth interior allows the material to e easily and quickly discharged.

The buckets are of formed and welded steel construction. The ont plates are either intermittent or continuous welded to the back nd side plates, depending on the fineness of the material being ndled.



31521A



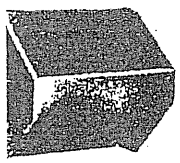


Bucket size, inches ■			Weight, pounds				Capacity, cubic feet ▲	
Length	Projection	Depth	12 gauge steel	10 gauge steel	3/16" steel	1/4" steel	Filled to line XX	Filled to line YY
8	5	7 3/4	4.9	6.2	8.5	....	.080	.052
10	5	7 3/4	5.7	7.3	10.0	....	.100	.065
10	6	9 1/4	7.2	9.1	12.6	....	.145	.098
10	7	11 3/8	9.1	11.6	16.0	20.9	.190	.130
12	6	9 1/4	8.3	10.4	14.4	....	.175	.115
12	7	11 3/8	10.3	13.2	18.2	23.9	.240	.155
12	8	11 3/8	11.3	14.3	20.0	26.0	.295	.205
14	7	11 3/8	11.5	14.8	20.4	26.7	.280	.184
14	8	11 3/8	12.6	16.0	22.4	28.1	.350	.240
16	8	11 3/8	13.9	17.7	24.7	32.2	.395	.275
16	12	17 3/8	....	30.3	41.9	55.0	.900	.635
18	10	15	....	26.2	36.1	47.7	.720	.485
20	12	17 3/8	....	35.1	49.1	64.6	1.150	.800
24	12	17 3/8	....	40.5	56.3	74.3	1.335	.960

ityle HFO continuous elevator buckets

tyle HFO continuous elevator buckets are made of welded steel or mounting on chains or belts. They have the same high front as tyle HF buckets, but in addition, are overlapping to prevent leakage etween the buckets. Bevel washers are recommended to avoid nterference of adjacent buckets. The smooth interior allows the naterial to be easily and quickly discharged.

The buckets are of formed and welded steel construction. The ont plates are either intermittent or continuous welded to the back nd side plates, depending on the fineness of the material being andled.



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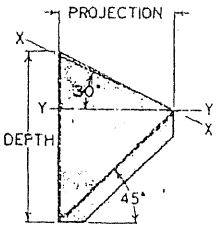
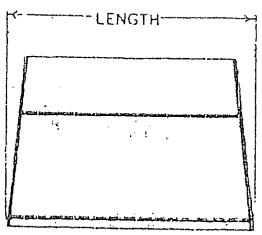


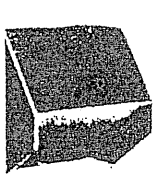


Bucket size, inches ■			Weight, pounds				Capacity, cubic feet ▲	
Length	Projection	Depth	12 gauge steel	10 gauge steel	3/16" steel	1/4" steel	Filled to line XX	Filled to line YY
8	5	8 1/2	5.1	6.5	8.9	....	.089	.059
10	5	8 1/2	5.9	7.6	10.5	....	.112	.077
10	6	10	7.5	9.5	13.1	....	.162	.108
10	7	12 1/2	9.6	12.3	16.7	....	.227	.150
12	6	10	8.6	10.8	15.0	....	.193	.126
12	7	12 1/2	10.8	14.0	19.0	....	.275	.182
12	8	12 1/2	11.8	15.0	20.5	27.1	.320	.200
14	7	12 1/2	12.1	15.7	21.3	....	.333	.224
14	8	12 1/2	13.1	16.8	22.9	30.4	.386	.246
16	8	12 1/2	14.5	18.6	25.2	33.6	.425	.265
16	12	18 3/8	....	31.1	43.0	56.8	.962	.605
20	12	18 3/8	....	36.4	50.4	66.6	1.203	.755
24	12	18 3/8	....	41.7	57.8	76.4	1.444	.905

ityle MF continuous elevator buckets

yle MF continuous elevator buckets are made of welded steel for ounting on chains or belts. They have medium fronts and are gularly used on continuous bucket elevators for handling a large ariety of materials. The smooth interior allows the material to make quick, clean discharge.

The buckets are of formed and welded steel construction. The ont plates are either intermittent or continuous welded to the back d side plates, depending on the fineness of the material being ndled.



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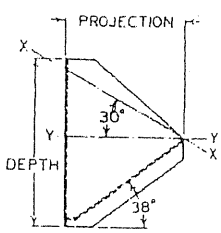
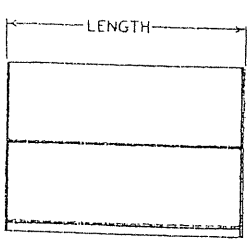




Bucket size, inches ■			Weight, pounds				Capacity, cubic feet ▲	
Length	Projection	Depth	12 gauge steel	10 gauge steel	3/16" steel	1/4" steel	Filled to line XX	Filled to line YY
8	5	7 3/4	5.1	6.3	8.7	....	.070	.040
9	6	9 1/4	6.7	8.6	11.9	....	.118	.068
10	5	7 3/4	5.9	7.4	10.2	....	.090	.050
10	6	9 1/4	7.2	9.2	12.7	....	.130	.075
10	7	11 3/8	9.3	11.9	16.5	....	.180	.103
10	8	11 3/8	9.9	12.8	17.8	23.2	.235	.135
11	6	9 1/4	7.7	9.9	13.6	....	.145	.081
12	6	9 1/4	8.1	10.5	14.5	....	.155	.091
12	7	11 3/8	10.4	13.4	18.6	....	.218	.125
12	8	11 3/8	11.2	14.4	20.0	26.1	.275	.163
14	7	11 3/8	11.6	14.9	20.7	....	.253	.145
14	8	11 3/8	12.4	16.0	22.2	29.1	.325	.190
16	8	11 3/8	13.7	17.6	24.5	32.0	.375	.220
16	12	17 3/8	....	29.9	40.6	54.8	.852	.490
18	8	11 3/8	14.9	19.2	26.7	35.0	.420	.250
18	10	15	....	25.9	36.1	47.3	.662	.379
20	8	11 3/8	16.1	20.8	29.0	38.0	.470	.270
20	12	17 3/8	....	34.8	48.5	63.9	1.075	.620
24	10	11 3/8	....	27.4	38.2	50.0	.850	.512
24	12	17 3/8	....	39.8	55.4	73.1	1.295	.745

Have dimensions certified for installation purposes.

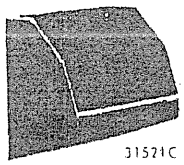
■ Unpunched steel buckets with intermittent welded joints normally furnished. Buckets with continuous welded joints can also be furnished.

▲ Actual capacity depends on angle of repose of material handled and inclination of elevator.

Style LF continuous elevator buckets

Style LF continuous elevator buckets are made of welded steel for mounting on chains or belts. They have low fronts and are designed for inclined bucket elevators or to handle finely pulverized or wet materials that would stick or pack in buckets of other styles.

The buckets are of formed and welded steel construction. The front plates are either intermittent or continuous welded to the back and side plates, depending on the fineness of the material being handled.


31521C

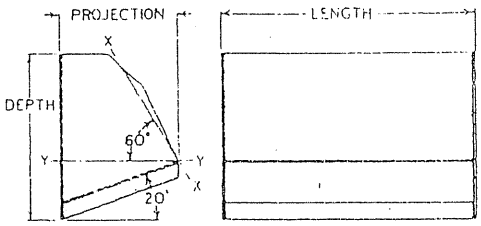


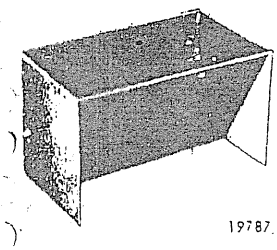
Fig. 8363

Bucket size, inches ■			Weight, pounds				Capacity, cubic feet▲	
Length	Projection	Depth	12 gauge steel	10 gauge steel	3/16" steel	1/4" steel	Filled to line XX	Filled to line YY
10	6	9 1/4	6.8	8.8	12.1		.168	.035
10	7	11 1/8	8.5	10.8	15.1		.242	.050
12	6	9 1/4	7.8	10.0	13.8		.201	.042
12	7	11 1/8	9.6	12.3	17.1		.302	.060
12	8	11 1/8	11.2	14.4	20.1		.347	.075
14	7	11 1/8	10.7	13.7	19.1		.345	.070
16	8	11 1/8	13.6	17.4	24.3		.463	.101
16	12	17 1/8		29.3	40.7	53.6	1.093	.229
18	10	15		25.4	35.0	46.5	.940	.183
20	8	11 1/8	15.9	20.5	28.5		.573	.126
20	12	17 1/8		33.9	47.1	62.0	1.365	.287
24	12	17 1/8		38.5	53.5	70.5	1.643	.346

Super-capacity continuous elevator buckets

Super-capacity continuous elevator buckets are made of welded steel for mounting between two strands of chain. They are normally used on continuous bucket elevators of the super-capacity type. The smooth interior allows the materials to make a quick, clean discharge.

The buckets are of formed and welded steel construction. The front and bottom plates are either intermittent or continuous welded to the back and side plates, depending on the fineness of the material being handled.


19787

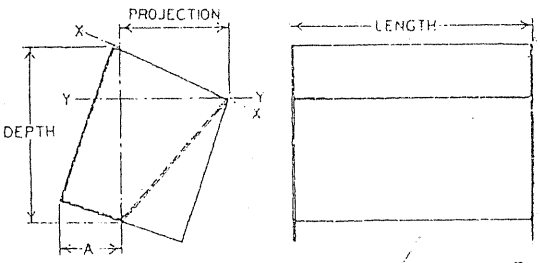


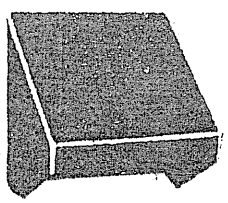
Fig. 8934

Bucket size, inches ■			A, inches	Weight, pounds				Capacity, cubic feet▲	
Length	Projection	Depth		10 gauge steel	3/16" steel	1/4" steel	5/16" steel	Filled to line XX	Filled to line YY
12	8 3/4	11 1/8	4 5/16	22	29	39	49	.54	.35
14	8 3/4	11 1/8	4 5/16	23	31	41	51	.63	.41
16	8 3/4	11 1/8	4 5/16	25	34	45	56	.72	.46
16	12	17 1/8	6 1/2	43	58	76	95	1.55	1.11
18	8 3/4	11 1/8	4 5/16	27	36	48	60	.81	.52
20	8 3/4	11 1/8	4 5/16	29	39	52	65	.90	.58
20	12	17 1/8	6 1/2	49	67	88	110	1.94	1.40
24	12	17 1/8	6 1/2	55	75	104	130	2.33	1.68
30	12	17 1/8	6 1/2	65	88	117	146	2.91	2.11
36	12	17 1/8	6 1/2	73	99	132	165	3.49	2.53

Style D continuous elevator buckets

Style D continuous elevator buckets are made of malleable iron for mounting on chains or belts. They are proportioned for easy filling and quick, clean discharge.

The buckets are smooth, seamless and uniformly cast with reinforced corners for strength and durability. Being cast, they resist abrasive wear, corrosion and rust.


7713A

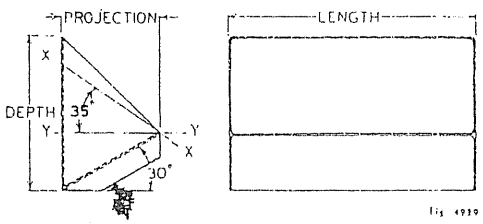


Fig. 4939

Bucket size, inches○			Weight, pounds	Capacity, cubic feet▲	
Length	Projection	Depth		Filled to line XX	Filled to line YY
8	5	7 3/4	8.5	.068	.028
12	5	7 3/4	11.0	.106	.045
12	7	11 3/4	20.0	.219	.099
14	8	11 3/4	30.0	.402	.220
16	7	11 3/4	27.0	.288	.129

Have dimensions certified for installation purposes.

■ Unpunched steel buckets with intermittent welded joints normally furnished. Buckets with continuous welded joints can be furnished.

○ Unpunched malleable iron buckets normally furnished. Buckets made of Promal, bronze, aluminum or malleable iron with galvanized or granitized protective coating can be furnished.

▲ Actual capacity depends on angle of repose of material handled and inclination of elevator.

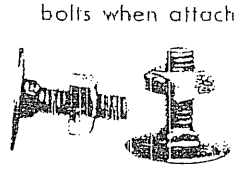
Bucket bolts

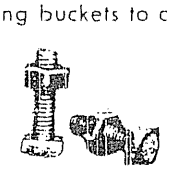
No. 1 Norway bolts are generally used with belts of 4 or more plies and when bolt centers are 2 3/4" or over. No. 3 Reliance bolts are generally used for light duty, with belts of less than 4 plies and when bolt centers are less than 2 3/4 inches.

Leather washers between the buckets and belt absorb shock as buckets pass over pulleys, serve as spacers to reduce accumulation of material between buckets and belt, and help to seal bolt holes against moisture.

Square head bolts are used in chain type elevators for attaching buckets to the chain attachments.

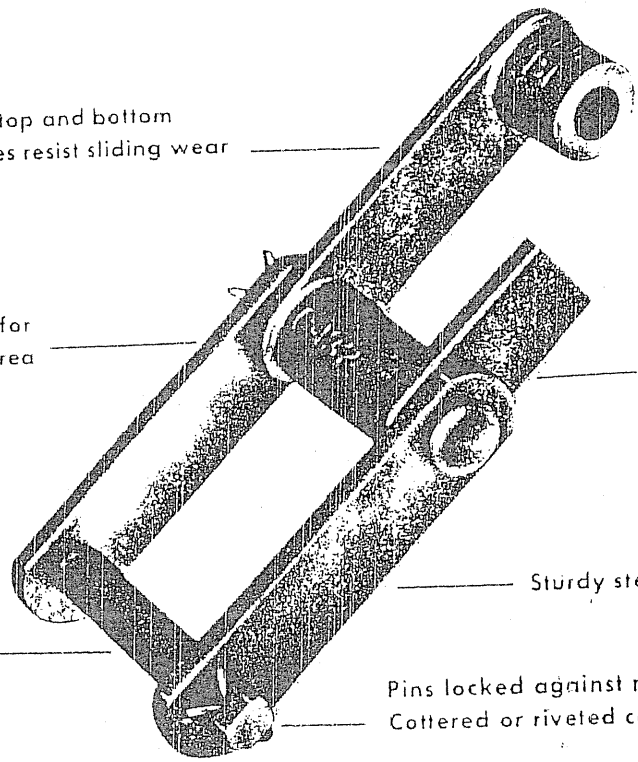
Spring lock washers are recommended for use with bolts when attaching buckets to chain attachments.


32022
No. 1 Norway bolt


32026
Square head bolt


32024
No. 3 Reliance bolt

C Class combination chains



C-1804

C Class combination chains are used extensively for conveyor and elevator applications, although some of the smaller sizes are also used for power transmission service. Because the chain joints are well protected and have generous pin bearing surfaces, these chains are widely used on bucket elevators handling stone, gravel and similar materials and are ideal for applications in the cement, chemical, pulp and paper, fertilizer, coal and other industries. They are also widely used for drag conveyor applications because link surfaces are ample to resist sliding wear. The combination of cast center links and steel sidebars results in a durable chain at a relatively low cost.

The center links for many sizes of chain are designed with elliptical barrels to provide extra metal in the area which contacts the sprocket. C Class combination chains can be furnished with durable malleable iron center links or with Promal center links. Promal is a pearlitic malleable iron having greater strength and superior resistance to wear and abrasion. For extremely abrasive conditions File-Hard Promal or Super File-Hard Promal center links and hardened steel side bars are recommended.

The steel sidebars are accurately machined for proper fit with the pins. The steel pins are locked against rotation by flat surfaces machined on one end which engage holes of similar shape in the sidebars.

Chains are available in riveted or cottered construction. Cottered construction will be furnished unless otherwise specified. Riveted construction is recommended for chains used in drag conveyor service.

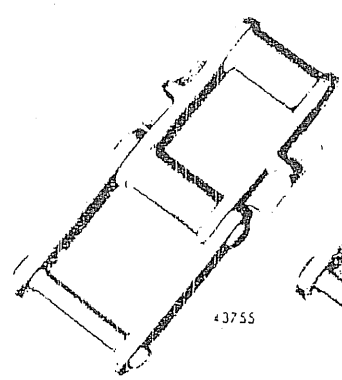
A large variety of center link and steel sidebar attachments is available. Offset links can be supplied for most sizes of chain and permit the coupling of strands assembled with an uneven number of links.

Type W combination chains are designed for heavy-duty drag conveyor service and are used primarily for woodyard conveyors in the pulp and paper industry. Wearing shoes on the center links provide additional area for increased resistance to abrasive and sliding wear. Chains with the suffix W2 also have increased sliding areas on the link barrels to retard wear on the return run.

Because of the severe conditions under which these chains operate, they are normally furnished with heat-treated steel sidebars and File-Hard Promal or Super File-Hard Promal center links. Super File-Hard Promal links are recommended. See page 20 for a complete description of these materials.

To combat the corrosive conditions often encountered in woodyard applications, cadmium plated or stainless steel pins are recommended.

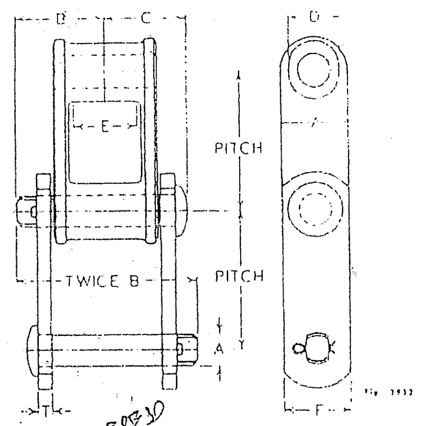
Type W combination chains are available in riveted and cottered construction. Riveted construction will be furnished unless otherwise specified.



C132W1 C132W2

C Class combination chains

Available in riveted or cottered construction. Cottered construction shown and will be furnished unless otherwise specified.



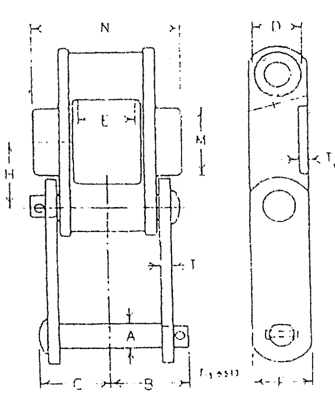
Couplers available for chain numbers:

C 55	C 102 1/2	C 131
C 77	C 110	C 132
C 102B	C 111	C 188

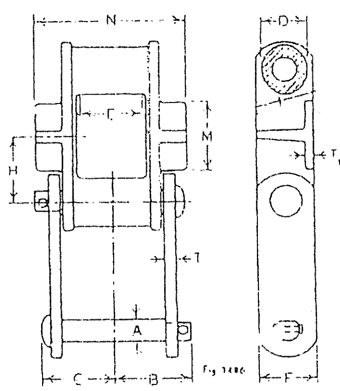
Chain number ★	Average pitch, inches	Allowable chain pull, pounds ▲	Average ultimate strength, pounds ■	Links in approx. 10 feet	Weight per foot, pounds	A	B	C ⊡	D	E	F	T	Attachments available ★ Center link attachments	Steel sidebar attachments
						INCHES								
C55	1.631	1110	9,000	74	2.0	3/8 ⊡	1 1/16	29/32	23/32	11/16	3/4	3/16	G19, K1	**A22**
C60 ⊡	2.307	2180	19,000	52	3.5	1/2 ⊡	1 9/16	1 3/8	3/4	7/8	1	1/4	F15, **K1**	
C77 ⊡	2.308	1400	11,000	52	2.2	7/16 ⊡	1 3/32	1	21/32	11/16	7/8	3/16	**F2, K1**	
C78 ⊡	2.609	2500	16,000	46	4.4	1/2	1 5/8	1 1/2	7/8	1 1/16	1 1/8	1/4	K2	K2
C102B ⊡	4.000	4000	24,000	30	6.8	5/8	2 1/4	2 7/32	1	2	1 1/2	3/8	G6, **K2**	**K2**, S1
C102 1/2 ⊡	4.040	5550	36,000	30	9.7	3/4	2 1/2	2 9/32	1 3/8	2	1 3/4	3/8	F2, **K2**, K3	**K2**, S1
C110	6.000	4000	24,000	20	6.0	5/8	2 5/16	2 5/32	1 9/32	1 15/16	1 1/2	3/8	G6, **K2**	**K2**
C111 ⊡	4.760	5950	36,000	25 1/2	9.8	3/4	2 21/32	2 15/32	1 7/16	2 3/8	1 3/4	3/8	F2, G6, **K2**	**K2**, S1
C111 Special ⊡	⊡	5950	36,000	20	8.5	3/4	2 21/32	2 15/32	1 7/16	2 3/8	1 3/4	3/8	F2, G6, **K2**	
C131	3.075	3220	24,000	39	6.5	5/8	1 27/32	1 23/32	1 1/4	1 1/8	1 1/2	3/8	**F2, G6**, G19, **K1, K2**	**K1**, K2
C132 ⊡	6.050	8330	50,000	20	14.5	1	3 3/8	3 1/8	1 25/32	3 1/8	2	1/2	**K2, RF12**, K15, **K24**	**K2**, S1
C188	2.609	1950	14,000	46	3.6	1/2	1 13/32	1 9/32	7/8	15/16	1 1/8	1/4	A22, **F2**, G6, G19, **K1, K2**	**G27, K1, K2**

Type W chains

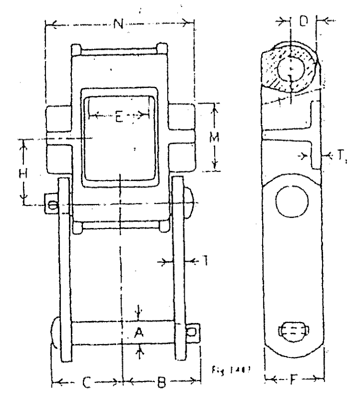
Available in riveted or cottered construction. Cottered construction shown. Riveted construction will be furnished unless otherwise specified.



C124W



C132W1



C111W2, C132W2

Chain number ★ ○	Average pitch, inches	Allowable chain pull, pounds ▲	Average ultimate strength, pounds ■	Links in approx. 10 feet	Weight per foot, pounds	A	B	C	D	E	F	H	M	N	T	T_1	Attachments available
						INCHES											
C111W2 ⊡	4.760	5950	36,000	25 1/2	11.8	3/4	2 21/32	2 15/32	23/32	2 3/8	1 3/4	2 3/8	2 1/2	5 1/8	3/8	7/16	S1
C124W	4.063	6300	60,000	29 1/2	15.4	7/8	2 9/16	2 5/16	1 3/4	1 11/16	[illegible] 1/4	2 1/32	1 1/2	4 7/16	1/2	3/8	RF84
C132W1 ⊡	6.050	8330	50,000	20	15.6	1	3 3/8	3 1/8	1 25/32	3 1/8	2	3 1/32	3 1/2	6 1/4	1/2	7/16	S1
C132W2 ⊡	6.050	8330	50,000	20	16.0	1	3 3/8	3 1/8	51/64	3 1/8	2	3 1/32	3 1/2	6 1/4	1/2	7/16	S1

Have dimensions certified for installation purposes.

Sprocket index, page 114.

★ Boldface type indicates chains and attachments with malleable iron center links normally carried in stock. Promal can be furnished.

▲ For malleable iron and promal center links. Ratings based on service factor [illegible] when selecting chain.

■ For malleable iron center links. Promal approximately 25 [illegible] stronger.

⊡ Dimension over pin head or riveted head, whichever is longer.

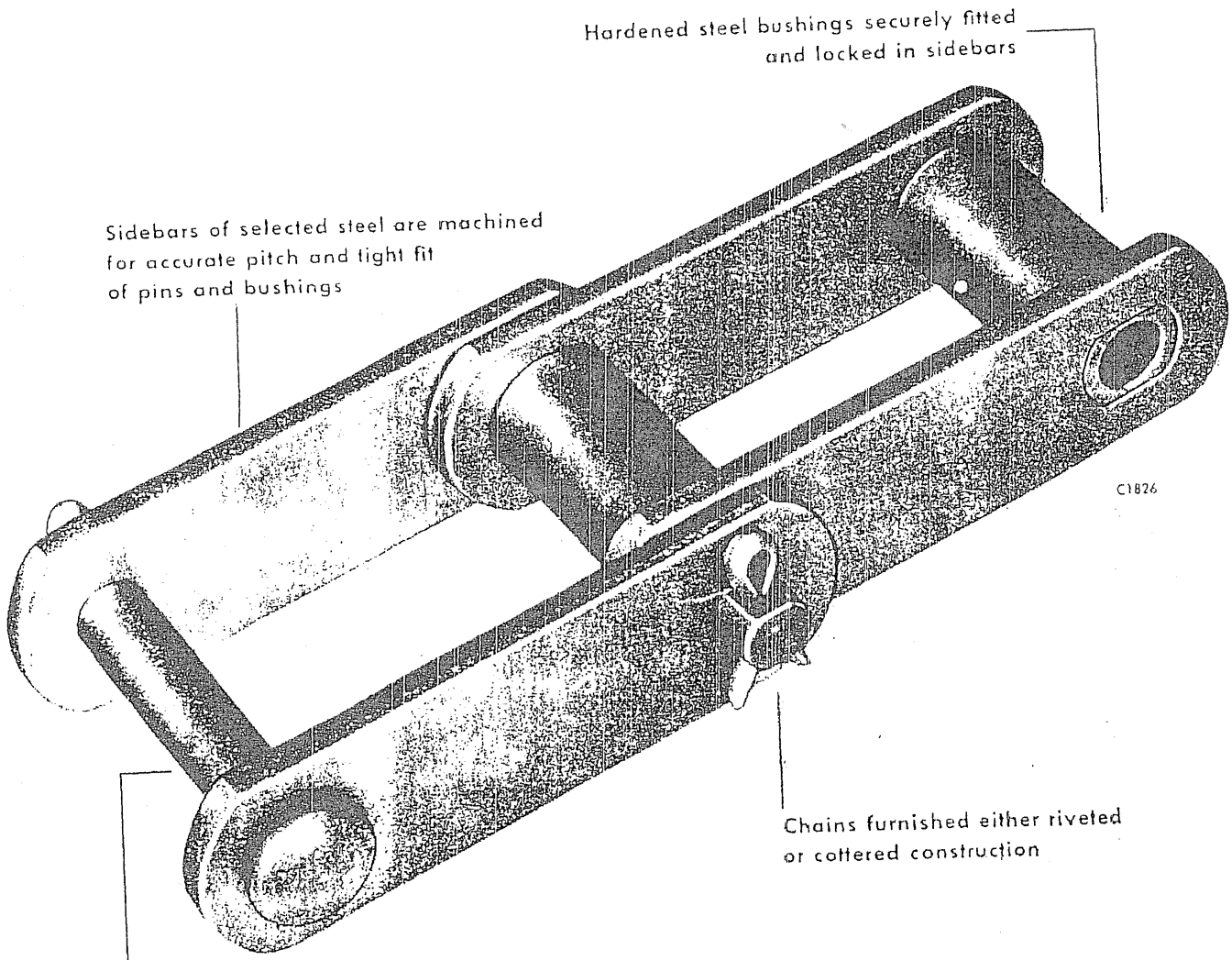
⊡ D-shaped lock under pin head and full-round pin end. Pin heads project from only one side of chain, not as shown in Figure 3952.

⊡ Pitch of center link, 4.760"; pitch of outside link, 7.240". Total of two consecutive links, 12".

⊡ Elliptical barrel

○ Normally furnished with File-Hard Promal center links

SS Class bushed chains



SS Class bushed chains are widely used for heavy duty service on bucket elevators, woodyard conveyors, assembly conveyors, or other conveyors and elevators operating under gritty or abrasive conditions.

These chains are made entirely of steel and are interchangeable with C Class combination chains having the same numerical suffix. Since they have hardened joint parts and greater strength, they are often used to replace C Class chains when installations are modified to handle heavier loads or to operate under more severe conditions.

Several of the longer-pitch chains are especially suited for higher elevators handling heavy loads with wide buckets.

The sidebars are fabricated from bar steel. Pitch holes are accurately machined to assure tight fits with pins and bushings and to provide close pitch control. Pins and bushings are made of tough, durable steel and are hardened to resist wear from joint articulation and sprocket contact. Machined flats on pin and bushing ends engage similar flats in the pitch holes, thereby preventing rotation in the sidebars.

Most SS Class bushed chains are available in riveted and cottered construction. Cottered construction is furnished unless otherwise specified.

Several attachments are available to suit a variety of conveyor and elevator applications.

SS Class bushed chains

Available in riveted or cottered construction. Cottered construction will be furnished unless otherwise specified.

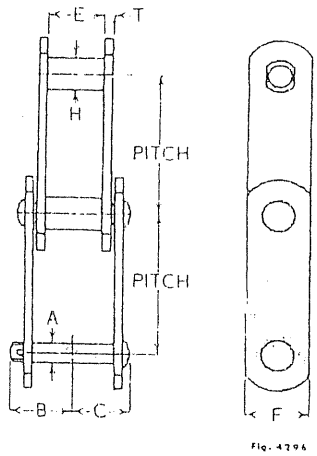


Fig. 4296

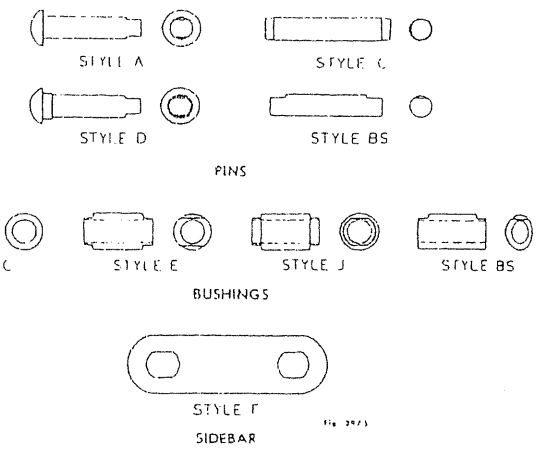


Fig. 2973

Chain number ★	Average pitch, inches	Allowable chain pull, pounds ▲	Average ultimate strength, pounds	Links in approx. 10 feet	Weight per foot, pounds	Sidebars F (inches)	Sidebars T (inches)	Sidebars Material ⊙	Sidebars Style	Pins A (inches)	Pins B (inches)	Pins C (inches)	Pins Material ⊙	Pins Style	Bushings E (inches)	Bushings H (inches)	Bushings Material ⊙	Bushings Style	Attachments available ★
SS 188	2.609	2750	25,000	46	3.8	1 1/8	1/4	CT	F	1/2	1 13/32	1 1/4	AT	A	1 1/16	7/8	CC	E	**A22, K1, K2**
SS 131	3.075	4500	40,000	39	7.4	1 1/2	3/8	CT	F	5/8	1 1/2	1 21/32	AC	A	1 5/16	1 1/4	CC	J	**K2**
SS 102B	4.000	6500	40,000	30	6.9	1 1/2	3/8	CT	F	3/4	2 15/64	2 7/64	AC	A	2 7/32	1	CC	E	**K2**
SS 102 1/3	4.040	7900	50,000	30	9.4	1 3/4	3/8	CT	F	3/4	2 29/64	2 13/64	AC	A	2 1/4	1 3/8	CC	J	K2
SS 111	4.760	8850	50,000	25 1/2	10.2	2	3/8	CT	F	3/4	2 31/32	2 13/32	AC	A	2 3/8	1 7/16	CC	J	**K2**
SS 111Special	■	8850	50,000	20	8.8	2	3/8	CT	F	3/4	2 31/32	2 13/32	AC	A	2 3/8	1 7/16	CC	J	**K2**
SS 110	6.000	6300	40,000	20	6.3	1 1/2	3/8	CT	F	5/8	2 5/16	2 1/16	AC	A	2 1/8	1 1/4	CC	J	K2
SS 856	6.000	14000	100,000	20	16.5	2 1/2	1/2	CT	F	1	3 5/32	2 29/32	AC.	D	3	1 3/4	AC	J	K2, K3, K6 K24, K35
SS 2857	6.000	14000	130,000	20	21.0	3 1/4 ◇	1/2	CT	F	1	3 1/16	. . .	ATS	C	3	1 3/4	AC	C	K44
SS 850	6.000	16100	100,000	20	23.5	3 △	1/4	CT	F	1 5/16	3 5/32	. . .	CC	BS	2 1/4	2	CC	E	
SS 2859	6.000	21800	200,000	20	34.0	4 □	5/8	CT	F	1 1/4	3 7/8	. . .	ATS	C	3 3/4	2 3/8	AC	C	K44
SS 150 Plus	6.050	15100	100,000	20	16.6	2 1/2	1/2	CT	F	1	3 5/16	3 1/32	AC	A	3 5/16	1 3/4	CC	J	K2, K3
SS 2864	7.000	21800	200,000	17	31.0	4 □	5/8	CT	F	1 1/4	3 7/8		ATS	C	3 3/4	2 3/8	AC	C	K44

A attachment

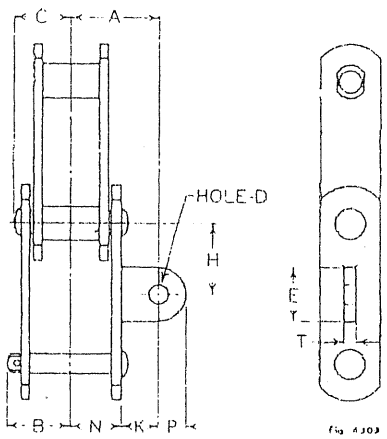


Fig. 4303

A22 attachment

Attachment number	Chain number ★	Weight per foot, pounds †	A (inches)	B (inches)	C (inches)	D (inches)	E (inches)	H (inches)	K (inches)	N (inches)	P (inches)	T (inches)
A22	**SS 188**	4.8	1 25/32	1 13/32	1 1/4	23/64	13/16	1 29/64	23/32	1 1/16	19/32	3/4

Have dimensions certified for installation purposes.
Sprocket index, page 114.
★ Boldface type indicates chains and attachments normally carried in stock.
▲ Based on service factor of 1. Apply service and correction factors, pages 27 and 36, when selecting chain.
■ Alternate pitches of 4.760" and 7.240", or a total of 12" for two pitches.
◇ Inside sidebars 3¼" high; outside sidebars 2½" high.
△ Inside sidebars 3" high; outside sidebars 2½" high. Chain can be furnished with inside and outside sidebars of 3" equal height.
□ Inside sidebars 4" high; outside sidebars 3" high.
⊙ CC = Carbon steel case-hardened. AC = Alloy steel case-hardened.
CT = Carbon steel heat-treated. AT = Alloy steel heat-treated.
ATS = Alloy steel heat-treated, specially hardened
† Attachments only

SS Class bushed chains

K attachments

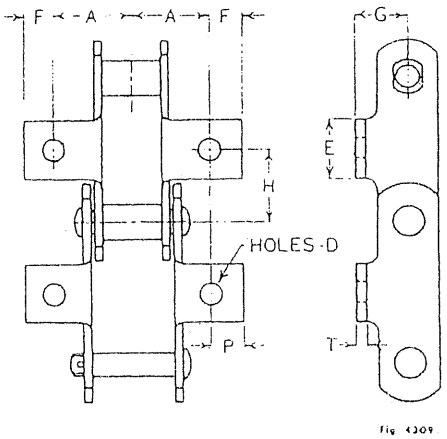


Fig 4309

K1 attachment

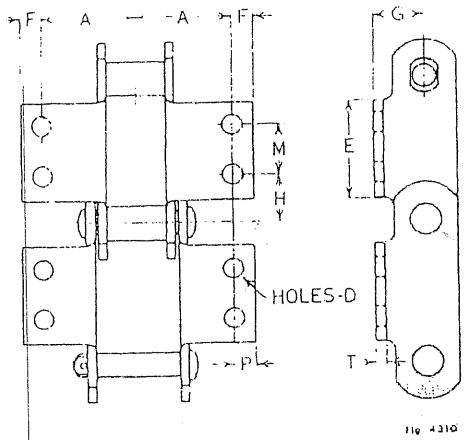


Fig 4310

K2, K24 attachments

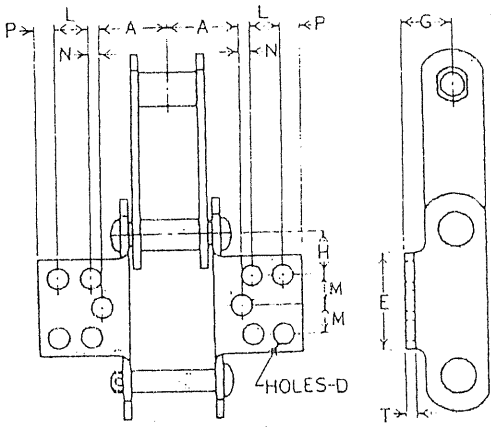


Fig 4313

K6 attachment

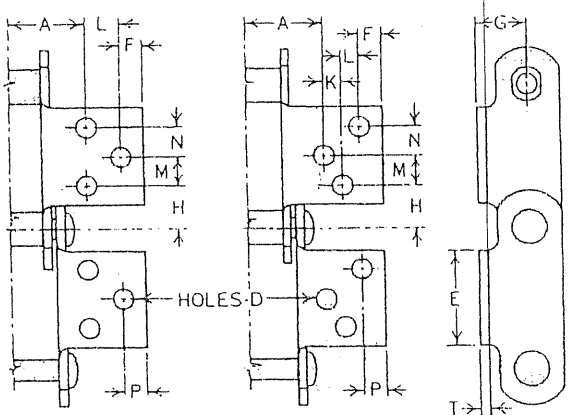


Fig 4318

SS 150 Plus chain

SS 856 chain

K3, K35 attachments

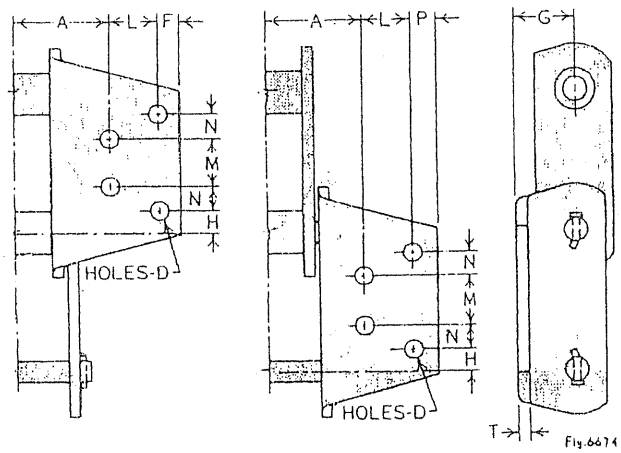


Fig.6674

K44 attachment

Attachment number	Chain number *	Weight per foot, pounds †	A	D	E	F	G	H	K	L	M	N	P	T
			INCHES											
K1	**SS188**	5.1	1 7/8	13/32	1 1/4	13/32	13/16	1 19/64	....	....	....	....	7/16	1/4
K2	**SS102B**	9.0	2 21/32	13/32	2 1/2	33/64	1	1 1/8	....	....	1 3/4	....	49/64	3/8
	SS102 1/2	13.4	2 21/32	17/32	2 7/8	....	1	1 9/64	....	....	1 3/4	....	51/64	3/8
	SS110	8.6	2 21/32	13/32	2 7/8	13/32	1	2 1/8	....	....	1 3/4	....	7/8	3/8
	SS111	15.2	3 1/8	17/32	3 5/8	1	1 1/2	1 7/32	....	....	2 5/16	....	29/32	3/8
	SS111 Special	13.0	3 1/8	17/32	3 5/8	....	1 1/2	1 7/32	....	....	2 5/16	....	29/32	3/8
	SS131	10.2	2 1/16	17/32	2 1/2	9/16	1	25/32	....	....	1 1/2	....	9/16	3/8
	SS150 Plus	23.0	3 3/4	17/32	4 1/4	1 1/32	1 7/8	1 21/32	....	....	2 3/4	....	1 1/32	1/2
	SS188	5.8	2 3/32	11/32	2 1/8	7/16	13/16	49/64	....	....	1 1/4	....	15/32	1/4
	SS856	23.0	3 5/32	17/32	4 1/4	1 15/32	1 7/8	1 7/8	....	....	2 1/4	....	1 7/16	1/2
K3	**SS150 Plus**	26.9	3 3/4	17/32	4 1/4	25/32	1 7/8	1 21/32		2	1 3/8	1 3/8	1 1/16	1/2
	SS856	27.3	3 5/32	9/16	4 1/4	19/32	1 7/8	1 5/8	2 3/16	9/16	1 3/8	1 3/8	13/16	1/2
K6	SS856	27.3	3 5/32	9/16	4 1/4	....	1 7/8	1 5/8	....	2	1 3/8	3/16	1 3/16	1/2
K24	SS856	23.0	3 3/8	11/16	4 1/4	1	1 7/8	1 3/4	....	....	2 1/2	....	31/32	1/2
K35	SS856	27.3	3 5/8	11/16	4 1/4	3/4	1 7/8	1 3/4	2 1/4	⊛	1 1/4	1 1/4	31/32	1/2
K44△	SS2857	42.0	3 1/2	9/16	....	7/8	2 1/2	1 1/4	....	2 1/2	3 1/2 ⊛	⊛	1 1/32	1/2
	SS2859	66.0	4 1/2	11/16	....	1 1/16	3	3/4	....	2	2 3/4	7/8	63/64	5/8
	SS2864	75.0	4 1/2	11/16	....	1 1/16	3	1/4	....	2	3 3/4	7/8		1/8

Have dimensions certified for installation purposes.
* Boldface type indicates attachments normally carried in stock.
† Attachments only.

△ Cannot be coupled consecutively.
⊛ Attachment holes are in line, not staggered as illustrated.

ANEXO 03: Tablas de Cargas del Viento

Velocity Pressure Exposure Coefficients, K_h and K_z

Table 29.3-1

Height above ground level, z		Exposure		
ft	(m)	B	C	D
0-15	(0-4.6)	0.57	0.85	1.03
20	(6.1)	0.62	0.90	1.08
25	(7.6)	0.66	0.94	1.12
30	(9.1)	0.70	0.98	1.16
40	(12.2)	0.76	1.04	1.22
50	(15.2)	0.81	1.09	1.27
60	(18)	0.85	1.13	1.31
70	(21.3)	0.89	1.17	1.34
80	(24.4)	0.93	1.21	1.38
90	(27.4)	0.96	1.24	1.40
100	(30.5)	0.99	1.26	1.43
120	(36.6)	1.04	1.31	1.48
140	(42.7)	1.09	1.36	1.52
160	(48.8)	1.13	1.39	1.55
180	(54.9)	1.17	1.43	1.58
200	(61.0)	1.20	1.46	1.61
250	(76.2)	1.28	1.53	1.68
300	(91.4)	1.35	1.59	1.73
350	(106.7)	1.41	1.64	1.78
400	(121.9)	1.47	1.69	1.82
450	(137.2)	1.52	1.73	1.86
500	(152.4)	1.56	1.77	1.89

Notes:

1. The velocity pressure exposure coefficient K_z may be determined from the following formula:

   For $15 \text{ ft.} \le z \le z_g$ $\quad K_z = 2.01\,(z/z_g)^{2/\alpha}$

   For $z < 15 \text{ ft.}$ $\quad K_z = 2.01\,(15/z_g)^{2/\alpha}$

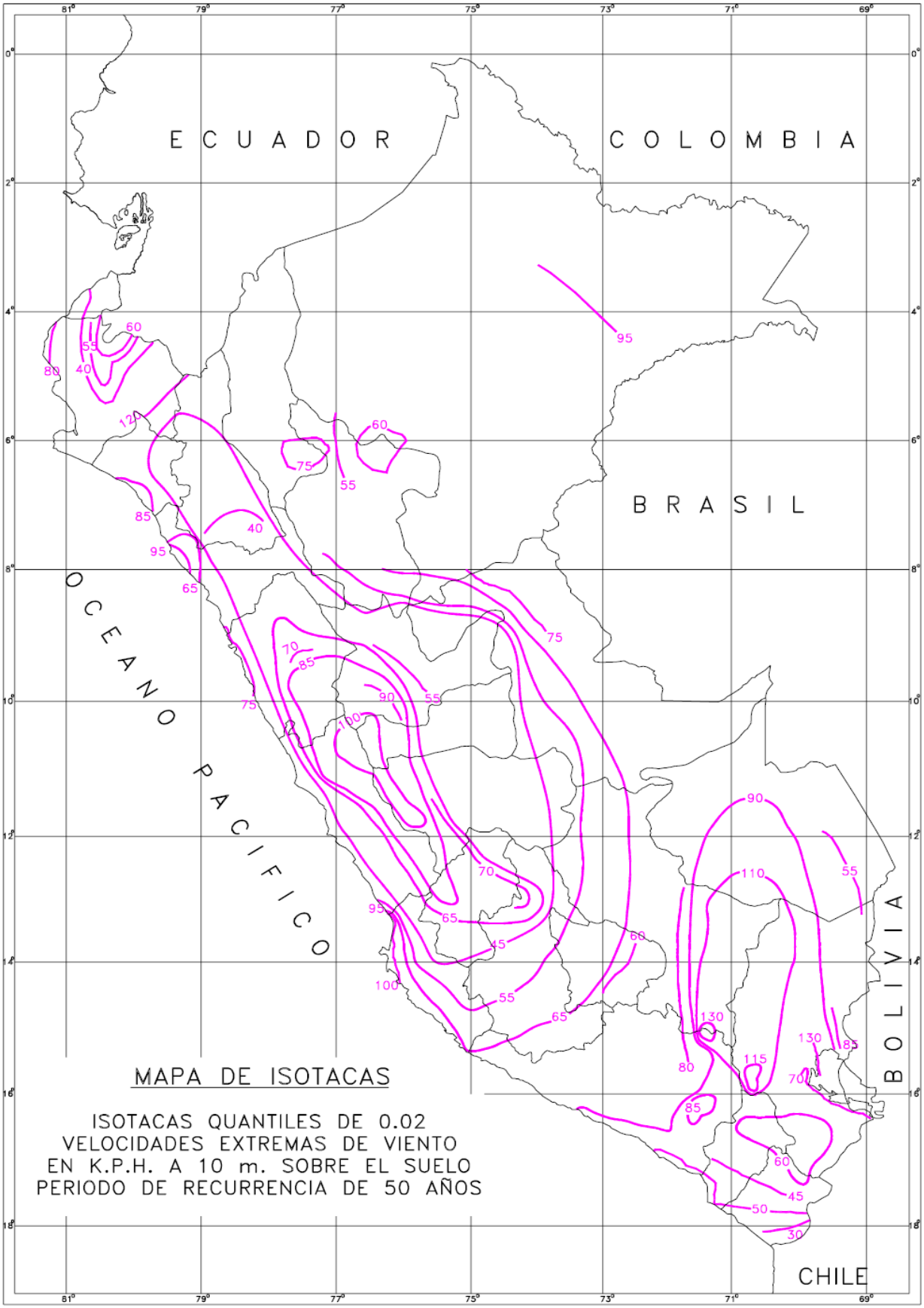
   2. α and z_g are tabulated in Table 26.9.1.
3. Linear interpolation for intermediate values of height z is acceptable.
4. Exposure categories are defined in Section 26.7.

Wind Directionality Factor, K_d

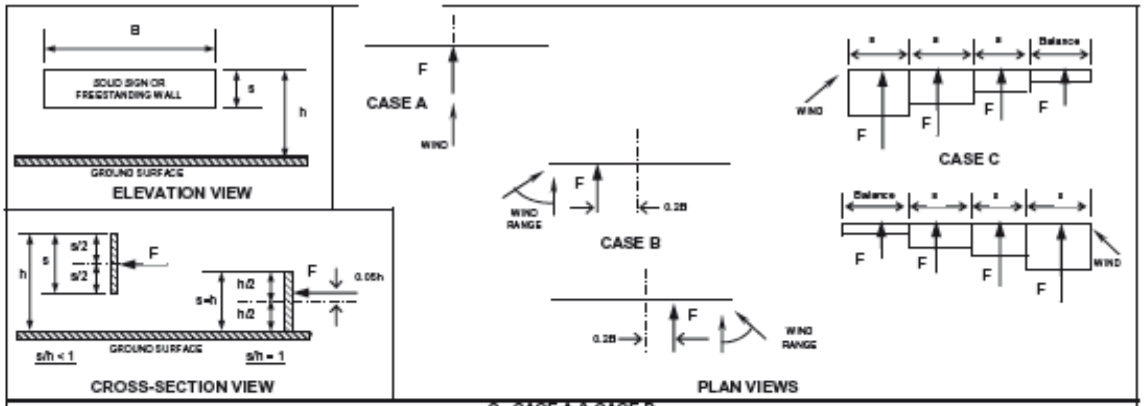
Table 26.6-1

Structure Type	Directionality Factor K_d*
Buildings	
Main Wind Force Resisting System	0.85
Components and Cladding	0.85
Arched Roofs	0.85
Chimneys, Tanks, and Similar Structures	
Square	0.90
Hexagonal	0.95
Round	0.95
Solid Freestanding Walls and Solid Freestanding and Attached Signs	0.85
Open Signs and Lattice Framework	0.85
Trussed Towers	
Triangular, square, rectangular	0.85
All other cross sections	0.95

*Directionality Factor K_d has been calibrated with combinations of loads specified in Chapter 2. This factor shall only be applied when used in conjunction with load combinations specified in Sections 2.3 and 2.4.



Design Wind Loads		All Heights
Figure 29.4-1	Force Coefficients, C_f	Solid Freestanding Walls & Solid Freestanding Signs
Other Structures		



C_f, CASE A & CASE B

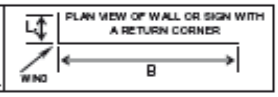
Clearance Ratio, s/h	Aspect Ratio, B/s											
	≤ 0.05	0.1	0.2	0.5	1	2	4	5	10	20	30	≥ 45
1	1.60	1.70	1.65	1.55	1.45	1.40	1.35	1.35	1.30	1.30	1.30	1.30
0.9	1.85	1.75	1.70	1.60	1.55	1.50	1.45	1.45	1.40	1.40	1.40	1.40
0.7	1.90	1.85	1.75	1.70	1.65	1.60	1.60	1.55	1.55	1.55	1.55	1.55
0.5	1.95	1.85	1.80	1.75	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.75
0.3	1.95	1.90	1.85	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.85	1.85
0.2	1.95	1.90	1.85	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.90	1.95
≤ 0.16	1.95	1.90	1.85	1.85	1.80	1.80	1.85	1.85	1.85	1.90	1.90	1.95

C_f, CASE C

Region (horizontal distance from windward edge)	Aspect Ratio, B/s									Region (horizontal distance from windward edge)	Aspect Ratio, B/s	
	2	3	4	5	6	7	8	9	10		13	≥ 45
0 to s	2.25	2.60	2.90	3.10*	3.30*	3.40*	3.55*	3.65*	3.75*	0 to s	4.00*	4.30*
s to 2s	1.50	1.70	1.90	2.00	2.15	2.25	2.30	2.35	2.45	s to 2s	2.60	2.55
2s to 3s		1.15	1.30	1.45	1.55	1.65	1.70	1.75	1.85	2s to 3s	2.00	1.95
3s to 10s			1.10	1.05	1.05	1.05	1.05	1.00	0.95	3s to 4s	1.50	1.85
										4s to 5s	1.35	1.85
										5s to 10s	0.90	1.10
										>10s	0.55	0.55

*Values shall be multiplied by the following reduction factor when a return corner is present

L_r/s	Reduction Factor
0.3	0.90
1.0	0.75
≥ 2	0.60



Notes:

1. The term "signs" in notes below also applies to "freestanding walls".

2. Signs with openings comprising less than 30% of the gross area are classified as solid signs. Force coefficients for solid signs with openings shall be permitted to be multiplied by the reduction factor $(1 - (1 - \varepsilon)^{1.5})$.

3. To allow for both normal and oblique wind directions, the following cases shall be considered:
   For s/h < 1:
   CASE A: resultant force acts normal to the face of the sign through the geometric center.
   CASE B: resultant force acts normal to the face of the sign at a distance from the geometric center toward the windward edge equal to 0.2 times the average width of the sign.
   For B/s ≥ 2, CASE C must also be considered:
   CASE C: resultant forces act normal to the face of the sign through the geometric centers of each region.
   For s/h = 1:
   The same cases as above except that the vertical locations of the resultant forces occur at a distance above the geometric center equal to 0.05 times the average height of the sign.

4. For CASE C where s/h > 0.8, force coefficients shall be multiplied by the reduction factor (1.8 - s/h).

5. Linear interpolation is permitted for values of s/h, B/s and L_r/s other than shown.

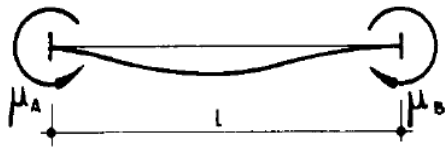
6. Notation:
   B: horizontal dimension of sign, in feet (meters);
   h: height of the sign, in feet (meters);
   s: vertical dimension of the sign, in feet (meters);
   ε: ratio of solid area to gross area;
   L_r: horizontal dimension of return corner, in feet (meters)

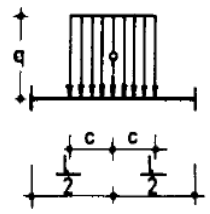
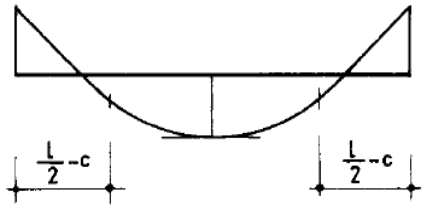
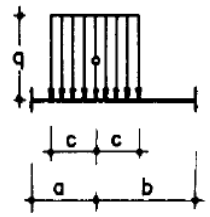
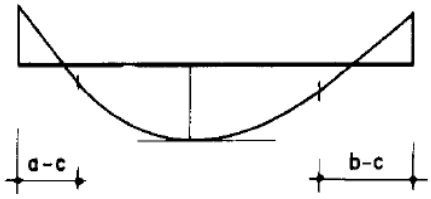
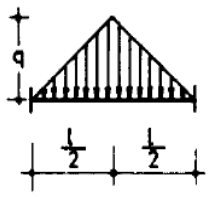
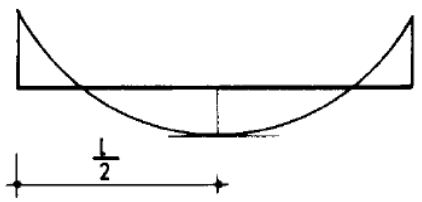
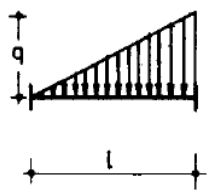
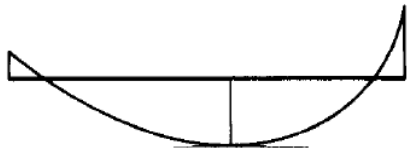
ANEXO 04: Tablas de Reacciones Vigas

VIGA EMPOTRADA

DISTINTAS HIPOTESIS DE CARGA

F, q y segmentos, en valor absoluto.



SOLICITACION	MOMENTOS DE EMPOTRAMIENTO PERFECTO	REACCIONES EN LOS APOYOS	DIAGRAMA DE MOMENTOS FLECTORES
	$\mu_A = \frac{qc}{12l}(3l^2-4c^2)$ $\mu_B = -\frac{qc}{12l}(3l^2-4c^2)$	$R_A = qc$ $R_B = qc$	
	$\mu_A = 2qc\left(a\frac{b^2}{l^2} - \frac{c^2}{l^2}\frac{3b-l}{3}\right)$ $\mu_B = -2qc\left(b\frac{a^2}{l^2} - \frac{c^2}{l^2}\frac{3a-l}{3}\right)$	$R_A = 2qc\left[1-3\frac{a^2}{l^2}\frac{c^2}{l^2}+2\frac{a}{l}\left(\frac{a^2}{l^2}+\frac{c^2}{l^2}\right)\right]$ $R_B = 2qc\left[3\frac{a^2}{l^2}+\frac{c^2}{l^2}-2\frac{a}{l}\left(\frac{a^2}{l^2}+\frac{c^2}{l^2}\right)\right]$	
	$\mu_A = \frac{5}{96}ql^2$ $\mu_B = -\frac{5}{96}ql^2$	$R_A = \frac{ql}{4}$ $R_B = \frac{ql}{4}$	
	$\mu_A = \frac{ql^2}{30}$ $\mu_B = -\frac{ql^2}{20}$	$R_A = \frac{3}{20}ql$ $R_B = \frac{7}{20}ql$	

ANEXO 05: Catalogos de Equipos

ATHEGSUR PERU E.I.R.L.
LINEA DE MAQUINARIA PARA
TRITURACIÓN Y MOLIENDA

ALIMENTADOR VIBRATORIO

Es adecuada para enviar materiales continua y uniformemente, al mismo tiempo, cribar los finos para aumentar la capacidad de trituración, y se aplica ampliamente en industrias de metalurgia, carbón, selección minera, materiales de Construcción, química, etc.

Serie GZD-ZSW

Principios de Operación

Consiste en una estructura vibratoria, resorte, vibrador, dispositivo vibratorio del motor y el motor. El vibrador está hecho de dos ejes excéntricos fijos y engranajes, y estos deben ser empujados de acuerdo con las indicaciones. Impulsados por el motor, los dos ejes excéntricos comienzan a rotar para producir una enorme potencia lineal que hace vibrar al alimentador. A través de la vibración, los materiales se deslizan en el embudo, avanzando. Cuando los materiales cruzan el tamiz, se caen los pequeños, realizando el efecto cribado.

Aplicaciones

Se utilizan ampliamente en la industria minera, metalúrgica y carbón para transferir material arenoso o bulto, o material de envasado. En muchas situaciones, es un componente muy importante de la maquinaria no estándar.

Características y Beneficios

1. Vibración estable, funcionamiento fiable, larga vida de trabajo.
2. Diseño especial de rejilla para evitar obstrucción de materiales.
3. Estructura simple, fácil de instalación y ajuste, peso ligero, tamaño pequeño, fácil mantenimiento.
4. Se puede optar el motor de ajuste velocidad con inversión para controlar fácilmente el volumen de alimentación sin abrir el motor con mucha frecuencia.
5. Bajo ruido, menor consumo eléctrico, buena capacidad de ajuste.

Especificaciones Técnicas

Se muestra en la siguiente tabla:

MODELO	TAMAÑO (mm)	TAMAÑO MAX. DE ENTRADA (mm)	INCLINACION (°)	CAPACIDAD (Tn/Hr)	POTENCIA MOTOR (HP)	PESO (Tn)
GZD-650X2300	650x2300	300	10	80	1,5x2	2,798
GZD-750X2500	750x2500	350	10	100	1,5x2	3,26
GZD-850x3000	850x3000	400	10	120	4x2	3,607
GZD-1000x3600	1000x3600	500	5	150	7,4x2	3,895
GZD-1100x4200	1100x4200	580	5	240	7,4x2	4,17
GZD-1100x4900	1200x4200	580	5	280	10x2	4,52
GZD-1300x4900	1500x2400	650	5	450	15x2	5,2
GZD-1500x5600	1500x4200	1050	10	450 - 800	16x2	7,5
ZSW-300x85	850x3000	400	0	80 - 120	10	4
ZSW-380x96	960x3800	500	0	100 - 160	15	4,823
ZSW-360x110	1100x3600	500	0	100 - 160	15	4,321
ZSW-490x110	1100x4900	630	0	150 - 320	20	6,647
ZSW-600x130	1300x6000	750	0	400 - 600	30	9,25
ZSW-600x150	1500x6000	800	0	500 - 700	40	10,19
ZSW-600x180	1800x6000	800	0	700 - 1000	50	13,75

ATHEGSUR construye soluciones estándar y personalizadas para las necesidades de nuestros clientes, ya sea de alimentadores, trituradoras, lavadoras, zarandas, fajas o cintas transportadoras, plantas completas de trituración, ATHEGSUR es conocido en nuestro país por la constante innovación en ingeniería y con valor agregado en construcción de maquinarias para soportar los trabajos más exigentes y entornos de la cantera, ATHEGSUR ayuda a las empresas a cumplir sus necesidades de funcionamiento en tiempo y en presupuesto.
ATHEGSUR establece un estándar para la capacidad de respuesta y flexibilidad en la industria minera y la construcción del tipo de relaciones que la competencia simplemente no puede igualar. Póngase en contacto con ATHEGSUR hoy para saber algo más acerca de nuestra gama de bienes duraderos, agregado productivo, altamente eficiente y rentable y equipos para la minería fácil.

ATHEGSUR PERU E.I.R.L.
LINEA DE MAQUINARIA PARA

Dirección: Calle Mariscal Sucre #120 - Urbanización La Calerita B-8
Paucarpata, Arequipa - Perú
Mayor información +51-054-467937
MOV: 958940870, RPM: #779244
RPC: 958331969, Nextel: 402*1155

Email: athegsurperu@athegsurperu.com
athegsurperu@gmail.com

ATHEGSUR PERU E.I.R.L.
LINEA DE MAQUINARIA PARA
TRITURACIÓN Y MOLIENDA

CHANCADORA DE QUIJADA

Es uno de los equipos de trituración más utilizados en la producción minera, y adecuada para triturar piedras y minerales de alta dureza, dureza media y suave, tales como escoria, mármol, etc, cuya fuerza de resistencia a la presión es menor a 320 MPa. Se utiliza ampliamente en industrias de minería, metalurgia, construcción, transportación, hidráulica y química, etc. Nuestro producto ocupa un puesto de liderazgo en China, nosotros investigamos, diseñamos y producimos nosotros con nuestro equipo de ingenieros y dispone de características tales como alta proporción de trituración, alto rendimiento, partículas finales uniformes, estructura simple, funcionamiento fiable, fácil.

Serie PE - PEX

Principios de Operación

El motor es la fuerza propulsora de esta máquina. Por medio de las ruedas del motor, el eje excéntrico es impulsado por la correa triangular y la ranura para que la mandíbula móvil haga movimiento alternante según la órbita predeterminada. Luego se puede triturar los materiales que entraron en la cavidad de trituración, la cual está compuesta por placa fija, placa móvil y alerón lateral y se descarga por salida.

Aplicaciones

Se utilizan ampliamente en la industria minera, metalúrgica y carbón para transferir material arenoso o bulto, o material de envasado. En muchas situaciones, es un componente muy importante de la maquinaria no estándar.

Características y Beneficios

1. Funcionamiento estable; bajo costo de operación.
2. Con cavidad profunda para elevar la capacidad de alimentar y la producción.
3. Alta proporción de trituración, partículas finales uniformes.
4. Con dispositivo de ajuste en la salida para aumentar la flexibilidad del equipo.
5. Sistema lubricante confiable y seguro, fácil para cambiar piezas, reduce el trabajo de mantenimiento;
6. Funcionamiento fiable, bajo costo de operación;
7. Ahorro de energía: para una máquina del 15% ~ 30%; para un sistema más de doble;
8. Bajo ruido, poco polvo.

Especificaciones Técnicas

Se muestra en la siguiente tabla:

MODELO	APERTURA (mm)	TAMAÑO MAX. DE ENTRADA (mm)	TAMAÑO MAX. DE SALIDA (mm)	CAPACIDAD (Tn/Hr)	POTENCIA MOTOR (HP)	PESO (Tn)
PE0610	150x250	125	10 - 40	1 – 3	7	0,8
PE0812	200x300	180	15 - 50	2 – 6	10	1,2
PE0814	200x350	180	18 - 70	3 - 10	15	1,5
PE0816	200x400	180	20 - 60	3 – 10	15	1,8
PE1016	250x400	210	20 - 60	5 – 20	20	2.8
PE1020	250x500	210	20 - 80	12 - 60	25	3,4
PE1624	400x600	340	35 - 100	15 – 65	40	6,5
PE2030	500x750	425	50 - 100	40 – 110	70	12
PE2430	600X750	500	150 - 200	80 - 240	73	15
PE2436	600X900	500	65 - 160	50 - 180	70	17
PEX0630	150x750	120	18 - 50	8 – 25	20	3,4
PEX0839	200X1000	160	15 - 50	15 - 50	40	5,6
PEX1030	250x750	210	25 - 60	10 – 40	30	5,5
PEX1036	250x900	210	25 - 60	15 - 50	40	5
PEX1039	250x1000	210	25 - 60	15 - 50	40	6,7
PEX1047	250X1200	210	25 - 60	20 - 60	50	9,7
PEX1251	300X1300	250	20 - 90	15 - 100	70	15,6
PEX1430	350X750	300	15 - 80	30 - 52	40	6,8
PEX1630	400x750	350	40 - 100	15 - 60	40	6.5

ATHEGSUR construye soluciones estándar y personalizadas para las necesidades de nuestros clientes, ya sea de alimentadores, trituradoras, lavadoras, zarandas, fajas o cintas transportadoras, plantas completas de trituración, ATHEGSUR es conocido en nuestro país por la constante innovación en ingeniería y con valor agregado en construcción de maquinarias para soportar los trabajos más exigentes y entornos de la cantera, ATHEGSUR ayuda a las empresas a cumplir sus necesidades de funcionamiento en tiempo y en presupuesto.

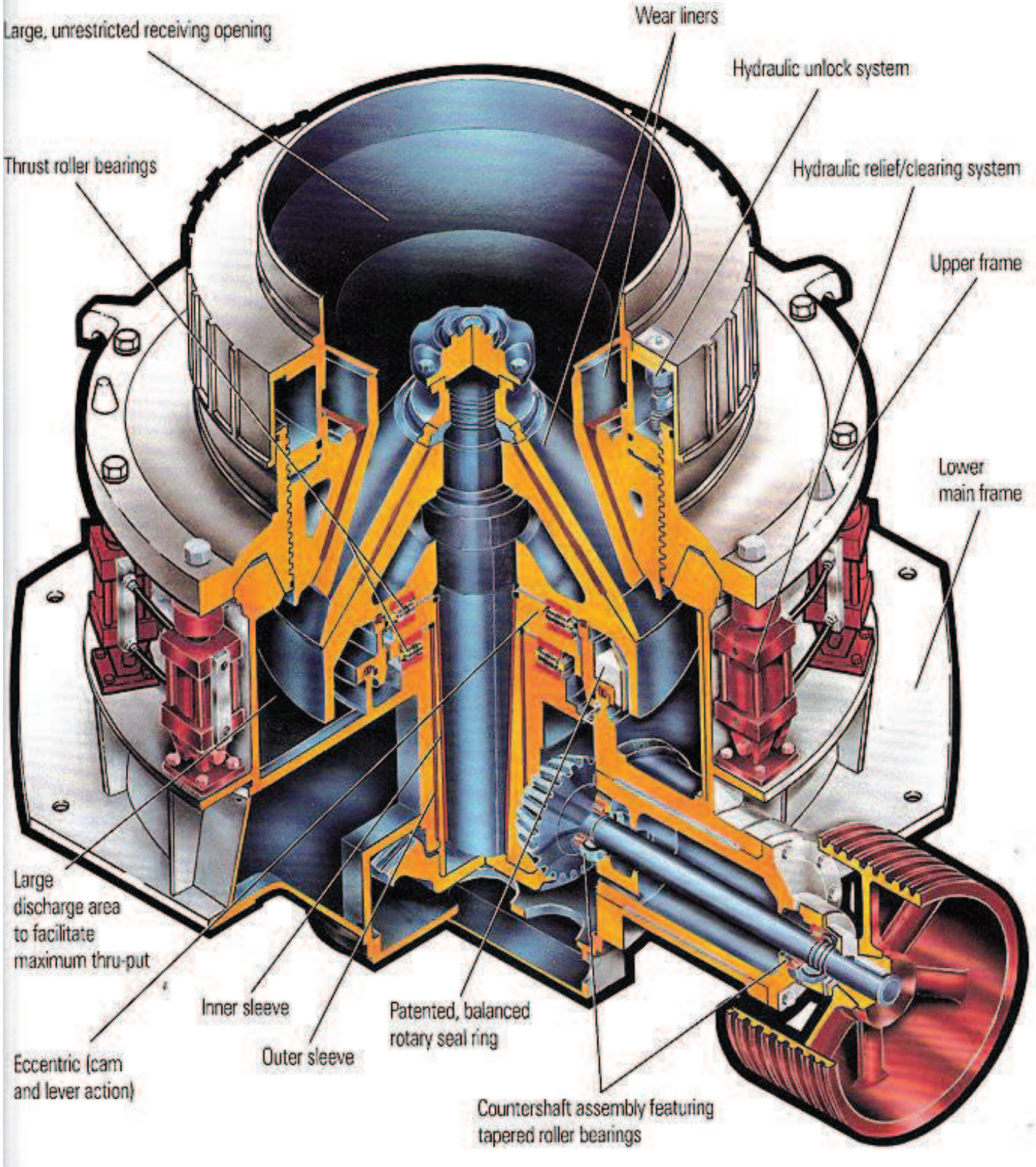
ATHEGSUR establece un estándar para la capacidad de respuesta y flexibilidad en la industria minera y la construcción del tipo de relaciones que la competencia simplemente no puede igualar. Póngase en contacto con ATHEGSUR hoy para saber algo más acerca de nuestra gama de bienes duraderos, agregado productivo, altamente eficiente y rentable y equipos para la minería fácil.

ATHEGSUR PERU E.I.R.L.
LINEA DE MAQUINARIA PARA TRITURACION Y MOLIENDA

Dirección: Calle Mariscal Sucre #120 - Urbanización La Calerita B-8
Paucarpata, Arequipa - Perú
Mayor información +51-054-467937
MOV: 958940870, RPM: #779244
RPC: 958331969, Nextel: 402*1155

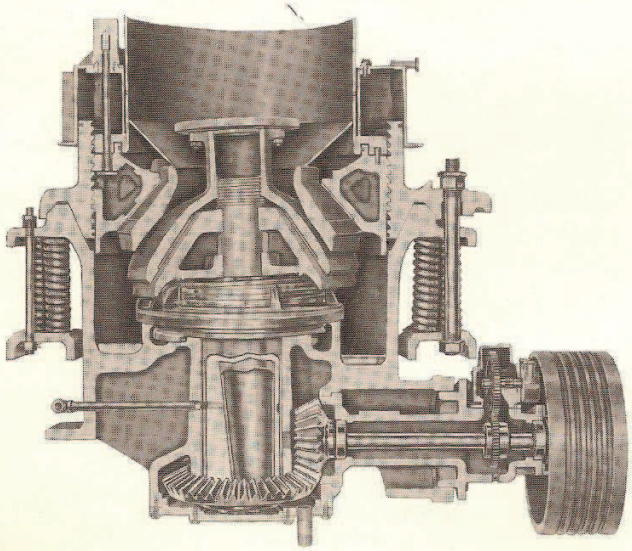
Email: athegsurperu@athegsurperu.com
athegsurperu@gmail.com

the gyrasphere® system



TELSMITH GYRASPHERES . .

SMITHBOND,
the non-metallic liner backing is safer, tougher, easier to use than the molten, volatile zinc formerly used. (Lower) Smithbond forms a solid mass to back crushing members. Also note wide discharge opening to permit rapid discharge, reducing manganese wear.

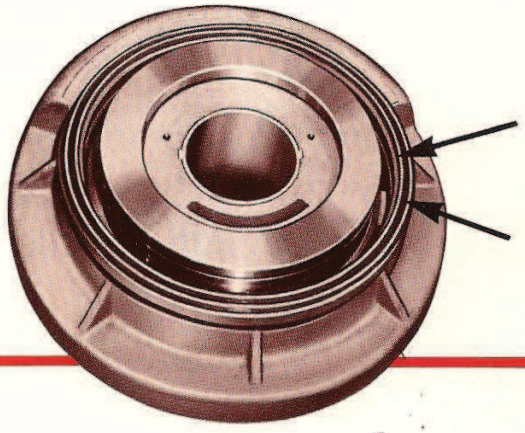


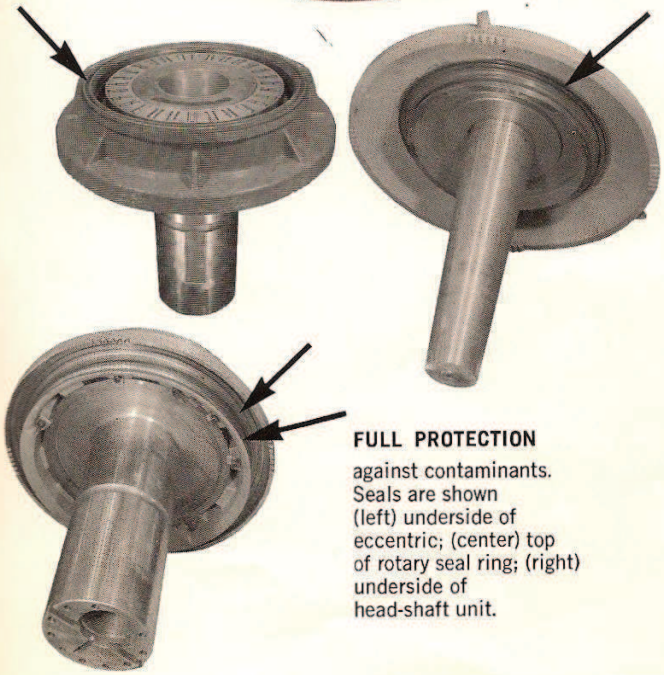
New production records are being set by Telsmith Gyrasphere crushers throughout the world. It is commonplace for Gyraspheres to crush more than a million tons with only routine maintenance and liner replacement required. This is one of the main reasons why Telsmith Gyraspheres are out-producing other crushers. Outstanding features include fabricated steel upper and lower frames, cast steel concave support bowl, and head; manganese or special alloy steel crushing members; roller thrust bearings; lead-bronze eccentric bearings; oil tank with filter system; temperature and pressure alarm system; exclusive labyrinth and piston ring triple seal, (positive barrier to contaminants); solid, forged, steel shaft; alloy steel drive gears with precision cut teeth; spring relief automatic reset; forced feed lubrication system; and unrestricted bottom discharge openings.

MAXIMUM POWER
use with roller thrust bearings which keep moving parts in perfect alignment.

. maintenance free performance

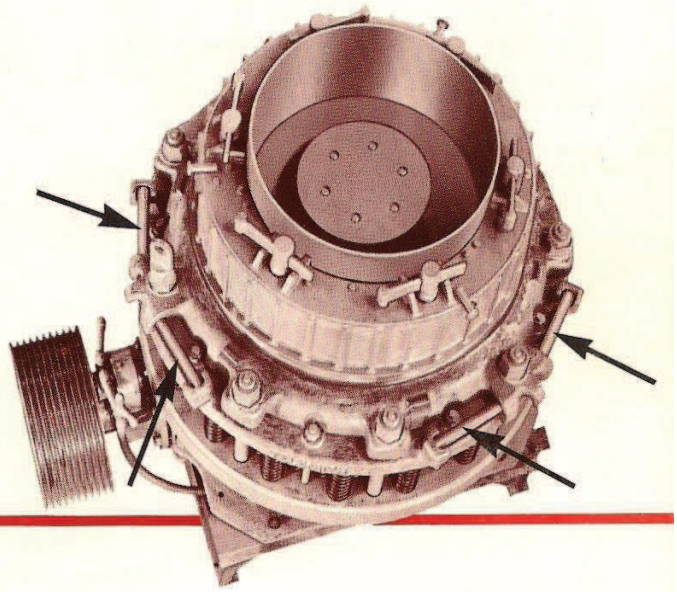
Telsmith Gyraspheres have a patented rotary seal ring. This exclusive feature converts reciprocating or gyratory motion into rotary motion, allowing the use of piston ring and labyrinth seals. All inside working parts are protected against dust and moisture, and loss of lubricant. Upper and lower piston rings, and double upper and lower labyrinth seals, form the most nearly perfect seal ever devised for crusher service. It is far superior to the sliding type, which is subject to wear from wiping in dust, wiping out oil, and often requires the use of supplementary air or water. With Telsmith's piston ring and labyrinth seal protection, in combination with the full force-feed oiling system, all moving parts last for many years. No other crusher can approach the low maintenance cost of Telsmith Gyraspheres.

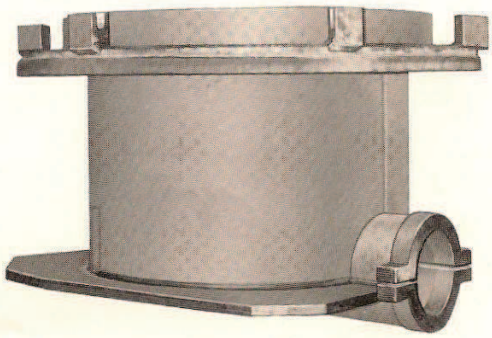




FULL PROTECTION
against contaminants. Seals are shown (left) underside of eccentric; (center) top of rotary seal ring; (right) underside of head-shaft unit.

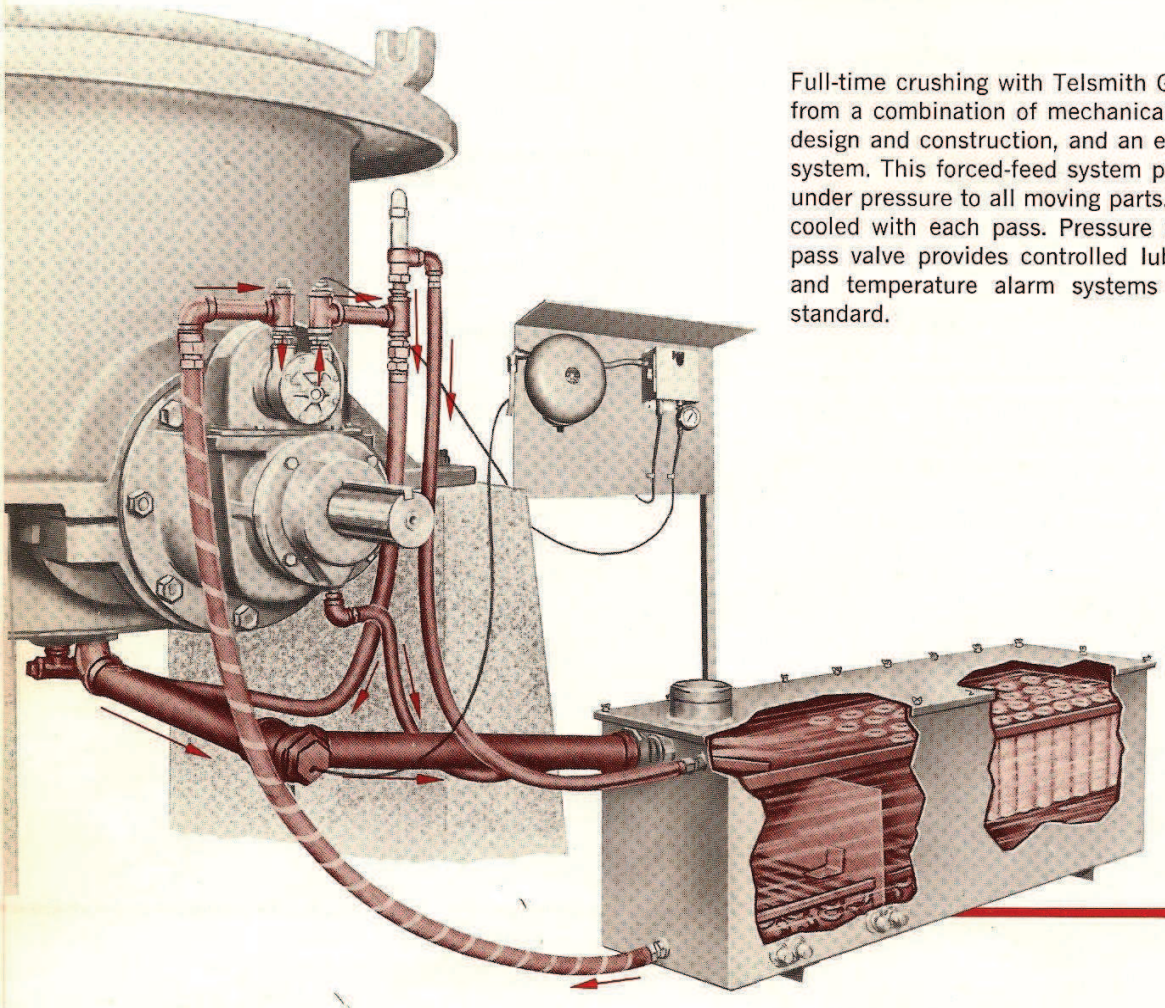
Telsmith Gyraspheres have an effective device to prevent rotation of the upper frame relative to the lower frame. Anchor lugs are cast as part of the lower main frame and upper frame. Thrust bars fit into holes in the lugs to prevent rotation of the upper frame, but permit it to tilt when necessary. With this device there is no wearing of tension bolts or of the tension bolt holes in the upper frame. It reduces wear on bearing surface between the upper and lower frames, and simplifies dismantling the crusher for manganese replacement.



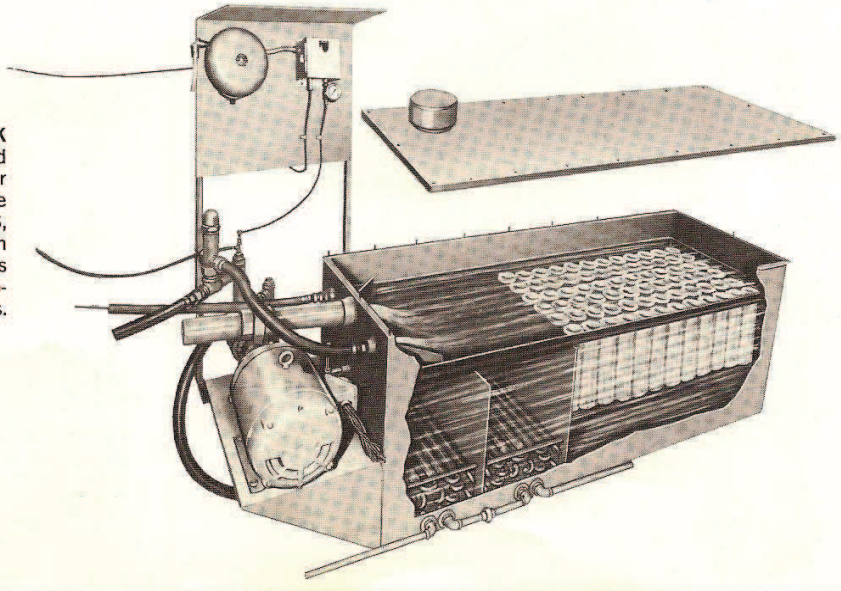


FABRICATED STEEL MAIN FRAME
careful heat treatment and heavy, massive construction provides the stability required to withstand crushing pressure.

TELSMITH GYRASPHERES . .

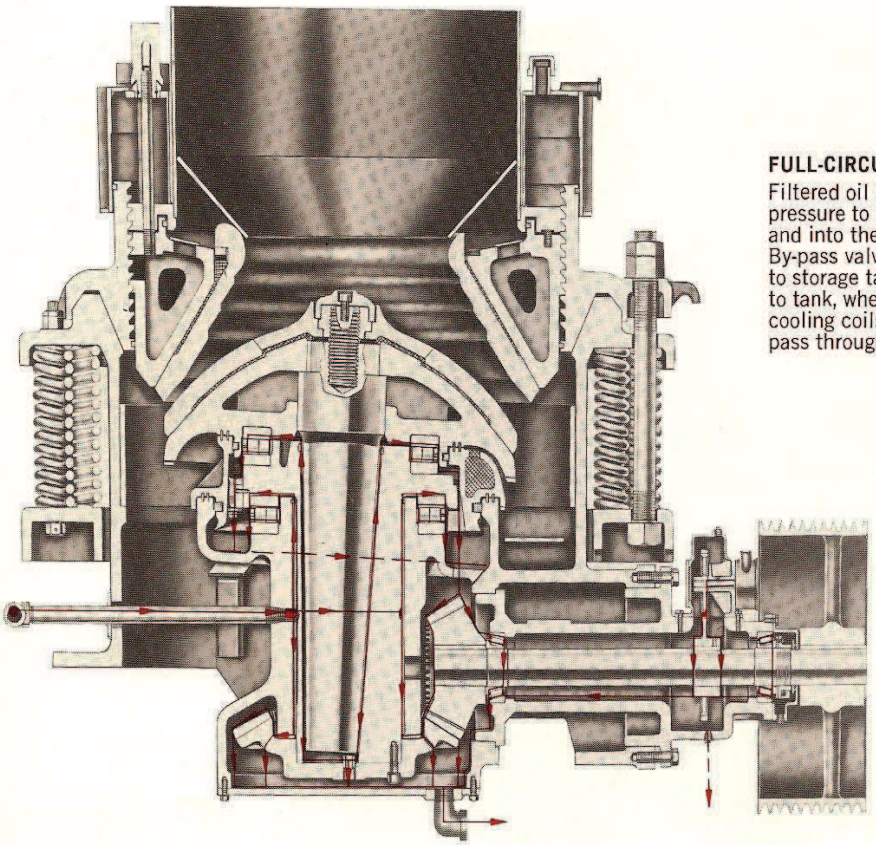


Full-time crushing with Telsmith Gyraspheres comes from a combination of mechanical precision, quality design and construction, and an efficient lubrication system. This forced-feed system provides lubrication under pressure to all moving parts. Oil is filtered and cooled with each pass. Pressure regulation and by-pass valve provides controlled lubrication. Pressure and temperature alarm systems are furnished as standard.

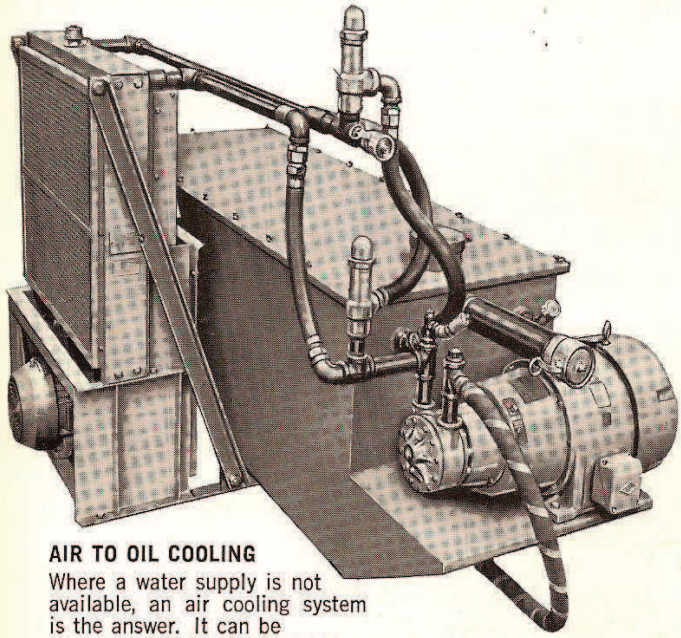


THE 66″ GYRASPHERE OIL TANK shown at the right has an independently mounted pump with separate electric motor. All other sizes as shown above have the oil pump built into the countershaft box. 66″ Gyraspheres, 245S, 367S, 489S, and all FC models are furnished with radiator coolers built into the oil tanks as standard, and can be furnished as optional equipment on other sizes.

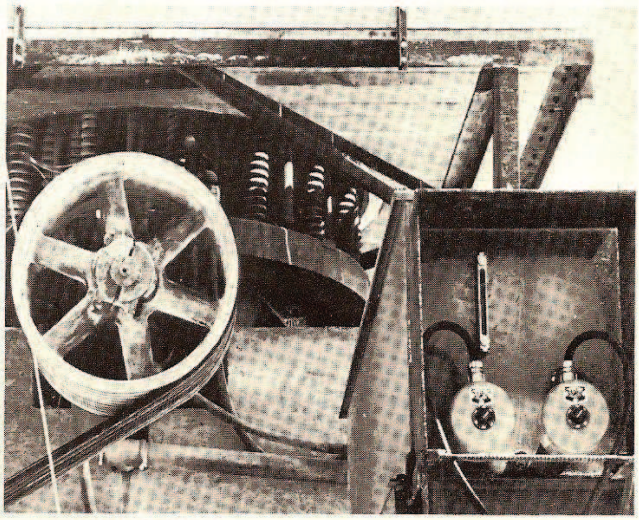
modern lubrication system prolongs life



FULL-CIRCULATION
Filtered oil is pumped under regulated pressure to main shaft and eccentric, and into the countershaft simultaneously. By-pass valve returns excess oil to storage tank. Circulating oil returns to tank, where a bank of filters and cooling coils prepare the oil for its next pass through the crusher.



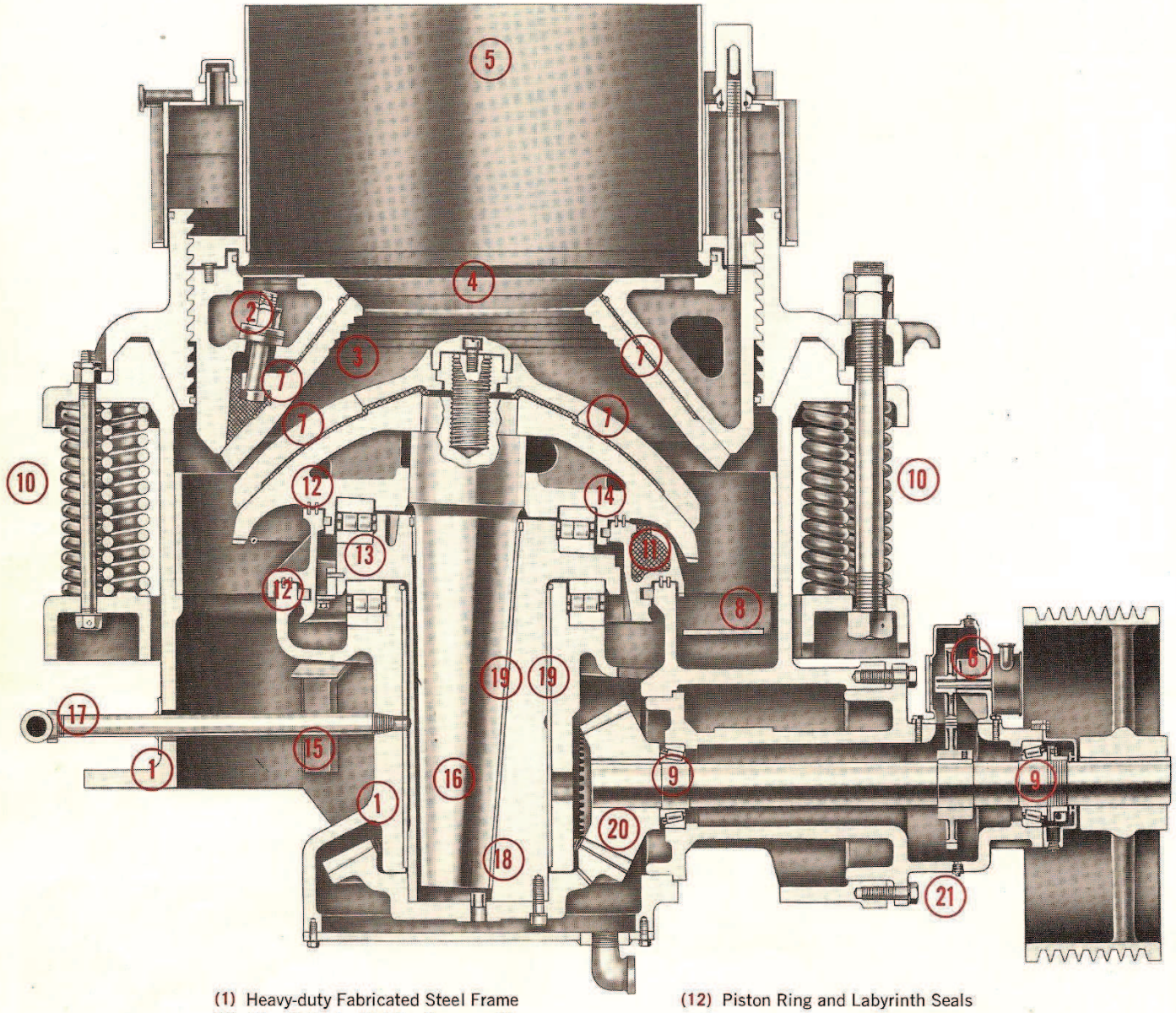
AIR TO OIL COOLING
Where a water supply is not available, an air cooling system is the answer. It can be mounted with oil tank as shown, or on a separate pedestal. Furnished as optional equipment.



IMMERSION HEATERS
220 and 440 volt heating units with thermostatic control. One to three units per tank can be installed in the field. Recommended for bringing oil up to proper temperature before start-up in cold weather. Furnished as optional equipment.

CUTAWAY

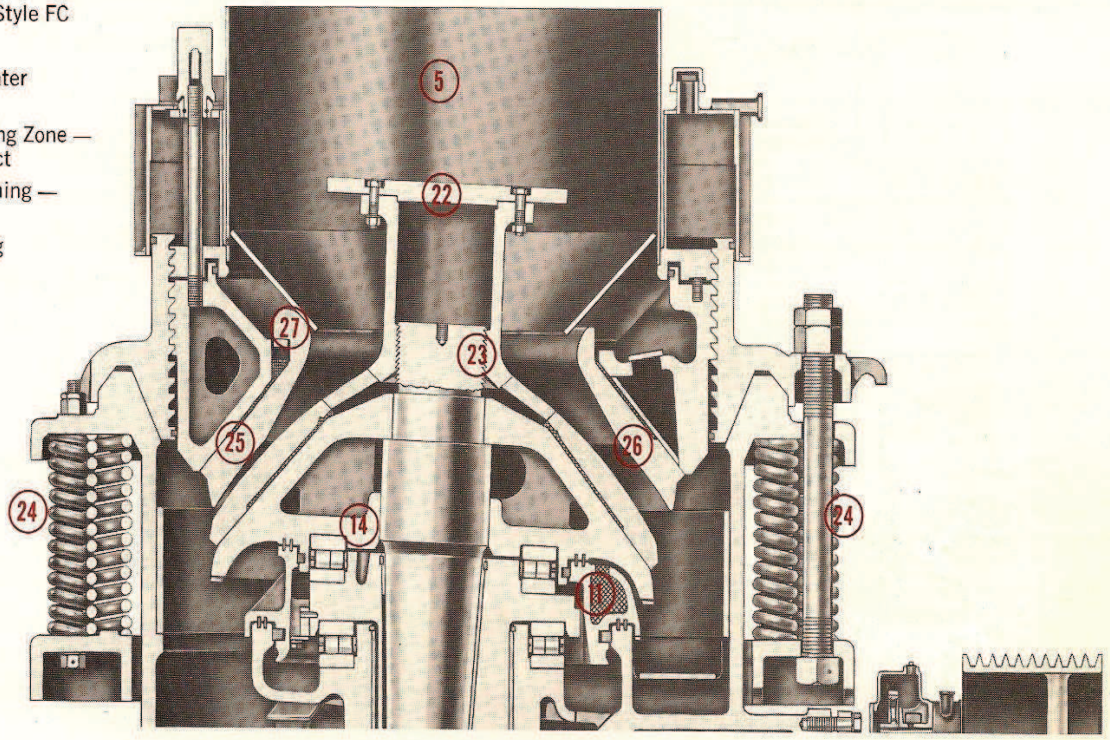
TELSMITH "S" GYRASPHERES

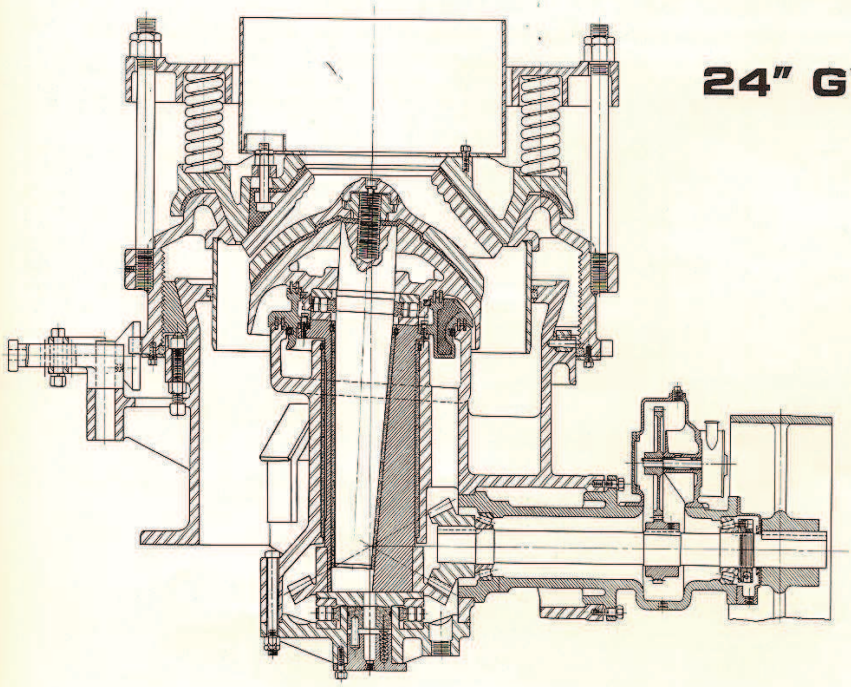


(1) Heavy-duty Fabricated Steel Frame
(2) Alloy Bolts for Holding Concave Ring
(3) Spherical Shaped Crushing Head
(4) Large Unobstructed Feed Opening
(5) Heavy Steel Hopper
(6) Self-priming Integral Gear Oil Pump
(7) Manganese Steel Crushing Members
(8) Replaceable Countershaft Box Shield
(9) Heavy Countershaft has tapered Rolled Bearings
(10) Spring Relief
(11) Patented Rotary Seal Ring
(12) Piston Ring and Labyrinth Seals
(13) Cam and Lever Crushing Action
(14) Heavy Duty Roller Bearings
(15) Frame Arm Shields
(16) Large Diameter Heavy Duty Main Shaft
(17) Main Oil Supply
(18) Large, Heavy Eccentric
(19) Large Diameter Long Sleeve Eccentric Bearings
(20) Cut Steel Drive Gears
(21) Countershaft Box Removable as a Unit

STYLE "FC" GYRASPHERES

(22) Feed Distributor on Style FC
(23) Mantle Nut
(24) More Springs of Greater Length on Style FC
(25) Long Parallel Crushing Zone — More Uniform Product
(26) Wide Discharge Opening — Rapid Discharge
(27) Gun Lock for Holding Concave Ring

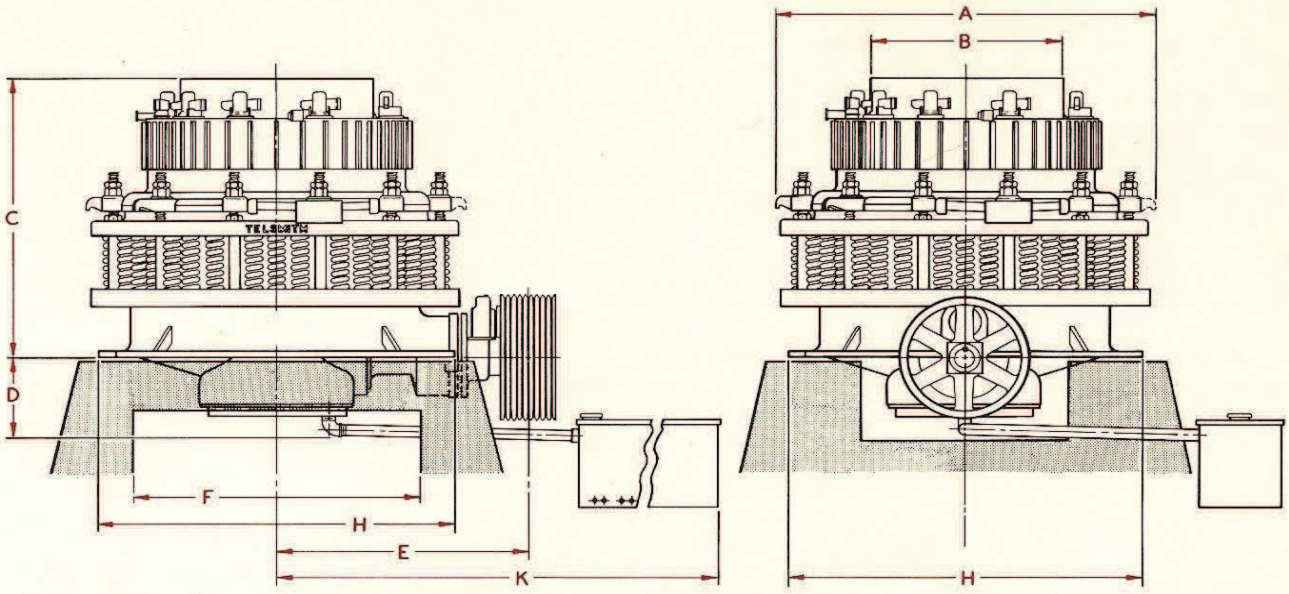




24" GYRASPHERE . . .

for coarse and fine crushing

The 24" Gyrasphere differs slightly in internal construction from the larger sizes. Smaller dimensions alter placement of the roller thrust bearings. The bearing normally supporting the eccentric under the rotary seal ring, is located at the bottom of the eccentric. This arrangement maintains the operating efficiency and economy for which Gyraspheres have been noted for many years. The shape of the head is the same for both the 24S and 24FC Gyraspheres.



DIMENSIONS

STYLE S Coarse Crushing Gyraspheres

Size	A	B	C	D	E	F	H	K
24 S	4′-2½″	2′- 2¾″	4′- 1½″	11″	3′-6″	2′-11″	3′-11″	6′-5″
36 S	6′-9½″	2′-11½″	5′- 8″	1′- 3⅜″	4′-4¾″	4′- 0″	5′- 2½″	10′-4″
367 S	6′-9½″	2′-11½″	5′- 8″	1′- 3⅜″	4′-4¾″	4′- 0″	5′- 2½″	10′-4″
48 S	8′-0½″	3′-10″	6′- 7¼″	1′- 6¾″	5′-3¼″	5′- 2″	6′- 9″	13′-3″
489 S	8′-0½″	3′-10″	6′- 7¼″	1′- 6¾″	5′-3¾″	5′- 2″	6′- 9″	13′-3″
66 S	10′-2″	4′-11⅜″	7′-10½″	1′-10½″	6′-3¾″	7′- 1¼″	9′- 1¼″	14′-5″
6614 S	10′-2″	4′-11⅜″	7′-10½″	1′-10½″	6′-3¾″	7′- 1¼″	9′- 1¼″	14′-5″

STYLE FC Fine Crushing Gyraspheres

Size	A	B	C	D	E	F	H	K
24 FC	4′-2½″	2′- 2¾″	4′- 1½″	11″	3′-6″	2′-11″	3′-11″	6′-5″
36 FC	6′-9½″	2′-11½″	5′- 8″	1′- 3⅜″	4′-4¾″	4′- 0″	5′- 2½″	10′-4″
48 FC	8′-0½″	3′-10″	6′- 7¼″	1′- 6¾″	5′-3¾″	5′- 2″	6′- 9″	13′-3″
66 FC	10′-2″	4′-11⅜″	7′-10½″	1′-10½″	6′-3¾″	7′- 1¼″	9′- 1¼″	14′-5″

SPECIFICATIONS

STYLE S Coarse Crushing Gyraspheres

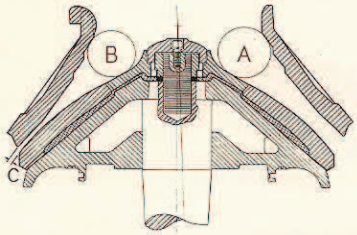
Size	H.P. Required (★)	Crusher Pulley R.P.M.	Pulley Size Dia. x Face Inches	Shipping Weight Lbs.	Weight Boxed for Export	Cu. Contents Export Boxed Cu. Ft.
24 S	25-30	725	24 x 10	9800	10000	160
245 S	25-30	725	24 x 10	10000	10200	160
36 S	60-75	600	28 x 12	24250	25000	340
367 S	60-75	600	28 x 12	25000	25750	340
48 S	125-150	525	34 x 14	43500	44600	650
489 S	125-150	525	34 x 15	44000	45100	650
66 S	200-250	500	40 x 15	91000	92600	1330
6614 S	200-300	500	40 x 15	93000	94600	1330

STYLE FC Fine Crushing Gyraspheres

Size	H.P. Required (★)	Crusher Pulley R.P.M.	Pulley Size Dia. x Face Inches	Shipping Weight Lbs.	Weight Boxed for Export	Cu. Contents Export Boxed Cu. Ft.
24 FC	30-40	725	24 x 10	10000	10200	160
36 FC	75-100	600	28 x 12	25000	25750	340
48 FC	150-200	525	34 x 15	44500	45600	650
66 FC	200-300	530	40 x 15	93400	95000	1330

★The horsepower required varies with the capacity, the hardness of the rock or ore and the size of the discharge opening. Wet, sticky material, excessive fines in the feed and close discharge openings may increase horsepower requirements.

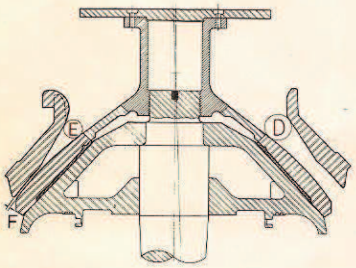
CAPACITIES



Diagrams and tables show the open and closed side feed openings, and the closed side discharge openings of Telsmith Style S Gyraspheres.

STYLE "S" GYRASPHERE

Size	Type of Bowl	Feed Opening "A" Open Side	Feed Opening "B" Closed Side	Recommended Minimum Discharge Opening "C" (†)	Capacities in Tons Per Hour at Indicated Discharge Opening "C." Tons of 2000 Lbs. Material Weighing 100 Lbs. Cu. Ft. (★) ¼"	⅜"	½"	⅝"	¾"	⅞"	1"	1¼"	1½"	2"	2½"
24 S (2 Ft.)	Coarse Medium	3½" 2½"	3" 1⅞"	⅜" ¼"	17	22	27	32	37	42	47	53		(†)	
245 S (2 Ft.)	Coarse	4⅝"	4⅛"	½"			27	32	37	42	47	53			
36 S (3 Ft.)	Ex. Coarse Coarse Medium	7⅛" 5¼" 4½"	6¼" 4⅝" 3¾"	¾" ½" ⅜"		36	41	56	71	77	83	89	105	110	
367 S (3 Ft.)	Coarse	7¾"	6½"	¾"					71	77	83	89	105	110	
48 S (4 Ft.)	Ex. Coarse Coarse Medium	8½" 7½" 5½"	7½" 6¾" 4½"	¾" ¾" ½"			85	110	135	155	170	185	200	215	230
489 S (4 Ft.)	Coarse	10"	9"	1"				(†)			170	185	200	215	230
66S (5½ Ft.)	Coarse Medium	11" 9"	10" 8"	1" ¾"			(†)		200	235	275	320	365	410	455
6614S (5½ Ft.)	Coarse	15"	14"	1½"						(†)		320	365	410	455



Diagrams and tables show the open and closed side feed openings, and the closed side discharge openings of Telsmith Style FC Gyraspheres. The FC diagram also shows distributing plate used on the fine crushers.

STYLE "FC" GYRASPHERE

Size	Type of Bowl	Feed Opening "D" Open Side	Feed Opening "E" Closed Side	Recommended Minimum Discharge Opening "F" (†)	Capacities in Tons Per Hour at Indicated Discharge Opening "F." Tons of 2000 Lbs. Material Weighing 100 Lbs. Cu. Ft. (△). ⅛"	3⁄16"	¼"	⅜"	½"	⅝"	¾"	⅞"
24 FC 2 Ft.	Coarse Medium Fine	2½" 1¾" 1¼"	1⅞" 1⅛" ½"	¼" 3⁄16" ⅛"	6	8	10	14	20	25	30	
36 FC 3 Ft.	Coarse Medium Fine	3" 2" 1¾"	2" 1⅛" ⅜"	5⁄16" ¼" 3⁄16"		22	32	42	52	62	72	80
48 FC 4 Ft.	Coarse Medium Fine	4" 3" 2"	2⅞" 1⅞" 1"	⅜" 5⁄16" ¼"			55	80	105	130	155	180
66 FC 5½ Ft.	Coarse Medium	5¾" 4½"	4" 2½"	½" ⅜"			95	140	180	215	250	280(†)

(*) Capacities shown are average and are neither maximum nor minimum. Capacities are in tons of 2,000 lbs. and are based on crushing clean, dry stone or ore weighing loose about 100 lbs. per cubic foot with a specific gravity of 2.6. Wet, sticky material will tend to reduce capacities especially at close discharge settings.

No crusher, when set with any given discharge opening will make a product all of which will pass a screen opening of the same dimension as the discharge opening. The amount of oversize will vary with the character of stone or ore. For maximum efficiency all undersize material should be removed from crusher feed.

To secure capacities shown, all feed to crushers should be smaller than the feed opening in at least one dimension.

(★) Capacities of Style S Gyraspheres are based on OPEN CIRCUIT crushing, one pass through the crusher.

(△) Capacities of Style FC Gyraspheres are based on CLOSED CIRCUIT crushing, and show net tons per hour that will pass through a square screen opening of the same size as the closed side discharge setting, assuming normal screen efficiency.

(†) Consult factory for settings smaller than minimum shown.

ANEXO 06: Cotización de Equipos

河南宏基矿山机械有限公司
HENAN HONGJI MINE MACHINERY CO.,LTD
Add: No.668 West Zhongyuan Road, Zhengzhou City, China
Tel:0086-371-67668558 Cell phone: 86-15038349509 E-mail:claire@chinahongji.com

Quotation List

卖方：**The Sellers**：Henan Hongji Mine Machinery Co.,Ltd.
地址：**Address**：No.668, West zhongyuan Road, Zhengzhou, China.
邮编：**Postal Code**： 450042
电话：**Tel**： 0086-371-67668558
传真：**Fax**：0086-371-67662768

I Quotation for 60 tph stone crushing line：

No.	Equipment Name	Model	Power (KW)	Quantity	EXW Price (USD)
1	Vibrating Feeder	GZD-1800x800	1.1x2	1	4,566.8
2	Jaw Crusher	PE-400x600	30	1	13,374.2
3	Belt conveyor	Width=500 , Long=11m	1.5-3	1	1,794.1
4	Cone crusher	PYZ900	55	1	39,144
5	Bucket elevator	Elevation of 4 meters, 60t/h	11-37	1	3,783.92
Total Price EX Work Price 62,663.02 USD					

ANEXO 07: Tablas de Motores Eléctricos

1. Cotización de Motores

Marca Baldor									
Potencia	**Voltaje**	**RPM**	**Frame**	**PRECIO**	**EFICIENCIA (%)**	**PESO (LB)**	**Altitud de Trabajo**	**Metodo de Arranque**	**Acople**
3 HP	380 V	1800	145TC	$ 293.35	86.5	62	2500 msnm	Directo	Fajas
5 HP	380 V	1800	184TC	$ 301.04	87.5	74	2500 msnm	Directo	Engranaje
7.5 HP	380 V	1800	213TC	$ 444.08	88.5	115	2500 msnm	Directo	Fajas
40 HP	380 V	1800	324T	$ 1,928.33	94.1	378	2500 msnm	Directo	Fajas
75 HP	380 V	1800	365T	$ 3,288.33	95	597	2500 msnm	Directo	Fajas

Marca ABB									
Potencia	**Voltaje**	**RPM**	**Frame**	**PRECIO**	**EFICIENCIA (%)**	**Nm**	**Altitud de Trabajo**	**Metodo de Arranque**	**Acople**
3 HP	380 V	1800	100L4A	$ 202.23	82.1	12.2	2500 msnm	Directo	Fajas
5 HP	380 V	1800	112M4A	$ 243.20	85.4	20.4	2500 msnm	Directo	Engranaje
7.5 HP	380 V	1800	112L4A	$ 361.44	83.5	35	2500 msnm	Directo	Fajas
40 HP	380 V	1800	180L4B	$ 1,401.00	90	116	2500 msnm	Directo	Fajas
75 HP	380 V	1800	225M4B	$ 2,364.96	93	338	2500 msnm	Directo	Fajas

2. Relaciones de Transmisión

RELACIONES DE TRANSMISION					
Equipo	**RPM Volante**	**Potencia Motor (HP)**	**RPM Motor**	**Relación de Transmisión**	**Acople**
Alimentador Vibratorio	500	3	1800	0.28	Fajas Trapezoidales
Trituradora de Mandíbulas	275	40	1800	0.15	Fajas Trapezoidales
Elevador de Cangilones	35	7.5	1800	0.02	Fajas Trapezoidales
Trituradora Cónica	775	75	1800	0.43	Fajas Trapezoidales
Faja Transportadora	55	5	1800	0.03	Moto reductor

3. Parámetros de Selección del Grupo Electrógeno

PARAMETROS DE SELECCIÓN DE GRUPO ELECTROGENO					
Equipo	**Potencia Nominal (KW)**	**Tensión (V)**	**Tipo de Arranque**	**Factor de Arranque**	**Potencia de Partida (KW)**
Alimentador Vibratorio	2.24	380	Directo	4	8.952
Trituradora de Mandíbulas	29.84	380	Directo	4	119.36
Elevador de Cangilones	5.60	380	Directo	4	22.38
Trituradora Cónica	55.95	380	Directo	4	223.8
Faja Transportadora	3.73	380	Directo	4	14.92
Total Potencia Nominal	97.35		**Total Potencia con Factor de Arranque**		389.412
Factor de Potencia	0.8				
Potencia Aparente Nominal del Generador		121.69 KVA	**Potencia Aparente en el Arranque del Generador**		486.77 KVA