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Pocket Reference Book

Disclaimer

Throughout the Terex MPS Pocket Reference Book, we've made every effort to provide accurate and up-to-date information. However, a variety of factors—such as engineering advancements, specification changes, physical properties of materials, feed rates and methods, moisture levels, altitude, and other operational conditions—can influence equipment performance, ratings, and results.

As a result, the data presented should be used as a general guideline. Actual field results may vary from the estimates provided. Please note that all specifications are subject to change without notice.

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Lockout Tagout



WARNING - Failure to follow good lockout and tagout procedures could result in death or serious injury.

What is the purpose of lockout/tagout?

1) Prevent the unexpected or accidental start-up of equipment and to notify other workers when a piece of equipment is unsafe to operate.
2) Prevent injury to personnel from energy that is stored in devices such as springs, accumulators, hydraulic systems, batteries, etc.

How do I lockout and tagout equipment?

1) Turn the master key to the OFF position and remove the key.
2) Disconnect the batteries.
3) Regardless of which lockout method is used, place one or more tags on machine controls or access doors to let other workers know that maintenance is being performed on the machine and/or the machine is unsafe to operate.

Who is responsible for establishing and administering a lockout/tagout program?

1) The employer must establish a lockout/tagout system of procedures, training and periodic inspection before any employee operates, services or maintains a piece of equipment per 29 CFR part 1910 of OSHA regulations.
2) All employees are responsible for seeing that equipment is locked out and tagged out according to the employers policies.

When is lockout and tagout necessary?

1) Any time repairs or maintenance on a machine are to be performed.
2) When cleaning or lubricating the machine.
3) While clearing blocked or jammed mechanisms.
4) Any time that the equipment will be left unattended.

Who should apply a lock or tag?

1) Any maintenance person who will be working on the equipment.
2) The foreman or team leader responsible for the job.
3) Anyone who will be working on the equipment.
4) If several people will be working on a piece of equipment, each person must apply their own tag.

Who can remove a lock or tag?

1) Only the person who applied a lock or tag can remove it.

Safety Alert Symbol



The safety alert symbol is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Hazard Classification

The signal words DANGER, WARNING and CAUTION are used to identify hazard levels in this book and Cedarapids Operation & Maintenance manuals. They will also be found on decals located on the equipment. The following signal words used with the safety alert symbol indicate a specific level of severity of the potential hazard. Signal words used without the safety alert symbol relate to property damage and protection only.



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a situation which, if not avoided, may result in property or equipment damage.

NOTICE

The signal word NOTICE is used to identify installation, operation or maintenance information which is important but not hazard related.

General Safety

This section contains important guidelines in the operation of your Terex Cedarapids crushing equipment. Carefully read the entire Operation & Maintenance manual supplied with your equipment before attempting to operate the equipment.

1) Install all guards and covers before operating machinery.
2) Never attempt to install or remove any part of assembly when the equipment is running.
3) All guards and protective devices must be in place when the equipment is being operated.
4) Keep all personnel clear when equipment is operating.
5) Do not refuel with the engine running. All sparks and open flames must be kept a minimum of 50 feet away from the equipment when refueling.
6) Do not operate this equipment until you have been trained in its operation or maintenance. This equipment may only be operated or maintained by trained personnel, who have demonstrated their ability to do so safely.

7) Keep this and all Operation & Maintenance manuals for future reference.
8) Read, understand and follow all current OSHA, federal, state and local regulations that are applicable to your job and equipment.
9) This equipment must be used in accordance with all operating and maintenance instructions.
10) All persons involved with this equipment must be familiar with this manual.
11) Read, understand and follow all DANGER, WARNING, CAUTION and instruction decals on the equipment.
12) When changing the configuration or adding equipment, all additional guards associated with the added equipment must be installed before operating.
13) Any changes made to the original design of the equipment must be approved by qualified personnel to ensure that the changes include appropriate guarding and provide a safe working environment for all personnel.
14) Wear clothing that fits snug to prevent getting caught in moving parts. Loose-fitting clothing should never be worn.
15) Mount and dismount all equipment using only the steps, handrails and walkways provided. Always face the ladder and always have both hands and at least one foot in contact with the ladder while mounting or dismounting.
16) Allow only the operator on the operator's platform when equipment is in operation.
17) Before staring, make sure all personnel and their equipment are clear of the machine.
18) Wear protective mask when fumes are present.
19) Wear safety goggles, gloves and long-sleeve shirts when working near hot asphalt materials.
20) Wear ear plugs while equipment is running.
21) Keep operator's platform, steps and walkways clear of all obstructions, tools and other items to prevent tripping or falling.
22) To prevent fire hazards, keep the engine basket area free of oil and trash buildup.

Identification of Units and Plants

Abbreviations:

S/N = Serial Number
P/L = Parts List Number
SPO = Shop Order Number

Locations of Serial Plates

The following locations are where the serial plates should be found:

Crushing Equipment

Serial plate location plus serial number to be stamped in the parent metal adjacent to the serial plate.

Jaw Crusher	Left hand side of the stationary jaw end below top rib of the side plate
Rollercone Crusher	Located on base frame opposite side of driven sheave
VSI (Vertical Shaft Impactor)	Located on opposite side of driven sheave of lower tub
Roll Crusher	Left hand side of the base frame and the adjustment end
Hammermills	Left hand side of the body just below the body's top flange
Limemills	Left hand side of the body just below the body's top flange
SIIB (Single Impeller)	Along the breaker door on the crusher side sheet
DIIB (Double Impeller)	Along the breaker door on the crusher side sheet
Feeders (Apron & Reciprocating)	On the drive sprocket side of the frame
Vibrating Grizzly Feeder/VGF	On left hand side on the intake end of feeder box
Vertical Inclined Screens/VIS	On left hand side on the intake end of screen box
Grizzly (Vibrating & Stationary)	On left hand side on the intake end of feeder box
Horizontal Screen (TSV, TSH, FSG & CR)	Located near center of screen base on the right hand side of the screen
Inclined Screen	Located on the reinforcing plate near the vibrator, on the left hand side of the screen
End-O-Con Screen	On the left side of the screen on the side sheet of the box near the intake end
Conveyors & Belt Feeders	Right hand side of the tail section
HSI (Horizontal Shaft Impactor)	Left hand side, lower frame, below hydraulic cylinder
Portable Crushing Plants	Looking at the kingpin end, serial plate is on the front cross member of the truck frame
Portable Screening Plants	Looking at the kingpin end, serial plate is on the front cross member of the truck frame

Serial Number/Date Record

Serial Number	Date	Serial Number	Date
3500	9/35	34120	1/75
4000	4/37	34720	1/76
4500	5/39	35190	1/77
5500	12/41	35790	1/78
6000	4/42	36326	1/79
7000	11/43	37180	1/80
7500	12/44	37910	1/81
8500	8/45	38460	1/82
9500	7/46	38760	1/83
10500	3/47	39090	1/84
11500	6/48	39420	1/85
12000	4/49	39810	1/86
12500	2/50	40290	1/87
13000	1/51	40918	1/88
14500	7/52	41526	1/89
15000	7/53	42195	1/90
15650	6/54	42772	1/91
16400	6/55	43248	1/92
17300	3/56	43637	1/93
18900	6/57	44062	1/94
19900	6/58	44630	1/95
20920	3/59	45400	1/96
22260	6/60	45735	1/97
22850	1/61	47214	1/98
23650	1/62	47703	7/98
24500	1/63	48187	1/99
25400	1/64	48729	7/99
26300	1/65	49198	12/99
27400	1/66	49970	6/00
28550	1/67	50640	12/00
29540	1/68	50950	6/01
30300	1/69	51130	12/01
31000	1/70	51200	1/02
31750	1/71	51800	12/02
32300	1/72	52000	2/03
32870	1/73	52400	10/03
33450	1/74	52500	Consult Factory

Crushing and Screening PIN Model Numbers Beginning July 1, 2008

World	*Machine*	*Random Letter*	*Factory*	*Year*	*Month*	*Sequence*
TRX	CRS620H	A-Z	OK	K	A	0001

i.e. TRXS620HSAOKKA1175

Year Code

2007 = 7	2018 = J
2008 = 8	2019 = K
2009 = 9	2020 = L
2010 = A	2021 = M
2011 = B	2022 = N
2012 = C	2023 = P
2013 = D	2024 = R
2014 = E	2025 = S
2015 = F	2026 = T
2016 = G	2027 = V
2017 = H	2028 = W

Jan = A
Feb = B
March = C
April = D
May = E
June = F
July = G
August = H
Sept = J
Oct = K
Nov = L
Dec = M

Month Code

Machine Description

Static units will start with a letter and end with a numerical digit.

Screen = S####
Impactors = B####
Jaws = J####
Rollercones = R####
Feeders = F####

Portable plants will begin with numerical digit and end with a letter.

Modular plants will begin with a letter "M" and end with a numerical digit.

ElJay Serial and Plant Number Explanations

All ElJay manufactured units (built before September, 1995) had a serial number that is designated in the following format: two numbers, a letter and four numbers (12A3456) The first number indicates the type of equipment. 2 indicates a crusher, 3 a screen and 4 a plant. The next number is used with the first number to determine the type of crusher, screen or plant.

21 - 36" crusher
22 - 45" crusher
2A- 45" RCII crusher
23 - 54" crusher
2B- 54" RCII crusher
24 - 60" crusher
25 - 66" crusher
26 - 72" crusher
27 - Sand cone
28 - VSI
29 - Rebuilt crusher
32 - Incline screen
34 - Flat screen with gears
35 - Heavy scalper
39 - Rebuilt screen
41 - Plant w/crusher only
42 - Plant w/screen & crusher
43 - Screening plant
44 - Wet screen w/screw
45 - Plant with primary
49 - Rebuilt plant

The letter in the serial number indicates the month that the unit was built. The letters A-L are used with A being January and L being December. The next two numbers following the letter indicates what number crusher, screen or plant made that month (ie., 04 indicates the 4th unit built that month). The last two numbers indicate the year the equipment was made.

Examples:
23G0489 - A 54" crusher built in July, 1989. It was the fourth crusher built that month.
34I0977 - A flat screen with gears built in September, 1977. It was the ninth screen made that month.

Screen Model Numbers Explanations

FSG - Flat screen with gears
FS - Flat screen/chain
RH - Removable housing

The next digit in the serial number is the width of the screen. The next two digits after the screen width is the length of the screen. The last digit indicates the number of decks on the screen.

Following the serial number, there may be a two-digit number indicating the drive assembly. Some of the more common numbers are 20, 22, 24, 26, 28 or 32. The bearing size can be determined by multiplying this number by 5. The result is the bearing diameter, in millimeters. These numbers may be followed by the following notations: QS - Quarry scalper, CS - Chip screen, S - Scalper, HS - Heavy scalper, FP - Fines pan, SP - Special.

Examples:
FSG 5163-26 = A flat screen with gears, 5' x 16', triple deck with a 26 drive assembly.
FSG 4143-24SP = A flat screen with gears, 4' x 14', triple deck special with a 24 drive assembly
RH 5121-22 = Four bearing, 5' x 12' single deck incline screen

Model	Crusher	Screen Size	Circuit	Other
1107	RC45	None	Open	
1142/4122	RC45	FSG 4122-24	Closed	2236 Jaw
1142/4143	RC45	FSG 4143-24SP	Closed	2236 Jaw
1145	RC45	FSG 5143-24SP	Closed	
1213	RC45	FSG 5143-24SP	Closed	Plate Feeder
1330	RC45	FSG 5163-26	Closed	Plate Feeder
CSC45 5163	RC45	FSG 5163-26	Closed	
CSC45II 6203	RC45II	FSG 6203-32	Closed	
CSC280 6203	MVP280	FSG 6203-32	Closed	
CSC380 6203	MVP380	FSG 6203-32	Closed	Special Axles
TP54	RC54	None	Open	Dual Cone Unit
1327	RC54	None	Open	Cone/VSI Combo
1140	RC54	FSG 5163-26	Open	
1200	RC54	None	Open	
1234S	RC54	None	Open	
C54	RC54	None	Open	45" Optional
C380	MVP380	None	Open	
C450	MVP450	None	Open	Triple Axle
1274/5163	RC54	FSG 5163-26	Open	
1274/6163	RC54	FSG 6163-32	Open	
1304	RC54	FSG 5142-24HS	Open	
1334	RC54	FSG 6163-32	Open	
1311	RC54	FSG 5163-26	Open	
1313/5163	RC54	FSG 5163-26	Closed	

Model	Crusher	Screen Size	Circuit	Other
1313/6163	RC54	FSG 6163-32	Closed	
1316	RC54	FSG 6203-32	Open	
1220	RC66	None	Open	
1482	VSI Unit	None	Open	
C1800	VSI 1800	None	Open	
C2100	VSI 2100	None	Open	
C2600	VSI 2600	None	Open	
1092	None	FSG 4142-24	Open	Eagle Sandscrew
1324	None	FSG 5163-26	Open	Eagle Sandscrew
1328	None	FSG 6163-32	Open	Eagle Sandscrew
1122	None	FSG 5163-26	Open	
1318	None	FSG 5163-26	Open	
1183	None	(2) FSG 6163-32	Open	Dual Screen Unit
S6203SB	None	FSG 6203-32	Open	1 Conveyor
S6203DB	None	FSG 6203-32	Open	Conveyors
S6203SC	None	FSG 6203-32	Open	Conveyors
S7203SB	None	FSG 7203-38	Open	1 Conveyor
1267	None	FSG 6203-32	Open	
1320	None	FSG 6203-32	Open	
1321	None	FSG 6203-32	Open	
1293	None	(2) FSG 6203-32	Open	Dual Screen Unit
1305	None	FSG 6163-32	Open	
1315	None	FSG 5142-26HS	Open	2236 Jaw
1317	None	None	Open	35" x 17' VGF
1319	None	Syntron Feeder	Open	Surge Bin Unit

Commander Capacity Chart

Model	Jaw	Roll	Screen	1-1/2"	1-1/4"	1"	3/4"
332	1024	3018	42" x 10'	180-265	155-225	110-165	90-130
432	1036	3018	42" x 10'	185-270	160-235	135-205	90-135
532	1236	3018	42" x 10'	185-270	160-235	135-205	90-135
544	1236	3025	48" x 12'	255-375	220-325	170-250	125-185
555	1236	3030	48" x 14'	270-400	230-340	170-250	135-200
565	1236	4026	48" x 14'	285-420	250-375	210-310	140-205
855	1242	3030	48" x 14'	300-445	255-385	195-290	145-280
865	1242	4026	48" x 14'	285-420	250-375	210-310	140-205
556	1236	3030	60" x 14'	270-400	230-340	170-250	135-200
566	1236	4026	60" x 14'	335-500	270-400	220-330	170-250
766	1636	4026	60" x 14'	335-500	270-400	220-330	170-250
856	1242	3030	60" x 14'	315-465	270-400	195-290	155-230
866	1242	4026	60" x 14'	355-525	315-465	260-385	175-260
777	1636	4132	60" x 16'	335-500	270-400	220-330	170-250
877	1242	4132	60" x 16'	400-600	315-470	260-400	200-295

Commander III Capacity Chart

Model	Jaw	Roll	Screen	1-1/2"	1-1/4"	1"	3/4"
567	1236	4026	60" x 16'	335-500	270-405	220-330	170-250
767	1636	4026	60" x 16'	335-500	270-405	220-330	170-250
967	1248	4026	60" x 16'	405-600	360-535	290-430	200-295
597	1236	4136	60" x 16'	335-500	270-405	220-330	170-250
797	1636	4136	60" x 16'	335-500	270-405	220-330	170-250
997	1248	4136	60" x 16'	405-600	360-535	290-430	200-295

Figures based on producing a single product from typical gravel pit gradation and weight (100 lbs./cu. ft.) proper feed and operating conditions (Roll shell surfaces and "gripper" beads must be properly maintained, particularly at finer settings). Rate may vary with type of material. Higher rates are maximum theoretical under ideal conditions

Commander Model Designations

Jaw	Roll	Screen
*1. 1016	1. 1616	1. 30" x 10'
*2. 1216 Twin	2. 2416	2. 42" x 10'
*3. 1024	3. 3018	3. 48" x 10'
4. 1036	4. 3025	4. 48" x 12'
	44. 3025-3	
5. 1236	5. 3030	5. 48" x 14'
*6. 1236 Twin	6. 4026	6. 60" x 14'
7. 1636	7. 4132	7. 60" x 16'
8. 1242	8. 3136	8. 72" x 16'
9. 1248	9. 4136	9. 72" x 20'
10. 1648		

Model 855 Commander has 1242 Jaw Crusher (8), 3030 Roll Crusher (5) and 48" x 14' Screen (5). *Consult factory for information regarding these unit.

How to Designate Right and Left Hand for Cedarapids Inc Products

All Single Jaw Crushers by facing the adjusting spring.

All Roll and Twin Jaw Crushers by facing the countershaft.

All Rollercone Crushers by facing pinion shaft.

All Vertical Shaft Crushers by facing pinion shaft.

All Hammermills by facing the breaker plate adjusting bolts.

All Limemills by facing side opposite cover.

All Impact Breakers and Horizontal Rotor Impact Breakers by facing the feed end.

All Conveyors by facing direction of material flow.

All Screens by standing at the intake end and facing the direction of material flow.

All Feeders by facing the direction the material flows.

For Portable Units stand at the rear of the plant facing the direction of forward travel.

For Stationary Plants stand at the feed end facing the direction of material flow.

Crusher Selection Guide

Use this guide to help you choose the crusher and configuration that's right for your primary, secondary or tertiary crushing needs. The following is a quick look at each crusher type and some basic selection parameters.

Jaw Crushers

The overhead eccentric jaw crusher is the most universally applicable primary crusher. In sedimentary rock to the hardest granites or basalts, this primary crusher operates effectively all over the world. The jaw crusher is a compression machine with a 6 to 1 reduction ratio. Generally in shot rock, material that is 90% of the feed opening is acceptable. Normally in gravel, because of the tendency of the material to be more rounded, feed that is 80% of the opening is recommended. As a general rule, discharge material is twice the crusher setting. Output gradation is changed by closing or opening the discharge setting.

Primary Horizontal Shaft Impact Crusher (HSI)

Recommend mainly for limestone and lower abrasive applications, single impeller impact breakers provide a cubical product even in slabby material, improve aggregate quality and increase plant capacity. The impact breaking action acts along natural cleavage lines to produce material with fewer thin sharp edges. Size of the impact breaker generally indicates the net feed opening after VGF grizzly is placed into the chamber opening. With reduction ratios up to 20 to 1, secondary crushing requirements are reduced when compared with a compression type primary. Impact breakers are normally used when material is 10-15% abrasives or less. Output gradation is generally changed by varying crusher speed and breaker bar setting.

Cone Crushers

Cone crusher have the same universal acceptance for secondary and tertiary crushing as jaws do for primary work. Cone crushers can be the "all -purpose" machine in most sand and gravels where a feed size up to 15" (385 mm) requires no primary. In shot rock, cones perform as intermediate and/or finishing crushers following a primary. For optimum performance, top feed size should be limited to an average between A and B, where A is the closed side feed opening and B is the open side feed opening. Cones, with a reduction ratio of up to 8 to 1 reduce material to a minimum of 3/4" (19 mm) minus. Cones can reduce material to a minimum of 1/4" (6 mm) minus with a reduction ratio of up to 6 to 1. Various liner configurations adapt each machine according to feed size and product requirements. Discharge gradation is changed by opening or closing the closed side setting.

Secondary Horizontal Shaft Impactor Crusher (HSI)

Combining the benefits of impact crushing with the application of high chrome technology, the secondary impactor provides a cubical product (necessary with today's tighter specifications) in material previously too abrasive for impacting. With a reduction ratio of up to 12 to 1, secondary impactors can reduce or replace finish crushing. Top size feed is approximately 12" (305 mm) to 22" (560 mm) with minimum product being ¾" (19 mm).

Output gradation is varied in two ways. The primary means is changing rotor speed. The higher the speed, the finer the product. Increasing the speed also increases wear. Secondly, adjusting the aprons also affects output gradation.

Roll Crushers

When a special product size is required, a roll crusher may be an often-forgotten tool. This compression type crusher produces more of a banded product range than any other crusher. A dual roll crusher is limited to a 2 to 2-½ to 1 reduction ratio. The triple roll is a 4 or 5:1 reduction machine. It is vitally important that feed material is spread across the face of the rolls to maximize production and

provide even wear. Output gradation is changed by opening or closing the discharge setting. Also, rolls are not affected by moisture or plasticity as are cone crushers.

Vertical Shaft Impact Crusher (VSI)

Like the HSI, the Vertical Shaft Impact Crusher combines impacting benefits with high chrome metallurgy. It is a finish crusher producing a desirable cubical product. Depending on crusher configuration, material as abrasive as 70-90% can be handled by the VSI. Feed size maximum is limited to 3/8" (10 mm) to 6" (152 mm) depending on crusher model and crushing chamber configuration. The VSI is an excellent machine for producing concrete rock, chips and manufactured sand. Anvils give better control of reduction flexibility; higher impeller speeds generate a finer product; the enclosed rock rotor saves wear cost in high abrasion materials and offers highest speed.

Hammermills/Limemills

In a high quality limestone, an abrasive content of less than 5% allows utilization of a mill-type crusher, providing the market exists for the considerable amount of fines generated. The hammermill is usually in a secondary application accepting up to an 8" (200 mm) feed and providing a reduction ratio of 20 to 1. Limemills are specifically designed for production of quality ag-lime and will accept feed size up to 4" (100 mm). Selecting the proper grates, breaker plate position and crusher speed determine the crusher gradation for both units.

Crushing Stage	Crusher Type	*Maximum Feed Size	Product Size
Primary	Jaw Crushers	48" (1200 mm)	3" to 20" (75 mm-500 mm)
	Horizontal Shaft Impactor	34" (865 mm)	2" to 16" (50 mm-400 mm)
Secondary and Tertiary	Secondary Cone	15" 385 mm)	3/4" to 4" (20 mm-100 mm)
	Horizontal Shaft Impactor	16" (400 mm)	3/4" to 4" (20 mm-100 mm)
	Hammermill	8" (200 mm)	4M to 1-1/2" (5 mm-40 mm)
	Roll	10" (250 mm)	1/4" to 4" (6mm-100 mm)
	Tertiary Cone	6" (150 mm)	1/4" to 5" (6 mm-125 mm)
	Vertical Shaft Impactor	6" (150 mm)	4M to 1-1/2" (5 mm-40 mm)
	Limemills	4" (100 mm)	10M to 4M (2 mm-5 mm)

* *Maximum feed size* will vary based on model and configuration.

JW, ST, and TJ Series Jaw Crushers

Jaw crushers are typically sized based on their gape and width dimensions. The gape refers to the space between the stationary and movable jaw liners (dies) at the top of the crushing chamber, which dictates the maximum size of the feed material that can be efficiently processed by the crusher. The width of a jaw crusher denotes the distance between the cheek plate liners, safeguarding the side sheets. This width parameter of the jaw controls capacity when stroked and closed side settings are held constant.

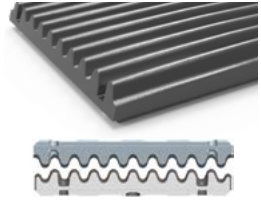
Recommended Closed Side Settings				
Model	Minimum		Maximum	
	in	mm	in	mm
JW42	3	76	7	177
JW55	3 1/2	89	8	203
ST47	4	102	9	228
TJ2440	2	50	5 3/4	146
TJ2844R	2	50	5	127

JW, ST, and TJ series jaw crushers measure closed side setting (CSS) is from tip to valley when jaws are as close together as possible at the discharge end. Material factors such as friability, work index, compressive strength, high fines content, and moisture content will also affect setting minimums.

Jaw Die Profiles

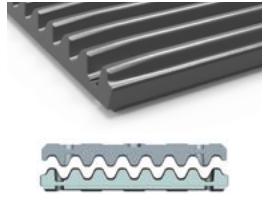
- JW Series models

Super Tooth (Medium Tooth)



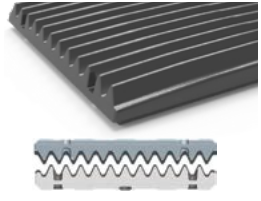
- Medium to hard rock applications
- Grips material to allow better crushing

Quarry Tooth



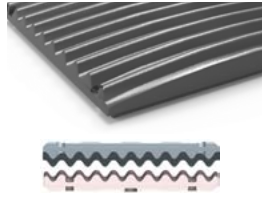
- Hard rock & high abrasive applications
- Deeper tooth profile allows for extra wear

Multi Tooth (Recycle Tooth)



- Recycling applications
- Good grip on smooth flat surfaces

Standard Tooth



- Recycling & soft rock applications
- Not available for all models

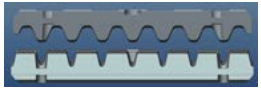
Heavy Duty Fixed Jaw Die

- JW Series models

- Designed for fixed side only
- Reduces the number of fixed die changes
- Can be used with Quarry or Super Tooth swing die



Quarry Tooth Swing & HD Fixed Jaw



Super Tooth Swing & HD Fixed Jaw



Jaw Fitted with Fixed Heavy Duty Die & Super Tooth Swing Die

JW, ST and TJ Factory Default Liners Alternate liners available at customer or application request.			
Model	Stationary Jaw Style	Movable Jaw Style	Tooth Type
JW42	Straight	Straight	Medium
JW55	Straight	Straight	Quarry
ST47	Straight	Straight	Quarry
TJ2440	Straight	Straight	Medium
TJ2844R	Straight	Straight	Medium

Grades of Liners Available for Jaw Crushers

14% Manganese: Good option for soft materials that may not have the compressive strength to properly work harden the higher grade manganese liners. In some soft materials it is not uncommon for 14% to outlast 18% or 21% liners due to properly work hardening. Liner is also more ductile than the higher grade liners.

18% Manganese: Selected as the *factory standard* because it's generally the best balance between cost, abrasiveness resistance, and ductility. A good choice for medium to hard rock with moderate to high abrasiveness. 18% can be used in virtually any application, but it may not be cost effective in soft rock due to the material not being hard enough to work harden the liner properly.

21% Manganese: Good option for hard materials where additional resistance to wear is worth the cost of the higher grade liner. Liner will harden faster and harder than the lower grades of liners, provided the material is sufficiently hard to properly work harden the liner.

JW, ST, AND TJ Jaw Crusher Capacity in tons & (metric tons)

Model / Closed Side Setting (CSS)	TJ2440	JW42	TJ2844R	ST47	JW55
2" 50.8mm	84-118 (76-107)		100-155 (91-141)		
2-1/2" 63.5mm	105-149 (95-135)		110-175 (100-159)		
3" 76.21mm	118-174 (107-158)	155-175 (135-160)	144-212 (131-192)		
3-1/2" 88.9mm	144-209 (130-189)	180-205 (165-185)	153-241 (139-218)		255-290 (230-255)
4" 101.6mm	157-247 (143-223)	210-235 (190-210)	167-279 (152-253)	209-231 (190-210)	295-330 (265-295)
4-1/2" 114.3mm	179-275 (163-249)	245-270 (220-240)	184-301 (167-273)	253-287 (230-260)	245-380 (310-340)
5" 127mm	200-300 (182-272)	270-295 (240-265)	201-321 (182-291)	292-325 (265-295)	380-410 (340-370)
6" 152.4mm		325-360 (290-320)	233-339 (212-308)	375-408 (340-370)	455-500 (405-450)
7" 177.8mm		375-425 (355-380)	259-425 (235-386)	452-496 (410-450)	525-595 (470-530)
8" 203.2mm				534-590 (485-535)	610-675 (545-605)

All capacities are based on 100 lbs. per cubic foot (1602 kg/m_3) weight of rock. Tonnage may vary depending on particle size of feed, rate of feed, proper operating conditions, breaking characteristics and compressing strength of rock. Type of faces and horsepower can also affect capacity.

JW, ST, AND TJ Jaw Crusher Specifications

Dimensions to nearest inch (mm) - weight to nearest pound (kg)

Model	TJ2440	TJ2844R	JW42	JW55	ST47
Weights	27,000 lbs	36,000 lbs	39,100 lbs	57,900 lbs	81,550 lbs
	12,200 kg	16,300 kg	17,740 kg	26,250 kg	36,990 kg
HP	150 (110 kw)	150 (110 kw)	150 (110 kw)	200 (150 kw)	200 (150 kw)
RPM	275	260	265	250	225
Jaw Opening	24 x 40"	28 x 44"	30x42"	32 x 55	36 x 48"
	600 x 1,000 mm	700 x 1,100 mm	760 x 1070 mm	820 x 1,400 mm	915 x 1,220 mm
Flywheel Diameter	48"	50"	55"	65"	67"
	1,220 mm	1,270 mm	1,400 mm	1,650 mm	1,700 mm
Flywheel Face	8-1/2"	16"	10"	11"	17"
	220 mm	405 mm	250 mm	275 mm	420 mm
Stationary Jaw Length	46"	49"	66"	70"	81"
	1,175 mm	1,240 mm	1,665 mm	1,775 mm	2,050 mm
Movable Jaw Length	53"	55"	69"	69"	81"
	1,340 mm	1,390 mm	1,750 mm	1,750 mm	2,050 mm

NOTES

JS and JC Series Jaw Crushers

Recommended Closed Side Settings									
Model	Minimum		Maximum		Model	Minimum		Maximum	
	in	mm	in	mm		in	mm	in	mm
JC1016	3/4	19	3-1/2	89	JC2436	2-1/2	64	6	152
JC1020	3/4	19	3-1/2	89	JC2438	4-1/2	114	8	203
JC1024	3/4	19	3-1/2	89	JC2542	3-1/2	89	10	254
JC1036	1-1/2	38	5	127	JC2742	3-1/2	89	10	254
JC1236	1-1/2	38	5	127	JC/JS3042	4	102	13	330
JC1242	1-1/2	38	5	127	JC/JS3054	3-1/2	89	11	280
JC1248	1-1/2	38	5	127	JC3242	4	102	13	330
JC1524	1-1/2	38	5	127	JC3648	4	102	13	330
JC1636	1-1/2	38	5	127	JC3660	4	102	13	330
JC1642	1-1/2	38	5	127	JS3750	4	102	13	330
JC1648	1-1/2	38	5	127	JC4242	14	356	23	584
JC1824	1-1/2	38	5	127	JC4248	4	102	13	330
JC2236	2-1/2	64	6	152	JC4552	4-1/2	114	13	330
JC2248	2-1/2	64	6	152	JC5460	6	152	20	508
					JC5748	19	483	28	711

Note: Not all sizes are currently produced.

Closed stroke is measured from crown to crown of jaw plates when jaws are as close together as possible at discharge end. Closed stroke settings are determined with new jaw plates and standard toggle plate. Jaw plate wear, toggle plate wear and type of toggle plate, if other than standard, will affect setting capability. Material factors such as friability, work index, compressive strength, high fines content, moisture content will also affect setting capability.

Minimum setting for standard duty jaw crusher based on 35,000 psi rock. For rock harder than 35,000 psi, consult factory.

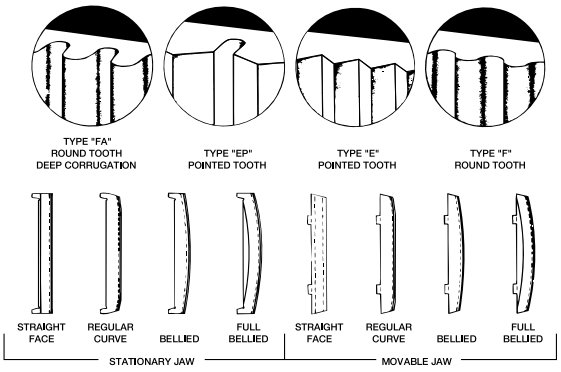
Warning - Do not exceed 6:1 reduction ratio at minimum settings.

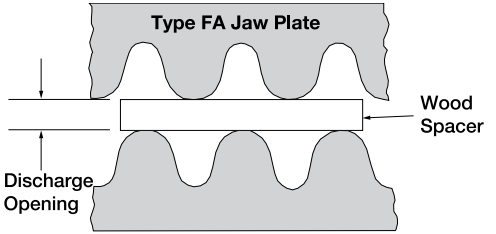
JC/JS Factory Default Liners Alternate liners available at customer or application request.			
Model	Stationary Jaw Style	Movable Jaw Style	Tooth Type
JC1016	Straight	Regular Curve	E
JC1020	Bellied	Regular Curve	E
JC1024	Bellied	Regular Curve	E
JC1036	Bellied	Regular Curve	FA
JC1236	Bellied	Regular Curve	FA
JC1242	Bellied	Regular Curve	FA
JC1248	Bellied	Regular Curve	FA
JC1524	Straight	Regular Curve	F
JC1636	Bellied	Regular Curve	FA
JC1642*	Bellied	Regular Curve	FA
JC1648	Bellied	Regular Curve	FA
JC1824	Straight	Regular Curve	F
JC1836	Regular Curve	Bellied	FA
JC2236	Regular Curve	Bellied	FA
JC2248	Regular Curve	Bellied	FA
JC2436*	Regular Curve	Bellied	EP
JC2438 †	Regular Curve	Bellied	FA
JC2542	Regular Curve	Bellied	FA
JC2742	Regular Curve	Bellied	FA
JC/JS3042	Regular Curve	Bellied	FA
JC/JS3054	Regular Curve	Bellied	FA
JC3242	Bellied	Regular Curve	FA
JC3648	Bellied	Regular Curve	FA
JC3660	Bellied	Bellied	FA
JS3750	Bellied	Regular Curve	FA
JC4242 ‡	Bellied	Regular Curve	FA
JC4248	Bellied	Regular Curve	FA
JS4552	Bellied	Regular Curve	FA
JC5460	Straight	Straight	FA
JC5748 ‡	Bellied	Regular Curve	FA

*Hard rock †Limestone ‡Rip-Rap

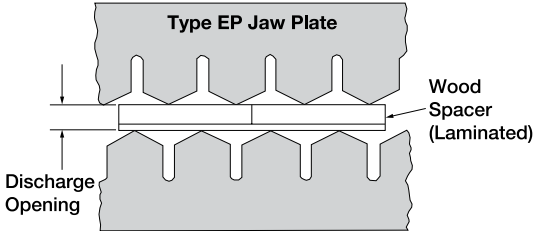
Standard & Special Jaw Plate Styles

Not all styles are available for all crusher models. Consult factory for information.





To set FA style jaws, use round bar of correct outside diameter set between jaws as shown.



To set EP or E style jaws, use a piece of wood cut to correct size and set between jaws as shown.

JS and JC Series Jaw Crusher Specifications
Dimensions to nearest inch (mm) - weights to nearest pound (kg)

Model	JC1016	JC1020	JC1024	JC1036	JC1236	JC1242	JC1248	JC1524	JC1636
Weights	5306	7000	8255	12551	13978	19936	24300	12305	21003
	(2406)	(3175)	(3744)	(5693)	(6340)	(9042)	(11022)	(5581)	(9527)
HP	20-30	25-50	40-50	55-70	60-75	70-100	80-120	40-60	60-90
RPM	300	250-300	250-300	250-300	250-300	250-300	250-300	250-300	250-300
Jaw Opening	10 x 16	10 x 20	10 x 24	10 x 36	12 x 36	12 x 42	12 x 48	15 x 24	16 x 36
	(255 x 405)	(255 x 510)	(255 x 610)	(255 x 915)	(305 x 915)	(305x1065)	(305x1220)	(380x610)	(405x915)
Standard Grooved Flywheel Diameter	30	36	36	36	36	42	42	36	42
	(760)	(915)	(915)	(915)	(915)	(1065)	(1065)	(915)	(1065)
Face Standard Flywheel	7	11	11	11	11	12	12	11	12
	(175)	(280)	(280)	(280)	(280)	(305)	(305)	(280)	(305)
Stationary Jaw Length	20	22	21	24	28	29	29	34	34
	(510)	(560)	(535)	(610)	(710)	(735)	(735)	(865)	(865)
Movable Jaw Length	26	27	27	27	31	33	34	40	41
	(660)	(685)	(685)	(685)	(785)	(840)	(865)	(1015)	(1040)

JS and JC Series Jaw Crusher Specifications
Dimensions to nearest inch (mm) - weights to nearest pound (kg)

Model	JC1642	JC1648	JC1824	JC1836	JC2236	JC2248	JC2436	JC2438	JC2542
Weights	33998	28406	12426	21280	24903	43094	46737	26017	42095
	(15421)	(12885)	(5636)	(9653)	(11296)	(19547)	(21200)	(11801)	(19094)
HP	100-130	100-150	40-60	60-90	90-125	125-175	125-150	90-125	125-175
RPM	250-300	250-300	250-300	250-300	250-300	225-275	225-275	250-300	225-275
Jaw Opening	16 x 42	16 x 48	18 x 24	18 x 36	22 x 36	22 x 49	24 x 36	24 x 38	25 x 42
	(405x1065)	(405x1220)	(455x610)	(455x915)	(560x915)	(560x1240)	(610x915)	(610x965)	(635x1065)
Standard Grooved Flywheel Diameter	55	42	36	42	50	57	57	55	57
	(1395)	(1065)	(915)	(1065)	(1270)	(1445)	(1445)	(1395)	(1445)
Face Standard Flywheel	13	12	11	12	12	15	15	13	15
	(330)	(305)	(280)	(305)	(300)	(375)	(380)	(330)	(380)
Stationary Jaw Length	38	34	33	34	43	45	53	43	57
	(965)	(865)	(840)	(865)	(1090)	(1145)	(1345)	(1090)	(1445)
Movable Jaw Length	45	41	40	41	50	56	65	50	63
	(1145)	(1040)	(1015)	(1040)	(1270)	(1420)	(1650)	(1270)	(1600)

JS and JC Series Jaw Crusher Specifications
Dimensions to nearest inch (mm) - weights to nearest pound (kg)

Model	JC2742	JC/JS3042	JC/JS3054	JC3242	JC3648	JC3660	JS3750	JC4242	JC4248	JS4552	JC5460	JC5748
Weights	45992	45500	53500	57137	79653	107664	80,000	58838	104567	104,600	196258	117000
	(20862)	(20638)	(24267)	(25917)	(36131)	(48836)	36,300	(26689)	(47431)	(47,500)	(89023)	(53071)
HP	125-175	125-175	150-200	150-200	200-250	250-300	250	150-200	250-300	250-300	350-450	250-300
RPM	225-275	225-275	225-275	225-275	200-250	210-235	250	225-275	200-225	225	200	200-225
Jaw Opening	27 x 42	30 x 43	30 x 54	32 x 44	36 x 49	36 x 61	37 x 50"	42 x 43	42 x 52	45 x52	54 x 61	57 x 48
	(685x1065)	(760x1090)	(760x1370)	(810x1130)	(915x1255)	(915x1550)	(940 x 1,270)	(1065x1090)	(1065x1330)	(1145 x 1320)	(1370x1550)	(1445x1220)
Std. Grooved Flywheel Diameter	57	57	57	57	73	73	60	57	73	73	84	73
	(1445)	(1445)	(1445)	(1445)	(1845)	(1845)	1,525	(1445)	(1845)	(1855)	(2135)	(1845)
Face Standard Flywheel	15	18	18	18	13	13	13	18	13	13"	20	13
	(380)	(450)	(450)	(450)	(330)	(330)	(330)	(450)	(330)	(330)	(520)	(330)
Stationary Jaw Length	57	57	57	68	77	77	77	68	90	90	113	90
	(1445)	(1455)	(1455)	(1740)	(1955)	(1955)	(1955)	(1740)	(2275)	(2290)	(2870)	(2275)
Movable Jaw Length	65	65	65	75	85	85	85	75	98	98	129	98
	(1650)	(1650)	(1650)	(1915)	(2150)	(2150)	(2160)	(1915)	(2475)	(2490)	(3275)	(2475)

NOTES

JC/JS Jaw Crusher Capacity in tons & (metric tons)

Model / Closed Side Setting (CSS)"	JC1016	JC1020*	JC1024* JC1524* JC1824*	JC1036* JC1236* JC1636* JC1836* JC2236* JC2436* JC2438*
3/4" 19mm	10-20 (9-18)	10-25 (9-23)	10-30 (9-27)	
1" 25.4mm	15-25 (14-23)	15-35 (14-32)	15-40 (14-36)	
1-1/2" 38.1mm	20-35 (18-32)	20-45 (18-41)	25-55 (23-50)	40-80 (36-73)
2" 50.8mm	25-45 (23-41)	30-55 (27-50)	35-70 (32-64)	50-100 (45-91)
2-1/2" 63.5mm	30-55 (27-50)	35-65 (32-59)	40-80 (36-73)	60-120 (54-109)
3" 76.21mm	30-65 (27-54)	40-75 (36-68)	45-95 (41-86)	70-140 (64-127)
3-1/2" 88.9mm	35-75 (32-68)	45-90 (41-82)	55-105 (50-95)	80-160 (63-145)
4" 101.6mm			60-120 (54-109)	85-165 (77-150)
4-1/2" 114.3mm			70-140 (64-127)	95-190 (86-172)
5" 127mm			80-160 (63-145)	115-230 (104-209)
6" 152.4mm				135-265 (122-240)
7" 177.8mm				170-340 (154-308)
8" 203.2mm				190-380 (172-345)

All capacities are based on 100 lbs. per cubic foot (1602 kg/m3) weight of rock. Tonnage may vary depending on particle size of feed, rate of feed, proper operating conditions, breaking characteristics and compressing strength of rock. Type of faces and horsepower can also affect capacity.

* CSS based capacities are not available for each size. See previous table for min and max CSS for each model.

JC/JS Jaw Crusher Capacity in tons & (metric tons)

Model / Closed Side Setting (CSS)	JC1242* JC/JS2442* JC2742*	JC/JS3242 JC3042	JC/JS1248* JC1648* JC2248*	JC3648 JC4248 JC5748	JS3750	JS4552	JC/JS3054 JC3660 JC5460
1-1/2" 38.1mm	50-100 (41-91)		55-105 (50-95)				
2" 50.8mm	60-120 (54-109)		*65-135 (60-122)				
2-1/2" 63.5mm	70-140 (64-127)		80-160 (63-145)				
3" 76.21mm	80-160 (63-145)		95-185 (86-168)				
3-1/2" 88.9mm	90-180 (82-163)		105-215 (95-195)				
4" 101.6mm	105-210 (95-190)	130-260 (118-236)	115-225 (104-204)	180-360 (163-327)	200-395 (181-358)		250-500 (226-453)
4-1/2" 114.3mm	120-240 (109-218)	150-300 (136-272)	125-255 (113-231)	200-400 (182-364)	225-450 (204-408)	225-450 (204-408)	300-600 (272-544)
5" 127mm	135-270 (122-245)	170-340 (154-308)	150-305 (136-277)	225-450 (204-408)	255-510 (231-463)	255-510 (231-462)	350-700 (317-635)
6" 152.4mm	165-330 (150-299)	200-400 (182-364)	180-360 (163-327)	275-550 (249-498)	315-625 (286-567)	315-625 (286-567)	425-850 (385-770)
7" 177.8mm	195-390 (177-354)	230-460 (209-418)		315-630 (286-572)	360-715 (327-649)	360-715 (327-684)	485-970 (440-880)
8" 203.2mm	225-450 (204-408)	260-520 (236-520)		360-720 (327-654)	420-820 (381-744)	420-820 (381-744)	560-1120 (508-1016)
10" 254mm	285-570 (258-517)	320-640 (290-580)		450-900 (408-816)	515-975 (467-885)	515-975 (467-884)	710-1420 (644-1288)
12" 304.8mm		400-800 (364-728)		550-1100 (499-998)		650-1300 (590-1179	850-1700 (771-1542)

All capacities are based on 100 lbs. per cubic foot (1602 kg/m3) weight of rock. Tonnage may vary depending on particle size of feed, rate of feed, proper operating conditions, breaking characteristics and compressing strength of rock. Type of faces and horsepower can also affect capacity.*

* CSS based capacities are not available for each size. See previous table for min and max CSS for each model.

Percent Passing (Open Circuit)
Jaw Crusher Gradation Chart

Product Size	Crusher Closed Side Setting							
	3/4"	1"	1-1/2"	1-3/4"	2"	2-1/4"	2-1/2"	2-3/4"
5"							100	100
4"							95	90
3-1/2"						100	89	81
3"					100	93	80	72
2-3/4"				100	96	88	75.5	67.5
2-1/2"				96	91	82	70	62.5
2-1/4"			100	93	85	76	65	58
2"		100	95	87	79	69	57	53
1-3/4"		98	90	80	72	62	52	48
1-1/2"	100	92	82	71	62	54.5	45	42
1-1/4"	97	86	75	62.5	55	48	40	37
1"	90	73	62	52	46	40	33.5	31
7/8"	86	66	56	46.5	41.5	36	30	28
3/4"	75	55	47	39	34.5	30.5	25.5	22.5
5/8"	67	49.5	42.5	35.2	31	27.2	22.5	21
1/2"	56	41.5	35.5	29.8	26	23	19.4	18
3/8"	42	31	27	22.5	19.5	17.5	14.6	13.7
5/16"	38	28	24	20	17.6	15.7	13.2	12.3
1/4"	31.5	23	20	17	14.8	13	11.2	10.3
4M	24	17.5	15	12.5	11.2	10	8.5	8
8M	13.5	9.9	8.5	7.3	6.4	5.7	4.9	4.6
10M	11.4	8.3	7.2	6.2	5.4	4.8	4.1	3.9
16M	6.8	5	4.4	3.8	3.3	2.9	2.5	2.4
30M	3.8	2.9	2.5	2.2	1.9	1.7	1.5	1.4
40M	2.9	2.1	1.9	1.7	1.4	1.3	1.2	1.2
50M	2.3	1.6	1.4	1.3	1.1	1	1	1
100M	1.3	1	.8	.7	.6	.5	.5	.5

Percent Passing (Open Circuit)
Jaw Crusher Gradation Chart

Product Size	Crusher Closed Side Setting								
	3"	3-1/2"	4"	5"	6"	7"	8"	9"	10"
+10"					100	100	100	100	100
10"					94	82	73	66	60
9"				100	88	76	68	61	55
8"				93	80	69	61	55	50
7"			100	83	72	62	54	48.5	44
6"	100	100	90	74	63	54	47.5	42.5	38.5
5"	96	87	78	64	54	47	41	36	32
4"	84	74	65	54	46	40	34	30	27
3-1/2"	76	66	58	48	41	35.5	30.5	26.5	23.5
3"	67	58	52	43	36.5	31.5	27	23.5	20.5
2-3/4"	62.5	54	48.5	40	34	29.5	25	21.8	19
2-1/2"	58	50	45	37	31.5	27	23	20	17.5
2-1/4"	53.5	46.5	41.5	34	29	25	21.3	18.3	16
2"	49	42.5	38	31	26.5	23	19.5	16.5	14.4
1-3/4"	44	38.5	34.5	28	24	20.5	17.5	14.7	12.6
1-1/2"	38.5	34	30.5	24.5	21	18	15	13	11
1-1/4"	34	30	27	22	18.5	15.9	13.2	11.3	9.6
1"	28.5	25	22.5	18.5	15.5	13.4	11.2	9.5	7.9
7/8"	26	22.5	20.1	16.5	14	11.9	10	8.4	7
3/4"	22	19	17.3	14	12	10.2	8.5	7	5.8
5/8"	19.5	17	15.5	12.5	10.8	9.1	7.6	6.3	5.2
1/2"	16.5	14.8	13.3	10.8	9.2	7.8	6.5	5.3	4.3
3/8"	12.7	11.2	10.2	8.2	7	5.9	4.8	3.9	3.1
5/16"	11.3	10	9.1	7.4	6.3	5.2	4.3	3.5	2.8
1/4"	9.7	8.6	7.8	6.3	5.3	4.4	3.6	2.9	2.3
4M	7.4	6.0	5.9	4.8	4	3.4	2.7	2.2	1.7
8M	4.3	3.8	3.4	2.8	2.4	2.0	1.6	1.2	1
10M	3.7	3.2	2.9	2.4	2.0	1.7	1.4	1	.8
16M	2.3	2	1.8	1.5	1.3	1	.9	.7	.5
30M	1.3	1.2	1.1	.9	.8	.6	.6	.4	.3
40M	1.1	1.0	.9	.7	.6	.5	.5	.3	.24
50M	.9	.8	.8	.6	.5	.4	.4	.2	.2
100M	.5	.4	.4	.3	.3	.2	.2	.1	.1

Twin Jaw Crusher Capacity

Crusher Size	HP Required	Size Opening Closed Stroke				
		1"	1-1/4"	1-1/2"	2"	2-1/2"
1216	20-40	15-25	18-35	20-45	25-55	36-60
1236	75-125		35-75	45-95	60-120	70-140
1836	75-125				60-120	70-140

Crusher Size	HP Required	Size Opening Closed Stroke				
		3"	3-1/2"	4"	4-1/2"	5"
1216	20-40	35-70				
1236	75-125	80-160	90-175	100-190		
1836	75-125	80-160	90-175	100-190	120-220	140-250

All capacities are based on 100 lbs. per cubic foot (1602 kg/m^3) weight of rock. Tonnage may vary depending on particle size of feed, rate of feed, proper operating conditions, breaking characteristics and compressing strength of rock. Type of faces and horsepower can also affect capacity.

Twin Jaw Crusher Estimated Product Gradation Chart Guide (Open Circuit)

All figures shown in percent (%)

Product Size (inches)	Crusher Closed Side Setting (in inches)												
	3/4	1	1-1/4	1-1/2	1-3/4	2	2-1/4	2-1/2	2-3/4	3	3-1/2	4	5
9 x 8													7.0
8 x 7													10.0
7 x 6												10.0	9.0
6 x 5										4.0	13.0	12.0	10.0
5 x 4								5.0	10.0	12.0	13.0	13.0	10.0
4 x 3-1/2							7.0	8.0	9.0	8.0	8.0	7.0	6.0
3-1/2 x 3						7.0	9.0	9.0	9.0	9.0	8.0	6.0	5.0
3 x 2-3/4					4.0	5.0	4.5	4.5	4.5	4.5	4.0	3.5	3.0
2-3/4 x 2-1/2				4.0	5.0	6.0	5.5	5.5	5.0	4.5	4.0	3.5	3.0
2-1/2 x 2-1/4				3.0	6.0	6.0	5.5	5.0	4.5	4.5	3.5	3.5	3.0
2-1/4 x 2			5.0	6.0	6.0	7.0	6.5	6.0	5.0	4.5	4.0	3.5	3.0
2 x 1-3/4		2.0	5.0	7.0	7.0	7.0	6.0	5.0	5.0	5.0	4.0	3.5	3.0
1-3/4 x 1-1/2		6.0	8.0	9.0	10.0	7.5	7.0	7.0	6.0	5.5	4.5	4.0	3.5
1-1/2 x 1-1/4	3.0	6.0	7.0	8.5	7.0	6.5	6.0	5.0	5.0	4.5	4.0	3.5	2.5
1-1/4 x 1	7.0	13.0	13.0	10.5	9.0	8.0	7.0	6.5	6.0	5.5	5.0	4.5	3.5
1 x 7/8	4.0	7.0	6.0	5.5	4.5	4.0	3.5	3.5	3.0	2.5	2.5	2.4	2.0
7/8 x 3/4	11.0	11.0	9.0	7.5	7.0	5.5	5.0	4.5	4.5	4.0	3.5	2.8	2.5
3/4 x 5/8	8.0	5.5	4.5	3.8	3.5	3.3	3.0	2.7	2.5	2.5	2.0	1.8	1.5
5/8 x 1/2	11.0	8.0	7.0	5.4	5.0	4.2	3.5	3.4	3.0	3.0	2.2	2.2	1.7
1/2 x 3/8	14.0	10.5	8.5	7.3	6.5	5.5	5.2	4.8	4.3	3.8	3.6	3.1	2.6
3/8 x 5/16	4.0	3.0	3.0	2.5	1.9	1.8	1.6	1.4	1.4	1.4	1.2	1.1	0.8
5/16 x 1/4	6.5	5.0	4.0	3.0	2.8	2.7	2.3	2.0	2.0	1.6	1.4	1.3	1.1
1/4 x 4M	7.5	5.5	5.0	4.2	3.6	3.0	2.8	2.7	2.3	2.3	2.0	1.9	1.5
4M x 8M	10.5	7.6	6.5	5.5	4.8	4.3	3.9	3.6	3.4	3.1	2.8	2.5	2.0
8M x 10M	2.1	1.6	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.4
10M x 16M	4.6	3.3	2.8	2.4	2.1	1.9	1.7	1.6	1.5	1.4	1.2	1.1	0.9
16M x 30M	3.0	2.1	1.9	1.6	1.4	1.2	1.1	1.0	1.0	1.0	0.8	0.7	0.6
30M x 40M	0.9	0.8	0.8	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2
40M x 50M	0.6	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1
50M x 100M	1.0	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.3
-100M	1.3	1.0	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3
Total %	100	100	100	100	100	100	100	100	100	100	100	100	100

For All Impactors When Ordering Be Sure to Specify

1. Percent of silica plus combined percent aluminum and iron oxide.
2. Type of stone in quarry.
3. Size of stone to be fed.
4. Size of finished stone.
5. Is finished product to be made in one pass or is product to be passed over sizing screen in a closed circuit.
6. Power unit, type, HP, RPM and keyway in PTO.

Horizontal Shaft Impact Crushers (HSI)

Model	TI4143	TI4250	IP1313
Rotor Diameter Inches (mm)	41 (1,040)	42 (1,070)	50 (1270)
Rotor Width Inches (mm)	43 (1,100)	50 (1,270)	48 (1219)
Feed Opening Inches (mm)	44-1/2 x 31-1/2 (1,130 x 800)	47 x 25-1/2 (1,190 x 650)	43-1/4 x 48-3/4 (1099 x 1238)
Maximum Feed Size Inches (mm)	18 (450)	20 (500)	34 (864)
Maximum Capacity stph (mtph)	250 (225)	300 (275)	300 (272)
Power HP (kW)	200 (150)	250 (186)	250-300 (186-224)
Speed Range RPM	466-758	535-840	350-610
Rotor Speed fpm (m/s)	5,250 – 8,750 (27-44)	5,900 – 7,900 (30-40)	4600-6500 (23.3-33.1)
Unit Weight lbs (Kg)	21,900 (9,950)	26,000 (11,800)	30,800 (13,970)
Impact Bar Size Inch (mm)	4 x 43 (100 x 1,092)	4 x 50 (100 x 1270)	5 x 48 (127 x 1219)
Impact Bar Weight lbs (Kg)	480 (220)	680 (310)	781 (354)
Monoblock Weight lbs (Kg)	2,690 (1,220)	2,900 (1300)	4600 (2087)
Second Curtin Liners lbs (Kg)	160 (72)	190 (85)	100 (45)
Frame Liners lbs (Kg)	100 (46)	45 (20)	35-71 (16-32)

Horizontal Shaft Impact Crushers (HSI)

Model	IP1316	IP1516	IP1520
Rotor Diameter Inches (mm)	50 (1270)	61 (1549)	61 (1549)
Rotor Width Inches (mm)	64 (1626)	64 (1626)	80 (2032)
Feed Opening Inches (mm)	43-1/4 x 64-3/4 (1099 x 1645)	52 x 65 (1321 x 1651)	52 x 81 (1321 x 2051)
Maximum Feed Size Inches (mm)	34 (864)	34 (864)	34 (864)
Maximum Capacity stph (mtph)	400 (363)	600-800 (544-725)	750-1000 (680-907)
Power HP (kW)	300-400 (224-298)	500-600 (373-447)	600-700 (447-522)
Speed Range RPM	350-610	300-500	300-500
Rotor Speed fpm (m/s)	4600-6500 (23.3-33.1)	4790-7985 (24.3-40.6)	4790-7985 (24.3-40.6)
Unit Weight lbs (Kg)	38,500 (17,463)	55,700 (25,260)	67,400 (30,572)
Impact Bar Size Inches (mm)	5 x 64 (127 x 1626)	5 x 64 (127 x 1625)	5 x 80 (127 x 2032)
Impact Bar Weight lbs (Kg)	1042 (472)	1300 (589)	1600 (726)
Monoblock Weight lbs (Kg)	6500 (2949)	8600 (3896)	10,700 (4853)
Second Curtin Liners lbs (Kg)	100 (45)	100 (45)	100 (45)
Frame Liners lbs (Kg)	35-71 (16-32)	39-106 (15-48)	39-106 (15-48)

HSI BLOW BAR METALLURGY

MANGANESE: Predominantly used in primary crushing applications and offers the best impact resistance of any Terex bar. However, it is not suited for abrasive wear.

MARTENSITIC: Ideal for applications involving primary blasted rock, building rubble, and limestone. It combines near-manganese impact resistance with improved abrasion resistance, but it is not a suitable option for very large feed.

MEDIUM CHROME: Designed to crush medium to highly abrasive materials, particularly in secondary crushing where feed sizes can be controlled. It offers higher abrasion resistance than martensitic alloys but is not suitable for large feed.

TOUGHENED CHROME: is a proprietary alloy designed for building rubble, concrete, and asphalt applications where the content of the feed is more difficult to identify and control. It offers impact resistance nearing that of the martensitic alloy and abrasion resistance approaching that of standard chrome. Consult your Terex dealer for detailed application recommendations.

HIGH CHROME: Recognized for its extreme hardness and ability to withstand abrasive materials. It is best suited for secondary, tertiary, and recycling applications where feed size can be controlled. These bars are not suitable for large feed.

CERAMIC BARS: Combines ceramic inserts with a host material to ensure a consistent wear profile when processing abrasive materials. The host cast material can be martensitic steel, medium chrome steel, or high chrome steel. The bar will retain most of the mechanical properties of the host material with additional wear resistance due to the ceramic inserts. It is commonly used in recycle, secondary, and asphalt applications, where feed size must be controlled. Martensitic ceramic steels can handle moderate feed sizes, but any ceramic bar will not tolerate large feed.

IMPORTANT NOTE: Tramp iron or other uncrushable applications will increase the possibility of breakage in all alloys, with some being more susceptible than others. To maximize the life expectancy of your genuine Terex bars, each application should be assessed individually. Consider feed material properties, the desired finished product, and crusher settings when selecting the proper alloy.

NOTES

Blow Bar Part Numbers:

Model	Blow Bar Part Numbers by Metallurgy and Model				
	Manganese	Manganese + 3% Chrome	Martensitic	Martensitic Ceramic	Martensitic Heavy Duty Ceramic
4040	-	-	04431792	0443179201	-
TI4143 (1111R)	-	-	CW027-001-MA500	CW027-001-MAC	CW027-001-HDC
TI4250 (1113R)	-	-	CW057-002-MA500	CW057-002-MAC	CW057-002-HDC
IP1313 Straight Bars*	0443182502	-	0443170409	0443170415	T192353
IP1313 C-Face Bars**	-	-	CW032-001-MA500	CW032-001-MAC	CW032-001-HDC
IP1316 Straight Bars*	0443182501	-	04431825	T162616	T192354
IP1316 C-Face Bars**	04431806	0443180601	04431811	T169394	T192359
IP1516	04431806	0443180601	-	-	-

*Part numbers shown for straight bars are the 5” thick single bars. Consult the crusher reference guide for 4” thick bars or split bars on the IP1316.

**C-face rotor design is the current factory standard

Blow Bar Part Numbers:

Model	Blow Bar Part Numbers by Metallurgy and Model				
	Medium Chrome	Medium Chrome Ceramic	High Chrome	Toughened Chrome	High Chrome Ceramic
4040	-	-	04431813	-	044318301
TI4143 (1111R)	CW027-001-CR018	CW027-001-CR18C	CW027-001-CR027	CW027-001-CR027TC	CW027-001-CR027C
TI4250 (1113R)	CW057-002-CR18	CW057-002-CR18C	CW057-002-CR27	CW057-002-CR27T	CW057-002-CR27C
IP1313 Straight Bars*	T165785	-	0443170404	T162614	0443170416
IP1313 C-Face Bars**	CW032-001-CR18	CW032-001-CR18C	CW032-001-CR27	CW032-001-CR27T	CW032-001-CR27C
IP1316 Straight Bars*	T165786	T192358	T192362	T162615	-
IP1316 C-Face Bars**	T165787	T178186	T192361	T164285	T192360
IP1516	-	-	-	-	-

*Part numbers shown for straight bars are the 5” thick single bars. Consult the crusher reference guide for 4” thick bars or split bars on the IP1316.

**C-face rotor design is the current factory standard

NOTES

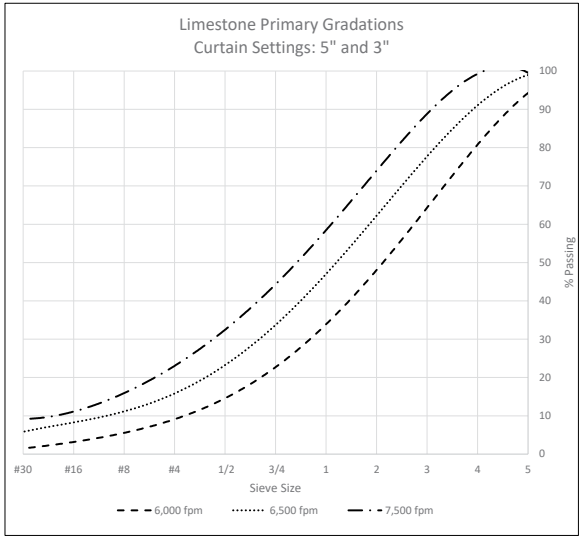
HSI Gradation Charts

The gradation charts on the following pages gives the percent passing a given square opening screen at various rpm's for the various breakers. For example, read down the model column to the correct model and then across to the correct impeller speed.

Ratio of fines to larger sizes can be increased or decreased by changing the speed of the impeller. Variation of speed can be determined by a test run.

These charts are intended as a guide only and percentages vary with nature and condition of the material processes. For further information on product sizes consult the factory.

Horizontal Shaft Impact Crushers (HSI) - Gradation Curve



ft/min	RPM 61" Rotor	RPM 50" Rotor	RPM 41/42" Rotor
7,500 fpm	475	575	690
6,500 fpm	415	500	600
6,000 fpm	375	450	550

The above curves show approximate gradation for various sizes of primary impactors at various speeds. The numbers on each curve are the fpm the curve represents. The chart is based on average limestone and breaker plate settings of 6" and 3". Gradation will vary depending on particle size of feed, rate of feed, hardness of rock and natural breaking characteristics.

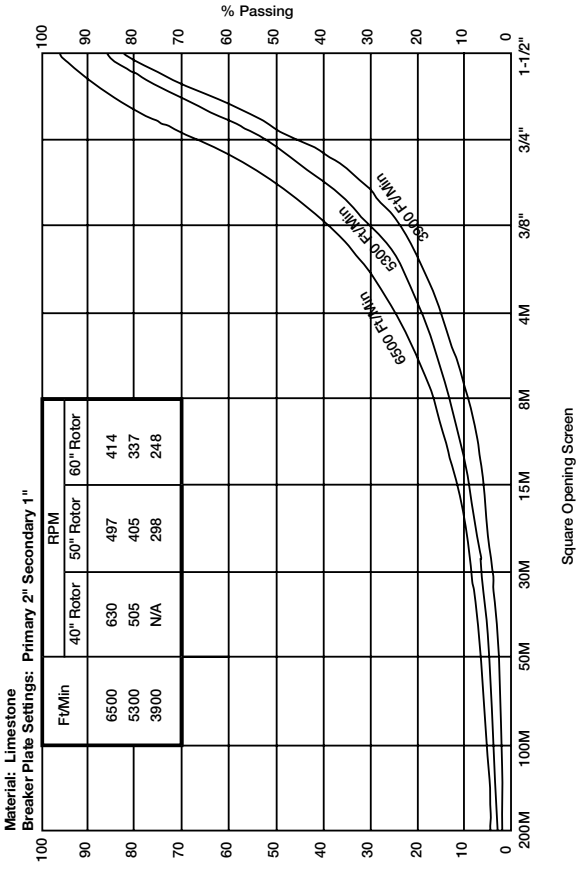
Horizontal Shaft Impactor - Specifications

HSI Model	4040	5048	5064
Rotor Diameter Inches (mm)	40 (1000)	50 (1270)	50" (1270)
Rotor Width Inches (mm)	40 (1000)	48 (1219)	64 (1626)
Feed Opening Inches (mm)	34-1/2 x 40-1/2 (876 x 1029)	43-1/4 x 48-3/4 (1099 x 1238)	43-1/4 x 64-3/4 (1099 x 1645)
Max Square Feed Size Inches (mm)	14-16 (356-406)	12-22 (304-560)	12-22 (304-560)
Capacity stph (mtph)	100-150 (91-136)	150-300 (136-272)	250-400 (224-298)
Power HP (kW)	100-150 (91-136)	150-300 (136-272)	250-400 (228-363)
Speed Range RPM	505-630	350-610	350-610
Rotor Speed FPM (m/s)	5300-6500 (27.0-33.1)	4600-6500 (23.3-33.1)	4600-6500 (23.3-33.1)
Unit Weight lbs (kg)	20,700 (9,388)	33,700 (15,286)	40,700 (18,462)
Impact Bar Size Inches (mm)	4 x 40 (102-1016)	4/5 x 48 (20-1219)	4/5x 32 (20-813)
Max Impact Bar Weight lbs (kg)	458 (207)	781 (354)	521 (236)
Monoblock Weight lbs (kg)	2560 (1162)	4600 (2087)	6500 (2949)
Second Curtin Liners lbs (kg)	100 (45)	100 (45)	100 (45)
Frame Liners lbs (kg)	17-70 (8-32)	34-106 (15-48)	34-106 (15-48)

Horizontal Shaft Impactor - Specifications

HSI Model	6080	6096
Rotor Diameter Inches (mm)	60 (1524)	60 (1524)
Rotor Width Inches (mm)	80" (2032)	96 (2438)
Feed Opening Inches (mm)	32 x 81 (816 x 2057)	32 x 97 (813 x 2464)
Max Square Feed Size Inches (mm)	14-16 (356-406)	14-16 (356-406)
Capacity stph (mtph)	400-650 (363-590)	450-750 (408-680)
Power HP (kW)	400-500 (298-373)	500-600 (373-447)
Speed Range RPM	300-510	300-510
Rotor Speed FPM (m/s)	4690-6500 (23.9-33.1)	4690-6500 (23.9-33.1)
Unit Weight lbs (kg)	67,500 (30,618)	77,000 lbs (34,927 kg)
Impact Bar Size Inches (mm)	4/5 x 32/48	4/5 x 48
Maximum Impact Bar Weight lbs (kg)	781 (354)	781 (354)
Second Curtin Liners lbs (kg)	100 (45)	100 (45)
Frame Liners lbs (kg)	66 (30)	66 (30)

HSI Gradation Curves



The above curves show approximate gradation for various sizes of secondary impactors at various speeds. The numbers on each curve are the fpm the curve represents. The chart is based on average limestone and breaker plate settings of 2" and 1". Gradation will vary depending on particle size of feed, rate of feed, hardness of rock and natural breaking characteristics.

Percent Passing - HSI Gradation Chart

Product Size	Limestone			Concrete Recycle	
	3900 FPM	5300 FPM	6500 FPM	5300 FPM	6500 FPM
4-1/2"	100.0	100.0			
4"	98.5	98.7			
3-1/2"	97.0	97.4		100.0	
3"	95.0	96.1		99.0	100.0
2-3/4"	93.0	94.8		97.0	99.5
2-1/2"	91.0	93.5		95.0	99.0
2-1/4"	89.0	92.3	100.0	94.0	98.0
2"	87.0	91.0	99.0	93.0	97.0
1-3/4"	85.0	89.7	97.0	90.0	94.0
1-1/2"	83.0	84.0	95.0	85.0	91.0
1-1/4"	76.0	79.9	88.0	80.0	88.0
1"	69.0	71.3	81.0	72.0	85.0
7/8"	62.0	62.8	74.0	63.0	81.0
3/4"	55.0	54.3	67.0	56.0	76.0
5/8"	46.0	46.7	58.0	51.0	71.0
1/2"	37.0	39.1	49.0	46.0	65.0
3/8"	27.0	31.5	40.0	40.0	55.0
5/16"	24.0	27.9	35.0	37.0	50.0
1/4"	21.0	24.3	30.0	34.0	46.0
4M	18.0	20.7	25.0	28.0	38.0
6M	15.5	17.6	21.0	24.0	34.0
8M	13.0	14.5	17.0	20.0	30.0
10M	11.0	12.4	14.0	17.0	25.0
16M	9.0	10.3	11.0	15.0	20.0
30M	6.0	7.2	9.5	12.0	16.0
40M	5.0	6.2	7	11.0	14.0
50M	4.0	5.2	5.5	9.0	12.0
100M	3.0	4.1	4.3	6.0	8.0
200M	2.0	3.1	3.4	4.0	5.0

Single Impeller Impact Breaker - Specifications

Model		3020	3633	4336	4338	4340	5348	6360
Inlet*	in	30 x 20	36 x 48	43 x 45	43 x 48	43 x 54	53 x 69	63 x 96
	mm	762x508	914x1219	1092x1143	1092x1219	1092x1372	1346x1753	1600x2438
Outlet	in	30 x 37	36 x 36	43 x 44	43 x 46	43 x 46	53 x 48	63 x 90
	mm	762x940	914x914	1092x1118	1092x1168	1092x1168	1346x1219	1600x2286
Capacity	tph	100-200	200-350	250-500	250-500	250-500	500-1000	1000-1500
	tonnes	91-182	182-318	227-454	227-454	227-454	454-907	907-1361
HP		125-150	150-200	250-300	250-300	250-300	300-400	500-600
Typical Impeller RPM		350-550	350-575	350-650	350-350	350-650	350-500	300-450
Minimum Size**	in	1.5" minus	1.5" minus	2" minus	2" minus	2" minus	3" minus	6" minus
	mm	38	38	51	51	51	76	152
Weight	lbs	15,200	29,850	35,504	40,100	44,210	71,900	160,300
	kg	6,985	13,540	16,105	18,189	20,055	32,615	72,715
Impellers								
Weight with shaft & bars	lbs	4345	6580	10,230	10,460	10,460	16,215	37,390
	kg	1971	2985	4640	4745	4745	7355	16,960
Diameter Outside bars	in	35.5	37.5	42.25	42.25	42.25	49.25	59.25
	mm	902	953	1073	1073	1073	1251	1505
Core Weight	lbs	3180	4700	8400	8360	8360	12570	26,300
	kg	1442	2132	3810	3792	3792	5702	11,930
Impeller bar weight (ea)	lbs	390	430	430	430	430	172	845
	kg	177	195	240	240	240	327	383
Shafts								
Diameter thru Impeller	in	4.065	6.125	6.125	7.5	7.5	10	14.5
	mm	103	156	156	191	191	250	368
Diameter @ Bearing	in	3.4375	5.4375	5.4375	6.6875	6.6875	8.375	14.1562
	mm	87	138	138	170	170	213	360
Weight	lbs	390	625	750	1030	1030	2200	6300
	kg	117	284	340	467	467	998	2858
Breaker Bars								
Diameter	in	5	6.5	6.5	6.5	6.5	8	10.5
	mm	127	165	165	165	165	203	267
Sleeve Diameter	in	7	9	9	9	9	12	16.5
	mm	179	229	229	229	229	305	419
Liners								
Thickness	in	1	1	1.5	1.5	1.5	1.5	1.5
	mm	25	25	38	38	38	38	38
Side Plate								
Thickness	in	1.5	1.5	2	2	2	3	4
	mm	38	38	51	51	51	76	102

*Maximum without feeder.
**Practical minimum in closed circuit. Capacity dependent on type & characteristics of material.

Percent Passing (Open Circuit)
Single Impeller Impact Breaker Gradation Chart

Model	Various Impeller Speeds - RPM							
3020	700	600	500	400	–	–	–	–
3026								
3623	630	590	550	510	470	430	390	–
3633								
4325	–	650	600	550	500	450	400	–
4336								
4338	–	650	600	550	500	450	400	–
4340								
5348	–	–	–	–	440	410	380	350
6360								
Product Size								
+8"							100	100
8"							96.6	89.0
7"						100	92.1	84.0
6"					100	96.0	86.3	78.5
5"				100	96.8	88.5	79.1	71.6
4"		100	100	94.0	87.4	78.6	70.0	63.0
3-1/2"	100	98.5	94.3	88.5	81.5	72.8	64.6	58.0
3"	97.0	92.3	87.5	81.7	74.7	66.5	58.8	52.8
2-3/4"	93.5	88.2	83.4	77.5	70.8	62.8	55.5	50.0
2-1/2"	89.2	83.7	78.6	72.6	66.3	58.9	52.0	47.0
2-1/4"	84.5	78.4	73.5	67.7	61.7	54.9	48.5	44.0
2"	78.9	72.8	68.0	62.1	56.7	50.4	44.5	40.5
1-3/4"	72.7	66.0	61.5	56.5	51.7	45.9	40.5	37.0
1-1/2"	65.1	59.2	55.0	50.7	46.0	40.9	36.1	33.0
1-1/4"	57.2	51.8	48.0	44.1	40.0	35.5	31.3	28.7
1"	49.3	44.4	41.0	37.5	34.0	30.1	26.5	24.4
7/8"	44.3	39.9	36.8	33.5	30.5	26.9	23.8	21.9
3/4"	39.3	35.4	32.6	29.5	27.0	23.7	21.1	19.4
5/8"	34.3	30.9	28.4	25.5	23.5	20.5	18.4	16.9
1/2"	28.8	25.9	23.7	21.3	19.5	17.0	15.1	13.9
3/8"	23.3	20.9	19.0	17.1	15.5	13.5	11.8	10.9
5/16"	19.7	17.6	16.0	14.4	13.0	11.4	9.9	9.2
1/4"	16.1	14.3	13.0	11.7	10.5	9.3	8.0	7.5
4M	12.5	11.0	10.0	9.0	8.0	7.2	6.1	5.8
8M	9.4	8.3	7.5	6.8	6.0	5.4	4.7	4.4
10M	8.5	7.5	6.8	6.2	5.4	4.9	4.3	4.0
16M	6.5	5.7	5.2	4.7	4.1	3.7	3.4	3.1
30M	4.2	3.6	3.3	3.0	2.6	2.3	2.2	2.0
40M	3.2	2.7	2.5	2.2	2.0	1.7	1.6	1.5
50M	2.5	2.2	2.0	1.8	1.6	1.4	1.3	1.2
100M	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.66

Double Impeller Impact Breaker Size
Specifications of Cedarapids Double Impeller Breakers
Impact breaker size is given in inches as to the size opening in which the rock enters.

Model	RPM	Horsepower	*Minimum Product Size	**Capacities TPH	Feed Opening (inches)	Approximate Weight (lbs)
2222	350-900	Two 40-50	1-1/2" minus	75-125	22 x 22	20,800
3042	350-900	Two 60-75	1-1/2" minus	125-250	30 x 42	25,500
3546S	350-900	Two 100-125	1-1/2" minus	250-500	36 x 45	39,700
3645H	350-900	Two 125-150	1-1/2" minus	250-500	36 x 45	42,170
4350S	350-675	Two 150-200	2-1/2" minus	400-800	43 x 50	73,950
4350H	350-675	Two 150-200	2-1/2" minus	400-800	43 x 50	91,400
5360H	350-575	Two 200-300	4" minus	600-1200	53 x 60	172,500
6372	300-450	Two 400-500	6" minus	1500-2000	63 x 72	290,000

*Minimum product size dependent upon type and characteristics of the material processed. Size shown is practical minimum for closed circuit operation.
**Capacities dependent upon type and characteristics of the material processed.

Percent Passing (Open Circuit)
Double Impeller Impact Breaker Gradation Chart

This chart shows the amount of material that can be expected from double impellers, at various rpm's in the size range shown in the left hand vertical columns. Impeller speeds (rpm's) are shown at the top. Gradation is shown in the columns directly below. *All figures are shown in percent passing.*

Model	Various Impeller Speeds - RPM										
2222	700	650	600	550	500	450	400	–	–	–	–
3042	700	650	600	550	500	450	400	–	–	–	–
3645S	700	650	600	550	500	450	400	–	–	–	–
3645H	–	610	580	550	520	490	460	430	400	370	–
4350S	–	610	580	550	520	490	460	430	400	370	–
4350H	–	610	580	550	520	490	460	430	400	370	–
5360H	–	–	–	–	530	505	480	455	430	405	380
6372	–	–	–	–	–	–	–	455	430	405	380
Product Size											
+8"										100	100
7"							100	100	100	98.3	95.8
6"					100	100	99.4	97.2	95.5	94.3	89.5
5"				100	98.3	96.0	93.5	91.1	88.5	85.0	86.5
4"		100	100	99.5	95.5	93.0	90.1	87.4	85.0	79.9	81.2
3-1/2"		99.4	99.2	95.0	92.5	89.0	85.4	80.9	76.0	61.4	73.4
3"	100	98.3	98.1	92.4	89.5	85.0	80.7	74.4	67.0	58.6	63.8
2-3/4"	99.0	97.2	95.1	90.7	87.4	81.9	76.0	68.0	61.5	57.2	54.2
2-1/2"	98.0	96.0	94.7	88.9	84.4	76.8	68.5	61.6	55.6	54.0	49.5
2-1/4"	97.0	94.8	93.5	86.3	79.9	68.8	61.5	56.2	49.7	50.7	44.8
2"	95.7	93.2	92.1	82.2	70.9	60.8	54.5	49.8	44.8	44.4	40.1

Percent Passing (Open Circuit)
Double Impeller Impact Breaker Gradation Chart

1-3/4"	94.3	91.0	90.0	71.4	61.3	52.6	47.4	43.2	40.6	42.1	36.4
1-1/2"	92.5	87.2	81.6	60.3	51.7	44.5	40.3	36.8	38.6	36.7	32.6
1-1/4"	89.4	77.7	73.5	48.8	42.1	32.4	33.2	30.4	32.9	31.3	28.8
1"	86.6	68.2	64.5	43.0	37.2	28.2	29.5	27.3	28.2	25.9	24.0
7/8"	82.0	58.7	52.9	34.2	32.3	24.0	25.8	24.2	25.2	23.2	22.4
3/4"	69.0	49.2	45.4	31.4	27.4	23.8	22.1	21.1	22.2	20.2	20.7
5/8"	55.0	40.2	38.6	25.9	22.7	20.9	18.6	17.9	19.2	17.5	18.3
1/2"	41.0	31.2	29.7	20.4	18.0	16.0	15.1	14.7	16.4	14.8	15.8
3/8"	34.5	26.2	24.5	17.4	15.5	14.7	13.1	12.7	13.6	12.1	12.3
5/16"	28.0	24.2	18.8	14.4	13.0	13.4	11.1	10.7	11.8	10.5	10.8
1/4"	19.0	15.7	14.1	10.4	9.5	8.9	8.8	8.7	10.0	8.9	9.3
4M	14.2	11.8	10.6	7.5	6.9	7.5	7.1	6.5	8.0	6.9	7.3
8M	12.8	10.6	9.9	6.7	6.1	6.8	6.2	5.9	6.0	5.0	5.5
10M	9.8	8.1	9.0	4.8	4.4	6.5	5.8	4.4	5.4	4.5	5.0
16M	6.2	5.2	6.9	2.6	2.4	5.0	4.2	2.8	4.2	3.3	3.9
30M	4.7	4.0	4.7	1.7	1.3	3.2	2.9	2.1	2.7	2.7	2.3
40M	3.9	3.1	3.7	1.1	0.8	2.4	2.0	1.7	2.0	2.3	1.7
50M	1.8	1.5	2.1	1.1	0.6	1.9	1.1	0.9	1.6	1.5	1.4
-100M	1.0	1.0	1.0	1.1	0.5	0.9	0.8	0.8	0.8	0.7	0.7

To get a total between two sizes, for example ½" to 1" for a 3645H operating at 460 rpm, subtract the lower number from upper number (29.5 - 15.1 = 14.4).

Rollercone MVP Specifications

Model	*MVP 280*	*MVP 380*	*MVP 450TC1300*	*TC1300X*
Operating RPM (Pinion RPM)	700-1000	700-1000	700-1000	700-1000
Power (kW)	200 (150)	300 (224)	400 (298)	500 (373)
Weight Lbs (kg)	36,500 (16,600)	46,000 (20,800)	52,500 (23,800)	68,000 (30,800)

Rollercone MVP Capacities

Open Circuit Capacities in tons-per-hour (tonnes-per-hour)					
Model	*3/8" (10mm)*	*1/2" (13mm)*	*5/8" (16mm)*	*3/4" (19mm)*	*7/8" (22mm)*
MVP 280	120-150 (109-136)	150-190 (136-172)	170-220 (154-200)	190-250 (172-227)	210-275 (209-272)
MVP 380	135-170 (123-155)	180-225 (164-205)	220-260 (201-236)	240-290 (218-264)	260-310 (236-282)
MVP 450	150-200 (136-182)	200-260 (182-236)	245-315 (222-285)	275-360 (250-326)	300-385 (272-349)
MVP 550	200-250 (182-228)	260-330 (237-300)	315-395 (287-359)	360-450 (328-410)	385-485 (350-441)
Open Circuit Capacities in tons-per-hour (tonnes-per-hour)					
Model	*1" (25mm)*	*1 1/4" (32mm)*	*1-1/2 " (32mm)*	*1 3/4" (44mm)*	*2" (51mm)*
MVP 280	230-300 (209-272)	260-335 (236-305)	305-390 (277-355)	355-455 (323-405)	440-490 (400-445)
MVP 380	275-335 (250-305)	295-380 (268-345)	350-445 (318-405)	405-510 (368-464)	500-560 (453-507)
MVP 450	320-415 (290-376)	355-450 (321-408)	390-500 (353-453)	445-575 (403-521)	505-645 (458-585)
MVP 550	405-510 (369-464)	450-565 (410-514)	495-620 (450-564)	565-715 (514-651)	645-810 (587-737)

Grades of Liners Available for Cone Crushers

14% Manganese: Good option for soft materials that may not have the compressive strength to properly work harden the higher grade manganese liners. In some soft materials it is not uncommon for 14% to outlast 18% or 21% liners due to properly work hardening. Liner is also more ductile than the higher grade liners.

18% Manganese: Selected as the *factory standard* because it's generally the best balance between cost, abrasiveness resistance, and ductility. A good choice for medium to hard rock with moderate to high abrasiveness. 18% can be used in virtually any application, but it may not be cost effective in soft rock due to the material not being hard enough to work harden the liner properly.

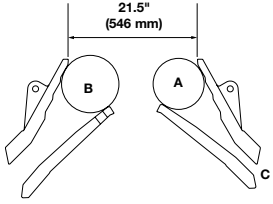
21% Manganese: Good option for hard materials where additional resistance to wear is worth the cost of the higher grade liner. Liner will harden faster and harder than the lower grades of liners, provided the material is sufficiently hard to properly work harden the liner.

NOTES

MVP 280 Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

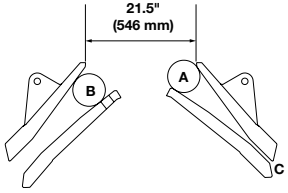
Coarse Chamber



A	B	C
7-3/4" (197 mm)	8-3/4" (222 mm)	3/4" (19 mm)
8" (203 mm)	9" (229 mm)	1" (25 mm)
8-1/2" (216 mm)	9-1/2" (241 mm)	1-1/2" (38 mm)
8-7/8" (225 mm)	9-7/8" (251 mm)	2" (51 mm)
9-3/4" (248 mm)	10-3/4" (273 mm)	3" (76 mm)
Mantle P/N: 04200-300-22		Liner P/N: 04200-300-24

Product Range: 3/4" to 3" Minus. Pinion Speed: 700 rpm to 800 rpm.

Medium Chamber

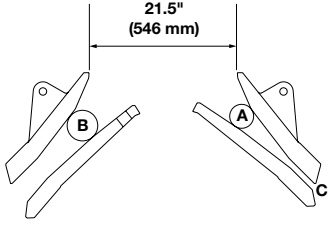


A	B	C
5-1/2" (140 mm)	6-5/8" (168 mm)	5/8" (16 mm)
6" (152 mm)	7" (178 mm)	1" (25 mm)
6-5/8" (168 mm)	7-5/8" (194 mm)	1-1/2" (38 mm)
7-1/4" (184 mm)	8-1/4" (209 mm)	2" (51 mm)
8-1/2" (216 mm)	9-7/16" (240 mm)	3" (76 mm)
Mantle P/N: 04200-300-22		Liner P/N: 04200-300-25

Product Range: 5/8" to 3" Minus. Pinion Speed: 700 rpm to 850 rpm.

MVP 280 Chamber Settings

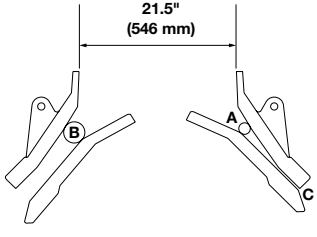
Medium-Fine Chamber



A	*B*	*C*
2-3/4" (70 mm)	4-1/4" (108 mm)	1/2" (13 mm)
3-3/8" (86 mm)	4-7/8" (124 mm)	1" (25 mm)
4" (102 mm)	5-1/2" (140 mm)	1-1/2" (38 mm)
4-5/8" (117 mm)	6" (152 mm)	2" (51 mm)
5-7/8" (149 mm)	7-1/4" (184 mm)	3" (76 mm)
Mantle P/N: 04200-300-22		Liner P/N: 04200-300-26

Product Range: 1/2" to 3" Minus. Pinion Speed: 750 rpm to 850 rpm.

Fine Chamber

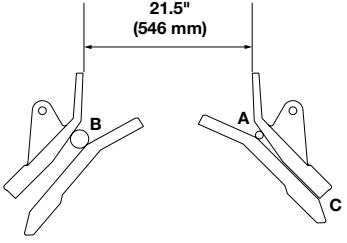


A	*B*	C
2" (51 mm)	3-1/2" (89 mm)	3/8" (10 mm)
2-1/4" (57 mm)	3-5/8" (92 mm)	5/8" (16 mm)
2-3/8" (60 mm)	3-7/8" (98 mm)	7/8" (19 mm)
2-5/8" (67 mm)	4-1/16" (103 mm)	1-1/8" (29 mm)
3-5/16" (84 mm)	4-3/4" (121 mm)	2" (51 mm)
Mantle P/N: 04200-300-23		Liner P/N: 04200-300-27

Product Range: 3/8" to 1-1/2" Minus. Pinion Speed: 800 rpm to 950 rpm.

MVP 280 Chamber Settings

Extra Fine Chamber



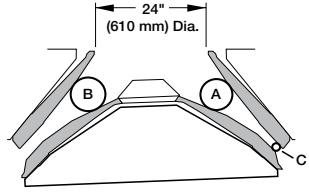
A	*B*	C
1-1/4" (32 mm)	2-3/4" (70 mm)	1/4" (6 mm)
1-3/8" (35 mm)	2-7/8" (73 mm)	3/8" (10 mm)
1-7/16" (37 mm)	2-15/16" (74 mm)	1/2" (13 mm)
1-9/16" (40 mm)	3" (76 mm)	5/8" (16 mm)
1-11/16" (43 mm)	3-1/8" (79 mm)	3/4" (19 mm)
Mantle P/N: 04200-300-23		Liner P/N: 04200-300-28

Product Range: 1/4" to 1" Minus. Pinion Speed: 850 rpm to 1000 rpm.

MVP 380 Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

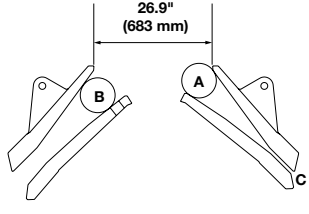
Coarse Chamber



A	*B*	C
10" (254 mm)	11-1/16" (281 mm)	3/4" (19 mm)
10-3/8" (263 mm)	11-1/4" (286 mm)	1" (25 mm)
10-3/4" (273 mm)	11-5/8" (295 mm)	1-1/2" (38 mm)
11-1/8" (283 mm)	12" (305 mm)	2" (51 mm)
Mantle P/N: 04800-300-24		Liner P/N: 04800-300-67
HD Mantle P/N T191697		Enlarged Feed Bowl P/N T191661

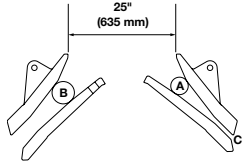
Product Range: 3/4" to 3" Minus. Pinion Speed: 700 rpm to 800 rpm.

Medium Chamber



A	*B*	C
6-5/16" (160 mm)	7-5/16" (186 mm)	5/8" (16 mm)
6-3/4" (171 mm)	7-3/4" (197 mm)	1" (25 mm)
7-1/4" (184 mm)	8-1/4" (210 mm)	1-1/2" (38 mm)
7-5/8" (194 mm)	8-5/8" (219 mm)	2" (51 mm)
Mantle P/N: 04800-300-24		Liner P/N: 04800-300-73
HD Mantle P/N: T191697		Enlarged Feed Bowl P/N T191671
Product Range: 5/8" to 3" Minus. Pinion Speed: 700 rpm to 850 rpm.		

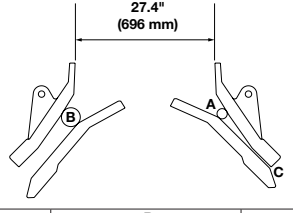
Medium-Fine Chamber



A	*B*	C
3-1/8" (79 mm)	4-13/16" (122 mm)	1/2" (13 mm)
4" (102 mm)	5-9/16" (141 mm)	1" (25 mm)
4-5/8" (117 mm)	6-1/8" (156 mm)	1-1/2" (38 mm)
5-1/4" (133 mm)	6-3/4" (171 mm)	2" (51 mm)
Mantle P/N: 04800-300-24 Liner P/N: 04800-300-69		

Product Range: 1/2" to 3" Minus. Pinion Speed: 750 rpm to 850 rpm.

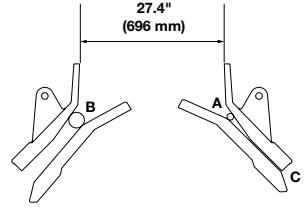
Fine Chamber



A	*B*	C
2" (51 mm)	3-5/8" (92 mm)	3/8" (10 mm)
2-3/16" (56 mm)	3-3/4" (95 mm)	5/8" (16 mm)
2-3/8" (60 mm)	4-1/16" (103 mm)	7/8" (19 mm)
2-9/16" (65 mm)	4-1/4" (108 mm)	1-1/8" (29 mm)
3-1/4" (82 mm)	4-15/16" (125 mm)	2" (51 mm)
Mantle P/N: 04800-300-51 Liner P/N: 04800-300-26		

Product Range: 3/8" to 1-1/2" Minus. Pinion Speed: 800 rpm to 950 rpm.

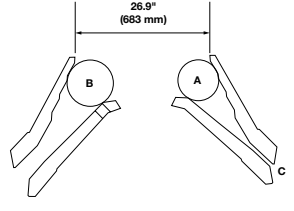
Extra-Fine Chamber



A	*B*	C
1-1/4" (32 mm)	2-15/16" (75 mm)	1/4" (6 mm)
1-3/8" (35 mm)	3-1/16" (78 mm)	3/8" (10 mm)
1-7/16" (37 mm)	3-3/16" (81 mm)	1/2" (13 mm)
1-9/16" (40 mm)	3-1/4" (82 mm)	5/8" (16 mm)
1-11/16" (43 mm)	3-3/8" (86 mm)	3/4" (19 mm)
Mantle P/N: 04800-300-51 Liner P/N: 04800-300-53		

Product Range: 1/4" to 1" Minus. Pinion Speed: 850 rpm to 1000 rpm.

Coarse-Medium Chamber

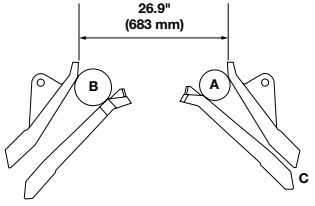


A	*B*	C
8-1/8" (206 mm)	9-1/4" (235 mm)	3/4" (19 mm)
8-1/2" (216 mm)	9-7/16" (240 mm)	1" (25 mm)
8-7/8" (225 mm)	9-13/16" (250 mm)	1-1/2" (38 mm)
9-1/2" (241 mm)	10-3/16" (259 mm)	2" (51 mm)
Mantle P/N: 04800-300-24-01 Liner P/N: 04800-300-67		
HD Mantle P/N: T191698		

Product Range: 3/4" to 3" Minus. Pinion Speed: 700 rpm to 800 rpm.

MVP 380 Chamber Settings

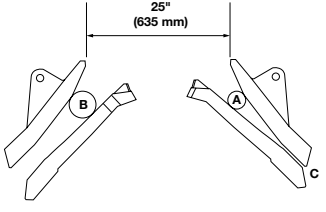
Medium-Medium Chamber



A	*B*	C
5-3/8" (136 mm)	6-3/8" (162 mm)	5/8" (16 mm)
5-3/4" (146 mm)	6-3/4" (171 mm)	1" (25 mm)
6-1/4" (159 mm)	6-3/4" (171 mm)	1-1/2" (38 mm)
6-5/8" (168 mm)	7-1/4" (184 mm)	2" (51 mm)
Mantle P/N: 04800-300-24-01		Liner P/N: 04800-300-73
HD Mantle P/N: T191698		

Product Range: 5/8" to 3" Minus. Pinion Speed: 700 rpm to 850 rpm.

Medium-Fine — Medium Chamber



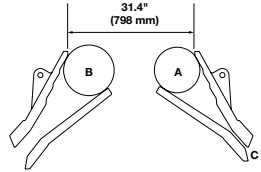
A	*B*	C
3" (76 mm)	4-5/8" (117 mm)	1/2" (13 mm)
3-7/8" (98 mm)	5-3/8" (137 mm)	1" (25 mm)
4-1/2" (114 mm)	6" (152 mm)	1-1/2" (38 mm)
5-1/8" (130 mm)	6-5/8" (168 mm)	2" (51 mm)
Mantle P/N: 04800-300-24-01		Liner P/N: 04800-300-69
HD Mantle P/N T191698		

Product Range: 1/2" to 3" Minus. Pinion Speed: 750 rpm to 850 rpm.

MVP 450 Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

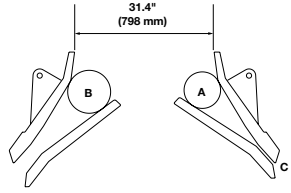
Coarse Chamber



A	*B*	C
11-3/4" (298 mm)	12-15/16" (329 mm)	3/4" (19 mm)
12-1/16" (306 mm)	13-1/4" (337 mm)	1" (25 mm)
12-1/2" (318 mm)	13-3/4" (349 mm)	1-1/2" (38 mm)
12-15/16" (329 mm)	14-1/8" (359 mm)	2" (51 mm)
13-3/4" (349 mm)	14-15/16" (379 mm)	3" (76 mm)
Mantle P/N: 05400-300-20		Liner P/N: 05400-300-15
HD Mantle P/N: T191700		Enlarged Feed Bowl P/N T191662

Product Range: 3/4" to 3" Minus. Pinion Speed: 700 rpm to 800 rpm.

Medium Chamber

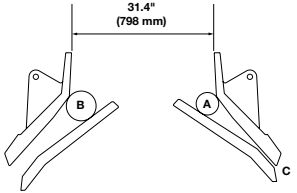


A	*B*	C
7-1/2" (191 mm)	9" (229 mm)	5/8" (16 mm)
8" (203 mm)	9-1/2" (241 mm)	1" (25 mm)
8-5/8" (219 mm)	10-1/16" (256 mm)	1-1/2" (38 mm)
9-5/16" (236 mm)	10-11/16" (271 mm)	2" (51 mm)
10-5/8" (270 mm)	11-15/16" (303 mm)	3" (76 mm)
Mantle P/N: 05400-300-20		Liner P/N: 05400-300-16
HD Mantle P/N: T191700		Enlarged Feed Bowl P/N: T191663

Product Range: 5/8" to 3" Minus. Pinion Speed: 700 rpm to 850 rpm.

MVP 450 Chamber Settings

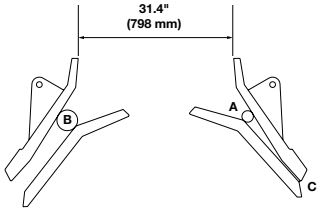
Medium-Fine Chamber



A	*B*	C
4" (102 mm)	5-13/16" (148 mm)	1/2" (13 mm)
4-5/8" (117 mm)	6-7/16" (164 mm)	1" (25 mm)
5-1/4" (133 mm)	7" (178 mm)	1-1/2" (38 mm)
5-15/16" (151 mm)	7-5/8" (194 mm)	2" (51 mm)
7-1/4" (184 mm)	8-7/8" (225 mm)	3" (76 mm)
Mantle P/N: 05400-300-20 Liner P/N: 05400-300-17		
HD Mantle P/N* T191700		

Product Range: 1/2" to 3" Minus. Pinion Speed: 750 rpm to 850 rpm.

Fine Chamber

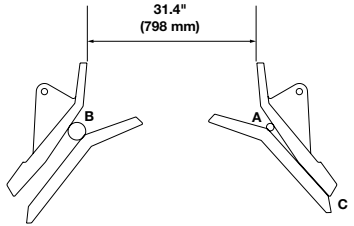


A	*B*	C
2-1/4" (57 mm)	4-1/8" (105 mm)	3/8" (10 mm)
2-7/16" (62 mm)	4-5/16" (109 mm)	5/8" (16 mm)
2-5/8" (67 mm)	4-1/2" (114 mm)	7/8" (19 mm)
2-7/8" (73 mm)	4-3/4" (121 mm)	1-1/8" (29 mm)
3-1/2" (89 mm)	5-7/16" (138 mm)	2" (51 mm)
Mantle P/N: 05400-300-21 Liner P/N: 05400-300-18		

Product Range: 3/8" to 1-1/2" Minus. Pinion Speed: 800 rpm to 950 rpm.

MVP 450 Chamber Settings

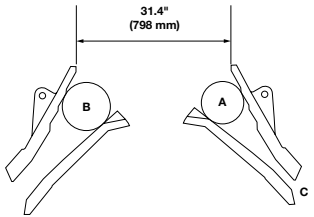
Extra-Fine Chamber



A	*B*	C
1-1/4" (32 mm)	3-1/8" (79 mm)	1/4" (6 mm)
1-3/8" (35 mm)	3-1/4" (82 mm)	3/8" (10 mm)
1-7/16" (37 mm)	3-5/16" (84 mm)	1/2" (13 mm)
1-9/16" (40 mm)	3-7/16" (87 mm)	5/8" (16 mm)
1-11/16" (43 mm)	3-1/2" (89 mm)	3/4" (19 mm)
Mantle P/N: 05400-300-21 Liner P/N: 05400-300-19		

Product Range: 1/4" to 1" Minus. Pinion Speed: 850 rpm to 1000 rpm

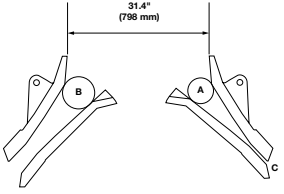
Coarse-Medium Chamber



A	*B*	C
7-5/8" (194 mm)	9-1/8" (232 mm)	3/4" (19 mm)
7-15/16" (201 mm)	9-7/16" (238 mm)	1" (25 mm)
8-7/16" (214 mm)	9-7/8" (251 mm)	1-1/2" (38 mm)
8-5/8" (219 mm)	10-1/8" (257 mm)	1-3/4" (44 mm)
8-7/8" (225 mm)	10-1/4" (260 mm)	2" (51 mm)
9-5/8" (244 mm)	11-1/8" (283 mm)	3" (76 mm)
Mantle P/N: 05400-300-20-01 Liner P/N: 05400-300-15		
HD Mantle P/N: T191699		
Product Range: 3/4" to 3" Minus. Pinion Speed: 700 rpm to 800 rpm		

MVP 450 Chamber Settings

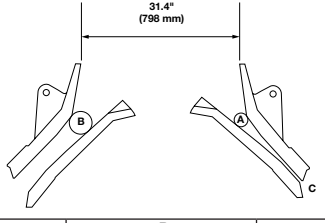
Medium-Medium Chamber



A	*B*	C
5-3/4" (146 mm)	7-1/4" (184 mm)	5/8" (16 mm)
6-1/4" (159 mm)	7-3/4" (197 mm)	1" (25 mm)
6-7/8" (175 mm)	8-5/16" (211 mm)	1-1/2" (38 mm)
7-9/16" (191 mm)	8-15/16" (227 mm)	2" (51 mm)
8-15/16" (225 mm)	10-3/16" (259 mm)	3" (76 mm)
Mantle P/N: 05400-300-20-01 Liner P/N: 05400-300-16		
HD Mantle P/N T191699		

Product Range: 5/8" to 3" Minus. Pinion Speed: 750 rpm to 850 rpm.

Medium-Fine — Medium Chamber

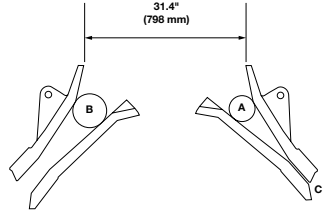


A	*B*	C
2-3/4" (70 mm)	4-9/16" (116 mm)	1/2" (13 mm)
3-3/8" (86 mm)	5-3/16" (132 mm)	1" (25 mm)
4" (102 mm)	5-3/4" (146 mm)	1-1/2" (38 mm)
4-11/16" (119 mm)	6-3/8" (162 mm)	2" (51 mm)
5-7/8" (149 mm)	7-3/8" (194 mm)	3" (76 mm)
Mantle P/N: 05400-300-20-01 Liner P/N: 05400-300-17		
HD Mantle P/N T191699		

Product Range: 1/2" to 3" Minus. Pinion Speed: 750 rpm to 900 rpm.

MVP 450 Chamber Settings

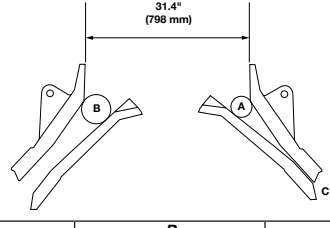
Fine-Medium Chamber



A	*B*	C
5-1/8" (130 mm)	6-11/16" (170 mm)	1/2" (13 mm)
5-11/16" (145 mm)	7-1/4" (184 mm)	1" (25 mm)
6" (153 mm)	7-1/2" (192 mm)	1-1/4" (32 mm)
7" (178 mm)	8-3/8" (213 mm)	2" (51 mm)
7-11/16" (196 mm)	9-1/2" (241 mm)	3" (76 mm)
Mantle P/N: 05400-300-20-01 Liner P/N: 05400-300-18		
HD Mantle P/N T191699		

Product Range: 5/8" to 3" Minus. Pinion Speed: 750 rpm to 850 rpm.

Extra-Fine — Medium Chamber



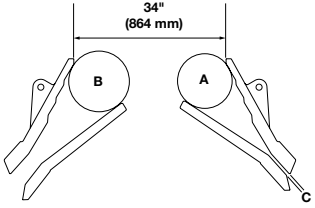
A	*B*	C
4" (102 mm)	5-11/16" (144 mm)	1/4" (6 mm)
4-3/16" (106 mm)	5-7/8" (149 mm)	1/2" (13 mm)
4-7/8" (122 mm)	6-1/2" (165 mm)	1" (25 mm)
6-3/16" (157 mm)	7-5/16" (186 mm)	2" (51 mm)
7-1/2" (190 mm)	8-7/16" (214 mm)	3" (76 mm)
Mantle P/N: 05400-300-20-01 Liner P/N: 05400-300-19		
HD Mantle P/N T191699		

Product Range: 1/2" to 3" Minus. Pinion Speed: 750 rpm to 900 rpm.

MVP 550 Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

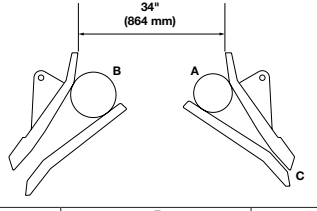
Coarse Chamber



A	*B*	*C*
12-5/8" (321 mm)	14" (356 mm)	3/4" (19 mm)
12-7/8" (327 mm)	14-3/16" (360 mm)	1" (25 mm)
13-1/4" (337 mm)	14-5/8" (371 mm)	1-1/2" (38 mm)
13-5/8" (346 mm)	15" (381 mm)	2" (51 mm)
14-1/2" (368 mm)	15-13/16" (402 mm)	3" (76 mm)
Mantle P/N: 06000-300-01 Liner P/N: 06000-300-03		

Product Range: 3/4" to 3" Minus. Pinion Speed: 615 rpm to 700 rpm.

Medium Chamber

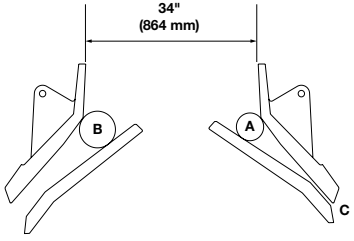


A	*B*	C
8-15/16" (227 mm)	10-1/2" (267 mm)	5/8" (16 mm)
9-3/8" (238 mm)	10-15/16" (278 mm)	1" (25 mm)
10-1/16" (255 mm)	11-9/16" (294 mm)	1-1/2" (38 mm)
10-3/4" (273 mm)	12-3/16" (309 mm)	2" (51 mm)
12" (305 mm)	13-7/16" (341 mm)	3" (76 mm)
Mantle P/N: 06000-300-01 Liner P/N: 06000-300-04		

Product Range: 5/8" to 3" Minus. Pinion Speed: 615 rpm to 700 rpm.

MVP 550 Chamber Settings

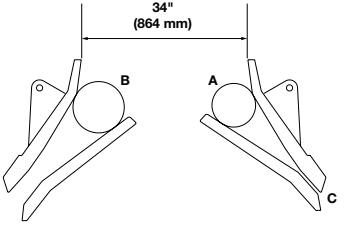
Medium-Fine Chamber



A	*B*	C
5-3/8" (136 mm)	7-1/16" (179 mm)	1/2" (13 mm)
6" (152 mm)	7-11/16" (195 mm)	1" (25 mm)
6-5/8" (168 mm)	8-5/16" (211 mm)	1-1/2" (38 mm)
7-5/16" (186 mm)	8-15/16" (227 mm)	2" (51 mm)
8-5/8" (219 mm)	10-1/8" (257 mm)	3" (76 mm)
Mantle P/N: 06000-300-01 Liner P/N: 06000-300-05		

Product Range: 1/2" to 3" Minus. Pinion Speed: 615 rpm to 750 rpm.

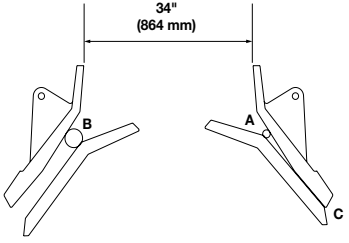
Fine Chamber



A	*B*	C
2-1/2" (63 mm)	4-1/2" (114 mm)	3/8" (10 mm)
2-11/16" (68 mm)	4-11/16" (119 mm)	5/8" (16 mm)
2-7/8" (73 mm)	4-15/16" (125 mm)	7/8" (19 mm)
3-1/16" (78 mm)	5-1/8" (130 mm)	1-1/8" (29 mm)
3-3/4" (95 mm)	5-13/16" (148 mm)	2" (51 mm)
Mantle P/N: 06000-300-02 Liner P/N: 06000-300-06		

Product Range: 3/8" to 1-1/2" Minus. Pinion Speed: 650 rpm to 800 rpm.

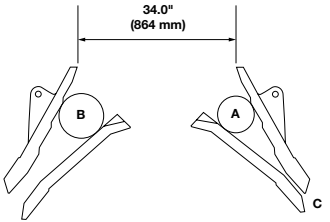
Extra-Fine Chamber



A	*B*	C
1-1/2" (38 mm)	3-1/2" (89 mm)	1/4" (6 mm)
1-5/8" (41 mm)	3-5/8" (92 mm)	3/8" (10 mm)
1-11/16" (43 mm)	3-3/4" (95 mm)	1/2" (13 mm)
1-13/16" (46 mm)	3-13/16" (97 mm)	5/8" (16 mm)
1-15/16" (49 mm)	3-15/16" (100 mm)	3/4" (19 mm)
Mantle P/N: 06000-300-02 Liner P/N: 06000-300-07		

Product Range: 1/4" to 1" Minus. Pinion Speed: 700 rpm to 850 rpm.

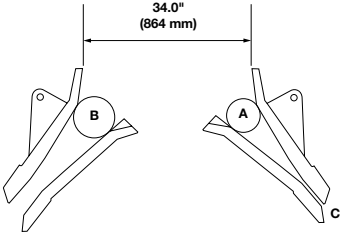
Coarse-Medium Chamber



A	*B*	C
7-7/8" (200 mm)	9-11/16" (246 mm)	3/4" (19 mm)
8-1/16" (205 mm)	9-15/16" (252 mm)	1" (25 mm)
8-1/2" (216 mm)	10-5/16" (262 mm)	1-1/2" (38 mm)
8-7/8" (225 mm)	10-11/16" (271 mm)	2" (51 mm)
9-11/16" (246 mm)	11-9/16" (294 mm)	3" (76 mm)
Mantle P/N: 06000-300-01-01 Liner P/N: 06000-300-03		

Product Range: 3/4" to 3" Minus. Pinion Speed: 615 rpm to 700 rpm.

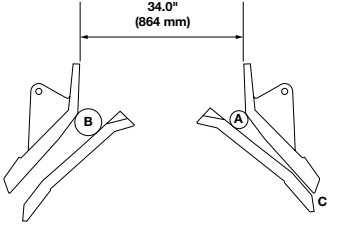
Medium-Medium Chamber



A	*B*	C
6-3/4" (171 mm)	8-7/16" (214 mm)	5/8" (16 mm)
7-1/4" (184 mm)	8-7/8" (225 mm)	1" (25 mm)
7-7/8" (200 mm)	9-1/2" (241 mm)	1-1/2" (38 mm)
8-1/2" (216 mm)	10-1/8" (257 mm)	2" (51 mm)
9-3/4" (248 mm)	11-3/8" (289 mm)	3" (76 mm)
Mantle P/N: 06000-300-01-01 Liner P/N: 06000-300-04		

Product Range: 5/8" to 3" Minus. Pinion Speed: 615 rpm to 700 rpm.

Medium-Fine — Medium Chamber

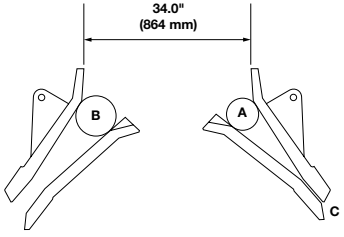


A	*B*	C
3-3/4" (95 mm)	5-5/8" (143 mm)	1/2" (13 mm)
4-3/8" (111 mm)	6-1/4" (159 mm)	1" (25 mm)
5" (127 mm)	6-7/8" (175 mm)	1-1/2" (38 mm)
5-11/16" (144 mm)	7-1/2" (190 mm)	2" (51 mm)
7" (179 mm)	8-11/16" (221 mm)	3" (76 mm)
Mantle P/N: 06000-300-01-01 Liner P/N: 06000-300-05		

Product Range: 1/2" to 3" Minus. Pinion Speed: 615 rpm to 750 rpm.

MVP 550 Chamber Settings

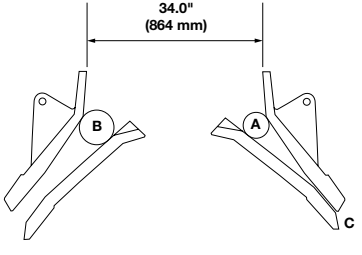
Fine-Medium Chamber



A	*B*	C
6-5/8" (168 mm)	8-5/16" (211 mm)	3/8" (10 mm)
6-13/16" (173 mm)	8-1/2" (216 mm)	5/8" (16 mm)
7-1/16" (179 mm)	8-3/4" (222 mm)	7/8" (19 mm)
7-5/16" (187 mm)	8-15/16" (227 mm)	1-1/8" (29 mm)
8" (203 mm)	9-5/8" (244 mm)	2" (51 mm)
Mantle P/N: 06000-300-01-01 Liner P/N: 06000-300-06		

Product Range: 5/8" to 3" Minus. Pinion Speed: 700 rpm to 850 rpm.

Extra-Fine — Medium Chamber



A	B	C
5" (127 mm)	6-3/4" (171 mm)	1/4" (6 mm)
5-1/8" (130 mm)	6-7/8" (175 mm)	3/8" (10 mm)
5-1/4" (133 mm)	7" (179 mm)	1/2" (13 mm)
5-3/8" (136 mm)	7-1/8" (181 mm)	5/8" (16 mm)
6-1/16" (154 mm)	7-13/16" (198 mm)	3/4" (19 mm)
Mantle P/N: 06000-300-01-01 Liner P/N: 06000-300-07		

Product Range: 1/2" to 3" Minus. Pinion Speed: 650 rpm to 800 rpm.

Rollercone MVP Gradation Chart - Percent Passing

Sieve Size	*Crusher Closed Side Setting*					
	5/16" (7.9)	3/8" (9.5)	7/16" (11.1)	1/2" (12.7)	5/8" (15.9)	3/4" (19.1)
1-1/2" (38)						100
1-1/4" (32)					100	98
1" (25.4)				100	99	95
7/8" (22.2)			100	99	95	88
3/4" (19.1)		100	97	95	91	83
5/8" (15.9)		98	94	90	85	73
1/2" (12.7)	100	96	89	85	75	63
3/8" (9.5)	91	85	75	69	63	51
5/16" (7.9)	85	75	65	61	50	43
1/4" (6.4)	74	63	52	50	45	37
4M (4.8)	61	51	43	36	33	28
5/32" (4.0)	51	42	37	31	28	24
8M (2.4)	42	35	31	26	24	21
10M (1.7)	36	31	26	22	20	18
16M (1.0)	29	24	21	17	15	14
30M (0.55)	21	18	15	12	9	9
40M (0.4)	19	15	14	10	8	7
50M (0.3)	15	12	12	8	7	6
100M (0.15)	12	9	9	7	6	5
200M (0.08)	8	7	6	6	5	4

Rollercone MVP Gradation Chart- Percent Passing

Sieve Size (mm)	Crusher Closed Side Setting					
	7/8" (22.2)	1" (25.4)	1-1/4" (32)	1- 1/2" (32)	1-3/4" (44)	2"
4" (102)						100
3-1/2" (89)					100	95
3" (76)				100	95	90
2-3/4" (70)				98	92	86
2-1/2 (64)			100	95	88	81
2-1/4" (57)			97	91	83	74
2" (51)		100	94	85	76	65
1-3/4" (44)	100	98	88	79	66	55
1-1/2" (38)	99	97	80	68	56	45
1-1/4" (32)	95	90	70	56	46	38
1" (25.4)	87	79	58	45	36	29
7/8" (22.2)	80	70	48	38	30	25
3/4" (19.1)	71	61	40	32	26	21
5/8" (15.9)	58	49	34	28	22	18
1/2" (12.7)	50	42	28	23	19	16
3/8" (9.5)	42	33	21	17	14	12
5/16" (7.9)	35	27	19	15	13	10
1/4" (6.4)	29	23	16	13	11	9
4M (4.8)	23	19	14	11	9	7
5/32" (4.0)	19	16	12	10	8	6
8M (2.4)	17	13	9	7	5	4
10M (1.7)	14	10	8	6	4	3
16M (1.0)	10	8	6	4	3	2
30M (0.55)	6	5	4	3	2	1.5
40M (0.4)	5	4	3	2	1.5	1
50M (0.3)	4	3	2	1.5	1	0.8
100M (0.15)	4	3	1.5	1	0.5	0.5
200M (0.08)	3	2	1	0.5	0.5	0.3

TC Line of Cone Crushers

Model	*TC1000*	*TC1150*	*TC1300*	*TC1300X*
Head Diameter Inches (mm)	40" (1,000)	45" (1,150)	51" (1,300)	51" (1,300)
Operating RPM (Pinion RPM)	940	1,700	720	1,800
Horsepower (kW)	200 (160)	300 (225)	300 (225)	400 (300)
Weight Lbs (kg)	22,000 (10,000)	31,400 (14,225)	48,500 (22,000)	42,000 (19,000)

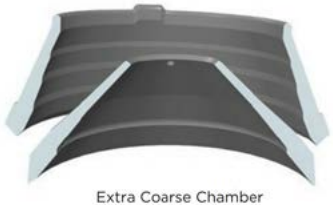
Weights of same size crushers will vary due to differences in major castings.

TC Cone Nominal Capacities

	*Maximum Crusher Capacity in stph (mtph) Per CSS**			
Model	*5/8" (16mm)*	*3/4" (19mm)*	*7/8" (22mm)*	*1" (25mm)*
TC1100	120 (109)	138 (125)	155 (141)	164 (149)
TC1150	168 (152)	186 (169)	203 (184)	215 (195)
TC1300	-	-	249 (226)	267 (242)
TC1300X	-	-	308 (279)	346 (314)
	*Maximum Crusher Capacity in stph (mtph) Per CSS**			
Model	*1-1/4" (32mm)*	*1-1/2" (38mm)*	*1-3/4" (44mm)*	*2" (51mm)*
TC1100	181 (164)	186 (171)	-	-
TC1150	239 (217)	256 (232)	-	-
TC1300	297 (269)	321 (291)	-	-
TC1300X	405 (367)	436 (396)	466 (423)	609 (552)

*TC cone capacities based on a density of 100 pcf, work index of 13, medium coarse liners, open circuit configuration, less than 10% fines (smaller than the CSS), less than 1.5% moisture, well distributed feed gradation, and long throw machine setup. Capacities can vary higher or lower if any of these variables change. Contact your sales rep for capacities adjusted to your site-specific application.

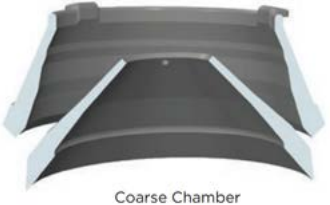
TC1000 Extra Coarse Liners



Extra Coarse Chamber

Max Feed Size: 7-3/4” (195mm)	
CSS Range: 3/4” – 1-1/2” (19-38mm)	
Mantle P/N: 603/9106E	Concave P/N: 603/9053E

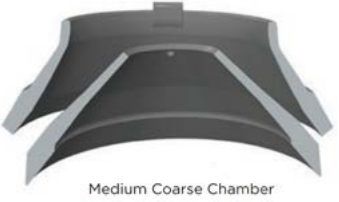
TC1000 Coarse Liners



Coarse Chamber

Max Feed Size: 7” (175mm)	
CSS Range: 3/4” – 1-1/2” (19-38mm)	
Mantle P/N: 603/9106E	Concave P/N: 603/9107E

TC1000 Medium Coarse / Heavy Duty Liners



Medium Coarse Chamber

Max Feed Size: 6-1/4” (160mm)	
CSS Range: 5/8” – 1-1/2”* (16-38mm*)	
Mantle P/N: 603/9106E	Concave P/N: 603/9052E
HD Mantle P/N: 603/9273E	HD Concave P/N: 603/9274E
HD liners’ maximum CSS limited to 1-1/4” (32mm) with new liners	

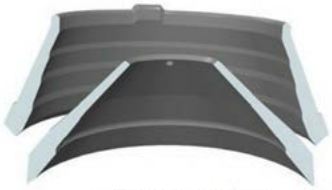
TC1000 Auto Sand Liners



Auto Sand Chamber

Max Feed Size: 2-1/2” (63mm)	
CSS Range: 1/2” – 1” (13-25mm)	
Mantle P/N: 603/9106E	Concave P/N: 603/9071E

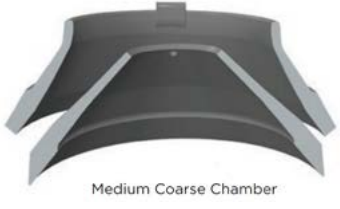
TC1150 Extra Coarse Liners



Extra Coarse Chamber

Max Feed Size: 8-3/4” (220mm)	
CSS Range: 1” – 1-3/4” (25-44mm)	
Mantle P/N: CW023-006-MN180	Concave P/N: CW023-005-MN180

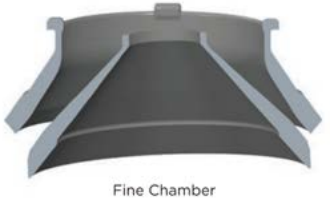
TC1150 Medium Coarse Liners



Medium Coarse Chamber

Max Feed Size: 7-1/2” (190mm)	
CSS Range: 3/4” – 1-3/4”* (19-44mm*)	
Mantle P/N: CW023-006-MN180	Concave P/N: CW023-003-MN180
HD P/N: CW023-007-MN180	HD Concave P/N: CW023-008-MN180
* HD liners Max’ CSS limited to 1-1/2” (38mm) when liners are new	

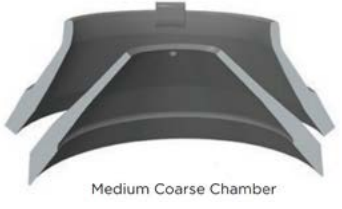
TC1150 Extra Coarse Liners



Fine Chamber

Max Feed Size: 4-1/4” (110mm)	
CSS Range: 1/2” – 1” (13-14mm)	
Mantle P/N: CW023-006-MN180	Concave P/N: CW023-002-MN180

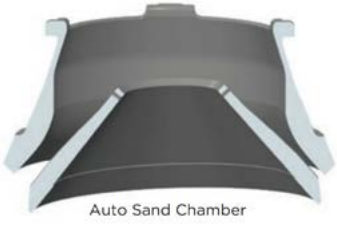
TC1300 Medium Coarse



Medium Coarse Chamber

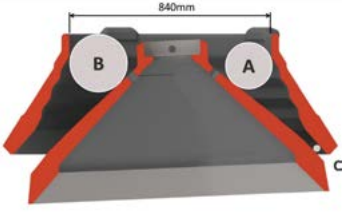
Max Feed Size: 8-3/4” (220mm)	
CSS Range: 3/4” – 1-3/4”* (19-44mm*)	
Mantle P/N: 603/1508E	Concave P/N: 603/1416E
HD Mantle P/N: 603/1617E	HD Concave P/N: 603/1618E
*HD liners’ CSS is limited to 1-1/2” (38mm) when liners are new.	

TC1300 Auto Sand



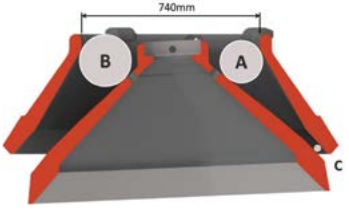
Max Feed Size: 2-1/2” (63mm)	
CSS Range: 5/8” – 1-1/4” (16-32mm)	
Mantle P/N: 603/1508E	Concave P/N: 603/1407E

TC1300X Extra Coarse



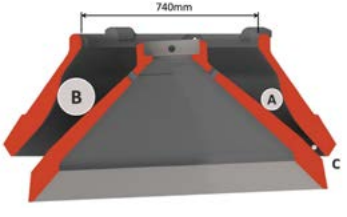
Max Feed Size: 10-1/4” (260mm)	
CSS Range: 1-1/8” – 2” (29-51mm)	
Mantle P/N: CW058-001-MN180	Concave P/N: CW058-004-MN180

TC300X Medium Coarse



Max Feed Size: 8-3/4” (220mm)	
CSS Range: 3/4” – 1-3/4” (19-44mm)	
Mantle P/N: CW058-001-MN180	Concave P/N: CW058-003-MN180

TC1300X Auto Sand



Max Feed Size: 2-1/2” (65mm)	
CSS Range: 9/16” – 1” (14-25mm)	
Mantle P/N: CW058-001-MN180	Concave P/N: CW058-013-MN180

TC Gradation Chart

Closed Side Setting (CSS)		*TC Cone Gradations in % passing per CSS**						
		5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)
Sieve Size	3-1/2" (89mm)	-	-	-	-	-	100	100
	3" (76mm)	-	-	-	-	100	99	95
	2-1/2" (64mm)	-	-	-	100	91	89	82
	2" (51mm)	-	-	-	87	74	69	57
	1-1/2" (38mm)	-	100	100	62	50	46	33
	1-1/4" (32mm)	100	97	94	47	37	33	23
	1" (25mm)	97	91	83	33	26	23	15
	3/4" (19mm)	87	77	66	25	19	16	9.4
	1/2" (13mm)	63	55	46	17	13	11	6.6
	3/8" (10mm)	50	44	37	13	11	8.7	5.1
	1/4" (6mm)	37	32	28	9.4	7.8	7.0	3.4
	#4 (5mm)	31	26	22	7.1	5.5	4.7	2.0
	#8 (2.4mm)	20	17	14	4.3	2.8	2.0	1.0
	#16 (1.2mm)	14	11	9.8	2.3	1.0	1.0	-

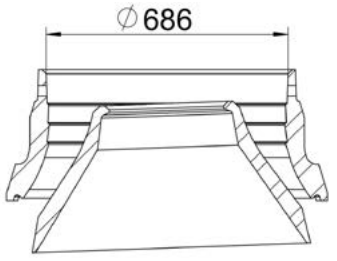
* TC cone gradations based on a work index of 13, medium coarse liners, open circuit configuration, less than 10% fines (smaller than the CSS), and long throw machine setup. Gradations can vary if any of these variables change. Contact your sales rep for gradations adjusted to your site-specific application.

TG Line of Crusher

Model	*TG120*	*TG220*	*TG320*	*TG420*
Head Diameter Inches (mm)	30" (762)	36" (914)	43" (1,092)	52" (1,321)
Operating RPM (Pinion RPM)	1,470	1,470	1,470	1,175
Horsepower (kW)	100 (90)	200 (160)	300 (250)	400 (315)
Weight Lbs (kg)	12,125 (5,500)	21,000 (9,500)	33,100 (15,000)	55,600 (25,200)

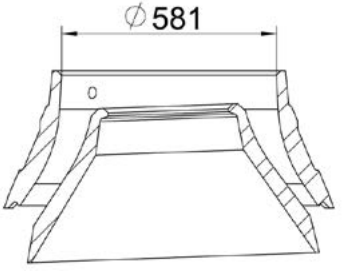
All TG cone crusher capacities are listed on following pages based on a density of 100 pcf, work index of 13, open circuit configuration, less than 10% fines (smaller than the CSS), less than 1.5% moisture, and well distributed feed gradation. Capacities can vary higher or lower if any of these variables change. Contact your sales rep for capacities adjusted to your site-specific application.

TG120 Extra Coarse Liner Profile:



Closed Side Setting (CSS)		*TC Cone GTG120 Extra Coarse Liner Capacities in short tons per hour (mtph)*						
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)
Stroke	1/2" (13mm)	53* (48)	55* (50)	60 (55)	65 (59)	68 (61)	72 (65)	88 (77)
	5/8" (16mm)	-	69* (63)	73* (66)	78 (71)	85 (77)	91 (82)	106 (92)
	11/16" (18mm)	-	75* (69)	82* (75)	88 (80)	94 (85)	100 (90)	115 (105)
	13/16" (20mm)	-	85* (78)	91* (83)	99 (90)	107 (97)	114 (103)	126 (115)
	7/8" (22mm)	-	94* (86)	102* (93)	110 (100)	115 (104)	125 (113)	139 (127)
Max Feed: 4-3/4" (120mm) *Requires fine mantle								
Mantle P/N: CR072-142-808					Concave P/N: CR072-237-808			

TG120 Coarse Liner Profile:



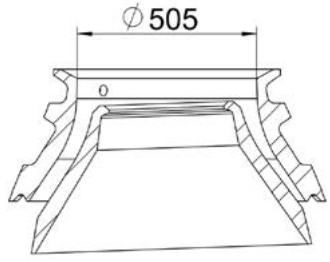
Closed Side Setting (CSS)		*TG120 Coarse Liner Capacities in short tons per hour (mtph)*					
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)
Stroke	1/2" (13mm)	46* (42)	50* (46)	55 (50)	60 (54)	64 (58)	68 (61)
	5/8" (16mm)	59* (54)	63* (58)	69 (63)	74 (67)	79 (71)	86 (77)
	11/16" (18mm)	-	69* (63)	75 (68)	83 (75)	88 (79)	95 (85)
	13/16" (20mm)	-	78* (71)	85 (77)	90 (82)	97 (88)	103 (103)
	7/8" (22mm)	-	88* (80)	92* (84)	100 (91)	108 (98)	113 (102)
	1" (25mm)	-	97* (89)	104* (95)	115 (104)	122 (110)	130 (117)
Max Feed: 3-1/8" (80mm) *Requires fine mantle							
Mantle P/N: CR072-142-808					Concave P/N: CR072-238-808		

TG120 Medium Liner Profile:



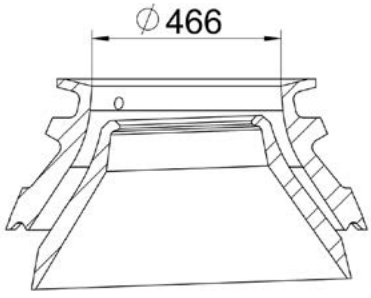
Closed Side Setting (CSS)		*TG120 Medium Liner Capacities in short tons per hour (mtph)*			
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)
Stroke	1/2" (13mm)	41* (37)	46 (42)	48 (44)	52 (47)
	5/8" (16mm)	50* (47)	56 (51)	59 (54)	66 (60)
	11/16" (18mm)	59* (54)	62 (56)	69 (63)	-
	13/16" (20mm)	63* (58)	70* (64)	77 (70)	-
	7/8" (22mm)	71* (65)	76* (69)	85 (77)	-
	1" (25mm)	*81 (74)	87* (79)	-	-
Max Feed: 2-3/8" (60mm) *Requires fine mantle					
Mantle P/N: CR072-142-808		Concave P/N: CR072-240-808			

TG120 Medium Fine Liner Profile:



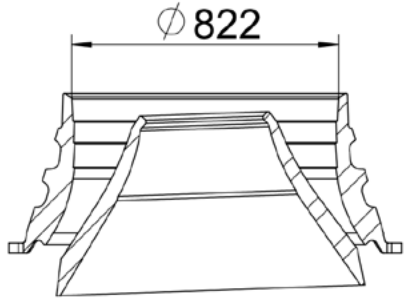
Closed Side Setting (CSS)		*TG120 Medium Fine Liner Capacities in short tons per hour (mtph)*			
		1/4" (6mm)	3/8" (10mm)	1/2" (13mm)	5/8" (16mm)
Stroke	5/8" (16mm)	*41 (37)	45 (41)	47 (43)	51 (46)
	11/16" (18mm)	-	*50 (46)	55 (50)	59 (54)
	13/16" (20mm)	-	56* (51)	60 (55)	-
	7/8" (22mm)	-	61* (56)	67 (61)	-
	1" (25mm)	-	68* (63)	73 (67)	-
	1-1/8" (28mm)	-	79* (73)	-	-
Max Feed: 1-3/4" (45mm) *Requires fine mantle					
Mantle P/N: CR072-142-808		Concave P/N: CR072-241-808			

TG120 Fine Liner Profile:



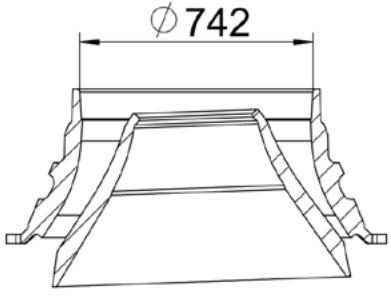
Closed Side Setting (CSS)		*TG120 Fine Liner Capacities in short tons per hour (mtph)*			
		1/4" (6mm)	3/8" (10mm)	1/2" (13mm)	5/8" (16mm)
Stroke	5/8" (16mm)	30 (30)	36 (33)	37 (34)	41 (37)
	11/16" (18mm)	37 (33)	40 (37)	44 (40)	
	13/16" (20mm)	40 (36)	44 (40)	47 (43)	
	7/8" (22mm)	45* (41)	49 (45)	57 (52)	
	1" (25mm)	51* (46)	57 (52)		
	1-1/8" (28mm)	56* (50)	63 (58)		
Max Feed: 1-3/8" (35mm) *Requires fine mantle					
Mantle P/N: CR072-142-808		Concave P/N: CR072-242-808			

TG220 Extra Coarse Liner Profile:



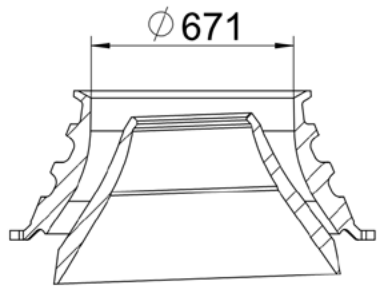
Closed Side Setting (CSS)		*TG220 Extra Coarse Liner Capacities in short tons per hour (mtph)*						
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)
Stroke	5/8" (16mm)	76* (69)	81* (74)	88 (80)	102 (92)	114 (104)	127 (115)	133 (120)
	3/4" (19mm)	88* (81)	99* (90)	106 (96)	121 (109)	134 (122)	151 (137)	157 (142)
	7/8" (22mm)	103* (94)	112* (102)	122 (111)	140 (126)	156 (142)	175 (159)	182 (165)
	1" (25mm)	118* (108)	129* (117)	139* (126)	158 (142)	177 (161)	200 (181)	-
	1-1/8" (28mm)	-	148* (135)	161* (146)	182 (164)	205 (187)	229 (207)	-
	1-1/4" (32mm)	-	164* (149)	175* (159)	189 (171)	201 (181)	228 (208)	-
Max Feed: 6-1/4" (160mm) *Requires fine mantle								
Mantle P/N: CR073-142-808					Concave P/N: CR073-237-808			

TG220 Coarse Liner Profile



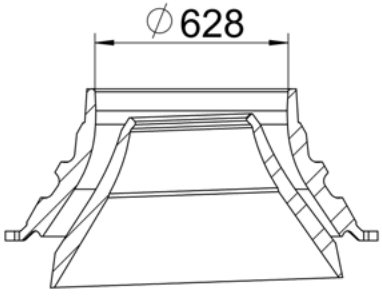
Closed Side Setting (CSS)		*TG220 Coarse Liner Capacities in short tons per hour (mtph)*						
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)
Stroke	5/8" (16mm)	71* (65)	79* (72)	84 (76)	91 (82)	97 (87)	109 (99)	121 (110)
	3/4" (19mm)	84* (77)	93* (85)	100 (91)	108 (97)	116 (104)	130 (118)	144 (130)
	7/8" (22mm)	97* (89)	107* (97)	116 (105)	126 (114)	133 (120)	149 (136)	164 (149)
	1" (25mm)	111* (102)	123* (112)	132 (120)	143 (129)	149 (134)	168 (153)	-
	1-1/8" (28mm)	129* (118)	142* (129)	153 (139)	164 (148)	173 (156)	197 (180)	-
	1-1/4" (32mm)	146* (133)	157* (143)	168 (152)	182 (164)	193 (174)	218 (199)	-
Max Feed: 5-1/8" (130mm) *Requires fine mantle								
Mantle P/N: CR073-142-808					Concave P/N: CR073-238-808			

TG220 Medium Coarse Liner Profile



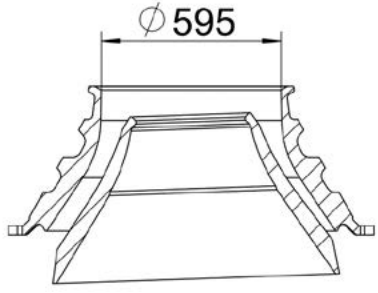
Closed Side Setting (CSS)		*TG220 Medium Coarse Liner Capacities in short tons per hour (mtph)*						
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)
Stroke	5/8" (16mm)	61* (56)	69* (63)	74 (67)	78 (71)	85 (77)	91 (82)	103 (94)
	3/4" (19mm)	-	82* (75)	87 (79)	93 (84)	102 (92)	109 (98)	122 (111)
	7/8" (22mm)	-	94* (86)	102 (93)	108 (98)	117 (106)	125 (112)	142 (129)
	1" (25mm)	-	105* (96)	116* (106)	125 (113)	134 (121)	142 (128)	160 (146)
	1-1/8" (28mm)	-	124* (113)	134* (122)	142 (129)	155 (140)	166 (149)	-
	1-1/4" (32mm)	-	137* (125)	148* (135)	158 (143)	171 (154)	182 (164)	-
	1-5/16" (34mm)	-	146* (133)	157* (143)	169 (153)	181 (164)	191 (172)	-
	1-7/16" (36mm)	-	154* (141)	166* (151)	178 (161)	193 (174)	204 (184)	-
Max Feed: 4-1/8" (105mm) *Requires fine mantle								
Mantle P/N: CR073-142-808					Concave P/N: CR073-239-808			

TG220 Medium Liner Profile



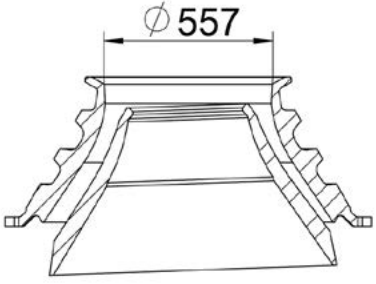
Closed Side Setting (CSS)		TG220 Medium Fine Liner Capacities in short tons per hour (mtph)						
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)
Stroke	3/4" (19mm)	*69 (63)	74* (68)	82 (75)	88 (80)	95 (86)	101 (91)	113 (103)
	7/8" (22mm)	79* (73)	86* (79)	94 (86)	102 (92)	109 (98)	117 (105)	-
	1" (25mm)	89* (82)	*98 (90)	106 (96)	116 (105)	125 (113)	135 (121)	-
	1-1/8" (28mm)	-	116* (106)	124 (113)	132 (120)	144 (130)	156 (140)	-
	1-1/4" (32mm)	-	127* (116)	136 (124)	148 (134)	158 (143)	169 (152)	-
	1-5/16" (34mm)		136* (124)	147* (134)	157 (142)	168 (152)	-	-
	1-7/16" (36mm)	-	143* (131)	155* (141)	166 (150)	180 (162)	-	-
Max Feed: 3-1/8" (80mm) *Requires fine mantle								
Mantle P/N: CR073-142-808					Concave P/N: CR073-240-808			

TG220 Medium Fine Liner Profile:



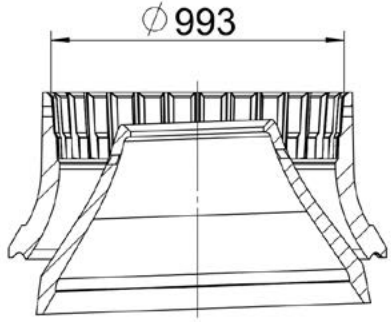
Closed Side Setting (CSS)		TG220 Medium Fine Liner Capacities in short tons per hour (mtph)					
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)
Stroke	7/8" (22mm)	71* (65)	77 (70)	85 (77)	89 (81)	96 (87)	103 (93)
	1" (25mm)	82* (75)	89 (81)	95 (86)	100 (91)	111 (100)	-
	1-1/8" (29mm)	92* (85)	102 (93)	111 (100)	118 (107)	127 (115)	-
	1-1/4" (32mm)	103* (95)	113* (103)	122 (111)	129 (117)	-	-
	1-5/16" (34mm)	108* (100)	120* (110)	130 (118)	138 (125)	-	-
	1-7/16" (36mm)	115* (106)	128* (117)	137 (125)	-	-	-
Max Feed: 2-3/4" (70mm) *Requires fine mantle							
Mantle P/N: CR073-142-808					Concave P/N: CR073-241-808		

TG220 Fine Liner Profile:



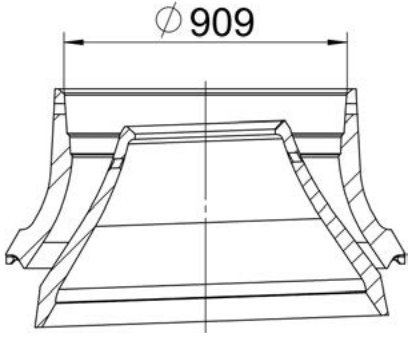
Closed Side Setting (CSS)		*TG220 Fine Liner Capacities in short tons per hour (mtph)*					
		1/4" (6mm)	3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)
Stroke	7/8" (22mm)	53* (48)	58 (53)	64 (59)	68 (62)	76 (69)	80 (72)
	1" (25mm)	61* (55)	66 (60)	73 (67)	80 (73)	86 (78)	88 (80)
	1-1/8" (29mm)	71* (64)	76 (69)	85 (78)	92 (84)	99 (90)	103 (93)
	1-1/4" (32mm)	78* (70)	84 (77)	94 (86)	102 (93)	110 (100)	-
	1-5/16" (34mm)	84* (75)	90 (82)	99 (91)	109 (99)	117 (106)	-
	1-7/16" (36mm)	88* (79)	95 (87)	106 (97)	113 (103)	-	-
Max Feed: 1-3/4" (45mm) *Requires fine mantle							
Mantle P/N: CR073-142-808				Concave P/N: CR073-242-808			

TG320 Extra Coarse Liner Profile



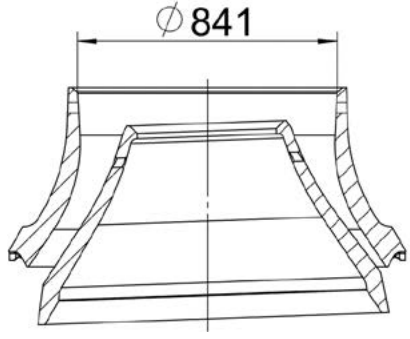
Closed Side Setting (CSS)		*TG320 Extra Coarse Liner Capacities in short tons per hour (mtph)*						
		5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)
Stroke	5/8" (16mm)	125* (114)	134* (121)	143 (129)	154 (139)	175 (159)	193 (175)	213 (192)
	13/16" (20mm)	156* (142)	168* (152)	180 (162)	194 (175)	215 (196)	242 (219)	266 (240)
	15-16" (24mm)	187* (170)	202* (183)	216* (195)	232 (209)	259 (236)	290 (263)	320 (288)
	1-1/8" (28mm)	220* (200)	235* (213)	253* (228)	272 (245)	302 (275)	337 (305)	372 (335)
	1-1/4" (32mm)	-	269* (244)	289* (261)	309 (278)	347 (316)	386 (350)	424 (382)
	1-7/16" (36mm)	-	303* (275)	324* (292)	348* (313)	389 (355)	436 (395)	-
Max Feed: 7-1/4" (185mm *Requires fine mantle								
Mantle P/N: CR074-142-808					Concave P/N: CR074-237-808			

TG320 Coarse Liner Profile:



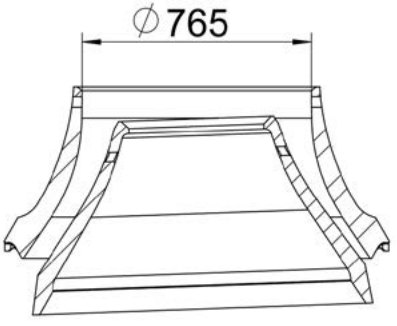
Closed Side Setting (CSS)		TG320 Coarse Liner Capacities in short tons per hour (mtph)							
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)
Stroke	5/8" (16mm)	110* (101)	121* (110)	130 (118)	139 (125)	150 (135)	166 (151)	185 (168)	203 (183)
	13/16" (20mm)	-	149* (136)	161* (146)	173 (156)	184 (166)	207 (189)	232 (210)	249 (225)
	15-16" (24mm)	-	180* (164)	194* (176)	207 (187)	223 (201)	250 (228)	278 (252)	-
	1-1/8" (28mm)	-	211* (192)	226* (205)	243 (219)	260 (234)	291 (265)	325 (294)	-
	1-1/4" (32mm)	-	242* (220)	259* (235)	278* (251)	297 (267)	331 (302)	371 (336)	-
	1-7/16" (36mm)	-	-	291* (264)	312* (282)	333 (300)	374 (341)	-	-
	1-9/16" (40mm)	-	-	323* (293)	346* (312)	371 (334)	415 (378)	-	-
Max Feed: 6-1/8" (155mm) *Requires fine mantle									
Mantle P/N: CR074-142-808					Concave P/N: CR074-238-808				

TG320 Extra Coarse Liner Profile:



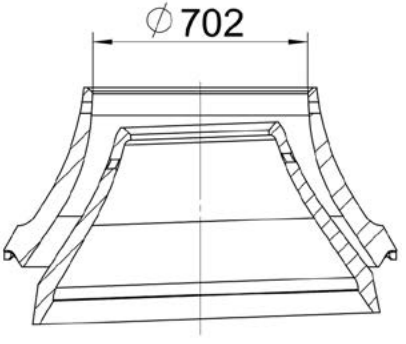
Closed Side Setting (CSS)		TG320 Medium Coarse Liner Capacities in short tons per hour (mtph)						
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)
Stroke	5/8" (16mm)	107* (98)	116* (106)	127 (115)	132 (119)	142 (128)	159 (145)	178 (161)
	13/16" (20mm)	132* (121)	145* (132)	158 (143)	165 (149)	179 (161)	199 (181)	224 (203)
	15-16" (24mm)	-	174* (158)	188* (170)	198 (179)	214 (193)	239 (218)	263 (238)
	1-1/8" (28mm)	-	203* (185)	218* (198)	233 (210)	250 (225)	279 (254)	-
	1-1/4" (32mm)	-	232* (211)	249* (226)	266 (240)	285 (257)	319 (291)	-
	1-7/16" (36mm)	-	260* (237)	280* (254)	299 (270)	321 (289)	359 (327)	-
	1-9/16" (40mm)	-	289* (263)	314* (285	332* (300)	357 (321)	-	-
Max Feed: 4-7/8" (125mm) *Requires fine mantle								
Mantle P/N: CR074-142-808					Concave P/N: CR074-239-808			

TG320 Medium Liner Profile



Closed Side Setting (CSS)		*TG320 Medium Liner Capacities in short tons per hour (mtph)*						
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)
Stroke	13/16" (20mm)	126* (115)	138* (126)	150 (136)	159 (143)	171 (154)	192 (175)	211 (191)
	15-16" (24mm)	151* (138)	167* (152)	179 (162)	192 (173)	204 (184)	230 (210)	-
	1-1/8" (28mm)	177* (162)	195* (178)	209 (189)	224 (202)	239 (215)	269 (245)	-
	1-1/4" (32mm)	202* (185)	223* (203)	238* (216)	255 (230)	272 (245	307 (280)	-
	1-7/16" (36mm)	-	251* (228)	268* (243)	288 (260)	307 (276)	-	-
	1-9/16" (40mm)	-	278* (254)	319* (289)	320 (289)	340 (304)	-	-
	1-3/4" (44mm)	-	306* (278)	328* (297)	350 (316)	377 (339)	-	-
Max Feed: 3-7/8" (100mm) *Requires fine mantle								
Mantle P/N: CR074-142-808					Concave P/N: CR074-240-808			

TG320 Medium Fine Liner Profile:



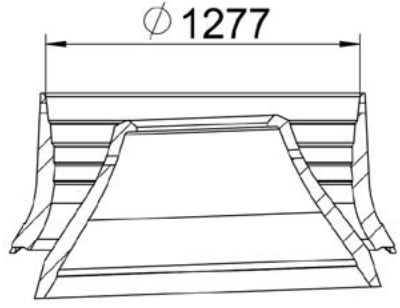
Closed Side Setting (CSS)		*TG320 Medium Fine Liner Capacities in short tons per hour (mtph)*						
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)
Stroke	15-16" (24mm)	125* (115)	136* (124)	147 (134)	159 (144)	170 (153)	183 (165)	202 (184)
	1-1/8" (28mm)	-	157* (144)	174* (158)	184 (167)	199 (180)	213 (192)	236 (215)
	1-1/4" (32mm)	-	179* (164)	198* (180)	212 (192)	227 (205)	244 (220)	270 (246)
	1-7/16" (36mm)	-	204* (187)	222* (202)	238 (216)	256 (231)	275 (247)	-
	1-9/16" (40mm)	-	224* (205)	247* (225)	265 (240)	283 (255)	304 (273)	-
	1-3/4" (44mm)	-	248* (227)	271* (247)	291 (264)	311 (281)	335 (301)	-
Max Feed: 3" (75mm) *Requires fine mantle								
Mantle P/N: CR074-142-808					Concave P/N: CR074-241-808			

TG320 Fine Liner Profile:



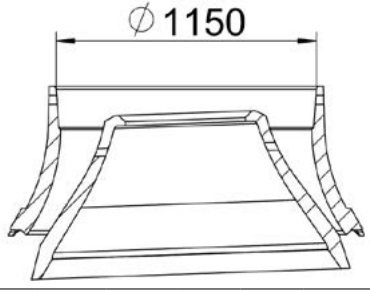
Closed Side Setting (CSS)		*TG320 Fine Liner Capacities in short tons per hour (mtph)*						
		3/8" (10mm)	1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)
Stroke	15-16" (24mm)	105* (96)	115 (105)	122 (111)	134 (121)	142 (128)	153 (138)	169 (154)
	1-1/8" (28mm)	123* (113)	132 (121)	143 (130)	154 (140)	165 (149)	179 (161)	198 (180)
	1-1/4" (32mm)	140* (129)	153 (140)	164 (149)	177 (160)	188 (170)	202 (182)	225 (205)
	1-7/16" (36mm)	157* (145)	172 (157)	184 (167)	199 (180)	213 (192)	229 (206)	-
	1-9/16" (40mm)	175* (161)	190 (174)	204 (186)	222 (201)	236 (213)	255 (229)	-
	1-3/4" (44mm)	192* (176)	208 (190)	227 (207)	244 (221)	260 (235)	280 (252)	-
Max Feed: 2-1/2" (65mm) *Requires fine mantle								
Mantle P/N: CR074-142-808					Concave P/N: CR074-242-808			

TG420 Extra Coarse Liner Profile:



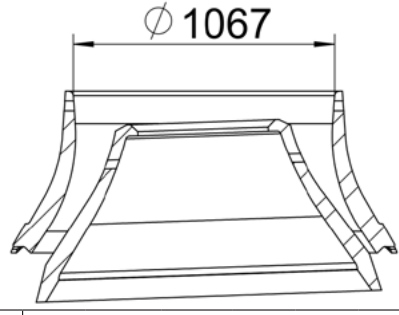
Closed Side Setting (CSS)		*TG420 Extra Coarse Liner Capacities in short tons per hour (mtph)*							
		5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)	2" (51mm)
Stroke	11/16" (18mm)	191* (174)	207* (188)	224* (202)	239 (215)	270 (246)	299 (271)	328 (296)	357 (325)
	13/16" (20mm)	-	231* (209)	249* (225)	266* (239)	300 (273)	332 (301)	366 (330)	399 (363)
	15-16" (24mm)	-	277* (251)	299* (270)	319* (287)	359 (327)	401 (363)	439 (396)	479 (436)
	1-1/8" (28mm)	-	324* (294)	349* (315)	372* (335)	420 (383)	466 (422)	513 (462)	559 (508)
	1-1/4" (32mm)	-	371* (336)	399* (360)	426* (383)	480 (437)	533 (483)	586 (528)	-
	1-7/16" (36mm)	-	-	434* (392)	464* (417)	539* (491)	599 (543)	659 (594)	-
	1-9/16" (40mm)	-	-	483* (436)	517* (464)	600* (547)	667 (604)	732 (660)	-
Max Feed: 9-1/4" (235mm) *Requires fine mantle									
Mantle P/N: CR076-142-808					Concave P/N: CR076-237-808				

TG420 Coarse Liner Profile:



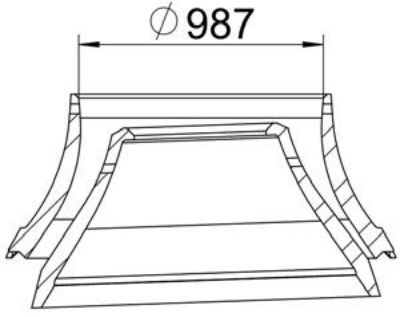
Closed Side Setting (CSS)		TG420 Medium Fine Liner Capacities in short tons per hour (mtph)							
		5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)	2" (51mm)
Stroke	11/16" (18mm)	188* (171)	203* (184)	219* (198)	233 (210)	261 (238)	291 (264)	318 (287)	346 (315)
	13/16" (20mm)	210* (191)	225* (204)	244* (220)	258 (232)	292 (266)	323 (293)	354 (319)	385 (350)
	15-16" (24mm)	-	270* (245)	292* (264)	310 (279)	350 (319)	389 (352)	425 (383)	-
	1-1/8" (28mm)	-	315* (285)	340* (307)	362* (326)	408 (372)	453 (410)	496 (447)	-
	1-1/4" (32mm)	-	360* (326)	389* (351)	413 (372)	466 (425)	518 (469)	567 (511)	-
	1-7/16" (36mm)	-	405* (367)	437 (395)	466 (419)	524 (477)	582 (527)	-	-
	1-9/16" (40mm)	-	-	485* (438)	517* (465)	582 (530)	647 (587)	-	-
	1-3/4" (44mm)	-	-	534* (482)	568* (511)	641 (584)	711 (644)	-	-
Max Feed: 8-1/2" (215mm) *Requires fine mantle									
Mantle P/N: CR076-142-808					Concave P/N: CR076-238-808				

TG420 Medium Coarse Liner Profile:



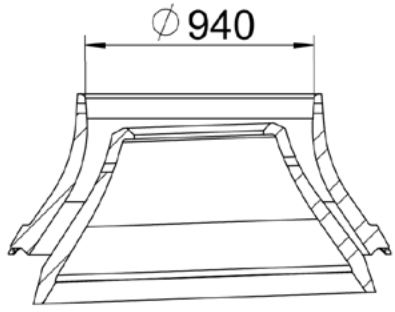
Closed Side Setting (CSS)		TG420 Medium Fine Liner Capacities in short tons per hour (mtph)						
		5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)	1-3/4" (44mm)
Stroke	11/16" (18mm)	177* (161)	191* (173)	207* (187)	221 (199)	249 (227)	274 (248)	303 (273)
	13/16" (20mm)	197* (179)	213* (193)	230* (208)	246 (221)	277 (252)	305 (276)	335 (302)
	15-16" (24mm)	236* (215)	255* (231)	276* (249)	293 (264)	329 (300)	367 (332)	402 (362)
	1-1/8" (28mm)	278* (253)	298* (270)	322* (291)	343 (309)	384 (350)	427 (387)	-
	1-1/4" (32mm)	-	341* (309)	368* (332)	392 (353)	439 (400)	489 (443)	-
	1-7/16" (36mm)	-	383* (347)	413* (373)	441* (397)	496 (452)	550 (498)	-
	1-9/16" (40mm)	-	426* (386)	460* (415)	490* (441)	552 (503)	-	-
	1-3/4" (44mm)	-	469* (425)	505* (456)	539* (485)	607 (553)	-	-
Max Feed: 6-1/8" (155mm) *Requires fine mantle								
Mantle P/N: CR076-142-808					Concave P/N: CR076-239-808			

TG420 Medium Liner Profile:



Closed Side Setting (CSS)		*TG420 Medium Fine Liner Capacities in short tons per hour (mtph)*					
		5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)
Stroke	15/16" (24mm)	215* (196)	231* (209)	250 (226)	267 (240)	301 (274)	333 (302)
	1-1/8" (28mm)	252* (229)	269* (244)	290* (262)	310 (279)	349 (318)	389 (352)
	1-1/4" (32mm)	286* (260)	309* (280)	333* (301	356 (320)	400 (364)	442 (400)
	1-7/16" (36mm)	323* (294)	348* (315)	373* (337)	399 (359)	449 (409)	-
	1-9/16" (40mm)	-	386* (350)	417* (377)	443 (399)	449 (409)	-
	1-3/4" (44mm)	-	425* (385)	459* (414)	489 (440)	552 (503)	-
	1-7/8" (48mm)	-	465* (421	500* (451)	533* (480)	-	-
	1-15/16" (50mm)	-	483* (438)	520* (470)	554* (499)	-	-
Max Feed: 4-3/4" (120mm) *Requires fine mantle							
Mantle P/N: CR076-142-808				Concave P/N: CR076-240-808			

TG420 Medium Fine Liner Profile:



Closed Side Setting (CSS)		*TG420 Medium Fine Liner Capacities in short tons per hour (mtph)*						
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)
Stroke	1-1/8" (28mm)	213* (194)	227* (206)	245* (222)	261 (235)	281 (253)	315 (287)	351 (318)
	1-1/4" (32mm)	-	261* (237)	278* (252)	298 (269)	321 (289)	360 (328)	396 (359)
	1-7/16" (36mm)	-	294* (267)	313* (284)	337 (304)	361 (325)	405 (369)	-
	1-9/16" (40mm)	-	325* (296)	349* (316)	374 (338)	401 (361)	450 (410)	-
	1-3/4" (44mm)	-	358* (326)	383* (347)	411 (371)	438 (394)	495 (451)	-
	1-7/8" (48mm)	-	390* (355)	418* (379)	449* (405)	481 (433)	-	-
	1-15/16" (50mm)	-	430* (390)	437* (396)	471* (425)	501 (451)	-	-
Max Feed: 3-7/8" (100mm) *Requires fine mantle								
Mantle P/N: CR076-142-808					Concave P/N: CR076-241-808			

TG420 Fine Liner Profile:



Closed Side Setting (CSS)		*TG420 Fine Liner Capacities in short tons per hour (mtph)*						
		1/2" (13mm)	5/8" (16mm)	3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (38mm)
Stroke	1-1/4" (32mm)	213* (195)	230 (209)	249 (226)	268 (242)	284 (265)	320 (292)	357 (323)
	1-7/16" (36mm)	238* (218)	258* (235)	280 (254)	301 (272)	320 (288)	361 (329)	-
	1-9/16" (40mm)	264* (242)	289* (263)	311 (282)	334 (302)	357 (321)	402 (366)	-
	1-3/4" (44mm)	292* (267)	318* (289)	342 (310)	368 (332)	392 (353)	438 (399)	-
	1-7/8" (48mm)	318* (291)	345* (314)	373 (338)	402 (363)	447 (383)	-	-
	1-15/16" (50mm)	332* (304)	360* (328)	387 (351)	417 (377)	470 (400)	-	-
Max Feed: 3" (75mm) *Requires fine mantle								
Mantle P/N: CR076-142-808				Concave P/N: CR076-242-808				

TG Gradation Chart

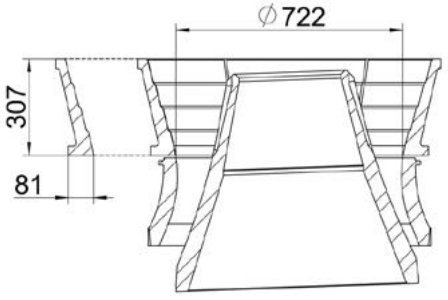
Sieve Size	*% Passing per Closed Side Setting*										
	1/4 (6)	3/8 (10)	1/2 (13)	5/8 (16)	3/4 (19)	7/8 (22)	1 (25)	1-1/4 32)	1-1/2 (38)	1-3/4 (44)	2 (51)
3 (76)	-	-	-	-	-	-	-	-	-	-	100
2-3/4 (70)	-	-	-	-	-	-	-	-	-	100	96
2-1/2 (64)	-	-	-	-	-	-	-	-	100	97	90
2-1/4 (57)	-	-	-	-	-	-	-	-	98	93	82
2 (51)	-	-	-	-	-	-	-	100	95	87	73
1-3/4 (44)	-	-	-	-	-	-	100	95	87	77	63
1-1/2 (38)	-	-	-	-	-	100	98	87	80	66	53
1-1/4 (32)	-	-	-	-	100	97	93	75	61	53	42
1 (25)	-	-	-	100	97	89	82	60	49	40	30
7/8 (22)	-	-	-	97	91	81	73	52	42	35	26
3/4 (19)	-	-	100	92	83	71	63	44	35	29	22
5/8 (16)	-	100	93	83	71	59	51	37	29	24	18
1/2 (13)	-	93	80	69	56	46	40	29	22	19	15
3/8 (10)	100	84	66	54	43	35	30	22	17	15	12
5/16 (8)	92	70	54	44	35	28	24	18	12	12	10
1/4 (6)	84	56	42	34	27	22	19	14	12	10	8.9
#4 (4)	62	39	30	24	19	16	14	10	8.9	7.9	6.9
#10 (4)	34	23	18	15	12	10	8.9	6.9	6.5	6.0	5.3
#16 (1.2)	24	17	13	11	10	8.0	7.3	6.2	5.8	5.4	4.9

TGS Line of Cones

Model	*TGS120*	*TGS220*	*TGS320*	*TGS420*
Head Diameter Inches (mm)	27 (686)	33” (838)	39” (991)	45” (1,143)
Operating RPM (Pinion RPM)	1,310	1,410	1,310	1,050
Horsepower (kW)	100 (90)	200 (160)	300 (250)	400 (315)
Weight Lbs (kg)	15,100 (6,850)	26,700 (12,100)	43,000 (19,500)	80,500 (36,500)

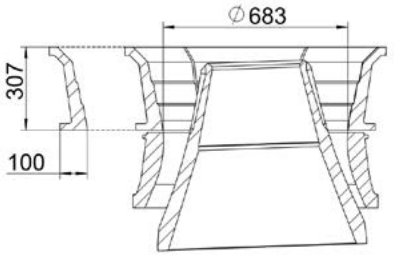
All TG cone crusher capacities are based on a density of 100 pcf, work index of 13, open circuit configuration, less than 10% fines (smaller than the CSS), less than 1.5% moisture, and well distributed feed gradation. Capacities can vary higher or lower if any of these variables change. Contact your sales rep for capacities adjusted to your site-specific application.

TGS120 Extra Coarse Liner Profile:



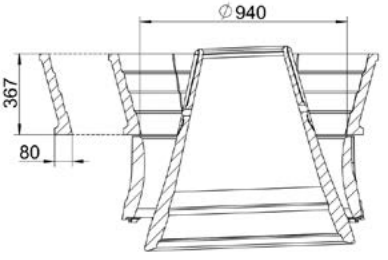
Closed Side Setting (CSS)		*TGS120 Extra Coarse Liner Capacities in short tons per hour (mtph)*					
		3/4” (19mm)	7/8” (22mm)	1” (25mm)	1-1/8” (29mm)	1-1/4” (32mm)	1-3/8” (35mm)
Stroke	5/8” (16mm)	93* (84)	103* (93)	113 (102)	118 (108)	126 (115)	132 (120)
	13/16” (20mm)	-	127* (114)	139* (125)	145 (133)	156 (142)	-
	1” (25mm)	-	-	174* (157)	210* (167)	-	-
Max Feed: 7-1/2” (190mm) *Requires fine mantle							
Mantle P/N: CR072-416-808					Lower Concave P/N: CR072-449-808		
					Upper Concave set P/N: CR072-452-808		

TGS120 Coarse Liner Profile:



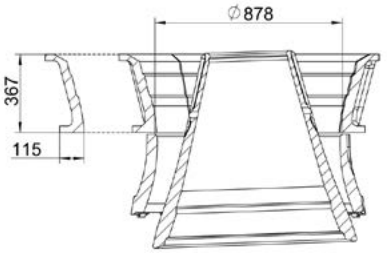
Closed Side Setting (CSS)		*TGS120 Coarse Liner Capacities in short tons per hour (mtph)*				
		3/4" (19mm)	7/8" (22mm)	1" (25mm)	1-1/8" (29mm)	1-1/4" (32mm)
Stroke	5/8" (16mm)	83* (75)	85* (77)	90 (81)	98 (90)	104 (104)
	13/16" (20mm)	-	106* (96)	113* (102)	120 (111)	139 (127)
	1" (25mm)	-	-	139* (127)	-	-
Max Feed: 6-1/2" (165mm) *Requires fine mantle						
Mantle P/N: CR072-416-808					Lower Concave P/N: CR072-450-808	
					Upper Concave set P/N: CR072-453-808	

TGS220 Extra Coarse Liner Profile:



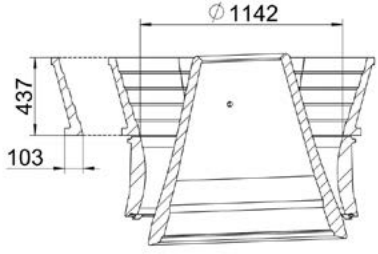
Closed Side Setting (CSS)		*TGS220 Extra Coarse Liner Capacities in short tons per hour (mtph)*						
		1" (25mm)	1-1/8" (29mm)	1-1/4" (32mm)	1-3/8" (35mm)	1-1/2" (38mm)	1-3/4" (44mm)	2" (51mm)
Stroke	5/8" (16mm)	139* (125)	150 (137)	160 (146)	171 (155)	181 (164)	203 (183)	225 (205)
	13/16" (20mm)	-	188* (172)	202* (184)	214 (194)	228 (206)	255 (230)	282 (257)
	1" (25mm)	-	-	253* (231)	269* (244)	284* (257)	318 (286)	-
	1-3/16" (30mm)	-	-	-	321* (292)	343* (311)	382 (344)	-
Max Feed: 10-7/8" (275mm) *Requires fine mantle								
Mantle P/N: CR073-416-808					Lower Concave P/N: CR073-449-808			
					Upper Concave set P/N: CR073-452-808			

TGS220 Coarse Liner Profile:



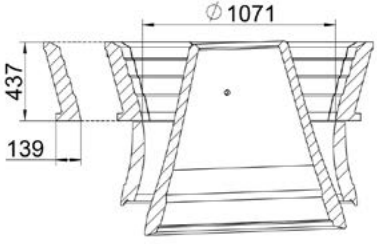
Closed Side Setting (CSS)		*TG220 Coarse Liner Capacities in short tons per hour (mtph)*						
		7/8" (22mm)	1" (25mm)	1-1/8" (29mm)	1-1/4" (32mm)	1-3/8" (35mm)	1-1/2" (38mm)	1-3/4" (44mm)
Stroke	5/8" (16mm)	119* (107)	128 (115)	138 (126)	147 (134)	160 (145)	167 (151)	189 (170)
	13/16" (20mm)	-	160* (144)	175* (160)	187 (170)	197 (179)	209 (189)	233 (210)
	1" (25mm)	-	-	219* (200)	231* (211)	247 (224)	262 (237)	295 (265)
	1-3/16" (30mm)	-	-	-	280* (255)	296* (269)	314 (284)	-
Max Feed: 9-1/2" (240mm) *Requires fine mantle								
Mantle P/N: CR073-416-808					Lower Concave P/N: CR073-450-808			
					Upper Concave set P/N: CR073-453-808			

TGS320 Extra Coarse Liner Profile:



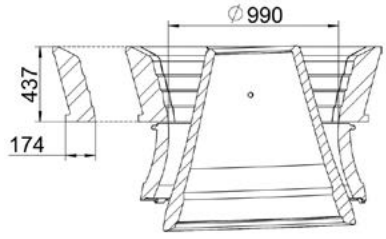
Closed Side Setting (CSS)		*TGS320 Extra Coarse Liner Capacities in short tons per hour (mtph)*				
		1-3/8" (35mm)	1-1/2" (38mm)	1-3/4" (44mm)	2" (51mm)	2-1/8" (54mm)
Stroke	13/16" (20mm)	294* (267)	313* (283)	346 (312)	285 (350)	403 (365)
	1" (25mm)	-	390* (353)	433* (390)	480 (437)	502 (455)
	1-3/16" (30mm)	-	-	521* (469)	577 (525)	-
	1-7/16" (36mm)	-	-	624* (562)	-	-
Max Feed: 13" (330mm) *Requires fine mantle						
Mantle P/N: CR074-416-808				Lower Concave P/N: CR074-449-808		
				Upper Concave set P/N: CR074-452-808		

TGS320 Coarse Liner:



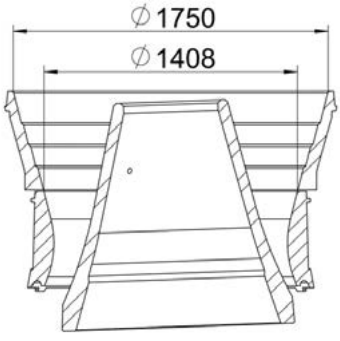
Closed Side Setting (CSS)		*TGS320 Coarse Capacities in short tons per hour (mtph)*					
		1-1/8" (29mm)	1-1/4" (32mm)	1-3/8" (35mm)	1-1/2" (38mm)	1-3/4" (44mm)	2" (51mm)
Stroke	13/16" (20mm)	245* (224)	261* (238)	278* (253)	298 (270)	332 (299)	367 (334)
	1" (25mm)	-	327* (298)	349* (317)	370* (335)	415 (374)	-
	1-3/16" (30mm)	-	-	418* (380)	444* (402)	499 (449)	-
	1-7/16" (36mm)	-	-	-	534* (484)	-	-
Max Feed: 12-1/4" (310mm) *Requires fine mantle							
Mantle P/N: CR074-416-808		Lower Concave P/N: CR074-450-808					
		Upper Concave set P/N: CR074-453-808					

TGS320 Medium Coarse Profile:



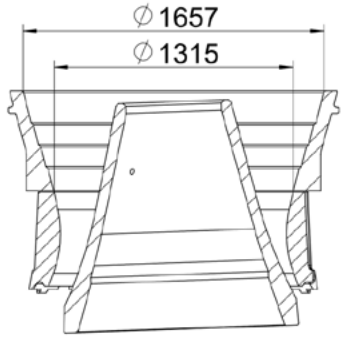
Closed Side Setting (CSS)		*TGS320 Medium Coarse Liner Capacities in short tons per hour (mtph)*					
		1" (25mm)	1-1/8" (29mm)	1-1/4" (32mm)	1-3/8" (35mm)	1-1/2" (38mm)	1-3/4" (44mm)
Stroke	13/16" (20mm)	216* (194)	234* (214)	249* (227)	268 (243)	283 (256)	317 (285)
	1" (25mm)	-	290* (266)	311* (284)	331* (301)	353 (320)	395 (356)
	1-3/16" (30mm)	-	-	374* (341)	398* (362)	424* (384)	474 (427)
	1-7/16" (36mm)	-	-	-	478* (434)	508* (460)	-
Max Feed: 11-3/4" (300mm) *Requires fine mantle							
Mantle P/N: CR074-416-808		Lower Concave P/N: CR074-448-808					
		Upper Concave set P/N: CR074-451-808					

TGS420 Extra Coarse Profile:



Closed Side Setting (CSS)		*TGS420 Extra Coarse Liner Capacities in short tons per hour (mtph)*			
		1-3/4" (44mm)	2" (32mm)	2-1/4" (57mm)	2-1/2" (64mm)
Stroke	13/16" (20mm)	408* (367)	451 (410)	494 (447)	536 (489)
	1" (25mm)	510* (459)	563* (512)	617 (558)	670 (612)
	1-3/16" (30mm)	-	675* (614)	739 (670)	803 (733)
	1-3/8" (35mm)	-	790* (719)	862* (781)	937 (855)
	1-9/16"(40mm)	-	-	986* (893)	1,071* (978)
Max Feed: 15-1/8" (385mm) *Requires fine mantle					
Mantle P/N: CR076-416-808			Lower Concave P/N: CR076-449-808		
			Upper Concave set P/N: CR076-452-808		

TGS420 Coarse:



Closed Side Setting (CSS)		*TGS420 Coarse Liner Capacities in short tons per hour (mtph)*				
		1-1/2" (38mm)	1-3/4" (44mm)	2" (32mm)	2-1/4" (57mm)	2-1/2" (64mm)
Stroke	13/16" (20mm)	350* (317)	391* (352)	433 (394)	474 (429)	514 (469)
	1" (25mm)	-	489* (440)	539 (491)	592 (537)	643 (587)
	1-3/16" (30mm)	-	587* (529)	650* (591)	710 (643)	770 (703)
	1-3/8" (35mm)	-	687* (617)	757* (689)	829 (751)	902 (823)
	1-9/16" (40mm)	-	-	866* (788)	948* (858)	-
Max Feed: 14-1/8" (360mm) *Requires fine mantle						
Mantle P/N: CR076-416-808				Lower Concave P/N: CR076-450-808		
				Upper Concave set P/N: CR076-453-808		

TGS Gradation Table

Sieve Size	Percent Passing Per Cone CSS (inch)										
	3/4 (19)	7/8" (22.2)	1" (25)	1 1/8" (29)	1-1/4 (32)	1-3/8 (35)	1-1/2 (38)	1-3/4 (44)	2 (51)	2-1/4 (57)	2-1/2 (64)
5" (120)	-	-	-	-	-	-	-	-	-	100	100
4" (102)	-	-	-	-	-	-	-	-	100	97	95
3" (76)	-	-	-	-	-	-	-	100	93	86	77
2-3/4" (70)	-	-	-	-	-	100	100	96	90	81	70
2-1/2" (64)	-	-	-	-	-	99	98	92	83	73	62
2-1/4" (57)	-	-	-	100	100	98	95	85	75	65	53
2" (51)	-	-	100	99	98	94	90	75	65	55	43
1-3/4" (44)	-	-	98	95	93	87	81	66	55	47	36
1-1/2" (38)	100	100	95	89	86	77	71	56	45	38	29
1-1/4" (32)	97	93	86	78	77	64	59	46	36	30	24
1" (25.4)	91	82	72	63	56	49	43	34	27	23	18
7/8" (22.2)	83	73	64	55	49	43	39	30	24	20	16
3/4" (19.1)	74	64	54	47	41	37	33	25	20	17	14
5/8" (15.9)	62	55	45	39	36	32	28	21	18	15	12
1/2" (12.7)	50	44	36	31	31	25	22	17	15	12	10
3/8" (9.5)	39	34	29	24	27	19	17	14	12	10	7.9
5/16" (7.9)	32	28	24	20	22	16	14	12	10	8.9	6.4
1/4" (6.4)	26	23	19	17	17	13	12	10	8.9	7.7	6.4
#4 (4.8)	20	17	15	13	12	11	10	7.9	6.9	6.3	5.5
#16	11	8.5	7.5	7.0	8.3	6.3	6.0	5.4	4.8	4.5	4.1

-Min and Max CSS dependent on machine and liner configuration

Capacities of Rollercone® Cone Crusher

The charts on the following pages show capacity ranges based on igneous rock (basalt, granite, etc.). These charts are to be used as guides to crusher and liner selection. Material processing includes many different factors that affect crusher performance. These charts are based on the following factors:

1. Less than 10% undersize (smaller than the CSS) in crusher feed.
2. Plastic material limited to where no "pancakes" are being created.
3. Proper crusher manganese configuration.
4. Moisture content of feed material below 5%
5. Uniform feed gradation
6. Proper feed distribution 360° around the feed opening
7. Use of the Fine Head feed control device when required
8. Proper crusher RPM under full load
9. Support equipment must be properly sized and in good operating condition including: conveyors, screens, electric motors, V-belt drives, support structures, undercrusher hoppers and feeders.

Feed openings are based on new manganese and ideal screening conditions. Due to the wear pattern it is not possible to maintain a constant feed opening as take up occurs. Minimum closed side setting is that point just above bowl float under maximum allowable pressure on the tramp iron relief system. This setting can vary widely depending on nature and condition of the material being crushed. Under some conditions when the setting is too close, "pancakes" will form and the bowl will float. If this condition exists, the setting must be increased until bowl float is eliminated. Data is offered as a guide only. Crushing characteristics of various rock and crusher operation will affect results. Capacities based on material weight of 100 lbs/cubic foot. Reduction ratio for standard liners should be between 6:1 to 8:1. Reduction ratio for fine head liners should not exceed 4:1.

Rollercone Classic Approximate Weights - lbs & kg

Model	*RC36*	*RC45*	*RC54*	*RC60*	*RC66*
Head Diameter Inch (mm)	*36" (914)*	*45" (1,118)*	*52" (1321)*	*60" (1524)*	*66" (1676)*
STD	16,800 lbs 7,620 kg	25,500 lbs 11,565 kg	42,000 lbs 18,145 kg	53,100 lbs 24,086 kg	65,500 lbs 29,438 kg
FH	17,000 lbs 7,710 kg	26,600 lbs 11,795 kg	42,000 lbs 18,145 kg	53,100 lbs 24,086 kg	65,500 lbs 29,438 kg
Power	75 hp 56 kw	125 hp 93 kw	200 hp 149 kw	250 hp 187 kw	300 hp 224 kw

Weights of crushers will vary due to differences in major castings.

RC Classic Open Circuit Capacities - Gross Throughput (GT) and Net Product (NP) in US & (metric)

		Closed Side Discharge Setting in Inches & nearest (mm)								
		1/4" (6)	*5/16" (8)*	*3/8" (10)*	*1/2" (13)*	*5/8" (16)*	*3/4" (19)*	*7/8" (22)*	*1" (25)*	
Recirculating Load		*18%*	*18%*	*20%*	*24%*	*25%*	*26%*	*26%*	*29.5%*	
36" (914)	*GT*	37-43 (33-39)	49-55 (44-50)	59-65 (54-59)	72-82 (65-75)	87-93 (79-84)	95-101 (86-92)	104-111 (94-101)	113-123 (103-112)	
	NP	30-35 (27-32)	40-45 (36-41)	47-52 (43-47)	55-62 (50-56)	65-70 (59-63)	70-75 (63-68)	75-80 (68-73)	80-87 (73-79)	
45" (1143)	*GT*	57-67 (52-61)	67-79 (61-72)	81-94 (73-85)	108-121 (98-110)	127-153 (115-139)	142-162 (129-147)	160-188 (145-171)	170-206 (154-187)	
	NP	47-55 (43-50)	55-65 (50-59)	65-75 (59-68)	82-92 (74-83)	95-114 (86-104)	105-120 (95-109)	115-135 (104-122)	120-145 (109-132)	
54" (1372)	*GT*		90-105 (82-96)	110-138 (100-126)	140-195 (127-178)	190-240 (173-218)	215-285 (196-259)	250-300 (228-273)	270-330 (246-300)	
	NP		74-86 (67-78)	88-110 (80-100)	106-148 (97-135)	143-180 (130-164)	159-192 (145-175)	180-216 (164-196)	190-233 (173-212)	
60" (1524)	*GT*		115-128 (105-114)	145-179 (132-163)	205-257 (187-234)	252-302 (229-275)	295-340 (269-309)	312-395 (284-360)	345-420 (314-382)	
	NP		94-105 (86-96)	116-143 (106-130)	156-178 (142-162)	189-227 (172-207)	218-252 (198-229)	225-284 (205-258)	243-269 (221-245)	
66" (1676)	*GT*		135-173 (123-157)	182-221 (166-201)	262-310 (238-282)	302-357 (275-325)	352-414 (320-377)	407-415 (370-378)	435-522 (396-475)	
	NP		111-142 (101-129)	146-177 (133-161)	199-236 (181-215)	227-268 (207-244)	261-306 (238-279)	293-299 (267-272)	307-368 (279-335)	

Rollercone Classic Gradation Chart - Percent Passing

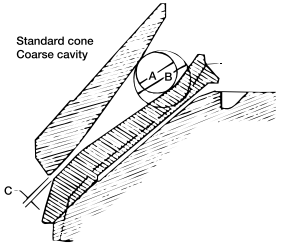
Product Size (mm)	Crusher Closed Side Setting					
	5/16" (7.9)	3/8" (9.5)	7/16" (11.1)	1/2" (12.7)	5/8" (15.9)	3/4" (19.1)
1-1/2" (38)						100
1-1/4" (32)					100	95
1" (25.4)				100	93.5	88
7/8" (22.2)			100	95	88	82
3/4" (19.1)		100	95	89.5	81.5	74
5/8" (15.9)	100	96	91	84	75	65
1/2" (12.7)	98	92	84	76	66	55
3/8" (9.5)	88	80	69	58	48	40.7
5/16" (7.9)	82	70	59	49	41.5	35
1/4" (6.4)	69	57	47	40	35	29.5
4M (4.8)	53	44	37	32	27.8	24.2
5/32" (4.0)	45	38.5	33	29	25	22
8M (2.4)	33	28.5	24.6	21.5	18.6	16.3
10M (1.7)	30.5	26	22.4	19.5	17	14.8
16M (1.0)	22.5	19.2	16.8	14.5	12.5	11
30M (0.55)	15.5	13	11.4	9.8	8.5	7.5
40M (0.4)	13	10.8	9.5	8.1	7.1	6.2
50M (0.3)	10.8	9	7.9	6.7	5.8	5.1
100M (0.15)	7.4	6.1	5.3	4.4	3.9	3.4
200M (0.08)	5	4.1	3.6	3	2.6	2.3

Rollercone Classic Gradation Chart - Percent Passing

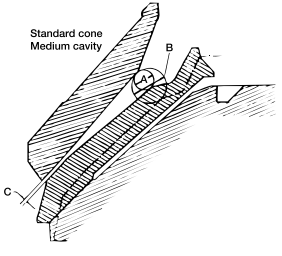
Product Size (mm)	Crusher Closed Side Setting					
	7/8" (22.2)	1" (25.4)	1-1/4" (32)	1-1/2" (38)	1-3/4" (44)	2" (51)
4" (102)						100
3-1/2" (89)					100	95
3" (76)				100	95	90
2-3/4" (70)				97.5	92	86
2-1/2" (64)			100	94.5	88	81
2-1/4" (57)			97	91	83	74
2" (51)		100	93.5	86	76	65
1-3/4" (44)	100	95	88	79	66	55
1-1/2" (38)	94.5	89	80	67.5	56	45
1-1/4" (32)	88	81	70	56	46	37.5
1" (25.4)	80	70.5	57.5	45	36	29
7/8" (22.2)	72	61	48	38	30	24.5
3/4" (19.1)	61.5	51	40	31.5	25.5	20.5
5/8" (15.9)	53	44	34	27.5	22	18
1/2" (12.7)	45	37	28.2	23	18.7	15.5
3/8" (9.5)	33.6	27	21.4	17.2	14	11.5
5/16" (7.9)	29.5	24	18.8	15.3	12.5	10.3
1/4" (6.4)	25	20.3	16.2	13	10.5	8.5
4M (4.8)	20.5	17	13.5	10.8	8.6	6.7
5/32" (4.0)	18.7	15.5	12.4	9.8	7.6	5.9
8M (2.4)	14	11.5	9	6.9	5.2	3.8
10M (1.7)	12.7	10.4	8.1	6.2	4.6	3.3
16M (1.0)	9.5	7.7	6	4.3	3.1	2.1
30M (0.55)	6.4	5.2	3.9	2.8	1.8	1.2
40M (0.4)	5.3	4.2	3.2	2.2	1.4	1
50M (0.3)	4.4	3.5	2.6	1.7	1.1	0.8
100M (0.15)	2.9	2.3	1.7	1.1	0.7	0.5
200M (0.08)	2	1.5	1.1	0.7	0.5	0.3

RC36 Rollercone Classic Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

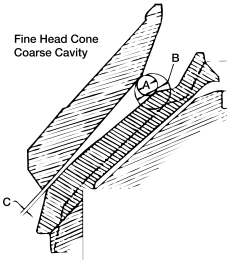


RC36 Standard - Coarse		
A	*B*	*C*
5-3/4" (146 mm)	6-1/2" (165 mm)	1/2" (13 mm)
6-3/8" (162 mm)	7-1/8" (181 mm)	1" (25 mm)
7-1/4" (184 mm)	8" (203 mm)	1-3/4" (44 mm)
Mantle P/N: 02-360-022-0003 Liner P/N: 02-360-023-0010		

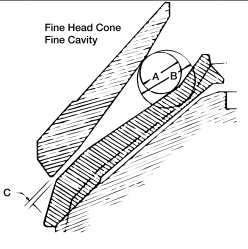


RC36 Standard - Medium		
A	*B*	*C*
3" (76 mm)	3-3/4" (92 mm)	3/8" (10 mm)
3-3/4" (95 mm)	4-1/2" (114 mm)	7/8" (22 mm)
4-5/8" (117 mm)	5-3/8" (137 mm)	1-5/8" (41 mm)
Mantle P/N: 02-360-022-0003 Liner P/N: 02-360-386-0010		

RC36 Rollercone Classic Chamber Settings



RC 36 Fine Head - Coarse		
A	*B*	*C*
3" (76 mm)	3-3/4" (95 mm)	3/8" (10 mm)
3-3/8" (86 mm)	4-1/8" (105 mm)	1/2" (13 mm)
3-5/8" (92 mm)	4-1/2" (114 mm)	3/4" (19 mm)
4" (102 mm)	4-7/8" (124 mm)	1" (25 mm)
4-3/4" (121 mm)	5-5/8" (143 mm)	1-3/4" (44 mm)
Mantle P/N: 02-360-363-7001 Liner P/N: 02-360-364-7000		

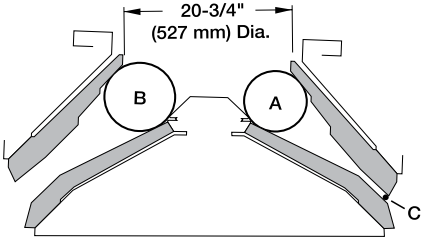


RC 36 Fine Head - Fine		
A	*B*	*C*
1-3/8" (35 mm)	2-3/8" (60 mm)	1/4" (6 mm)
1-5/8" (41 mm)	2-5/8" (67 mm)	1/2" (13 mm)
1-7/8" (48 mm)	2-7/8" (73 mm)	3/4" (19 mm)
2-1/8" (54 mm)	3-1/8" (79 mm)	1" (25 mm)
2-7/8" (73 mm)	3-7/8" (98 mm)	1-3/4" (44 mm)
Mantle P/N: 02-360-022-7011 Liner P/N: 02-360-023-7010		

RC45 Rollercone Classic Chamber Settings

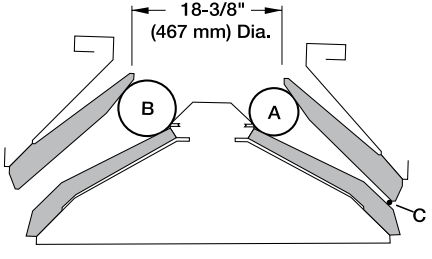
Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

Coarse Chamber



A	B	C
7" (178 mm)	7-3/4" (197 mm)	5/8" (16 mm)
7-3/4" (197 mm)	8-1/2" (216mm)	1-1/8" (29 mm)
8-7/8" (225 mm)	9-5/8" (244 mm)	2-1/8" (54 mm)
9-5/8" (244 mm)	10-3/8" (264 mm)	2-7/8" (73 mm)
Mantle P/N: 02-450-022-0004		Liner P/N: 02-450-023-0010

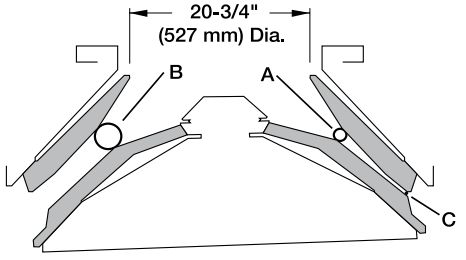
Medium-Fine Chamber



A	B	C
3-1/4" (83 mm)	4-1/8" (105 mm)	1/2" (13 mm)
3-7/8" (98 mm)	4-3/4" (121 mm)	1" (25 mm)
5" (127 mm)	5-7/8" (149 mm)	2" (51 mm)
5-7/8" (149 mm)	6-3/4" (171 mm)	2-3/4" (70 mm)
Mantle P/N: 02-450-022-0004		Liner P/N: 02-450-386-0000

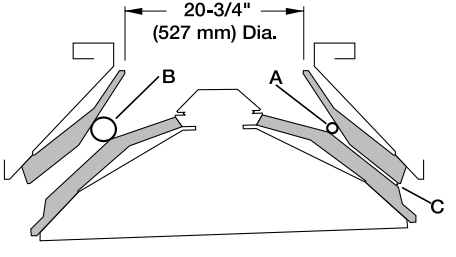
RC45 Rollercone Classic Chamber Settings

Fine Chamber



A	B	C
1-3/8" (35 mm)	2-7/8" (73 mm)	3/8" (10 mm)
1-1/2" (38 mm)	3" (76 mm)	5/8" (16 mm)
1-5/8" (41 mm)	3-1/8" (79 mm)	7/8" (22 mm)
1-7/8" (48 mm)	3-3/8" (86 mm)	1-1/8" (29 mm)
2-1/4" (57 mm)	3-1/2" (89 mm)	2" (51 mm)
Mantle P/N: 02-450-527-8000		Liner P/N: 02-450-530-8000

Extra-Fine Chamber

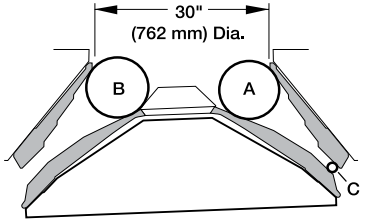


A	B	C
1-1/4 (32 mm)	2-5/8" (67 mm)	1/4" (6 mm)
1-5/16" (33 mm)	2-3/4" (70 mm)	3/8" (10 mm)
1-3/8" (35 mm)	2-7/8" (73 mm)	1/2" (13 mm)
1-7/16" (37 mm)	3" (76 mm)	5/8" (16 mm)
1-9/16" (40 mm)	3-1/2" (89 mm)	3/4" (19 mm)
Mantle P/N: 02-450-527-8000		Liner P/N: 02-450-531-8000

RC54 Rollercone Classic Chamber Settings

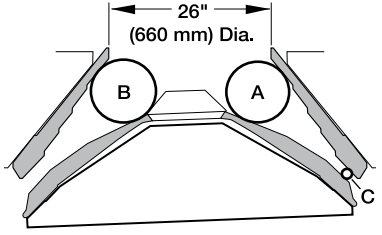
Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

Coarse Chamber Enlarged Feed



A	B	C
9-1/2" (241 mm)	10-1/4" (260 mm)	3/4" (19 mm)
10-1/8" (257 mm)	10-7/8" (275 mm)	1" (25 mm)
10-7/8" (275 mm)	11-5/8" (295 mm)	1-1/2" (38 mm)
11-1/2" (292 mm)	12-1/2" (318 mm)	2" (51 mm)
12-1/2" (318 mm)	13-1/4" (337 mm)	2-7/8" (73 mm)
Mantle P/N: 02-540-022-0003		Liner P/N: 02-540-495-0000
HD Mantle P/N: T191701		

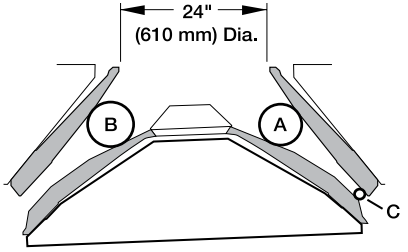
Coarse Chamber



A	B	C
10" (254 mm)	10-3/4" (273 mm)	3/4" (19 mm)
10-1/4" (260 mm)	11" (279 mm)	1" (25 mm)
10-7/8" (276 mm)	11-5/8" (295 mm)	1-1/2" (38 mm)
11-1/2" (292 mm)	12-1/4" (311 mm)	2" (51 mm)
12-1/2" (318 mm)	13-1/4" (337 mm)	3" (76 mm)
Mantle P/N: 02-540-022-0003		Liner P/N: 02-540-023-0003
HD Mantle P/N: T191701		Enlarged Feed Bowl P/N: T191676

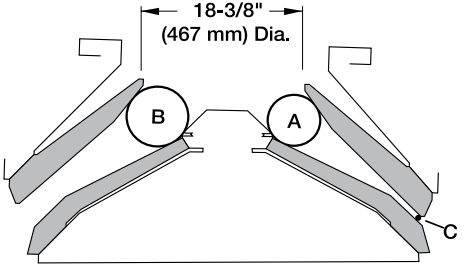
RC54 Rollercone Classic Chamber Settings

Medium Chamber



A	B	C
5" (127 mm)	6-1/8" (156 mm)	1/2" (13 mm)
5-1/2" (140 mm)	6-5/8" (168 mm)	1" (25 mm)
6-1/8" (156 mm)	7-3/8" (187 mm)	1-1/2" (38 mm)
6-7/8" (175 mm)	8" (203 mm)	2" (51 mm)
7-7/8" (200 mm)	9" (229 mm)	2-3/4" (70 mm)
Mantle P/N: 02-540-022-0003		Liner P/N: 02-540-488-0000
HD Mantle P/N: T191701		Enlarged Feed Bowl P/N: T191685

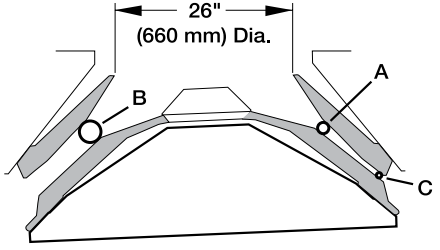
Medium Fine Chamber



A	B	C
3-3/4" (95 mm)	4-7/8" (124 mm)	1/2" (13 mm)
4-3/8" (111 mm)	5-1/2" (140 mm)	1" (25 mm)
5" (127 mm)	6-1/8" (156 mm)	1-1/2" (38 mm)
5-5/8" (143 mm)	6-3/4" (172 mm)	2" (51 mm)
6-3/8" (162 mm)	7-5/8" (194 mm)	2-3/4" (70 mm)
Mantle P/N: 02-540-022-0003		Liner P/N: 02-540-386-0010
HD Mantle P/N: T191701		

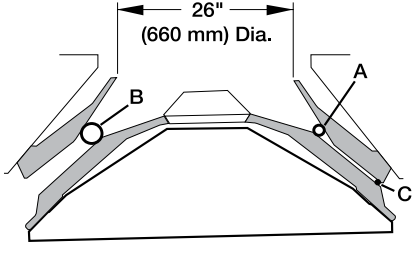
RC54 Rollercone Classic Chamber Settings

Fine Chamber



A	B	C
1-1/2" (38 mm)	2-7/8" (73 mm)	3/8" (10 mm)
1-5/8" (41 mm)	3" (76 mm)	5/8" (16 mm)
1-7/8" (48 mm)	3-1/8" (79 mm)	7/8" (22 mm)
2-1/8" (54 mm)	3-1/2" (89 mm)	1-1/8" (29 mm)
2-1/2" (64 mm)	4-1/8" (105 mm)	2" (51 mm)
Mantle P/N: 02-540-527-8000		Liner P/N: 02-540-530-8000

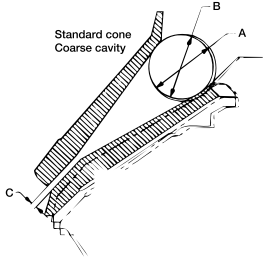
Extra Fine Chamber



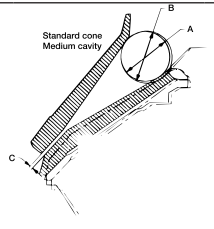
A	B	C
1-5/16" (33 mm)	2-3/4" (70 mm)	1/4" (6 mm)
1-3/8" (35 mm)	2-7/8" (73 mm)	3/8" (10 mm)
1-1/2" (38 mm)	3" (76 mm)	1/2" (13 mm)
1-9/16" (40 mm)	3-1/8" (79 mm)	5/8" (16 mm)
1-5/8" (41 mm)	3-1/4" (83 mm)	3/4" (19 mm)
Mantle P/N: 02-540-527-8000		Liner P/N: 02-540-531-8000

RC60 Rollercone Classic Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

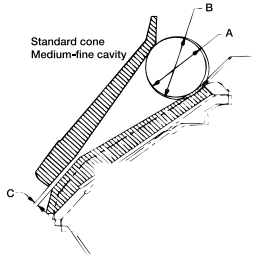


RC60 Standard - Coarse		
A	B	C
10-3/4" (273 mm)	11-1/2" (292 mm)	7/8" (22 mm)
11" (279 mm)	11-3/4" (298 mm)	1" (25 mm)
11-1/2" (292 mm)	12-1/4" (311 mm)	2" (51 mm)
12" (305 mm)	12-3/4" (324 mm)	3" (76 mm)
12-1/2" (318 mm)	13-1/4" (337 mm)	4" (102 mm)
Mantle P/N: 02-600-022-0010		Liner P/N: 02-600-023-0010

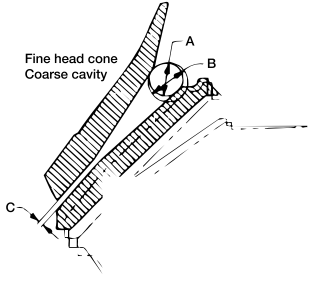


RC60 Standard - Medium Fine		
A	B	C
5-1/2" (140 mm)	6-3/8" (162 mm)	5/8" (16 mm)
5-3/4" (146 mm)	6-3/4" (171 mm)	1" (25 mm)
7" (178 mm)	8" (203 mm)	2" (51 mm)
8-1/4" (210 mm)	9-1/4" (235 mm)	3" (76 mm)
8-7/8" (225 mm)	9-7/8" (251 mm)	3-1/2" (89 mm)
Mantle P/N: 02-600-022-0010 Liner P/N: 02-600-488-0010		

RC60 Rollercone Classic Chamber Settings

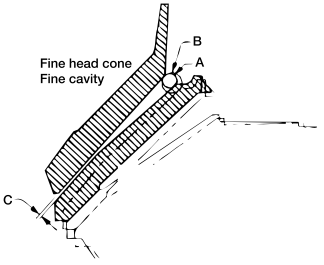


RC60 Standard - Medium Fine		
A	**B**	**C**
5-1/2" (140 mm)	6-3/8" (162 mm)	5/8" (16 mm)
5-3/4" (146 mm)	6-3/4" (171 mm)	1" (25 mm)
7" (178 mm)	8" (203 mm)	2" (51 mm)
8-1/4" (210 mm)	9-1/4" (235 mm)	3" (76 mm)
8-7/8" (225 mm)	9-7/8" (251 mm)	3-1/2" (89 mm)
Mantle P/N: 02-600-022-0010 Liner P/N: 02-600-386-0000		



RC60 Fine Head - Coarse		
A	**B**	**C**
3-7/16" (87 mm)	4-5/8" (117 mm)	1/2" (13 mm)
3-1/2" (89 mm)	4-3/4" (121 mm)	3/4" (19 mm)
3-3/4" (95 mm)	5" (127 mm)	1" (25 mm)
4-1/2" (114 mm)	5-3/4" (146 mm)	2" (51 mm)
5-7/16" (138 mm)	6-1/2" (165 mm)	3" (76 mm)
Mantle P/N: 02-600-022-8000 Liner P/N: 02-600-364-8000		

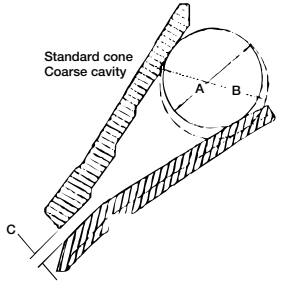
RC60 Rollercone Classic Chamber Settings



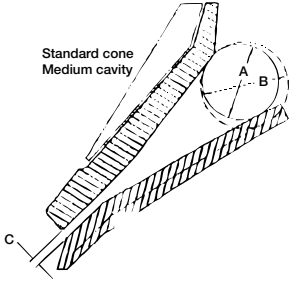
RC60 Fine Head - Fine		
A	**B**	**C**
1-1/2" (38 mm)	2-3/4" (70 mm)	1/4" (6 mm)
2" (51 mm)	3-1/4" (83 mm)	3/4" (19 mm)
2-1/4" (57 mm)	3-1/2" (89 mm)	1" (25 mm)
3-1/4" (83 mm)	4-1/2" (114 mm)	2" (51 mm)
4-3/4" (121 mm)	5-1/2" (140 mm)	3-1/2" (89 mm)
Mantle P/N: 02-600-022-8000 Liner P/N: 02-600-023-8000		

RC66 Rollercone Classic Chamber Settings

Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

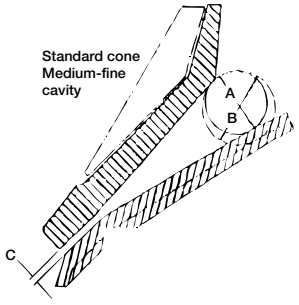


RC66 Standard - Coarse		
A	**B**	**C**
12-1/4" (311 mm)	13-1/8" (333 mm)	1-1/2" (38 mm)
12-3/4" (324 mm)	13-1/2" (343 mm)	2" (51 mm)
13-9/16" (344 mm)	14-5/16" (364 mm)	3" (76 mm)
14-1/8" (359 mm)	14-7/8" (378 mm)	4-1/8" (105 mm)
Mantle P/N: 02-660-022-0010 Liner P/N: 02-660-023-0000		



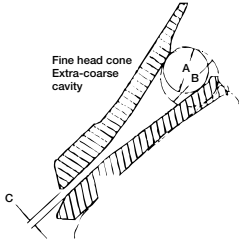
RC66 Standard - Medium		
A	**B**	**C**
9-1/16" (230 mm)	10-1/4" (260 mm)	1" (25 mm)
10-1/2" (267 mm)	11-11/16" (297 mm)	2" (51 mm)
11-11/16" (297 mm)	12-13/16" (325 mm)	3" (76 mm)
12-3/4" (324 mm)	13-15/16" (354 mm)	3-7/8" (98 mm)
Mantle P/N: 02-660-022-0010 Liner P/N: 02-660-488-0000		

RC66 Rollercone Classic Chamber Settings

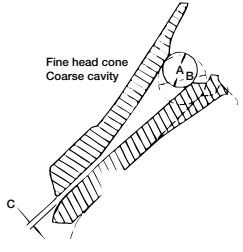


RC66 Standard - Medium-Fine		
A	**B**	**C**
7" (178 mm)	8-1/8" (206 mm)	3/4" (19 mm)
7-1/4" (184 mm)	8-1/2" (216 mm)	1" (25 mm)
8-1/2" (216 mm)	9-11/16" (246 mm)	2" (51 mm)
9-13/16" (249 mm)	11" (279 mm)	3" (76 mm)
10-15/16" (278 mm)	12-1/8" (308 mm)	3-7/8" (98 mm)
Mantle P/N: 02-660-022-0010 Liner P/N: 02-660-386-0010		

RC66 Rollercone Classic Chamber Settings

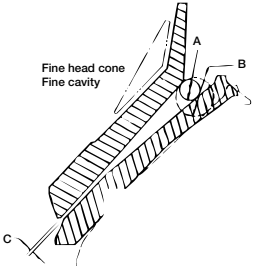


RC66 Fine Head - Extra Coarse		
A	B	C
5-1/8" (130 mm)	6-5/8" (168 mm)	3/4" (19 mm)
5-5/16" (135 mm)	6-13/16" (173 mm)	1" (25 mm)
6-1/16" (154 mm)	7-9/16" (192 mm)	2" (51 mm)
6-3/4" (171 mm)	8-1/4" (210 mm)	3" (76 mm)
7" (178 mm)	8-1/2" (216 mm)	3-3/8" (86 mm)
Mantle P/N: 02-660-363-8010 Liner P/N: 02-660-364-8010		

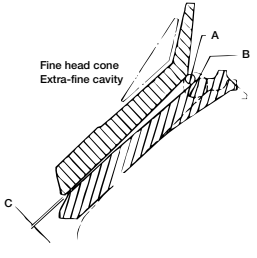


RC66 Fine Head - Coarse		
A	B	C
3-3/4" (95 mm)	5-1/4" (133 mm)	1/2" (13 mm)
3-15/16" (100 mm)	5-7/16" (138 mm)	3/4" (19 mm)
4-1/8" (105 mm)	5-5/8" (143 mm)	1" (25 mm)
4-7/8" (124 mm)	6-5/16" (160 mm)	2" (51 mm)
5-11/16" (144 mm)	7-1/16" (179 mm)	3" (76 mm)
5-15/16" (151 mm)	7-5/16" (186 mm)	3-3/8" (86 mm)
Mantle P/N: 02-660-022-8000 Liner P/N: 02-660-364-8010		

RC66 Rollercone Classic Chamber Settings



RC66 Fine Head - Fine		
A	B	C
2" (51 mm)	3-5/8" (92 mm)	5/16" (8 mm)
2-3/16" (56 mm)	3-11/16" (94 mm)	3/8" (10 mm)
2-1/4" (57 mm)	4-1/8" (105 mm)	3/4" (19 mm)
2-13/16" (71 mm)	4-3/8" (111 mm)	1" (25 mm)
3-15/16" (100 mm)	5-3/16" (132 mm)	2" (51 mm)
Mantle P/N: 02-660-363-8010 Liner P/N: 02-660-023-8010		



RC66 Fine Head - Extra-Fine		
A	B	C
1" (25 mm)	2-1/2" (64 mm)	3/16" (5 mm)
1-3/8" (35 mm)	2-13/16" (71 mm)	3/8" (10 mm)
1-3/4" (44 mm)	3-3/16" (87 mm)	3/4" (19 mm)
2" (51 mm)	3-7/16" (87 mm)	1" (25 mm)
2-15/16" (75 mm)	4-3/8" (111 mm)	2" (51 mm)
Mantle P/N: 02-660-522-8000 Liner P/N: 02-660-523-8000		

Rollercone II and III Specifications

Model	RC45II	RC45III	RC54II
Head Diameter Inches (mm)	44" (1,118mm)	44" (1,118mm)	52" (1,321mm)
Operating RPM (Pinion Speed)	750 - 900	750 - 900	750 - 900
Horsepower	200 (149 kW)	200 (149 kW)	300 (224 kW)
Approximate Weights in lbs and (kg)			
Lower Assembly	16,500 lbs (7,484 kg)	19,800 lbs (8,982 kg)	27,500 lbs (12,474 kg)
Upper Assembly	12,500 lbs (5,670 kg)	12,200 lbs (5,534 kg)	15,000 lbs (6,804 kg)
Total	29,000 lbs (13,154 kg)	32,000 lbs (14,516 kg)	42,500 lbs (19,278 kg)

Material processing includes many different factors that affect crusher performance. The minimum closed side setting is the closest setting possible that does not induce bowl float. The actual minimum closed side setting possible at a given crushing site can vary widely, depending on the nature and condition of the material being crushed, as well as common variations in crusher operating styles. The factors listed below are critical for proper crusher operation:

1. Do not exceed maximum allowable pressure in the tramp iron relief system.
2. Do not allow more than 10% undersize (material smaller than the closed side setting) in the crusher feed.
3. Keep plastic material limited to where no "pancakes" are being created.
4. Install and maintain the proper manganese configuration.
5. Do not allow more than 5% moisture in the feed materiel.
6. Maintain uniform feed gradation.
7. Maintain proper feed distribution 360° around the feed opening.
8. Use the fine chamber feed control device when required.
9. Maintain the proper crusher rpm under full load.
10. Make sure that support equipment is properly sized and in good operating condition. This includes conveyors, screens, electric motors, V-belt drives, support structures, undercrusher hoppers and feeders.

Rollercone II and III Capacity Chart

Closed Side Settings (CSS)		*1/2" (13 mm)*	*5/8" (16 mm)*	*3/4" (19 mm)*	*7/8" (22 mm)*	*1" (25 mm)*	*1-1/4" (32 mm)*	*1-1/2" (32 mm)*	*1-3/4" (44 mm)*	*2" (51 mm)*
Open Circuit Capacities in tons-per-hour (tonnes-per-hour)										
Gross Throughput	*RC45II RC45III*	135-170 (122-154)	150-200 (136-181)	170-225 (154-204)	185-245 (168-222)	205-270 (186-245)	220-320 (200-290)	240-340 (218-308)	260-360 (236-327)	270-380 (245-345)
	RC54II	180-210 (163-191)	210-250 (191-227)	230-280 (209-254)	240-300 (218-272)	250-340 (227-308)	280-385 (254-350)	305-405 (277-368)	325-450 (295-409)	335-475 (304-431)

Closed Side Settings (CSS)		*1/4" (6 mm)*	*5/16" (8 mm)*	*3/8" (10 mm)*	*1/2" (13 mm)*	*5/8" (16 mm)*	*3/4" (19 mm)*	*7/8" (22 mm)*	*1" (25 mm)*
Closed Circuit Capacities in tons-per-hour (tonnes-per-hour)									
Recirculating Load		15%	15%	17%	20%	22%	24%	26%	28%
Gross Throughput	*RC45II*	80-95 (73-86)	95-110 (86-100)	115-145 (104-131)	150-190 (136-172)	170-220 (154-199)	185-245 (168-222)	200-270 (181-245)	215-285 (195-258)
Net Product	*RC45III*	68-81 (62-73)	81-94 (73-85)	95-120 (86-109)	118-150 (107-136)	133-172 (121-156)	140-186 (127-169)	150-198 (136-180)	153-204 (139-185)
Gross Throughput	*RC54II*		120-140 (108-127)	150-185 (136-168)	195-235 (177-213)	230-275 (208-249)	250-310 (227-281)	265-335 (290-304)	275-355 (249-322)
Net Product			102-119 (93-106)	124-153 (112-139)	156-188 (141-170)	180-215 (163-195)	190-236 (172-214)	196-248 (178-225)	198-256 (179-232)

Rollercone II and III Gradation Chart - Percent Passing

Product Size (mm)	*Crusher Closed Side Setting*					
	5/16" (7.9)	3/8" (9.5)	7/16" (11.1)	1/2" (12.7)	5/8" (15.9)	3/4" (19.1)
1-1/2" (38)						100
1-1/4" (32)					100	97
1" (25.4)				100	99	90
7/8" (22.2)			100	99	93	86
3/4" (19.1)		100	97	94	87	80
5/8" (15.9)		98	94	87	80	69
1/2" (12.7)	100	95	88	80	69	58
3/8" (9.5)	91	84	73	63	52	44
5/16" (7.9)	85	74	63	54	46	37
1/4" (6.4)	74	61	50	44	36	32
4M (4.8)	58	48	42	35	32	26
5/32" (4.0)	50	41	36	30	28	23
8M (2.4)	40	35	30	26	24	20
10M (1.7)	35	31	26	22	20	18
16M (1.0)	28	24	21	17	15	13
30M (0.55)	20	18	15	11	9	8
40M (0.4)	18	15	14	10	8	7
50M (0.3)	14	12	12	8	7	6
100M (0.15)	11	9	9	7	6	5
200M (0.08)	8	7	6	6	5	4

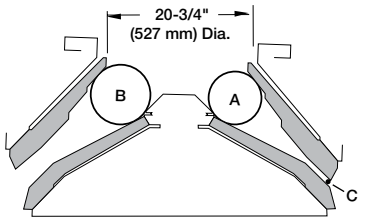
Rollercone II and III Gradation Chart - Percent Passing

Product Size (mm)	Crusher Closed Side Setting					
	7/8" (22.2)	1" (25.4)	1-1/4" (32)	1-1/2" (38)	1-3/4" (44)	2" (51)
4" (102)						100
3-1/2" (89)					100	95
3" (76)				100	95	90
2-3/4" (70)				98	92	86
2-1/2" (64)			100	95	88	81
2-1/4" (57)			97	91	83	74
2" (51)		100	94	86	76	65
1-3/4" (44)	100	97	88	79	66	55
1-1/2" (38)	96	91	80	68	56	45
1-1/4" (32)	90	83	70	56	46	38
1" (25.4)	82	72	58	45	36	29
7/8" (22.2)	74	64	48	38	30	25
3/4" (19.1)	65	54	40	32	26	21
5/8" (15.9)	55	46	34	28	22	18
1/2" (12.7)	47	39	28	23	19	16
3/8" (9.5)	37	28	21	17	14	12
5/16" (7.9)	31	25	19	15	13	10
1/4" (6.4)	26	21	16	13	11	9
4M (4.8)	21	18	14	11	9	7
5/32" (4.0)	18	15	12	10	8	6
8M (2.4)	16	12	9	7	5	4
10M (1.7)	14	10	8	6	4	3
16M (1.0)	10	8	6	4	3	2
30M (0.55)	6	5	4	3	2	1.5
40M (0.4)	5	4	3	2	1.5	1
50M (0.3)	4	3	2	1.5	1	0.8
100M (0.15)	4	3	1.5	1	0.5	0.5
200M (0.08)	3	2	1	0.5	0.5	0.3

RC45II and RC45III Chamber Settings

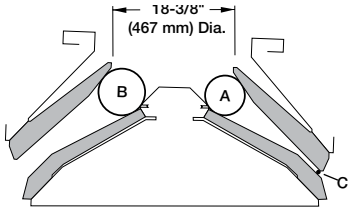
Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

Coarse Chamber



A	*B*	C
7-3/4" (197 mm)	8-3/4" (222 mm)	3/4" (19 mm)
8" (203 mm)	9" (229 mm)	1" (25 mm)
8-3/8" (213 mm)	9-3/8" (238 mm)	1-1/2" (38 mm)
8-7/8" (225 mm)	9-3/4" (248 mm)	2" (51 mm)
9-3/4" (248 mm)	10-3/8" (264 mm)	3" (76 mm)
Mantle P/N: 02-450-022-0004		Liner P/N: 02-450-023-0010
HD Mantle P/N: T191702		Enlarged Feed Bowl P/N: T191669

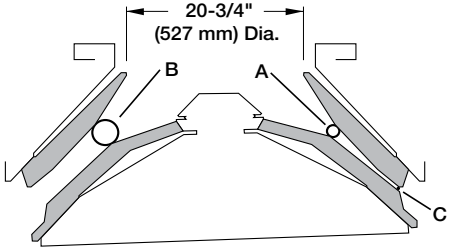
Medium-Fine Chamber



A	*B*	C
3-5/8" (92 mm)	5" (127 mm)	1/2" (13 mm)
4-3/8" (111 mm)	5-1/2" (140 mm)	1" (25 mm)
5" (127 mm)	6-1/8" (156 mm)	1-1/2" (38 mm)
5-1/2" (140 mm)	6-3/4" (171 mm)	2" (51 mm)
6-1/4" (159 mm)	7-3/8" (187 mm)	2-1/2" (63 mm)
Mantle P/N: 02-450-022-0004		Liner P/N: 02-450-386-0000
HD Mantle P/N T191702		Enlarged Feed Bowl P/N T191670

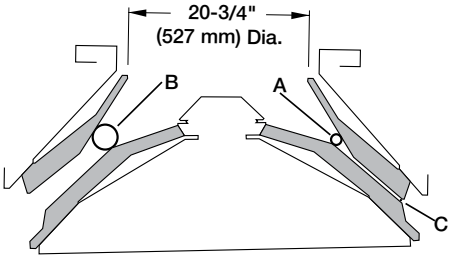
RC45II and RC45III Chamber Settings

Fine Chamber



A	*B*	*C*
1-3/8" (35 mm)	3" (76 mm)	3/8" (10 mm)
1-5/8" (41 mm)	3-1/4" (83 mm)	5/8" (16 mm)
1-7/8" (48 mm)	3-1/2" (89 mm)	7/8" (22 mm)
2" (51 mm)	3-5/8" (92 mm)	1-1/8" (29 mm)
2-3/4" (70 mm)	4-3/8" (111 mm)	2" (51 mm)
Mantle P/N: 02-450-527-8000		Liner P/N: 02-450-528-8000

Extra-Fine Chamber

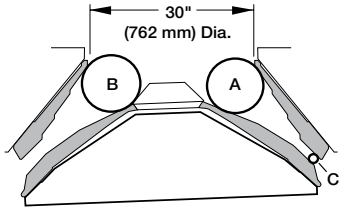


A	*B*	*C*
1-1/4 (32 mm)	2-3/4" (70 mm)	1/4" (6 mm)
1-5/16" (33 mm)	2-7/8" (73 mm)	3/8" (10 mm)
1-3/8" (35 mm)	2-15/16" (75 mm)	1/2" (13 mm)
1-7/16" (37 mm)	3-1/16" (78 mm)	5/8" (16 mm)
1-9/16" (40 mm)	3-1/8" (79 mm)	3/4" (19 mm)
Mantle P/N: 02-450-527-8000		Liner P/N: 02-450-529-8000

RC54II Chamber Settings

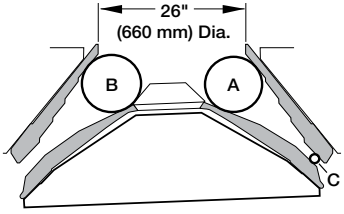
Note: Charts are to be used as guides only to proper mantle and liner selection. Cedarapids offers standard (as shown) and other special liner configurations. Consult factory for details.

Coarse Chamber Enlarged Feed



A	*B*	C
9-3/4" (248 mm)	10-7/8" (276 mm)	3/4" (19 mm)
10-1/8" (257 mm)	11-1/8" (283 mm)	1" (25 mm)
10-3/4" (273 mm)	11-7/8" (302 mm)	1-1/2" (38 mm)
11-3/8" (289 mm)	12-3/8" (314 mm)	2" (51 mm)
12-1/4" (311 mm)	13-3/8" (340 mm)	3" (76 mm)
Mantle P/N: 02-540-022-0003 Liner P/N: 02-540-495-0000 HD Mantle P/N: T191701		

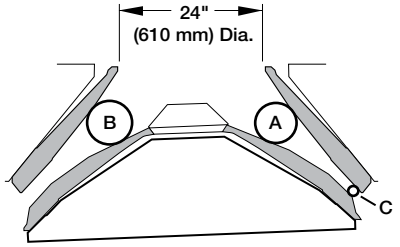
Coarse Chamber



A	*B*	C
10-1/8" (257 mm)	11-1/8" (283 mm)	3/4" (19 mm)
10-3/8" (264 mm)	11-3/8" (289 mm)	1" (25 mm)
10-5/8" (270 mm)	11-3/4" (298 mm)	1-1/2" (38 mm)
11-1/8" (283 mm)	12-1/8" (308 mm)	2" (51 mm)
12" (305 mm)	13" (330 mm)	3" (76 mm)
Mantle P/N: 02-540-022-0003 Liner P/N: 02-540-023-0003 HD Mantle P/N: T191701 Enlarged Feed Bowl P/N: T191676		

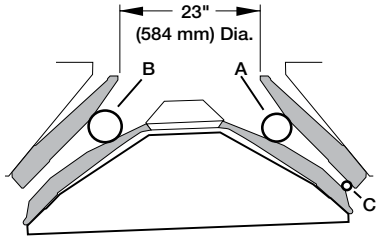
RC54II Chamber Settings

Medium Chamber



A	*B*	C
5-1/8" (130 mm)	6-1/2" (165 mm)	1/2" (13 mm)
5-3/4" (146 mm)	7-1/8" (181 mm)	1" (25 mm)
6-1/2" (165 mm)	7-3/4" (197 mm)	1-1/2" (38 mm)
7" (178 mm)	8-3/8" (213 mm)	2" (51 mm)
8-3/8" (213 mm)	9-5/8" (244 mm)	3" (76 mm)
Mantle P/N: 02-540-022-0003 Liner P/N: 02-540-488-0000 HD Mantle P/N: T191701 Enlarged Feed Bowl P/N: T191685		

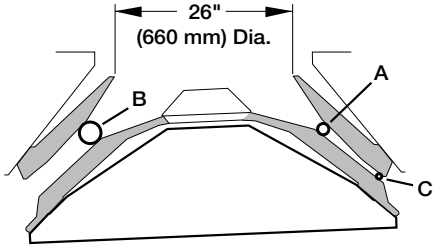
Medium Fine Chamber



A	*B*	C
3-5/8" (92 mm)	5" (127 mm)	1/2" (13 mm)
4-1/4" (108 mm)	5-5/8" (143 mm)	1" (25 mm)
4-7/8" (124 mm)	6-1/4" (159 mm)	1-1/2" (38 mm)
5-1/2" (140 mm)	6-7/8" (175 mm)	2" (51 mm)
6-3/4" (171 mm)	8" (203 mm)	3" (76 mm)
Mantle P/N: 02-540-022-0003 Liner P/N: 02-540-488-0000 HD Mantle P/N: T191701		

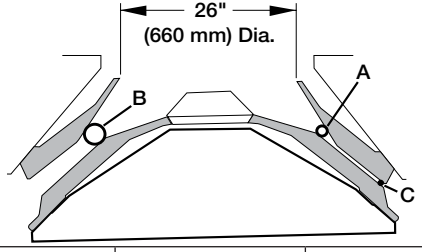
RC54II Chamber Settings

Fine Chamber



A	B	C
1-1/2" (38 mm)	3" (76 mm)	3/8" (10 mm)
1-5/8" (41 mm)	3-1/4" (83 mm)	5/8" (16 mm)
1-7/8" (48 mm)	3-1/2" (89 mm)	7/8" (22 mm)
2-1/8" (54 mm)	3-3/4" (95 mm)	1-1/8" (29 mm)
3" (76 mm)	4-1/2" (114 mm)	2" (51 mm)
Mantle P/N: 02-540-527-8000		Liner P/N: 02-540-528-8000

Extra Fine Chamber



A	B	C
1-5/16" (33 mm)	2-15/16" (75 mm)	1/4" (6 mm)
1-3/8" (35 mm)	3" (76 mm)	3/8" (10 mm)
1-1/2" (38 mm)	3-1/16" (78 mm)	1/2" (13 mm)
1-9/16" (40 mm)	3-3/16" (81 mm)	5/8" (16 mm)
1-5/8" (41 mm)	3-1/4" (83 mm)	3/4" (19 mm)
Mantle P/N: 02-540-527-8000		Liner P/N: 02-540-529-8000

VSI Application Specifications

Canica Design

Model	*Crusher Chamber*	*OD (mm)*	*Max. RPM*	*Max. TPH*	*Max. Feed Size (mm)*	*HP (kW)*
45/1200	Table	18" (457)	3100	70	1-1/2" (38)	50-150 (38-112)
65/1400	Table	26" (660)	2200	125	2" (51)	100-250 (75-187)
	HS Rotor	23" (584)	2500	125	1-1/2" (38)	
80/2000SD	Table	34" (864)	1550	250	4" (102)	200-400 (150-300)
	HD Rotor	34" (864)	1700	300	3" (76)	
	HS Rotor	32" (813)	1800	250	2" (51)	
90/2000DD	Table	38" (965)	1400	350	4" (102)	400-700 (300-525)
	HD Rotor	34" (864)	1700	300	3" (76)	
	HS Rotor	32" (813)	1800	250	2" (51)	
2050	Table	42" (1067)	1200	400	4" (102)	400-700 (300-525)
	HD Rotor	34" (864)	1700	300	3" (76)	
	HS Rotor	32" (813)	1800	250	2" (51)	
100	Table	38" (965)	1400	400	5" (127)	400-700 (300-525)
	HD Rotor	38" (965)	1500	400	3" (76)	
	HS Rotor	38" (965)	1500	500	2" (51)	
2300	Table	42" (1067)	1200	500	5" (127)	400-700 (300-525)
	HD Rotor	38" (965)	1500	400	3" (76)	
	HS Rotor	38" (965)	1500	500	2" (51)	
105	Table	42" (1067)	1200	600	6" (152)	500-800 (375-600)
	HD Rotor	38" (965)	1500	400	3" (76)	
	HS Rotor	38" (965)	1500	500	2" (51)	
2350	Table	42" (1067)	1200	600	8" (203)	500-800 (375-600)
	HD Rotor	38" (965)	1500	400	3" (76)	
	HS Rotor	38" (965)	1500	500	2" (51)	
125/2500	Table	46" (1168)	1050	800	8" (203)	600-1000 (450-750)
155/3000	Table	54" (1372)	1000	1000	12" (305)	700-1200 (525-900)

TPH is an estimate based on maximum feed size shown passing square screen cloth opening. A reduction in feed size will increase crusher throughput. Cutting feed size in half can increase TPH by 20%. Capacity figures are shown as total TPH through crusher. Total = New Feed plus Recirculating Load.

VSI Application Specifications

Cedarapids Design

Model	*Crusher Chamber*	*OD (mm)*	*RPM*	*TPH*	*Max. Feed Size (mm)*	*HP (kW)*
VSI 2600	Table	41" (1040)	960	300-650	6" (150)	300-600 (225-450)
	Table	41" (1040)	1080	300-650	5" (127)	300-600 (225-450)
VSI 2100	Table	37" (940)	1200	250-400	3" (76)	300-600 (225-450)
	Table	41" (1040)	1080	250-400	3" (76)	400-600 (300-450)
	Rotor	34" (864)	1550	200-350	2-1/2" (63)	300-600 (225-450)
VSI 1800	Table	32" (813)	1400	150-200	2-1/4" (57)	200-400 (150-300)
	Table	35" (893)	1280	150-200	2-1/4" (57)	200-400 (150-300)
	Rotor	34" (864)	1750	150-200	2" (51)	250-500 (187-375)

TPH is an estimate based on maximum feed size shown passing square screen cloth opening. A reduction in feed size will increase crusher throughput. Cutting feed size in half can increase TPH by 20%. Capacity figures are shown as total TPH through crusher. Total = New Feed plus Recirculating Load.

VSI Horsepower Requirements

This chart may be used as a guide to estimate the horsepower required per ton when producing different size materials with different crushing chamber configurations. It assumes hard stone or gravel.

Closed Circuit Screen Size (mm)	Required HP/TPH		
	Shoe Table & Anvil (S/A)	Enclosed Rotor & Anvil (R/A)	Enclosed Rotor & Rockshelf (R/R)
1" (25)	1.2 - 1.3	1.4 - 1.5	1.8 - 2.0
3/4" (20)	1.3 - 1.4	1.5 - 1.7	2.0 - 2.1
1/2" (13)	1.5 - 1.6	1.8 - 1.9	2.2 - 2.4
3/8" (10)	1.7 - 1.8	2.0 - 2.1	2.5 - 2.6
1/4" (6)	1.8 - 1.9	2.1 - 2.2	2.6 - 2.7

Notes: Maximum allowable applied horsepower is 600 hp for 2100 & 2600 VSI; 500 hp for 1800 VSI.

VSI Gradation: Table with Anvils Basalts, Gravels and Tougher Materials (Percent Passing)

Product Size		*5 or 6" Feed*				*3" Feed*			
		Feed	*Impeller Speed*			*Feed*	*Impeller Speed*		
Inch	*mm*		*100%*	*80%*	*60%*		*100%*	*80%*	*60%*
6"	152	100							
5"	127	97							
4"	102	88			100				
3"	76	70		100	97	100			
2-1/2"	64	52	100	98	93	76			100
2"	51	36	99	95	88	62		100	99
1-1/2"	38	10	94	88	74	42	100	99	93
1"	25.4	5	80	70	52	24	93	90	77
3/4"	19.1		70	57	40	12	83	77	61
1/2"	12.7		56	44	30	0	68	58	42
3/8"	9.5		46	35	24		57	47	32
1/4"	6.4		37	27	18		45	37	23
4M	4.8		30	22	14		38	30	19
8M	2.4		20	14	9		25	20	13
16M	1.0		13	10	7		17	13	9
30M	0.55		10	8	6		11	9	7
50M	0.3		8	6	4		7	6	5
100M	0.15		6	4	3		5	4	4
200M	0.08		4	3	2		4	3	3

VSI Gradation: Table with Anvils Limestone, Dolomite and Friable Materials (Percent Passing)

Product Size		5 or 6" Feed				3" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152	100							
5"	127	97							
4"	102	88			100				
3"	76	70			99	100			
2-1/2"	64	52		100	96	76			
2"	51	36	100	99	92	62			100
1-1/2"	38	10	98	94	83	42	100	100	98
1"	25.4	5	90	80	64	24	97	93	88
3/4"	19.1		81	70	53	12	90	83	71
1/2"	12.7		68	56	39	0	77	68	54
3/8"	9.5		58	46	32		66	57	42
1/4"	6.4		48	37	25		55	45	33
4M	4.8		41	30	20		46	38	27
8M	2.4		27	20	13		31	25	17
16M	1.0		18	13	9		21	17	12
30M	0.55		13	10	7		14	11	8
50M	0.3		9	8	5		9	7	6
100M	0.15		7	6	4		6	5	4
200M	0.08		5	4	3		5	4	3

VSI Gradation: Table with Anvils Basalts, Gravels and Tougher Materials (Percent Passing)

Product Size		2" Feed				1" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51	100							
1-1/2"	38	66	100	100	100				
1"	25.4	40	97	96	92	100	100	100	100
3/4"	19.1	26	90	86	76	58	99	98	97
1/2"	12.7	10	77	73	59	32	92	82	74
3/8"	9.5	0	66	59	44	15	78	64	51
1/4"	6.4		51	44	29	0	61	48	38
4M	4.8		42	35	21		49	40	30
8M	2.4		27	19	11		31	26	19
16M	1.0		18	13	8		20	17	13
30M	0.55		12	9	6		14	11	8
50M	0.3		8	7	5		9	8	6
100M	0.15		7	5	3		7	6	4
200M	0.08		5	4	2		6	5	3

VSI Gradation: Table with Anvils Limestone, Dolomite and Friable Materials (Percent Passing)

Product Size		2" Feed				1" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51	100							
1-1/2"	38	66	100	100	100				
1"	25.4	40	98	96	95	100		100	100
3/4"	19.1	26	91	88	82	58	100	99	97
1/2"	12.7	10	80	75	64	32	96	89	76
3/8"	9.5	0	68	62	50	15	84	70	53
1/4"	6.4		57	49	34	0	68	54	40
4M	4.8		48	38	25		56	45	33
8M	2.4		30	23	14		34	28	21
16M	1.0		20	15	9		22	18	14
30M	0.55		14	10	7		15	12	9
50M	0.3		9	7	5		9	8	7
100M	0.15		7	5	4		7	6	5
200M	0.08		5	4	3		6	5	4

VSI Gradation: Rotor with Anvils Basalts, Gravels and Tougher Materials (Percent Passing)

Product Size		2" Feed				1-1/2" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51	100							
1-1/2"	38	66	100	100	100	100		100	100
1"	25.4	40	98	96	96	70	100	99	98
3/4"	19.1	26	93	88	86	30	98	93	90
1/2"	12.7	10	82	75	69	20	89	79	74
3/8"	9.5	0	72	62	55	7	78	66	59
1/4"	6.4		60	49	41	0	65	51	43
4M	4.8		51	38	31		56	40	33
8M	2.4		33	23	17		35	25	19
16M	1.0		22	15	11		23	17	13
30M	0.55		15	10	8		15	12	9
50M	0.3		10	7	6		10	7	6
100M	0.15		8	5	4		7	5	4
200M	0.08		5	4	3		5	4	3

VSI Gradation: Rotor with Anvils Limestone, Dolomite and Friable Materials (Percent Passing)

Product Size		2" Feed				1-1/2" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51	100							
1-1/2"	38	66	100	100	100	100		100	100
1"	25.4	40	99	97	96	70	100	99	99
3/4"	19.1	26	95	90	86	30	99	95	92
1/2"	12.7	10	85	77	73	20	93	82	77
3/8"	9.5	0	75	66	59	7	84	70	63
1/4"	6.4		62	51	44	0	70	56	47
4M	4.8		53	42	35		59	45	36
8M	2.4		34	27	19		39	28	22
16M	1.0		22	18	13		25	19	15
30M	0.55		15	12	9		16	13	11
50M	0.3		10	8	7		10	8	7
100M	0.15		8	7	5		7	6	5
200M	0.08		5	5	4		5	4	4

VSI Gradation: Rotor with Anvils Basalts, Gravels and Tougher Materials (Percent Passing)

Product Size		1" Feed				3/8" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51								
1-1/2"	38								
1"	25.4	100		100	100				
3/4"	19.1	58	100	98	97				
1/2"	12.7	32	96	82	76				
3/8"	9.5	15	84	64	53	100		100	100
1/4"	6.4	0	68	48	40	75	100	99	94
4M	4.8		56	40	33	48	98	90	83
8M	2.4		34	26	21	0	69	58	47
16M	1.0		22	17	14		46	34	27
30M	0.55		15	11	9		30	20	15
50M	0.3		9	8	7		19	13	9
100M	0.15		7	6	5		12	8	6
200M	0.08		6	5	4		7	5	4

VSI Gradation: Rotor with Anvils Limestone, Dolomite and Friable Materials (Percent Passing)

Product Size		1" Feed				3/8" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51								
1-1/2"	38								
1"	25.4	100		100	100				
3/4"	19.1	58	100	99	97				
1/2"	12.7	32	97	89	80				
3/8"	9.5	15	90	70	58	100			100
1/4"	6.4	0	74	54	44	75	100	100	97
4M	4.8		61	45	37	48	99	94	86
8M	2.4		38	28	24	0	74	61	53
16M	1.0		24	18	16		50	38	30
30M	0.55		16	12	10		32	23	17
50M	0.3		10	8	7		21	15	11
100M	0.15		7	6	5		13	9	7
200M	0.08		6	5	4		8	6	5

VSI Gradation: Rotor with Rockshelf Basalts, Gravels and Tougher Materials (Percent Passing)

Product Size		2" Feed				1-1/2" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51	100	100	100	100				
1-1/2"	38	66	92	89	87	100	100	100	100
1"	25.4	40	76	68	62	70	85	77	71
3/4"	19.1	26	63	54	46	30	70	56	47
1/2"	12.7	10	49	40	32	20	52	38	30
3/8"	9.5	0	38	29	23	7	41	28	22
1/4"	6.4		30	23	17	0	32	22	17
4M	4.8		25	19	14		28	20	15
8M	2.4		18	13	10		22	15	12
16M	1.0		13	9	7		16	11	9
30M	0.55		11	8	6		11	9	7
50M	0.3		9	7	5		9	7	5
100M	0.15		7	5	4		7	5	4
200M	0.08		5	4	3		5	4	3

VSI Gradation: Rotor with Rockshelf Limestone, Dolomite and Friable Materials (Percent Passing)

Product Size		2" Feed				1-1/2" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51	100	100	100	100				
1-1/2"	38	66	93	91	88	100	100	100	100
1"	25.4	40	78	71	65	70	86	80	74
3/4"	19.1	26	66	57	50	30	74	60	53
1/2"	12.7	10	52	43	36	20	56	43	34
3/8"	9.5	0	41	33	26	7	45	32	25
1/4"	6.4		32	25	20	0	36	25	20
4M	4.8		27	21	16		31	23	18
8M	2.4		20	14	12		24	17	14
16M	1.0		15	10	8		18	12	10
30M	0.55		13	9	7		13	9	8
50M	0.3		10	7	6		11	7	5
100M	0.15		8	5	4		8	5	4
200M	0.08		6	4	3		6	4	3

VSI Gradation: Rotor with Rockshelf Basalts, Gravels, and Tougher Materials (Percent Passing)

Product Size		1" Feed				3/8" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51								
1-1/2"	38								
1"	25.4	100	100	100	100				
3/4"	19.1	58	91	82	78				
1/2"	12.7	32	70	57	47				
3/8"	9.5	15	54	40	31	100	100	100	100
1/4"	6.4	0	40	28	22	75	89	85	82
4M	4.8		33	24	18	48	76	70	66
8M	2.4		25	18	14	0	46	38	31
16M	1.0		19	13	10		30	23	18
30M	0.55		14	10	8		21	17	14
50M	0.3		11	8	6		16	13	11
100M	0.15		8	6	5		12	9	7
200M	0.08		5	4	3		9	7	6

VSI Gradation: Rotor with Rockshelf Limestone, Dolomite and Friable Materials (Percent Passing)

Product Size		1" Feed				3/8" Feed			
		Feed	Impeller Speed			Feed	Impeller Speed		
Inch	mm		100%	80%	60%		100%	80%	60%
6"	152								
5"	127								
4"	102								
3"	76								
2-1/2"	64								
2"	51								
1-1/2"	38								
1"	25.4	100	100	100	100				
3/4"	19.1	58	92	85	80				
1/2"	12.7	32	74	62	52				
3/8"	9.5	15	59	45	35	100	100	100	100
1/4"	6.4	0	44	31	25	75	91	86	83
4M	4.8		37	27	21	48	78	72	68
8M	2.4		28	20	16	0	48	42	34
16M	1.0		21	15	11		32	26	20
30M	0.55		16	11	9		22	19	16
50M	0.3		12	9	7		17	14	12
100M	0.15		9	7	5		12	10	8
200M	0.08		6	4	3		10	8	6

Hammermill Size

Hammermill size is determined by the distance between the inside of the side plates and diameter of hammer swing, ie 40" x 33".

HP, RPM, Openings & Weights						
Model	Size	Electric HP	RPM	Minimum Opening	Maximum Opening	Weight (lbs)
2033	20 x 33	50-100	600-1200	12-1/2 x 18	16-1/2 x 18	7,000
3033	30 x 33	100-200	600-1200	12-1/2 x 27-1/2	16-1/2 x 27-1/2	9,000
4033	40 x 33	200-300	600-1200	12-1/2 x 37	16-1/2 x 37-1/2	12,000
5040	50 x 40	300-500	600-1000	16 x 47	20 x 47	16,750

Hammer Options

Fasturn - tip on solid arm; tip can be turned 180° without removing arm. Finger clamp (Clark) - tip on split arm; tip and arm can be turned 180°, arm must be removed.

Long arms produce maximum fines. Short arms produce coarser material.

Hammer Weight Balancing

Hammer weights must be balanced between rows to ensure minimum vibration. Heaviest hammers should be mounted centrally on the spinner and lighter ones toward the outside. If there is more than two pounds difference between rows on a two-row spinner or between any two rows on a three-row spinner, hammers must be interchanged to obtain a balance within two pounds. Speeds over 1000 rpm require more accurate balance.

When Ordering Be Sure to Specify:

1. *Percent of silica and other abrasive oxides present.
2. *Type of stone in quarry.
3. Size of stone fed to mill.
4. Size of stone.
5. If finished product is being made in one pass or if it is to be passed over sizing screen in a closed circuit.
6. Power unit, type, hp, rpm and keyway in PTO.
7. Always specify type of drive: V-belt or direct.

With this information we can recommend correct grates for best performance.

*If in doubt send small sample to Cedarapids Inc.

Hammermill Capacities

Approximate Capacities for Limestone

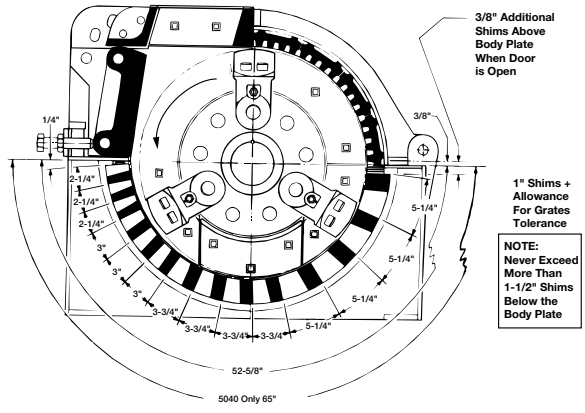
Size	5040	4033	3033	2033
1/8" Minus (agstone)	55-85	40-60	20-40	10-20
1/4" Minus	55-110	50-80	30-60	20-40
1/2" Minus	85-125	60-90	50-70	30-50
3/4" Minus	110-165	80-120	60-100	40-60
1" Minus	140-195	100-140	75-120	50-70
1-1/4" Minus	165-220	120-160	90-130	60-80
1-1/2" Minus	195-250	140-180	100-140	70-90

How to Control Product Size

Product size is controlled by breaker plate setting, hammer RPM and grate combinations. The standard combinations and type of product for each are shown in the tables in this section.

For ease in changing breaker plate setting, a hydraulic ram and pump are available as an optional extra. The hydraulic ram is used to move the plate in toward the hammer circle. To use the hammermill as an impact breaker, using two rows of hammers, a lower liner plate and grate filler ring, optional extra, replace the grates.

Hammermill Grate Specifications



Grate Specifications			
Size of Grate Opening	Chord Width	Size of Grate Opening	Chord Width
3/16"	6-1/2"	1"	2-1/4"
1/4"	6-7/16"	1-1/2"	3"
3/8"	6-7/16"	2"	3-3/4"
1/2"	3-3/8"	3"	5-1/4"
3/4"	3-3/8"		

Cedarapids recommends the following CFM be used to keep the hammermill/limemill under negative pressure for air pollution requirements:

20" hammermill	2000 CFM	20" limemill	2620 CFM
30" hammermill	3000 CFM	30" limemill	4000 CFM
40" hammermill	4000 CFM	40" limemill	5300 CFM
50" hammermill	6100 CFM		

All above CMFs include 10% excess

Typical Cedarapids Grate Combinations For Obtaining Different Sized Products – 2033, 3033, 4033 & 5040 Hammermills

Note - Chart below is based on average material, singe pass of feed, materials 5" and under. 2033, 3033 and 4033 mill speed will vary from 900 to 1200 rpm and 5040 mill will vary from 800 to 1000 rpm. When rpm is increased product sizes decreases. If in doubt as to mill speed or grate combination wanted consult factory.

Product	*Maximum Size	RPM 2033 3033 - 4033	RPM 5040	Grate Combination Number	Grate Quantity and Size	
					For 2033 - 3033 - 4033	For 5040
AG LIME	3/16" minus	1200	1000	1**	(4) 1/4", (4) 3/8"	(5) 1/4", (5) 3/8"
AG LIME	3/8" minus	1200	1000	2	(3) 1/4", (3) 3/8", (4) 1/2"	(4) 1/4", (4) 3/8", (4) 1/2"
1/2"	1" minus	1200	1000	3**	(2) 3/8", (3) 1/2", (4) 3/4" (3) 1", (1) 1-1/2", (1) 3"	(3) 3/8", (3) 1/2", (5) 3/4" (4) 1", (1) 1-1/2", (1) 3"
3/4"	1-1/4" minus	900	800	4**		
3/4"	1-1/4" minus	1200	1000	4**	(4) 1/2", (7) 1", (6) 2"	(4) 1/2", (11) 1", (7) 2"
1-1/2"	1-1/2" minus	900	800	6		
3/4"	1-1/4" minus	1200	1000	5**	(4) 3/4", (5) 1", (6) 1-1/2", (1) 2", (1) 3"	(5) 3/4", (6) 1", (6) 1-1/2", (2) 2", (1) 3"
1-1/4"	1-1/2" minus	900	800	8**		
1"	1-1/4" minus	900	800	6	(3) 3/4", (8) 1", (3) 1-1/2", (4) 2"	(4) 3/4", (9) 1", (4) 1-1/2", (5) 2"
7/8"	1-1/4" minus	900	800	7	(4) 3/4", (10) 1", (3) 1-1/2", (2) 2"	(4) 3/4", (1) 1-1/2", (5) 2", (5) 3"
1-1/4"	2" minus	900	800	8**	(3) 1", (3) 1-1/2", (4) 2", (4) 3"	(3) 1", (4) 1-1/2", (5) 2", (5) 3"
3/4"	1-1/2" minus	900	800	9	(12) 1", (3) 1-1/2", (3) 2", (1) 3"	(14) 1", (4) 1-1/2", (4) 2", (1) 3"
1-3/4"	2-1/2" minus	900	800	10	(7) 2", (6) 3"	(10) 2", (5) 3"
1-1/2"	2" minus	900	800	11**	(4) 1-1/2", (5) 2", (4) 3"	(5) 1-1/2", (6) 2", (5) 3"

*Occasional larger size material can be found in top size product. **Filler bar used to complete these combinations in 33" size hammermills.

Hammermill Gradation Charts For 20", 30", 40" & 50" Units

The estimated product gradation figures given in the two charts are based on use of three rows of new hammers with breaker plate set within ½" of hammers. Feed was minus 4", plus 1-½", dry, medium hard (3.5 Mohs') limestone. A breaker plate setting of 1-¼" from hammers (just covering body plate) gives product gradation approximately the same as 2-row operation for the speeds given at head of each column.

Coarse or No Grates Percent Passing

Product Size	#8 Grates				#11 Grates				Grates Out				Grates Out - 2 Row			
	RPM*				RPM*				RPM*				RPM*			
	750	900	1050	1200	750	900	1050	1200	750	900	1050	1200	750	900	1050	1200
	625	750	875	1000	625	750	875	1000	625	750	875	1000	625	750	875	1000
1-3/4"	100				100				96.8	100	100		**85.7	**89.8	**93.8	97.7
1-1/2"	100	100			99.8	100	100		89.1	93.8	96.7	100	84.2	88.2	92.5	96.6
1-1/4"	99.5	99.7	100		99.4	99.7	99.8	100	80.6	87.5	92.7	98.2	76.2	82.0	88.0	93.9
1"	98.4	98.9	99.6	100	98.4	98.9	99.3	99.8	72.9	81.4	88.3	95.4	68.4	75.7	83.3	90.9
7/8"	97.4	98.0	99.0	99.7	96.9	97.7	98.4	99.3	67.4	76.2	84.0	92.4	64.4	72.0	79.3	87.0
3/4"	96.0	97.0	98.2	99.2	94.8	96.1	97.3	98.6	60.8	70.7	79.2	87.9	59.7	67.2	75.0	82.9
5/8"	91.9	93.8	95.9	97.9	90.9	92.9	94.8	96.8	54.1	64.1	72.8	81.6	50.8	59.0	67.5	76.3
1/2"	82.8	86.8	91.0	94.9	81.0	85.0	89.0	92.9	44.1	54.4	63.3	72.3	42.7	50.7	59.1	67.8
3/8"	69.1	75.0	81.1	87.1	65.6	71.1	76.6	82.0	35.4	44.8	52.6	60.6	34.5	41.3	48.5	56.0
5/16"	59.0	66.8	74.2	82.0	54.2	61.9	68.8	75.0	30.0	39.8	47.0	53.9	28.7	35.2	44.5	49.0
1/4"	49.8	58.0	66.4	74.8	43.2	51.0	58.8	66.5	26.8	34.0	40.6	47.4	23.7	29.8	36.4	43.2
4M	38.6	47.0	55.5	64.0	30.4	38.4	46.5	54.4	20.7	26.9	32.7	38.6	17.5	22.4	28.4	34.4
8M	22.2	28.4	34.7	41.1	15.0	20.2	25.5	30.7	12.4	16.3	19.8	23.4	9.8	12.3	15.9	19.7
10M	21.0	26.8	32.1	37.7	13.9	18.9	23.6	28.0	11.9	15.3	18.1	21.6	9.2	11.2	14.0	17.8
16M	16.3	21.0	25.8	30.7	10.5	14.1	18.2	22.1	9.5	12.3	14.7	17.2	6.8	8.3	10.9	13.6
30M	12.2	15.7	19.3	23.0	7.9	10.4	13.4	16.2	7.2	9.3	11.0	12.8	4.5	5.1	6.6	8.2
40M	10.0	13.0	16.1	19.3	6.6	8.6	11.1	13.3	5.7	7.6	9.1	10.7	3.1	3.4	4.6	5.9
50M	9.0	11.4	13.9	16.7	5.8	7.5	9.7	11.6	4.5	6.2	7.5	8.9	1.9	2.1	3.3	4.5
100M	5.7	7.2	8.8	10.4	3.0	4.3	6.1	7.6	2.1	3.2	3.9	4.9	0.0	0.0	0.9	1.8
-100M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Bottom row of figures is equivalent 50" Hammermill speed for same gradation.

Note: For 2-row operation instead of 3-row for ½" breaker plate setting, use figures from columns 150-300 rpm slower than column selected; that is, 2-row at 1200 rpm approximately equals 3-row at 1050 rpm. The figures used in these charts are to be considered as a guide only. Hardness of local deposits, condition of hammers and grates and breaker plate setting will affect all gradation.

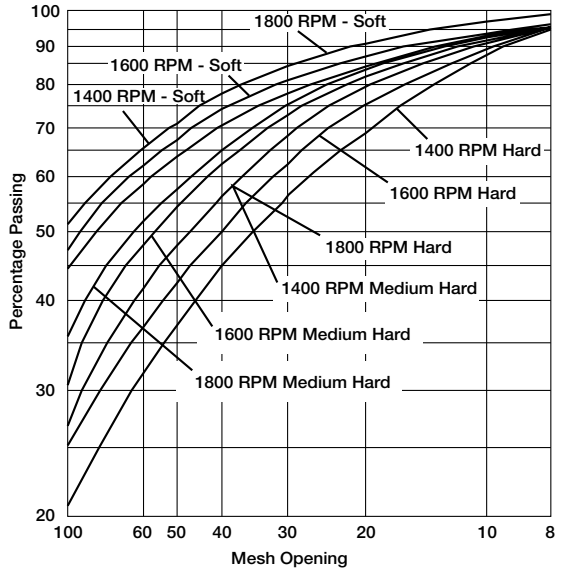
Fine Grates
Percent Passing

Product Size	All 3/16" Grates RPM*				#1 Grates RPM*				#3 Grates RPM*				#5 Grates RPM*			
	750	900	1050	1200	750	900	1050	1200	750	900	1050	1200	750	900	1050	1200
	625	750	875	1000	625	750	875	1000	625	750	875	1000	625	750	875	1000
1-3/4"																
1-1/2"													100			
1-1/4"									100				99.8	100	100	
1"									99.9				99.1	99.6	99.8	100
7/8"									99.8	100	100		98.6	99.2	99.5	99.8
3/4"									99.6	99.8	99.9	100	98.0	98.7	99.1	99.6
5/8"									99.0	99.3	99.5	99.7	95.6	96.8	97.7	98.8
1/2"					100	100	100	100	97.3	97.9	98.4	99.0	90.3	92.6	94.6	96.7
3/8"					99.6	99.7	99.8	99.9	91.8	93.6	95.3	97.2	80.4	84.5	88.3	92.0
5/16"	100	100			98.5	98.9	99.2	99.5	86.9	89.4	91.8	94.2	73.7	78.3	83.2	88.0
1/4"	99.8	99.9	100	100	97.4	97.9	98.4	98.9	80.8	84.3	87.7	91.4	65.4	71.4	77.1	82.9
4M	98.8	99.1	99.3	99.5	89.8	92.4	95.0	97.5	69.9	74.3	78.6	83.2	54.3	60.9	67.1	73.4
8M	86.6	88.8	90.9	93.0	70.1	75.3	80.5	85.5	49.8	55.1	60.3	65.9	36.0	42.0	47.6	53.3
10M	80.8	84.0	87.2	89.7	65.2	71.1	76.9	82.0	46.8	51.9	56.9	62.3	33.5	39.4	44.6	50.0
16M	64.4	69.6	74.8	79.9	51.8	58.2	64.6	70.7	37.8	42.5	47.1	52.0	27.9	32.0	36.5	41.1
30M	49.3	54.2	59.1	63.9	36.0	42.1	48.2	54.1	28.0	32.2	36.3	40.8	20.2	23.7	27.6	31.6
40M	42.6	46.8	51.0	55.0	29.4	34.9	40.4	45.8	23.3	27.0	30.6	34.6	16.5	19.7	23.3	27.1
50M	36.9	40.0	43.1	45.9	24.8	29.5	34.2	38.9	19.8	23.1	26.3	29.9	14.2	16.9	20.0	23.3
100M	17.9	20.4	22.8	25.0	14.7	17.5	20.2	23.0	10.6	13.3	15.9	19.0	8.0	9.9	12.2	14.7
-100M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Bottom row of figures is equivalent 50" Hammermill speed for same gradation. †Oversize to 3"

Approximate TPH Capacity for Limemill				
Size	2033	3033	4033	5040
1/8" Minus (Agstone)	10-20	20-40	40-60	55-85
1/4" Minus	20-40	30-60	50-80	55-110
1/2" minus	30-50	50-70	60-90	85-125
3/4" minus	40-60	60-100	80-120	110-165
1" minus	50-70	75-120	100-140	140-195
1-1/4" minus	60-80	90-130	120-160	165-220
1-1/2" minus	70-90	100-140	140-180	195-250

Limemill Gradation Charts



Limemill Data

Limemill capacity - Model 20, 20-40 tph; Model 30, 40-60 tph; Model 40, 75-85 tph. With all sizes approximately 40-75% passing #40 and 20- 50% passing #100. The accompanying Limemill product size charts can be used to determine the approximate percent passing different size mesh openings. They are intended as a guide only, as actual percent- ages will vary according to feed size, hammer and moisture content.

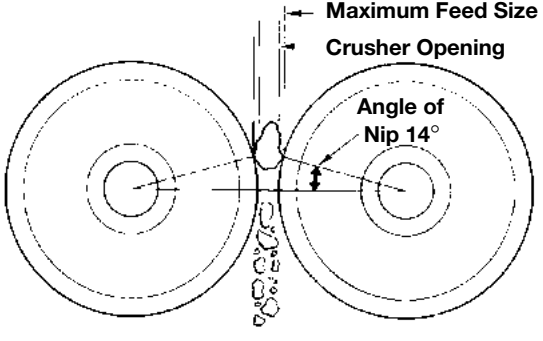
Roll Crushers

Sizing Feed to Crusher

If particle size is only slightly larger than the discharge opening, very little reduction takes place and the potential capacity is not fully used. If particle size is too large, material is not crushed until the weight of the material above it eventually drives it between the rolls. When material builds up in the hopper, the shells are subject to unnecessary rubbing wear.

Maximum efficiency and minimum wear occur when properly sized particles are fed at a rate which produces no excessive buildup but maintains just enough buildups to keep the level of material just above the point at which the particle will be grabbed and pulled between the rolls.

Refer to "Roll Crusher Maximum Feed Size in Inches" table and the roll crusher Operation & Maintenance Manual for further instruction.



Size Feed in Relation to Discharge Opening

Roll Crusher Maximum Capacity CAUTION!

Crushers can be damaged if operated in excess of these production rates, particularly at fine setting and low reductions ratios.

Note:
1. Rate shown represent *total* feed to crusher. (including circulating load, if in closed circuit)
2. Rates at other shell speeds are directly proportional.
3. Rates based on material density 100 lbs/cu. ft. Other densities proportional.
4. Consult other charts for maximum feed size and recommended settings.

Maximum Capacity Per Inch or Roll Width			
Roll Setting (inches)	TPH @ 500 FPM Shell Speed	TPH @ 700 FPM Shell Speed	Estimated Ribbon Density
1/4	2.1	2.9	80.0
3/8	3.0	4.2	77.0
1/2	3.8	5.3	74.0
5/8	4.6	6.4	71.0
3/4	5.3	7.4	68.0
7/8	5.9	8.3	65.0
1	6.4	9.0	62.0
1-1/4	7.5	10.5	58.0
1-1/2	8.4	11.8	54.0
1-3/4	9.1	12.7	50.0
2	9.4	13.1	45.0
2-1/4	10.6	14.7	45.0
2-1/2	11.8	16.4	45.0
2-3/4	12.9	18.0	45.0
3	14.1	19.6	45.0
3-1/4	15.3	21.3	45.0
3-1/2	16.5	22.9	45.0
3-3/4	17.6	24.6	45.0
4	18.8	26.2	45.0
4-1/2	20.0	27.8	45.0

Roll Crusher Specifications

Model	1616	2416	3018	3025	3030	3136	4026	4130	4132	4136	5530	5530 XHD
Size	16 x 16	24 x 16	30 x 18	30 x 25	30 x 30	31 x 36	40 x 26	41 x 30	41 x 32	41 x 36	55 x 30	55 x 30
HP*	40-80	50-100	75-150	100-200	150-250	200-300	150-250	200-300	200-300	250-350	250-350	300-400
RPM Countershaft	395-425	350-375	350-400	300-375	300-375	260-325	260-420	245-385	245-385	245-385	245-385	283-475
Weight** Rubber Tire	4,300	7,650	10,600	12,700	17,800	25,600	20,900	28,500	25,500	31,300	35,000	45,000

Note: Up to 700 FPM shell speed permissible on 40" diameter and larger rolls. For 5530XHD, speed to 1200 FPM permissible. Consult factory for correctness of application.

*Maximum motor/power unit rpm 1200; for fine crushing applications, use maximum hp shown. For larger-than-normal feed, an increase in power may be necessary, consult factory.

**Listed weights are approximate for rubber tire models.

Two-Roll Crusher Specifications

Size	Center Thickness New Shells		New Shell Diameter*		Center to Center Working Range			Roll Opening with New Shells				
									Recom. Maximum		Absolute Maximum	
	STD	HD	STD	HD	Minimum	Recom. Normal	Absolute Maximum	Recom. Minimum	STD	HD	STD	HD
16 x 16	2	–	16	–	15-1/4	16-3/4	17	1/4	3/4	–	1	–
24 x 16	2	–	24	–	22-7/8	25-1/2	25-7/8	1/4	1-1/2	–	1-7/8	–
30 x 18	2	–	30	–	28-3/4	32-1/4	32-5/8	1/4	2-1/4	–	2-5/8	–
30 x 25	2-1/4	2-3/4	30	31	28-3/4	32-1/4	32-5/8	1/4	2-1/4	1-1/4	2-5/8	1-5/8
30 x 30	2-1/2	3	30	31	28-3/4	32-1/4	32-5/8	1/4	2-1/4	1-1/4	2-5/8	1-5/8
**40 x 26	2	2-1/2	40	41	37-3/4	42	42-3/8	1/4	2	1	2-3/8	1-3/8
41 x 30	2-3/4	3	41	43	39-1/4	44	44-1/4	1/4	–	1	2-3/8	1-3/8
41 x 32	2-3/4	–	41	–	39-1/4	44	44-1/4	1/4	3	–	3-1/4	–
41 x 36	–	3-1/2	–	41	39-1/4	44	44-1/4	1/4	–	3	–	3-1/4
55 x 30	–	3-1/2	–	55	53	59	59-1/4	1/4	–	4	–	3-1/4

Size	Center Thickness New Shells		New Shell Diameter‡		Center to Center Working Range			Roll Opening Range New Shells			Maximum Shim Setting Range†	Tire Size	Ply
	STD	HD	STD	HD	15 - 20 psi	20 - 25 psi	25 - 30 psi	Min.	Std.	HD			
41 x 30	2-3/4	3-1/2	41	43	40 - 41	41 - 44	–	1/4	3	1	38-1/2 - 44	11 x 24	12
41 x 32	2-3/4	–	41	–	38-1/2 - 39-1/2	39-1/2 - 42	43	1/4	2	–	38-1/2 - 45-1/2	11 x 22	12
41 x 32	2-3/4	–	41	–	–	42 - 44	–	1	3	–	38-1/2 - 45-1/2	11 x 22 ML**	12
41 x 32	2-3/4	–	41	–	40 - 41	41 - 45	45-1/2	1/4	4-1/4	–	38-1/2 - 45-1/2	11 x 22	12
41 x 36	–	3-1/2	–	41	38-1/2 - 39-1/2	39-1/2 - 42	43	1/4	–	2	38-1/2 - 44-1/4	11 x 22	12
41 x 36	–	3-1/2	–	41	–	42 - 44	–	1	–	3	38-1/2 - 44	11 x 22 ML**	12
41 x 36	–	3-1/2	–	41	40 - 41	41 - 44-1/2	–	1/4	–	3-1/4	38-1/2 - 44-1/4	11 x 24	12
55 x 30	–	3-1/2	–	55	53 - 54	54 - 58	59-1/4	1/4	–	4-1/4	53 - 60-1/2	12 x 36	10
55 x 30 XHD	4-1/8	–	55	–	53 - 54	54 - 58	59-1/4	3/16	4-1/4	–	52-7/8 - 59-3/8	12 x 36	10

*With extended frame. †Tires used may not permit full use of maximum shim setting range. **Mining and logging tire.
‡Diameters can be .375" larger due to casting tolerances. Minimum opening is with two smooth shells.

Two-Roll Crusher Specifications

Size	Center Thickness New Shells		New Shell Diameter‡		Center to Center Working Range			Roll Opening Range New Shells			Maximum Shim Setting Range†	Tire Size	Ply
	STD	HD	STD	HD	15 - 20 psi	20 - 25 psi	25 - 30 psi	Min.	Std.	HD			
16 x 16	2	–	16	–	–	15 - 17	17-1/2	1/4	1-1/2	–	15 - 18	5.70 x 8	2
24 x 16	2	–	16	–	–	22-7/8 - 25-3/4	25-7/8	1/4	1-7/8	–	22-1/4 - 26-1/8	7 x 14.5	8
30 x 18	2	–	24	–	29-1/2 - 30	30 - 32-1/2	32-5/8	1/4	2-5/8	–	28 - 32-5/8	7 x 18	8
30 x 25	2-1/4	2-3/4	30	31	29-1/2 - 30	30 - 32-1/2	32-5/8	1/4	2-5/8	1-5/8	28 - 32-5/8	7 x 18	8
30 x 25*	2-1/4	2-3/4	30	31	31-1/2 - 32	32 - 34	–	1-1/2 ST 1/2 HD	4	3	28 - 34	7 x 20	8
30 x 30	2-1/4	3	30	31	29-1/2 - 30	30 - 32-1/2	32-7/8	1/4	2-5/8	1-5/8	28-3/4 - 32-5/8	7 x 18	8
31 x 36	–	3-1/2	–	31	29-3/4 - 31	31 - 33-1/2	34	1/4	–	3	28-1/2 - 34	9 x 16	8
40 x 26	2	2-1/4	40	41	38 - 39-1/2	39-1/2 - 42	43	1/4	3	2	37-3/4 - 44	11 x 22	12
40 x 26	2	2-1/4	40	41	–	42 - 44	–	2 STD 1 HD	4	3	37-3/4 - 44	11 x 22 ML**	12
41 x 30	2-3/4	3-1/2	41	43	38-1/2 - 39-1/2	39-1/2 - 42	43	1/4	2	–	38-1/2 - 44	11 x 22	12
41 x 30	2-3/4	3-1/2	41	43	–	42 - 44	–	1 STD 1/4 HD	3	1	38-1/2 - 44	11 x 22 ML**	12

*Diameters are minimum but can be 3/8" longer due to casting tolerances. Minimum opening is with two smooth shells.
**14-tooth finger gears available from approximately 7/8" larger maximum opening.

Roll Crusher Maximum Feed Size (in inches)*

Crusher Setting	Equipped with 2 Smooth Shells						Equipped with 1 Smooth Shell & 1 Smooth-Beaded Shell						Equipped with 2 Smooth-Beaded Shells or 1 Smooth-Beaded Shell & 1 Corrugated Shell***					
	Roll Shell Diameter (in inches)						Roll Shell Diameter (in inches)						Roll Shell Diameter (in inches)					
	16	24	30 31	40	41	55	16	24	30 31	40	41	55	16	24	30 31	40	41	55
** 1/4"	5/8	3/4	3/4	5/8	1	1												
			7/8	1-1/4	1-1/4	1-1/2												
** 3/8"	3/4	7/8	1-1/8	1-1/8	1-1/4	1-1/4												
				1-3/8	1-3/4	1-3/4												
** 1/2"	7/8	1-1/8	1-1/4	1-1/2	1-1/2	1-5/8	7/8	1-1/8	1-1/4	1-1/2	1-1/2	1-5/8						
						1-5/8	1-1/8	1-3/8	1-1/2	1-3/4	1-3/4	2						
** 5/8"	1	1-1/4	1-3/8	1-5/8	1-5/8	2	1-1/4	1-3/8	1-5/8	1-3/4	1-3/4	2						
								1-1/2	1-3/4	2	2	2-1/4						
** 3/4"	1-1/8	1-3/8	1-1/2	1-3/4	1-3/4	2-1/8	1-3/8	1-5/8	1-7/8	2	2	2-3/8	1-5/8	2	2-1/4	2-1/2	2-1/2	2-7/8
										2-1/4	2-1/4	2-5/8						3-1/8

Crusher Setting	Equipped with 2 Smooth Shells						Equipped with 1 Smooth Shell & 1 Smooth-Beaded Shell						Equipped with 2 Smooth-Beaded Shells or 1 Smooth-Beaded Shell & 1 Corrugated Shell***					
	Roll Shell Diameter (in inches)						Roll Shell Diameter (in inches)						Roll Shell Diameter (in inches)					
	16	24	30 31	40	41	55	16	24	30 31	40	41	55	16	24	30 31	40	41	55
7/8	1-1/4	1-1/2	1-5/8	1-7/8	1-7/8	2-1/4	1-1/2	1-3/4	2	2-1/4	2-1/4	2-3/4	1-3/4	2-1/4	2-3/8	2-3/4	2-3/4	3-1/4
1	1-3/8	1-5/8	1-3/4	2	2	2-3/8	1-3/4	2	2-1/4	2-1/2	2-1/2	3	2	2-3/8	2-1/2	2-7/8	2-7/8	3-1/2
1-1/4		1-7/8	2	2-1/4	2-1/4	2-5/8		2-3/8	2-1/4	2-3/4	2-3/4	3-1/4		2-3/4	2-7/8	3-1/4	3-1/4	3-3/4
1-1/2		2-1/8	2-1/4	2-1/2	2-1/2	2-7/8		2-5/8	2-3/4	2-1/8	3-1/8	3-5/8		3-1/8	3-1/4	3-5/8	3-5/8	4-1/8
1-3/4		2-3/8	2-1/2	2-3/4	2-3/4	3-1/4		3	3-1/8	3-1/2	3-1/2	4		3-1/2	3-5/8	4	4	4-3/4
2			2-3/4	3-1/8	3-1/8	3-5/8			3-1/2	4	4	4-1/2			4	4-1/2	4-1/2	5-1/4
2-1/2			3-1/4	3-5/8	3-5/8	4-1/8			4-1/4	4-5/8	4-5/8	5-1/8			4-3/4	5-1/4	4-1/4	5-7/8
3					4-1/4	4-3/4					5-3/8	5-7/8					6-1/8	6-5/8

*Based on regular shaped particles with relatively smooth surfaces, such as average gravel. Highly friable material, irregular shaped particles and/or particles with relatively rough surfaces permit somewhat larger feed sizes. However size or volume of feed must be regulated so that discharge volume does not exceed 70% of theoretical maximum (solid ribbon) volume, which could occur at the closer settings. **Top row of figures is recommended size; bottom row is maximum particle. Recommended particle sizes are within the prescribed reduction ratio. Maximum particle sizes are the permissible occasional oversize particles that will be gripped under normal conditions. ***Shells can be with or without beads as dictated by material characteristics.

Two-Roll Crusher Estimated Gradation Chart Percent Passing (Open Circuit)

Product Size	Crusher Closed Side Setting							
	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
10"								
9"								
8"								
7"								
6"								
5"								
4"								
3 1/2"								
3"								
2 3/4"								
2 1/2"								
2 1/4"								100
2"							100	95
1 3/4"							98	90
1 1/2"						100	92	82
1 1/4"					100	93	86	75
1"				100	90	81.5	73	62
7/8"			100	92	86	75	66	56
3/4"		100	92	85.1	75	65	55	47
5/8"		96	88	76.1	67	58.4	49.5	42.5
1/2"	100	90	78	65.5	56	48.9	41.5	35.5
3/8"	97	78	58	50	42	36.7	31	27
5/16"	92	72.4	53	45.5	38	33.2	29	24
1/4"	79	60.9	43	37.2	31.5	27.5	23	20
4M	56	45.7	35.5	28.2	24	21	17.5	15
8M	33	25.4	18	15.7	13.5	11.9	9.9	8.5
10M	28	21.6	15.3	13.3	11.9	9.8	8.3	7.2
16M	17	13.2	9.4	8.1	6.8	5.8	5	4.4
30M	9.4	7.3	5.2	4.5	3.8	3.3	2.9	2.5
40M	7	5.5	3.9	3.4	2.9	2.5	2.1	1.9
50M	5.4	4.3	3	2.6	2.3	1.9	1.6	1.4
100M	3.2	2.5	1.7	1.5	1.3	1.1	1.0	.8

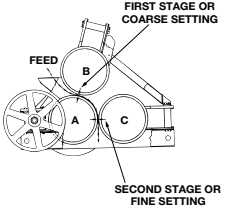
Two-Roll Crusher Estimated Gradation Chart Percent Passing (Open Circuit)

Product Size	Crusher Closed Side Setting								
	1 1/2"	1 3/4"	2"	2 1/4"	2 1/2"	2 3/4"	3"	3 1/2"	4"
10"									
9"									
8"									
7"									
6"							100	100	100
5"					100	100	96	87	78
4"				100	95	90	84	74	65
3 1/2"			100	93	87	81	76	66	58
3"		100	93	84	78	72	67	58	52
2 3/4"	100	96	88	79.5	73.5	67.5	62.5	54	48.5
2 1/2"	96	91	82	74	68	62.5	58	50	45
2 1/4"	93	85	76	68.5	63	58	53.5	46.5	41.5
2"	87	79	69	62	57	53	49	42.5	38
1 3/4"	80	72	62	56	52	48	44	38.5	34.5
1 1/2"	71	62	54.5	49	45	42	38.5	34	30.5
1 1/4"	62.5	55	48	43	40	37	34	30	27
1"	52	46	40	36	33.5	31	28.5	25	22.5
7/8"	46.5	41.5	36	32.5	30	28	26	22.5	20.1
3/4"	39	34.5	30.5	27.5	25.5	23.5	22	19	17.3
5/8"	35.2	31	27.2	24.5	22.8	21	19.5	17	15.5
1/2"	29.8	26	23	21	19.4	18	16.5	14.8	13.3
3/8"	22.5	19.5	17.5	15.8	14.6	13.7	12.7	11.2	10.2
5/16"	20	17.6	15.7	14.2	13.2	12.3	11.3	10	9.1
1/4"	17	14.8	13	11.9	11.2	10.3	9.7	8.6	7.8
4M	12.8	11.2	10	9.1	8.5	8	7.4	6.6	5.9
8M	7.3	6.4	5.7	5.3	4.9	4.6	4.3	3.8	3.4
10M	6.2	5.4	4.8	4.4	4.1	3.9	3.7	3.2	2.9
16M	3.8	3.3	2.9	2.7	2.5	2.4	2.3	2	1.8
30M	2.2	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.1
40M	1.7	1.4	1.3	1.2	1.2	1.2	1.1	1	.9
50M	1.3	1.1	1	1	1	1	.9	.8	.8
100M	.7	.6	.5	.5	.5	.5	.5	.4	.4

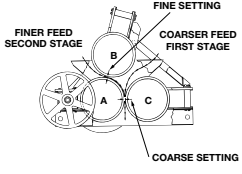
Three Roll Crushers

Three-roll crushers can provide twice the reduction ratio of a dual roll crusher. A single-feed, three roll with a 20/80 or up to 66-2/3 - 33-1/3 split will produce greater capacity and a smaller percentage of overs as its second stage does not have to re-crush material reduced to finished size by the first stage. These particles fill the voids at the second stage, resulting in a denser material ribbon.

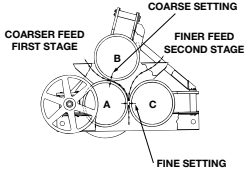
At higher material size split ratios, the dual feed will "out produce" the single feed but a much larger screen is required to handle the large recirculating load. For this reason in a closed circuit operation, the single feed method is preferred. The best application for dual feeding is in open circuit with other suitable crushers following to handle the high percentage of oversize passing through the three- roll.



Single Feed – Little recirculating load on screen. Capacity same as alternate dual feed below. Best for CLOSED circuit plants.



Dual Feed (Option #1) – Large recirculating load on screen. Best for OPEN circuit operation when other crushers follow.



Dual Feed (Option #2) – Little recirculating load on screen. Probable capacity about the same as single feed which is less complicated.

Three-Roll Reductioneer Specifications

Size		3025-3	4026-3	4132-3	4136-3
HP		200-350	250-400	300-450	350-550
Shell Diameter		30	40	41	41
Shell Width		25	26	32	36
Stationary Shaft Diameter	Ctr.	8	9	9	10.25
	Brg.	6-11/16	7-7/8	8	9-1/4
Movable Shaft Diameter	Ctr.	7	7.5	9	9
	Brg.	5.75	6.5	7.875	8
Countershaft dia. @ brg.		5-1/8	5-1/8	5-15-16	5-15/16
Countershaft Diameter	Dia.	36	51	58	58
	Face	14-3/8	12-1/2	17-5/8	17-5/8
Flywheel**	Dia.	36	51	58	58
	Face	14-3/8	15-1/2	17-5/8	17-5/8
RPM	Roll Shafts	58-63	45-52	45-50	45-50
	Counter-Shafts	300-375	260-420	245-385	245-385
Avg. FPM Shell Surface		500	600	600	600
Gear Drive Ratio		5.14:1	5.78:1	5.4:1	5.4:1
Compression Springs		4	8	8	8
Gas-Hydraulic Springs		4	4	8	8
Approximate Weight		19,000	28,300	38,000	43,000

NOTE: Up to 700 FPM shell speed permissible on 40" diameter and larger rolls. Up to 1800 maximum power RPM. For fine crushing applications use maximum hp shown. For larger- than-normal feed, an increase in power may be necessary. Consult factory.

** Used as drive pulley; standard size given, but may vary with drive arrangement.

Three-Roll Reductioneer Specifications

Size	Center Thickness New Shells		New Shell Diameter		Center to Center Working Range			Roll Opening Range New Shells			Maximum Shim Setting Range*	Tire Size	Ply
	STD	HD	STD	HD	15 - 20 psi	20 - 25 psi	25 - 30 psi	Min.	Std.	HD			
3025-3	2-1/4	–	30	–	29 1/2 - 30	30 - 32 1/2	35 5/8	1/4	2 5/8	–	28 - 34	7.00 x 18	8
3025-3	2-1/4	–	30	–	31 1/2 - 32	32 - 34	–	1 1/2	4	–	28 - 34	7.00 x 20	8
4026-3	2	–	40	–	38 - 39 1/2	39 1/2 - 42	43	1/4	3	–	37 3/4 - 44	11.00 x 22	12
4026-3	2	–	40	–	–	42 - 44	–	2	4	–	37 3/4 - 44	11.00x22M	12
4132-3	2-3/4	–	41	–	40 - 41	41 - 45	45 1/4	1/4	4 1/4	–	38 1/2 - 45 1/4	11.00 x 24	12
4136-3	3-1/2	–	41	–	40 - 41	41 - 45	45 1/4	1/4	4 1/4	–	38 1/2 - 45 1/4	11.00 x 24	12

*Tires used may not permit full use of maximum shim setting range.
†Mining and logging tire.

Three-Roll Estimated Product Gradation Chart Guide (Single Feed Only)

Upper Roll	*1/2"*	*3/4"*	*1"*	*1-1/4"*	*1-1/2"*	*1-3/4"*	*2"*	*2-1/2"*	*3"*	*3-1/2"*	*4"*	*4-1/2"*
Lower Roll	*1/4"*	*3/8"*	*1/2"*	*5/8"*	*3/4"*	*7/8"*	*1"*	*1-1/4"*	*1-1/2"*	*1-3/4"*	*2"*	*2-1/4"*
+5"												
5 x 4-1/2"												1.0
4-1/2 x 4												
4 x 3-1/2											1.0	2.0
3-1/2 x 3										1.0	2.0	7.0
3 x 2-3/4									1.0	1.0	3.0	3.0
2-3/4 x 2-1/2									1.0	3.0	4.0	5.5
2-1/2 x 2-1/4								1.0	1.0	4.0	6.0	5.5
2-1/4 x 2								1.0	4.0	6.0	7.0	7.2
2 x 1-3/4							1.0	4.0	6.0	7.0	7.8	6.7
1-3/4 x 1-1/2						1.0	4.0	7.0	8.0	10.8	8.4	7.8
1-1/2 x 1-1/4					3.0	2.0	4.0	7.0	9.5	7.6	7.3	6.7
1-1/4 x 1				2.0	3.0	10.5	11.0	13.9	11.7	9.8	8.9	7.8
1 x 7/8			2.0	2.0	2.0	5.5	7.7	6.4	6.1	4.9	4.5	3.9
7/8 x 3/4			2.0	5.0	10.0	10.8	12.1	9.6	8.3	7.6	6.1	5.5
3/4 x 5/8		2.0	3.0	9.0	8.7	7.1	6.0	4.8	4.2	3.8	2.7	2.3
5/8 x 1/2		4.0	10.0	11.3	12.0	10.3	8.8	7.5	6.0	5.4	4.7	3.9
1/2 x 3/8	1.0	11.0	21.3	16.8	15.3	13.2	11.5	9.1	8.1	7.1	6.0	5.8
3/8 x 5/16	3.0	5.9	5.3	4.8	4.4	3.8	3.3	3.2	2.8	2.1	2.0	1.8
5/16 x 1/4	12.0	12.2	10.6	8.9	7.1	6.1	5.5	4.2	3.3	3.0	3.0	2.6
1/4 x 4M	21.3	16.2	11.2	9.7	8.2	7.0	6.0	5.3	4.7	3.9	3.4	3.1
4M x 8M	27.6	21.6	15.4	13.5	11.5	9.8	8.3	6.9	6.1	5.2	4.8	4.3
8M x 10M	5.3	4.0	2.9	2.6	2.3	2.2	1.8	1.4	1.2	1.1	1.0	0.9
10M x 16M	11.7	8.9	6.3	5.6	5.0	4.3	3.6	3.0	2.7	2.3	2.1	1.9
16M x 30M	8.1	6.3	4.5	3.9	3.3	2.7	2.3	2.0	1.8	1.5	1.3	1.2
30M x 40M	2.6	1.9	1.4	1.2	1.0	0.9	0.9	0.6	0.6	0.5	0.4	0.4
40M x 50M	1.7	1.3	0.9	0.9	0.7	0.6	0.5	0.5	0.4	0.3	0.3	0.2
50M x 100M	2.3	2.0	1.4	1.2	1.1	0.9	0.6	0.6	0.7	0.5	0.6	0.5
-100M	3.4	2.7	1.8	1.6	1.4	1.2	1.1	0.9	0.8	0.6	0.6	0.5
Total %	100	100	100	100	100	100	100	100	100	100	100	100

Table I - Capacity Multipliers for Open Circuit*		
Feed Split Ratio Coarse/Fine	Double Roll (50% Solid Ribbon)	Dual Feed Three Roll
20/80	1.0	1.25
30/70	1.0	1.43
40/60	1.0	1.67
50/50	1.0	2.00
60/40	1.0	2.50
70/30	1.0	2.85
80/20	1.0	2.50
90/10	1.0	2.22

Table II - Percent Oversize at Finer Roll Setting Indicated Open Circuit Dual Feed Three Roll								
Upper Roll Setting	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
2	36.8	39.7	42.6	45.5	48.4	51.3	54.2	57.1
1-1/2	35.2	18.3	41.4	44.5	47.6	50.7	53.8	56.9
1-1/4	34.0	37.3	40.5	43.8	47.0	40.3	53.5	56.8
1	32.8	36.2	39.6	43.0	46.4	49.8	53.2	56.6
3/4	31.6	35.2	38.7	42.3	45.8	49.4	52.9	56.5
1/2	30.4	34.1	37.8	41.5	45.2	48.9	52.6	56.3
3/8	30.0	33.8	37.5	41.3	45.0	48.8	52.5	56.3
1/4	29.6	32.4	37.2	41.0	44.8	48.6	52.4	56.2

Table III - Capacity Multipliers for Closed Circut* (Result is net finished product)									
Finer Roll Setting	Double Roll	Dual Feed Three Roll							
		Split Feed Ratio Coarse/Fine							
		20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
2	.76	.87	.94	1.01	1.10	1.21	1.34	1.50	1.71
1-1/2	.77	.88	.94	1.02	1.11	1.21	1.33	1.48	1.68
1-1/4	.78	.89	.95	1.03	1.11	1.21	1.33	1.48	1.67
1	.79	.90	.96	1.03	1.12	1.22	1.33	1.48	1.63
3/4	.80	.91	.97	1.04	1.12	1.21	1.33	1.46	1.63
1/2	.81	.91	.97	1.04	1.11	1.20	1.31	1.43	1.58
3/8	.82	.91	.97	1.04	1.11	1.20	1.30	1.42	1.56
1/4	.82	.91	.97	1.03	1.11	1.19	1.29	1.40	1.54

*Maximum without feeder.

**Practical minimum in closed circuit. Capacity dependent on type & characteristics of material.

*Calculated on the basis of 500 FPM roll speed and 50% solid material feed ribbon.

Vibrating Screen Capacity

Before the capacity of any screen can be estimated it is necessary to know the various factors and conditions that regulate screen production. The tables and formula given below can be used to more accurately determine capacity of a screen.

FORMULA: A= B x S x D x V x H x T x K x P x W x O

Note: Factors S, K, P and W will usually be constant for a given set of calculations and may be combined into one figure by multiplying them together. Also see Screen Bed Depth data.

A= Actual capacity to screen deck, which can be screened at 90% efficiency, per sq. ft.
B= Basic capacity (See Table I)
S= Incline factor (See Table II)
D= Deck factor (See Table III)
V= Oversize factor (See Table IV)
H= Halfsize factor (See Table IV)
T= Slot factor (See Table V)
K= Condition factor (See Table VI)
P= Shape factor (See Table VII)
W= Weight factor (See footnote Table I)
O= Open area factor (See Table VIII)

When selecting a screen to separate crusher-run material, it is necessary to tabulate from a gradation curve the percent passing the screen cloth sizes required and the percent passing ½ the screen cloth size. Gradation for the example below is: percent passing 3" -100%; 1-½" -92%; ¾" - 80%; 3/18" -62%; 3/16" -40%; 8M -21%.

EXAMPLE: Select a screen to separate the following sizes: plus 1-½"; 1-½" – ¾"; ¾" – 4M; minus 4M.

DATA: Production 250 TPH; Material - clean, cubical gravel; Weight 115 lb/cu. ft.; 15% slivers in the minus ½" to plus 1/8" range; triple deck horizontal screen to be used. Square clear opening determined from Cedarapids screen cloth bulletin.

CALCULATIONS:
1. Top Deck – 100% of feed, 1-½" separation A=B x S x D x V x H x T x K x P x W x O
S=* 1.20 (Table II)
B= 6.50 TPH/sq. ft. for 1-½" SCO (Table I)
D= 1.00 (Table III)
V= 0.926 for 8% oversize (Table IV)
H= 1.80 for 80 % halfsize (Table IV)
T= 1.00 for square opening cloth (Table V)
K=* 1.25 for clean gravel (Table VI)
P= 1.00 for less than 5% slivers (Table VII)
W=* 1.15 for 115 lb./cu.ft. (Table I footnote)
O= 1.28 for 64% opening (Table VIII)

*Items thus marked are constant for these calculations and can be combined into Q. K x W x S = 1.725 = Q.

A= (6.50)(1.00)(.926)(1.80)(1.00)(1.00)(1.00)(1.28)(1.725) = 23.9 TPH/sq. ft.

2. Center deck - 92% total feed, ¾" separation. Actual percentage of material size to this deck will be 100 ÷ 92 or 1.087 times the percentage found in the gradation curve.

A= B x D x V x H x T x P x O x Q
B= 4.80 for ¾" opening
D= .90
V= .942 x 1.087 x 12% oversize = approximately 13% or 3/5 the difference between 10% and 15% factors in Table IV
H= 1.550 x 1.087 x 62% halfsize = 67.39% or approximately 2/5 the difference between 65% and 70% factors in Table IV
T= 1.0 P=1.0
O= 1.21 for 60.5% clear opening Q= 1.725

A= (4.80) (0.90) (0.942) (1.550) (1) (1) (1.21) (1.725)= 13.1 TPH/sq ft

3. Bottom Deck - 80% of total feed, 4M separation, slotted wire. 100/80 = 1.25

A= B x D x V x H x T x P x O x Q B=1.80 for 4 mesh
D= .80
V= 1.18 (50% oversize)
H= 0.725 (1.25) (21% halfsize)= 26.25% or approximately 1/5 the difference between 25% and 30% factors of Table IV
T= 1.40
P= 1.0
O= 1.21 for 60.5% clear opening
Q= 1.725

A= (4.80) (0.90) (0.942) (1.550) (1.00) (1.00) (1.21) (1.725)= 13.1 TPH/sq ft.

Therefore the deck area required for each deck to handle 250 TPH total feed is :

Top deck - 250/23.9=10.46 sq ft.
Center deck - (250) (92)/13.1=17.55 sq ft.
Bottom deck - (250) (80)/3.48=57.50 sq ft.

The bottom deck in this case controls the size of screen unit required. A 60" x 12' screen will provide 60 sq ft of area on each deck and will fulfill the requirements.

Table I, Basic Capacity - Bc TPH per Square Foot*

These values are based on TPH (total feed to deck) per one square foot of square opening screen cloth (with 25% oversize, 40% halfsize, 50% open area and 90% efficiency)

Screen Opening	Bc	Screen Opening	Bc	Screen Opening	Bc	Screen Opening	Bc	Screen Opening	Bc
100M	0.23	7/32"	2.20	11/16"	4.70	1-5/8"	6.80	2-5/8"	8.60
20M	0.65	1/4"	2.50	3/4"	4.80	1-3/4"	7.00	2-3/4"	8.80
10M	0.99	5/16"	2.75	7/8"	5.10	1-7/8"	7.25	2-7/8"	9.00
8M	1.11	3/8"	3.20	1"	5.50	2"	7.50	3"	9.25
7M	1.24	7/16"	3.50	1-1/8"	5.80	2-1/8"	7.70	3-1/8"	9.50
6M	1.39	1/2"	3.80	1-1/4"	6.10	2-1/4"	7.90	3-1/4"	9.75
5M	1.57	9/16"	4.20	1-3/8"	6.30	2-3/8"	8.20	3-3/8"	10.00
4M	1.80	5/8"	4.50	1-1/2"	6.50	2-1/8"	8.40	3-1/2"	10.25

Screen Opening	Bc
3-5/8"	10.50
3-3/4"	10.70
3-7/8"	10.90
4"	11.20
4-1/8"	11.40
4-1/8"	11.60
4-3/8"	11.80
4-1/2"	12.10

*Material weight 100 lbs per cu. ft. For material weighting 75 lbs/cu ft, include a factor of .75; 125 lbs/cu ft use 1.25. Other weights in proportion (Factor W).

Table II, Inclined Factor S		
Factor	*Degree Incline*	*Approximate Conveying Velocity*
1.00	20°	100 FPM
1.04	15°	70 FPM
1.07	10°	40 FPM
1.15	5°	10 FPM
1.20	CR Horizontal - Normal Amplitude	60 FPM
1.40	CR Horizontal - Low Amplitude	
1.60	CR Horizontal - High Speed	

Table III, Deck Factor D	
Deck	*Factor*
Top	1.00
Second	0.90
Third	0.80
Fourth	0.70

Table IV Oversize and Halfsize Factors
(Factor V and Factor H)

*Percent**	*Oversize Factor V*	*Halfsize Factor H*	*Percent**	*Oversize Factor V*	*Halfsize Factor H*
0	0.98	0.40	50	1.18	1.20
5	0.92	0.45	55	1.25	1.30
10	0.93	0.50	60	1.33	1.40
15	0.95	0.55	65	1.42	1.50
20	0.97	0.60	70	1.55	1.60
25	1.00	0.70	75	1.75	1.70
30	1.03	0.80	80	2.00	1.80
35	1.06	0.90	85	2.60	1.90
40	1.09	1.00	90	3.40	2.00
45	1.13	1.10	95	4.30	2.10

*For V factor percent of feed not passing opening. For H factor percent of feed less than half the screen opening size.

Table V, Slot Factor T	
Slot length 6 or more times width	1.60
Slot length 3-6 times width	1.40
Slot length 2-3 times width	1.10
Square opening	1.00
Round opening	0.80

Table VI, Condition Factor K	
Factor	*Condition of Material*
0.75	Moist or dirty stone
0.85	Moist ore from underground; coal
1.00	Dry quarried material, 4% or less moisture; Crushed rock and gravel
1.25	Dry uncrushed material, 6% or less moisture; hot dry material from drier; gravel - clean, not cemented; wet screening with sprays, 1" material
1.75	Wet screening with sprays, 1/4" minus material

Table VII, Shape Factor P

Percent of particles in the feed to the deck between one-half and one and one-half times the size of screen opening which have length more than three times major width.

Percent	*Shape Factor P*	*Percent*	*Shape Factor P*
5	1.00	40	0.75
10	0.95	50	0.70
15	0.90	60	0.65
20	0.85	70	0.60
30	0.80	80	0.55

Table VIII - Open Area, Factor '0'	
*Percent Open**	*Factor '0'*
40	0.80
45	0.90
50	1.00
55	1.10
60	1.20
65	1.30
70	1.40
75	1.50
*For exact percent opening, consult screen media manufacturer's guide.	

Screen Bed Depth

D = TK / 5SW
D= Material depth (inches)
T= Material retained on deck (TPH)
K= Specific volume of material (cubic feet/ton)
S= Conveying velocity (feet/minute)
W= Deck width (feet)
For Cedarapids Horizontal Screens (in lieu of specific data)
K= 20 (cubic feet/ton)
S= 60 ft/min
D= 20T / (5) (60) W = T / 15 (W)

Equivalent Sizes for Round & Square Perforations (sizes are clear openings in inches)					
Round Hole (inches rd.)	Sq. Hole Equ. (in. sq)	Round Hole (inches rd.)	Sq. Hole Equ. (in. sq)	Round Hole (inches rd.)	Sq. Hole Equ. (in. sq)
1/32	.0257	1-3/4	1-1/2	5/8	3/4
3/64	.0386	2	1-5/8	3/4	7/8
1/16	.053	2-1/4	1-7/8	7/8	1
3/32	5/64	2-1/2	2-1/16	1	1-1/4
		3	2-1/2	1-1/8	1-3/8
1/8	7/64	3-1/2	2-7/8	1-1/4	1-1/2
3/16	5/32	4	3-3/8	1-3/8	1-5/8
1/4	7/32	4-1/2	3-3/4	1-1/2	1-3/4
5/16	1/4	5	4-1/4	1-3/4	2-1/16
3/8	5/16	1/32	.038	2	2-7/16
7/16	32/8	3/64	.058	2-1/4	2-3/4
1/2	7/16	1/16	.075	2-1/2	3
5/8	1/2	3/32	7/64	3	3-5/8
3/4	5/8	1/8	5/32	3-1/2	4-1/4
7/8	3/4	3/16	7/32	4	4-3/4
1	7/8	1/4	5/16	4-1/2	5-3/8
1-1/8	15/16	5/16	3/8	5	6
1-1/4	1	3/8	7/16	6	7-1/4
1-3/8	1-1/8	7/16	1/2		
1-1/2	1-1/4	1/2	5/8		

U.S. Sieve Sizes (Fine Series)				
U. S. Sieve Number	Sieve Opening			Tyler Screen Scale Mesh Equivalent
	Microns	Millimeters	Inches	
3-1/2	5660	5.66	.223	3-1/2
4	4760	4.76	.187	4
5	4000	4.00	.157	5
6	3360	3.66	.132	6
7	2830	2.83	.111	7
8	2380	2.38	.0937	8
10	2000	2.00	.0787	9
12	1680	1.68	.0661	10
14	1410	1.41	.0555	12
16	1190	1.19	.0469	14
18	1000	1.00	.0394	16
20	840	0.84	.0331	20
25	710	0.71	.0280	24
30	590	0.59	.0232	28
35	500	0.50	.0197	32
40	420	0.42	.0165	35
45	350	0.35	.0138	42
50	297	0.297	.0117	48
60	250	0.250	.0098	60
70	210	0.210	.0083	65
80	177	0.177	.0070	80
100	149	0.149	.0059	100
120	125	0.125	.0049	115
140	105	0.105	.0041	150
170	88	0.088	.0035	170
200	74	0.074	.0029	200
230	62	0.062	.0024	250
270	53	0.053	.0021	270
325	44	0.044	.0017	325
400	37	0.037	.0015	400

Approximate Equivalents of Square & Round Openings of U.S. Standard Sieves (inches)			
Square Hole	*Round Hole*	*Square Hole*	*Round Hole*
3	3-1/2	7/8	1
2-1/2	3	3/4	7/8
2-1/8	2-1/2	5/8	3/4
2	2-3/8	1/2	5/8
1-3/4	2	3/8	1/2
1-1/2	1-3/4	5/16	3/8
1-1/4	1-1/2	1/4	5/16
1	1-1/4	3/16 (No. 4)	1/4

Horizontal Sizing Screen Drive Data							
Overhead Vibrator							
Size	*Nom. HP**	*Cold HP**	*VS HP***	*Stroke/RPM*			
				Standard Shafts		*Adjust. Shafts†*	
36 x 10 DD	10	15	20	13/16"	825	–	–
36 x 10 TD	15	20	25	13/16"	825	–	–
42 x 10 DD	10	15	20	13/16"	825	–	–
42 x 10 TD	15	20	25	13/16"	825	–	–
48 x 8 DD	10	15	NA	13/16"	825	–	–
48 x 8 TD	15	20	NA	3/4"	825	–	–
48 x 10 DD	15	20	25	13/16"	825	–	–
48 x 10 TD	20	25	30	13/16"	825	–	–
48 x 12 DD	15	20	25	13/16"	825	–	–
48 x 12 TD	25	30	40	13/16"	825	9/16"	975
48 x 14 DD	20	25	30	13/16"	825	5/8"	975
48 x 14 TD	25	30	40	13/16"	825	9/16"	975
60 x 12 DD	30	40	40	7/8"	825	–	–
60 x 12 TD	30	40	40	13/16"	825	–	–
60 x 14 DD	30	40	40	3/4"	825	9/16"	975
60 x 14 TD	40	50	50	13/16"	825	9/16"	975
60 x 16 DD	30	40	40	13/16"	825	9/16"	975
60 x 16 TD	40	50	50	13/16"	825	9/16"	975
72 x 20 DD	60	60	NA	13/16"	800	9/16"	950
72 x 20 TD	60	60	NA	13/16"	800	9/16"	950
Underslung Vibrator							
48 x 12 TD	25	30	30	13/16"	825	9/16"	975
48 x 14 DD	20	25	25	13/16"	825	5/8"	975
48 x 14 TD	25	30	30	13/16"	825	9/16"	975
60 x 14 DD	30	40	40	3/4"	825	9/16"	975
60 x 14 TD	40	50	50	13/16"	825	9/16"	975
60 x 16 DD	30	40	40	13/16"	825	9/16"	975
60 x 16 TD	40	50	50	13/16"	825	9/16"	975
72 x 20 DD	60	60	60	13/16"	800	9/16"	950
72 x 20 TD	60	60	60	13/16"	800	9/16"	950

Scalping Screen Drive Data		
Overhead Vibrator		
Size	*Nom. HP**	*Cold HP**
48 x 10 SD	15	20
48 x 10 DD	20	25
48 x 14 DD	40	50
60 x 12 SD	40	50
60 x 16 DD	50	60
60 x 16 TD	60	60
48 x 14 DD	40	50
60 x 14 DD	50	60

*Adding accessories such as cylinder trays, extended discharge chutes, require increased HP. Cold HP for below 32° F **Vibra-Skimmer - factory installation only

†Hi-speed, low amplitude motors must be HST;

Inclined Screen Drive Data			
Inclined Sizing Screens			
Size	*HP*	*Nom. Stroke*	*Rec. RPM*
60" x 16' DD	20	5/16"	890
60" x 16' TD	25	5/16"	890
72" x 16' DD	20	5/16"	890
72" x 16' TD	25	5/16"	890
72" x 20' DD	30	13/32"	800
72" x 20' TD	40	13/32"	800
84" x 20' DD	30	13/32"	800
84" x 20' TD	40	13/32"	800
96" x 20' DD	30	13/32"	800
96" x 20' TD	40	13/32"	800
Inclined Scalping Screens			
60" x 16' DD	30	1/2"	755
60" x 16' TD	40	1/2"	755
72" x 16' DD	30	1/2"	755
72" x 16' TD	40	1/2"	755

End-O-Con Screens Horsepower Requirements			
Size	HP	Size	HP
36 x 6 SD	7-1/2	42 x 8 DD	10
36 x 6 DD	10	42 x 10 SD	7-1/2
36 x 8 SD	7-1/2	42 x 10 DD	10
36 x 8 DD	10	48 x 6 SD	7-1/2
36 x 10 SD	7-1/2	48 x 6 DD	10
36 x 10 DD	10	48 x 8 SD	7-1/2
42 x 6 SD	7-1/2	48 x 8 DD	10
42 x 6 DD	10	48 x 10 SD	7-1/2
42 x 8 SD	7-1/2	48 x 10 DD	10
Motors: 1800 RPM, TEFC (460-3-60). Screen Speed: 1500 RPM. 3/16" circle throw.			

LF Inclined Screens Horsepower Requirements			
Size	HP	Size	HP
48 x 10 DD	10	48 x 14 TD	10
48 x 10 TD	10	60 x 16 DD	15
48 x 12 DD	10	60 x 16 TD	15
48 x 12 TD	10	72 x 16 DD	20
48 x 14 DD	10	72 x 16 TD	20
Motors: 1800 RPM, TEFC (460-3-60).			

ElJay Horizontal Screens HP Requirements			
Finish Screens			
Size	HP	Size	HP
48 x 12 DD	20	72 x 16 DD	30
48 x 12 TD	20	72 x 16 TD	40
48 x 14 DD	20	72 x 20 DD	40
48 x 14 TD	20	72 x 20 TD	40
60 x 14 DD	25	84 x 20 DD	50
60 x 14 TD	25	84 x 20 TD	50
60 x 16 DD	25	96 x 20 TD	50
60 x 16 TD	30		
Scalping Screens			
48 x 10 DD	20	60 x 14 TD	30
48 x 12 DD	25	60 x 16 DD	30
60 x 14 DD	25	72 x 16 DD	50

ElJay Horizontal Screens Operating Data				
Application	*Angle*	*Nom. Stroke*	*RPM*	*Weight Plug Per Disc*
Scalping	35° -45°	0.75"	675 - 725	3
Medium Material	40° -50°	0.70"	725 - 775	2
Medium Material*	45° -55°	0.65"	775 - 825	1
Fine Screening	45° -60°	0.60"	825 - 875	0

*Gives maximum efficiency on bottom deck. Stroke may vary with screen and application. Angle adjustable in 5° increments.

Screen Cloth - FSG, TSH, and TSS Models				
Model	*Style*	*Dimensions inches (mm)*		*Hook**
		Inside Hook	*Along Hook*	
FSG/TSH 412	Side Tension	48.00 (1,219)	72.00 (1,829)	45
	End Tension	71.63 (1,819)	48.00 (1,219)	Square**
FSG/TSH 414	Side Tension	48.00 (1,219)	84.00 (2,134)	45
	End Tension	83.63 (2,124)	48.00 (1,219)	Square**
FSG/TSH 514	Side Tension	60.00 (1,524)	84.00 (2,134)	45
	Divided Deck	28.88 (734)	84.00 (2,134)	45R
	End Tension	83.63 (2,124)	20.00 (508)	Square**
FSG/TSH 516	Side Tension	60.00 (1,524)	48.00 (1,219)	45
	Divided Deck	28.88 (734)	48.00 (1,219)	45R
	End Tension	95.63 (2,429)	20.00 (508)	Square**
FSG/TSH 616	Side Tension	74.50 (1,892)	48.00 (1,219)	45
	Divided Deck	36.13 (918)	48.00 (1,219)	45R
	End Tension	95.63 (2,429)	25.00 (635)	Square**
FSG/TSH/TSS 620	Side Tension (4' panel)***	74.50 (1,892)	48.00 (1,219)	45
	Side Tension (5' panel)***	74.50 (1,892)	60.00 (1,524)	45
	Divided Deck (4' panel)***	36.13 (918)	48.00 (1,219)	45R
	Divided Deck (5' panel)***	36.13 (918)	60.00 (1,524)	45R
	End Tension	119.63 (3,039)	25.00 (635)	Square**
FSG/TSH/TSS 720	Side Tension (4' panel)***	86.50 (2,197)	48.00 (1,219)	45
	Side Tension (5' panel)***	86.50 (2,197)	60.00 (1,524)	45
	Divided Deck (4' panel)***	42.13 (1,070)	48.00 (1,219)	45R
	Divided Deck (5' panel)***	42.13 (1,070)	60.00 (1,524)	45R
	End Tension	119.63 (3,039)	29.00 (737)	Square**
TSH 820	Side Tension	98.50 (2,502)	48.00 (1,219)	45
	Divided Deck	48.00 (1,219)	48.00 (1,219)	45R
	End Tension	119.63 (3,039)	33.00 (838)	Square**

45 Hook is angled 45 degrees. Hook length is limited to 7/8" (22 mm) from inside bend. 45R Hook is same dimensions as above except one hook is reverse bend (one up, one down). Square Hook is formed 180 degrees, able to fit over 3/8" (10 mm) edge or clamp.

** Interior cross wire clusters are normally spaced 12" (305 mm), end spaces to be equal both ends.

*** FSG models standard side tension and divided deck panel is 60"; 48" is optional (see serial). TSH/TSS models standard side tension and divided deck panel is 48"; 60" is optional (see Serial).

Table of Recommended Screen Wire Diameters for Square Clear Openings and Percentages of Open Area - Mineral Aggregate Production

Square Clear Opening	Light Wire			Standard Wire			Heavy Wire		
	Size	Thickness	% Open Area	Size	Thickness	% Open Area	Size	Thickness	% Open Area
1/8"	#18	.047"	52.8	#15	.072"	40.3	#13	.092"	33.2
3/16"	#16	.063"	56.0	#14	.080"	49.1	#13	.092"	45.1
1/4"	#14	.080"	57.4	#12	.105"	49.6	#9	.148"	39.4
5/16"	#14	.080"	63.4	#12	.105"	56.0	#9	.148"	46.0
3/8"	#13	.092"	64.5	#11	.120"	57.4	#6	.192"	43.8
7/16"	#12	.105"	65.0	#10	.135"	58.4	#6	.192"	48.3
1/2"	#12	.105"	68.3	#9	.148"	59.5	#6	.192"	52.2
5/8"	#9	.148"	65.4	#7	.177"	60.7	#4	.225"	45.0
3/4"	#8	.162"	67.6	#6	.192"	63.4	#3	.244"	56.3
7/8"	#8	.162"	71.2	#6	.192"	67.2	#3	.244"	60.5
1"	#8	.162"	74.0	#5	.207"	68.6	5/16	.3125"	58.0
1-1/8"	#5	.207"	71.3	#3	.244"	66.9	5/16	.3125"	61.2
1-1/4"	#4	.225"	71.8	5/16	.3125"	64.0	3/8	.375"	59.2
1-3/8"	#3	.244"	71.6	5/16	.3125"	66.4	3/8	.375"	61.7
1-1/2"	#3	.244"	73.4	5/16	.3125"	68.5	3/8	.375"	64.0
1-3/4"	#3	.244"	76.6	5/16	.3125"	71.9	3/8	.375"	67.8
2"	5/16	.3125"	74.8	3/8	.375"	70.9	1/2	.500"	64.0
2-1/4"	5/16	.3125"	77.1	3/8	.375"	73.4	1/2	.500"	69.4
2-1/2"	5/16	.3125"	79.0	3/8	.375"	75.6	1/2	.500"	69.4
2-3/4"	5/16	.3125"	80.6	3/8	.375"	77.4	1/2	.500"	71.6
3"	3/8	.375"	79.0	1/2	.500"	73.5	5/8	.625"	68.5

Typical Urethane Screen Panels Dependent Upon Application

Opening Size "A"			Overall Thickness (inches) "B"	Screen Thickness (inches) "C"	Percent of Open Area (approx)	Approx. weight per Sq. Foot (lbs)
Decimal	Fraction	Metric (mm)				
.138	1/8	3.5	3/4	9/32	20.0	2.5
.217	3/16	5.5	3/4	5/16	32.0	2.5
.276	1/4	7.0	3/4	3/8	33.0	2.5
.335	5/16	8.5	3/4	3/8	38.2	2.5
.394	3/8	10.0	3/4	5/8	41.4	2.6
.472	7/16	11.5	3/4	3/4	42.2	2.7
.492	1/2	12.5	3/4	3/4	43.3	2.7
.571	9/16	14.5	1	3/4	36.0	2.8
.610	5/8	15.5	1	3/4	35.7	2.8
.768	3/4	19.5	1	3/4	34.2	2.8
.875	7/8	22.3	1	1	35.8	3.3
1.000	1	25.4	1	1	42.9	3.3
1.181	1-3/16	30.0	1	1	42.1	3.3
1.500	1-1/2	38.1	1-3/16	1-3/16	41.5	3.9
1.750	1-3/4	44.5	1-9/16	1-9/16	46.1	5.0
2.500	2-1/2	63.5	2-1/4	2-1/4	46.4	5.7
3.000	3	76.2	2-1/2	2-1/2	46.5	6.0

Standard Sizes of Round Wire Using Wasburn and Moen Wire Gauge					
Gauge & No. Wire	Decimal Inch	Fraction Inch	Gauge & No. Wire	Decimal Inch	Fraction Inch
1/2	.500	1/2	11	.120	1/8
7/16	.4375	7/16	12	.105	7/64
7/8	.375	3/8	13	.092	3/32
0	.307	5/16	14	.080	5/64
3	.244	1/4	15	.072	5/64
4	.225	7/32	16	.063	1/16
5	.207	13/64	17	.054	1/16
6	.192	3/16	18	.048	3/64
7	.177	11/64	19	.041	3/64
8	.162	5/32	20	.035	3/64
9	.148	5/32	21	.032	1/32
10	.135	9/64	22	.029	1/32

Amount of Water Required for Washing Aggregate

As a general rule, 5-10 gallons of water per minute per ton of material per hour should be available for washing under aver- age conditions, based on total amount of material fed to screen.

Spray bars should be mounted so that spray is with or towards flow of material. Using high pressure spray perpendicular to the screen surface will only drive near-size material into screen surface, causing blinding.

Spray Orifice Capacities in Gallons Per Minute			
Size	20 PSI	30 PSI	40 PSI*
5/32"	2.1	2.5	2.9
3/16"	3.0	3.6	4.1
7/32"	4.0	4.8	5.7
1/4"	5.2	6.4	7.4
9/32"	6.6	8.1	9.3
5/16"	8.1	10.0	11.5
11/32"	9.8	12.0	13.9
3/8"	11.7	14.4	16.5
13/32"	13.7	16.8	19.4
7/16"	15.8	19.5	22.4
15/32"	18.2	22.4	25.8
1/2"	20.1	25.4	29.4
*Recommended pressure for most washing installations. Figures represent pressure at orifices, not at the pump.			

Sand Classification

Capacities, horsepower and screw speeds given in the tables are from Eagle Iron Works and are based on washing concrete sand. In washing, classifying and/or dewatering material of the finer mesh sizes, or material with over 15% passing the 50 mesh screen, turbulence becomes a critical problem.

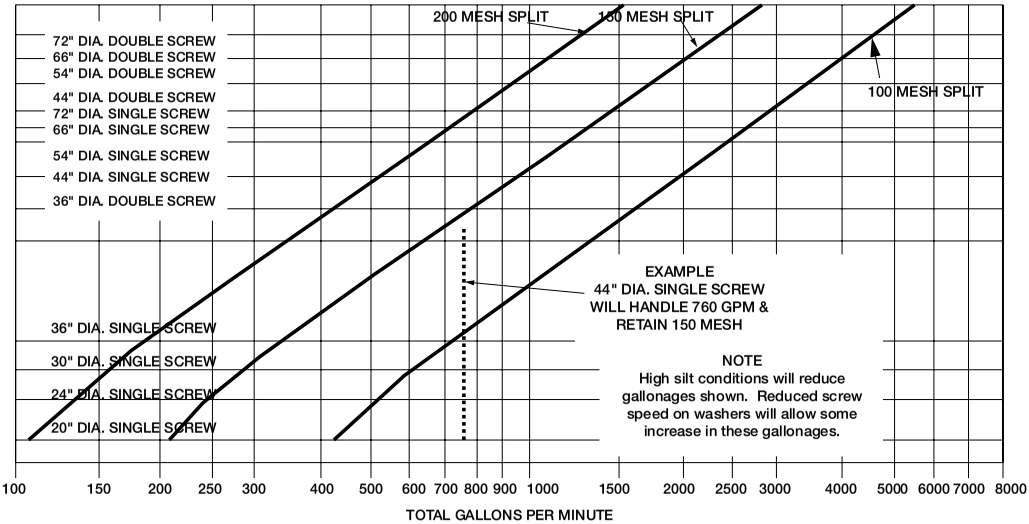
To correct this, turbulence must be reduced by slowing down the screw speed, thus allowing the fine mesh particles to settle and be conveyed out as part of the product. Slowdown required is dependent on the percentages of fine sand present. See specific screw specifications for recommended screw speed reductions.

When determining gallonage needed, all water must be included in the total gallons per minute in considering water capacities for fine material units - such as water used for the Hydrotex bearing, drain-board flushing pipe, water already in the feed and additional dilution water if needed when handling high- percentage silt feed.

Information concerning Eagle Iron Works units is presented as a guide only and not intended to promote one manufacturer over another. For specific applications, contact any sand washing equipment manufacturer.

GALLONAGE CHART FOR EAGLE IRON WORKS FINE MATERIAL UNITS

Maximum Amount of Slurry at Low Silt Content Tub Will Handle for Various Retention of Fines



Specifications - Single Screw Fine Material Washer-Classifier-Dehydrator								
Screw Diameter	20"	24"	30"	36"	44"	54"	66"	72"
Tub Length - Feet	22	22	25	25	32	34	35	38
*Capacity - TPH	30	50	75	100	175	275	400	475
Maximum Material Size	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
** HP Required (Normal / Electric)	5	7-1/2	15	15	25	40	60	75
Water Required (GPM @ 25 PSI)	30 - 195	30 - 235	40 - 275	40 - 360	60 - 740	60 - 950	60 - 1150	60 - 1250
Screw Speed - RPM (Normal)	38	32	26	21	17	14	11	11
Weight of Washer (lbs)	5,500	6,100	9,000	10,400	17,900	27,500	40,200	47,750
Loaded Weight (lbs)	16,850	17,850	24,900	29,800	69,900	86,500	131,000	173,270

Double Screw Fine Material Washer-Classifier-Dehydrator Specifications					
Diameter of Flights	36"	44"	54"	66"	72"
Tub Length - Feet	25	32	34	35	38
*Capacity - TPH	200	350	550	800	950
Max.Material Size	3/8"	3/8"	3/8"	3/8"	3/8"
** HP Required (Normal / Electric)	30	50	80†	120†	150†
Water Required (GPM @ 25 PSI)	105-620	125-1400	125-1700	125-2050	125-2500
Screw Speed - RPM (Normal)	21	17	14	11	11
Washer Weight (lbs)	17,650	34,400	55,200	77,500	99,950
Loaded Weight (lbs)	54,150	123,200	164,200	249,500	347,400

*Capacity ratings are stockpiled materials and are to be used as a guide only. They are based on average amount of fines in material feeds. Reduced screw speed and capacity require less horsepower.

**Horsepower requirement listed are for electric motors. When replacing with gasoline or diesel engine, multiply the electric motor horsepower by 1.5 and select an engine with a corresponding continuous horsepower - if continuous horsepower is not give, use 80% of maximum horsepower given for the engine.

†Two motors and separate reducers and drives.

Eagle Fine Material Units Recommended Screw Speed Reductions						
Identification of Material	#1	#2	#3	#4	#5
% Passing 50 Mesh	15% or less	20% or less	30% or less	50% or less	85% or less
Screw Speed Reduction % of Normal Catalog Rated Speed	100%	75%	50%	25%	16%
% of Catalog Rated Tonnage	100%	75%	50%	25%	16%
Resultant Peripheral Catalog Rated Speed	*200 Ft/Min	150 Ft/Min	100 Ft/Min	50 Ft/Min	32 Ft/Min

*200 Ft./Min. Peripheral Speed Equal to 100% Catalog Rated Screw Speed On ALL Size Units.

Specifications - Single Screw Coarse Material Washer-Dewaterer							
Diameter of Flights	22"	22"	24"	24"	30"	36"	44"
Tub Length - Feet	15	18	15	18	18	18	20
*Capacity - TPH	45-55	45-55	60-75	60-75	100-125	150-175	200-250
Maximum Material Size	2"	2"	2"	2"	2-1/2"	2-1/2"	3
** HP Required (Normal / Electric)	10	15	15	15	20	30	40
Water Required (GPM @ 25 PSI)	250-350	250-350	300-400	300-400	350-450	400-600	500-750
Screw Speed - RPM (Normal)	40	40	40	40	35	32	26
Washer Weight (lbs)	5,250	6,050	6,156	7,100	9,450	12,150	20,600
Loaded Weight (lbs)	9,550	10,650	13,850	15,350	22,250	30,350	36,500

Specifications - Double Screw Coarse Material Washer-Dewaterer			
Diameter of Flights	30"	36"	44"
Tub Length - Feet	18	18	20
*Capacity - TPH	200-250	300-350	400-500
Maximum Material Size	2-1/2"	2-1/2"	3"
** HP Required (Normal / Electric)	40	50	75
Water Required (GPM @ 25 PSI)	600-800	700-900	900-1100
Screw Speed - RPM (Normal)	35	32	26
Washer Weight (lbs)	17,150	22,000	34,400
Loaded Weight (lbs)	35,350	49,800	69,000

*Power requirements are based on electric motors and on handling gravel. If the washer is handling a high percentage of maximum sized material, or if the washer is handling crushed stone or ore, the capacity of the unit will be reduced. Installation of paddles in place of screw flights will also reduce capacity slightly and if more than six sets of paddles are employed on each conveyor shaft, larger motors will be required. When replacing electric motor with gasoline or diesel engine, multiply the electric motor HP by 1.5 and select an engine with a corresponding continuous HP - if continuous HP is not given, use 80% of maximum HP given for the engine.

Eagle Iron Works Log Washer Specifications

Log Diameter	36"	36"	36"	38"	38"	44"	44"	46"	46"
Tub Width	7'-0"	7'-0"	7'-0"	7'-0"	7'-0"	8'-5"	8'-5"	8'-5"	8'-5"
Tub Length	24'	30'	35'	30'	35'	30'	35'	30'	35'
Capacity TPH	50 - 125	50 - 125	50 - 125	60 - 140	60 - 140	75 - 175	75 - 175	75 - 190	75 - 190
Maximum Material Size	3"	3"	3"	3"	3"	4"	4"	4"	4"
Log Speed	32 RPM	32 RPM	32 RPM	32 RPM	32 RPM	26 RPM	26 RPM	26 RPM	26 RPM
HP Requirement	75	100	150	150	150	150	200	200	200
Water Required (GPM@ 25 PSI)	50-500	50-500	50-500	50-500	50-500	75-750	75-750	75-750	75-750
Washer Weight	32,500 lbs	38,800 lbs	47,100 lbs	40,500 lbs	48,500 lbs	57,800 lbs	70,800 lbs	59,400 lbs	72,300 lbs
Loaded Weight	61,500 lbs	87,500 lbs	103,800 lbs	88,100 lbs	105,100 lbs	139,100 lbs	165,500 lbs	140,500 lbs	167,000 lbs

†Refers to maximum size of piece and not screen opening.

Maximum capacity rating is on basis of logs turning at 32 RPM with 2" size material in 36" diameter unit. Maximum particle size of 4" can be handled with special paddle spacing, but capacity will be reduced somewhat. On the 44" diameter log washers, capacity rating is based on logs operating at 26 RPM with 2-1/2 particle size. Maximum material size of 5" can be handled with special paddle spacing, but product capacity will be somewhat reduced.

Increasing the tub slope beyond standard 8° reduces the tonnage capacity. In contrast, decreasing the tub slope increase the tonnage capacity over normal.

Caution: Oversize material will damage machine.

*The HP requirements are based on electric motors handling gravel. The larger the material grades in size the more HP is required - crushed sone requires 10 - 15% more HP than gravel. When replacing electric motor with gasoline or diesel engine, multiply the electric motor HP by 1.5 and select an engine with a corresponding continuous HP. If continuous HP is not given, use 80% of maximum HP given for the engine.

It is recommended that all log washers be followed by a screen rinse to remove film and residual matter from product.

Maximum GPM for Fines Retention in Eagle Iron Works Water Scalping/Classifying Tanks

SINGLE TANK Length & Width	Maximum Gallons Per Minute of Slurry at Low Silt Content Allowable in Saving Fine Sand Retained		
	100 Mesh	150 Mesh	200 Mesh
20' x 8'	2300	1200	700
24' x 8'	2800	1400	800
28' x 8'	3200	1600	900
24' x 10'	3500	1800	950
28' x 10'	4100	2100	1100
32' x 10'	4700	2400	1250
36' x 10'	5300	2700	1400
40' x 10'	5900	3000	1550
48' x 12'	8100	4200	2150

Note: Shading indicates classification zone.
To determine gallonage for 8' x 32' tank for portable sand section, use same figure as 10' x 24' tank on charts.

DOUBLE TANK Length & Width	Maximum Gallons Per Minute of Slurry at Low Silt Content Allowable in Saving Fine Sand Retained on		
	100 Mesh	150 Mesh	200 Mesh
32' x 10'	9,400	4,800	2,500
36' x 10'	10,600	5,400	2,800
40' x 10'	11,800	6,000	3,100
48' x 12'	16,200	8,400	4,300

Note: Shading indicates classification zone.

Electric Power Information

Specify voltage when ordering electrified plant or part of plant. Specify high starting torque motors for all Cedarapids horizontal vibrating screens.

Electric Power Control Equipment

Electric power control and distribution to the electric drive motors (if supplied fully-wired by Cedarapids) will meet the general specifications of the National Electric Code relating to machine tool type applications. The power distribution cabinet has a weather-resistant enclosure as standard. The power supply is considered 460 volts, 3 phase, 60 cycle unless otherwise specified. 380 volts, 3 phase, 50 cycle; 575 volt, 3 phase, 60 cycle or 415 volt, 3 phase, 50 cycle can be provided. Consult factory for correct application. Due to the variables involved in the total- plant installation, the customer will supply his own main power disconnect and power supply leads to the plant power distribution cabinet unless these items are specifically ordered. Electric power distribution to the individual electric drive motors from the power distribution cabinet is by mine-type cables, each carrying its continuous grounding lead unless otherwise specified. Push button control of the individual drive motor starters is by 115 volt, 60 cycle or 220 volt, 50 cycle control.

Specific wiring to meet local requirements must be specified on the order and a copy of the local requirements be sent to Cedarapids Inc. Pricing of electrical equipment by Cedarapids is based on the above general specifications. Deviations to meet specific area code requirements requires pricing considerations by Cedarapids.

Electric Grounding

When Cedarapids supplies the electric-drive motors and their associated controls completely wired as part of the original equipment, the motor shells are grounded to the control cases or panels by Cedarapids. The starter cases or control panel must be grounded by the customer. When electric drive motors only are supplied or when motors and controls are supplied unwired, no electric wiring is supplied and no grounding tie-ins are supplied. ***All electrical grounding must be done by customer.***

It is the customer's responsibility to adequately ground the individual units, or with a completely wired plant to ground the units so tagged. Soil conditions vary so widely between localities it is impossible for Cedarapids to supply grounding equipment adequate to meet all conditions and comply with local codes.

Horsepower Ratings

Note: Our catalog and price book ratings of engine horsepower are continuous ratings, **not** peak ratings unless otherwise specified.

Gasoline Engines *(Effect of Altitude & Temperature)*

Output horsepower decreases with an increase in altitude and/or ambient temperature. Aspirated engine horsepower decreases by 3% for every 1000 ft above 3000 ft and/or 2% for each 10°F increase in ambient temperature above 80°F. Turbo charged engines are capable of maintaining their rated output to a considerably greater altitude and ambient temperature. The significant differences between models and manufacturers makes it necessary to individually determine the capability of each unit.

Diesel Engines *(Altitude Effect on Diesel Engine)*

Due to the many variables involved, establishing a general rule for altitude derating is difficult. Barometric pressure, air temperature and humidity also affect the engine's performance. Engine design and supercharging make a difference. Each engine manufacturer establishes its own performance data.

Consult Cedarapids or engine manufacturer for specific information on derating.

Diesel Electric Set

A diesel electric set consists of the diesel engine and generator. Each has different characteristics. The diesel will stall under excessive load; the generator will attempt to meet the load and destroy itself. The diesel must have sufficient power to maintain the generator at operating speed under running and motor-starting conditions. The generator must be capable of supplying this power without causing damage to itself.

The KW requirement of a generator must include the voltage and frequency at which it is to be operated. Generators are normally rated in KW, not to be confused with KVA. For most applications a KW is 1.25 KVA or 1 KVA is 0.8 KW.

Effect of Altitude & Temperature

Kilowatt output from diesel electric generator sets decreases with an increase in altitude and/or ambient temperature. Aspirated engine horsepower decreases by 3% for every 1000 ft above 3000 ft and/or 1% for each 10°F increase in ambient temperature above 85°F. Turbo charged engines are capable of maintaining their rated output to a considerably greater altitude and ambient temperature. The significant differences between models and manufacturers makes it necessary to individually determine the capability of each unit.

This generator sizing involves generators supplied by Cedarapids. If others are supplying the generator, it is imperative the list of motors be furnished to the generator supplier so proper accessories for motor starting are supplied.

Motor starting abilities for generators of various sizes and from different vendors will vary.

A different application is when a generator is driven off an engine driving other equipment as in crushing applications. If a Lima MAC-R generator is used, it can be sized 1 KW per horsepower. Example: total horsepower adds to 125 hp, a 125 KW generator will suffice. Allow 1.5 hp of engine for each KW of generator.

If a single large motor, or if one motor comprises a high percentage of total hp and a diesel electric set is used, a generator supplier should be consulted.

Note: The term "power factor" refers to electrical characteristics only and not to the loading factor of motor or generator.

Wire Size

Current carrying capacity – or wire size – must be ample to keep voltage at motor within 5% of motor nameplate rating for adequate motor operation.

For best operation of electric motors, voltage should be between 460V and 470V for 460V motors. Some power companies are already overloaded. When selling an electrified plant which will be connected to a power company's line, make sure there will be ample power available to start and operate the plant.

Determine the largest motor size on which the power company will allow line starter starting – use reduced voltage starters on all larger motors.

Electrical Formulas		
To Fine	*Alternating Current*	
	Single-Phase	*Three-Phase*
Amperes when HP is known	Hp x 746 E x Eff x pf	Hp x 746 1.73 x E x Eff x pf
Amperes when kilowatts are known	Kw x 1000 E x pf	Kw x 1000 1.73 x E x pf
Amperes when kva are known	Kva x 1000 E	Kva x 1000 1.73 x E
Kilowatts	I x E x pf 1000	1.73 x I x E x pf 1000
Kva	I x E 1000	1.73 x I x E 1000
Horsepower (output)	I x E x Eff x pf 746	1.73 x I x E x pf 746

Inductive Reactance: $X_L = 2\pi FL$

Capacitive Reactance: $X_C = 1 \div 2\pi FC$

Impedance: $Z = \sqrt{R^2 + (X_L - X_C)^2}$

Three-Phase Power: $P = E \times I \times \sqrt{3} \times pf$

Motor Amps: $I = hp \times 746 \div E \times \sqrt{3} \times eff \times pf$

Amperes: $I = E/2$

Resistance in Series: $R_T = r_1 + r_2 + r_3 + r_n$

Resistance in Parallel: $1/RT = 1/r_1 + 1/r_2 + 1/r_3 + 1/r_n$

I = Amperes
E = Voltage
Z = Impedance
R = Resistance
F = Frequency
Kva - Kilovolt-amperes

L = Inductance
C = Capacitance
pf = Power Factor
Eff = Efficiency

At 1800 RPM a motor develops approximately 3 lb ft per HP.

At 1200 RPM a motor develops approximately 4-1/2 lb ft per HP.

Cedarapids Strigid® Conveyors
Simplified Selection Procedure

Following is a step by step method of determining what size Strigid conveyor will best suit your requirements. Note that these conveyors are NOT currently part of Cedarapids, Inc. production. This data is for information only

STEP 1. For Maximum Recommended Incline, based on type of material handled, see Table A. Then, knowing the actual lift height required, the suitable conveyor length can be found using the Conveyor Elevation Chart.

STEP 2. Belt width required depends on "lump" size and capacity. Table B shows maximum lump size, for both "sized" and "unsized" material, for each belt width. Table C lists capacities for each belt width in both tons and yards per hour for 20°, 35° and 40° trough idlers and at various belt speeds in feet per minute. Standard conveyors operate @ 350 FPM but other speeds are available. Table D lists maximum free fall distances for various lump sizes and belt types.

Caution: Belt width determined from Table B and C may differ. Always select the wider belt size determined to satisfy both conditions.

STEP 3. Horsepowers are found in Tables E, F and G. The figures from these charts must be added to obtain the total horsepower required. Table E lists horsepowers to drive empty conveyors. Table F lists HP to drive loaded conveyors horizontally. Table G gives HP to lift load. Interpolate lengths not shown.

NOTE: On declining (downhill) conveyors, subtract HP from Table G.

EXAMPLE: Select a conveyor to handle 3-½" sized (no fines) stone at a discharge height of 44' with a capacity of 300 TPH.

STEP 1. Maximum incline = 16°, Table A. Length = 160', Elevation chart.

STEP 2. Width 18" - Table B. Width 24" - Table C. Select 24" min. width.

STEP 3. Power = 2.93, Table E. + 3.03, Table F. + 13.34, Table G. Total = 19.3 HP required. Use 20 HP drive.

TABLE A			
Type of Material	*Max. Incline*	*Type of Material*	*Max. Incline*
Concrete, 6" slump	12°	Sand, very free flow	15°
Concrete, 4" slump	20°	Sand, sluggish, moist	20°
Concrete, 2" slump	24°	Sand, tempered foundry	24°
Coal, bituminous, +4" lump	15°	Stone, 4" and over, sized	15°
Coal, bituminous, -4" lump	16°	Stone, 4" and under, sized	16°
Coal, anthracite	16°	Stone, 4" and over, unsized	16°
Coal, unsized	18°	Stone, 4" and under, unsized	18°
Coal, bituminous, fine free flow	20°	Stone, 3/8" and under	20°
Coal, bituminous, fine, sluggish	22°	Ore, 4" and over	18°
Gravel, sized, washed	12°	Ore, 4" and under	20°
Gravel, sized, unwashed	15°	Earth, free flow	20°
Gravel, unsized	18°	Earth, sluggish	22°
Grain	15°		

TABLE B					
Belt Width	*Max. Lump Size*		*Belt Width*	*Max. Lump Size*	
	*Unsized**	*Sized***		*Unsized**	*Sized***
18"	6"	4-1/2"	36"	12"	9"
24"	8"	6"	42"	14"	10-1/2"
30"	10"	7-1/2"	48"	16"	12"

* Mixed with 90% fines.

** Uniform size lumps.

Footnotes for Table C

350 FPM is standard belt speed and is most readily available from stock. Other speeds available but considered special. Capacities based on 80% of theoretical capacity of conveyor inclined at 20° material weight 100 lbs. per cu/ft, constant feed with 20° normal surcharge. For free-flowing materials, 5° surcharge, reduce capacities by 25%.

TABLE C: Conveyor Capacity - Tons/Yards-per-hour								
FPM	*Roll Type*	*Cap.*	*Conveyor Width*					
			18"	*24"*	*30"*	*36"*	*42"*	*48"*
100	20°	TPH	50	100	150	200	266	333
		YPH	37	74	111	148	197	246
	35°	TPH	56	111	180	270	373	498
		YPH	41	82	133	200	276	369
	40°	TPH	–	116	200	283	400	550
		YPH	–	86	148	209	296	407
150	20°	TPH	75	150	225	300	400	500
		YPH	55	111	166	222	296	370
	35°	TPH	84	166	270	405	560	748
		YPH	62	123	200	300	415	554
	40°	TPH	–	175	300	425	600	825
		YPH	–	129	222	314	444	611
200	20°	TPH	100	200	300	400	532	666
		YPH	74	148	222	296	394	492
	35°	TPH	112	221	359	539	746	998
		YPH	83	164	266	399	553	739
	40°	TPH	–	232	400	566	800	1100
		YPH	–	172	296	418	592	814
250	20°	TPH	125	250	375	500	665	830
		YPH	92	185	277	370	492	615
	35°	TPH	140	276	449	674	933	1246
		YPH	104	204	332	499	691	923
	40°	TPH	–	290	500	705	1000	1375
		YPH	–	215	370	522	740	1015
300	20°	TPH	150	300	450	600	800	1000
		YPH	111	222	333	444	592	740
	35°	TPH	168	332	540	810	1120	1496
		YPH	124	246	400	600	830	1108
	40°	TPH	–	350	600	850	1200	1650
		YPH	–	259	444	629	888	1222
350	20°	TPH	175	350	525	700	933	1166
		YPH	129	259	388	518	690	863
	35°	TPH	196	386	628	944	1306	1746
		YPH	145	286	465	699	967	1293
	40°	TPH	–	408	700	991	1400	1925
		YPH	–	302	518	733	1036	1425
400	20°	TPH	200	400	600	800	1064	1332
		YPH	148	296	444	592	788	984
	35°	TPH	224	442	718	1078	1492	1996
		YPH	166	328	532	798	1105	1478
	40°	TPH	–	464	800	1132	1600	2200
		YPH	–	344	592	837	1184	1628

TABLE D: Maximum Material Size Recommended for Free Fall Distances Show					
Belt Type		*Roll Type*	*Drop (ft) and Material Size (in)*		
			2'	*3'*	*4'*
CE	1602	Steel	4"	3-1/2"	3"
		Impact	6"	5"	4-1/2"
	2252	Steel	5"	4-1/2"	4"
		Impact	8"	7"	6"
	3253	Steel	6-1/2"	5-1/2"	5"
		Impact	10-1/2"	9"	8-1/2"
	4204	Steel	8"	6-1/2"	6"
		Impact	16"	12"	10"

Based on material weight of 100 lbs. per cu/ft and 75% less-than-maximum-size material. Material larger than that indicated will require a chute, baffle or type of grizzly to reduce free fall distance to avoid belt damage.

Table E: HP to Drive Empty Conveyor at 350 FPM						
Conveyor Centers	*Belt Width*					
	18"	*24"*	*30"*	*36"*	*42"*	*48"*
25'	1.84	2.23	2.61	2.99	3.45	4.11
50'	1.94	2.37	2.82	3.20	3.72	4.42
75'	2.05	2.51	2.99	3.41	3.97	4.73
100'	2.16	2.64	3.17	3.65	4.25	5.05
150'	2.37	2.89	3.55	4.07	4.80	5.67
200'	2.58	3.17	3.90	4.52	5.36	6.26
250'	2.78	3.45	4.28	4.94	5.88	6.89
300'	2.99	3.72	4.63	5.39	6.44	7.52
350'	3.20	3.97	5.01	5.81	6.99	8.14
400'	3.41	4.25	5.36	6.26	7.52	8.77
450'	3.62	4.52	5.74	6.68	8.07	9.40
500'	3.86	4.80	6.09	7.13	8.60	10.02
HP-10' Inc.	.042	.055	.073	.087	.105	.124

*Note: For other speeds, divide figures by 3.5 and multiply by new speed in hundreds, i.e. 400 FPM or 4.

TABLE F: Horsepower to Convey Material Horizontally											
Conv. Ctrs.	*Capacity in TPH at any Speed*										
	100	*150*	*300*	*350*	*400*	*450*	*500*	*600*	*800*	*850*	*1200*
25'	0.61	0.91	1.82	2.12	2.44	2.74	3.04	3.64	4.88	5.10	7.28
50'	0.68	1.02	2.04	2.38	2.72	3.06	3.40	4.08	5.44	5.78	8.16
100'	0.83	1.25	2.50	2.92	3.32	3.74	4.16	5.00	6.64	7.06	10.00
150'	0.98	1.47	2.94	3.43	3.92	4.41	4.90	5.88	7.84	8.33	11.76
200'	1.14	1.71	3.42	3.99	4.56	5.13	5.70	6.84	9.12	9.69	13.68
250'	1.29	1.93	3.86	4.50	5.16	5.80	6.44	7.72	10.32	10.96	15.44
300'	1.44	2.16	4.32	5.04	5.76	6.48	7.20	8.64	11.52	12.24	17.28
350'	1.59	2.38	4.76	5.55	6.36	7.15	7.94	9.52	12.72	13.51	19.04
400'	1.74	2.61	5.22	6.09	6.96	7.83	8.70	10.44	13.92	14.79	20.88
450'	1.89	2.83	5.66	6.60	7.56	8.50	9.44	11.32	15.12	16.06	22.64
500'	20.5	3.07	6.14	7.16	8.20	9.22	10.24	12.28	16.40	17.42	24.56
HP 10' inc	.03	.045	.09	.106	.121	.136	.151	.181	.242	.246	.362

TABLE G: Horsepower - To Lift Head											
Vert. Lift	*Capacity in TPH at any speed*										
	100	*150*	*300*	*350*	*400*	*450*	*500*	*600*	*800*	*850*	*1200*
5'	0.51	0.76	1.52	1.77	2.04	2.29	2.54	3.04	4.08	4.33	6.08
10'	1.01	1.52	3.04	3.55	4.04	4.55	5.06	6.08	8.08	8.59	12.16
20'	2.02	3.03	6.06	7.07	8.08	9.09	10.10	12.12	16.16	17.17	24.24
30'	3.03	4.55	9.10	10.62	12.12	13.64	15.16	18.20	24.24	25.76	36.40
40'	4.04	6.06	12.12	14.14	16.16	18.18	20.20	24.24	32.32	34.34	48.48
50'	5.05	7.58	15.16	17.69	20.20	22.73	25.26	30.32	40.40	42.93	60.64
60'	6.06	9.09	18.18	21.21	24.24	27.27	30.30	36.36	48.48	51.51	72.72
70'	7.07	10.60	21.20	24.74	28.28	31.82	35.36	42.40	56.56	60.10	84.80
80'	8.08	12.12	24.24	28.28	32.32	36.36	40.40	48.48	64.64	68.68	96.96
90'	9.09	13.64	27.28	31.83	36.36	40.91	45.46	54.56	72.72	77.27	109.12
100'	10.10	15.15	30.30	35.35	40.40	45.45	50.50	60.60	80.80	85.85	121.20
HP/1' Inc.	.101	.152	.304	.355	.404	.455	.506	.608	.808	.859	1.216

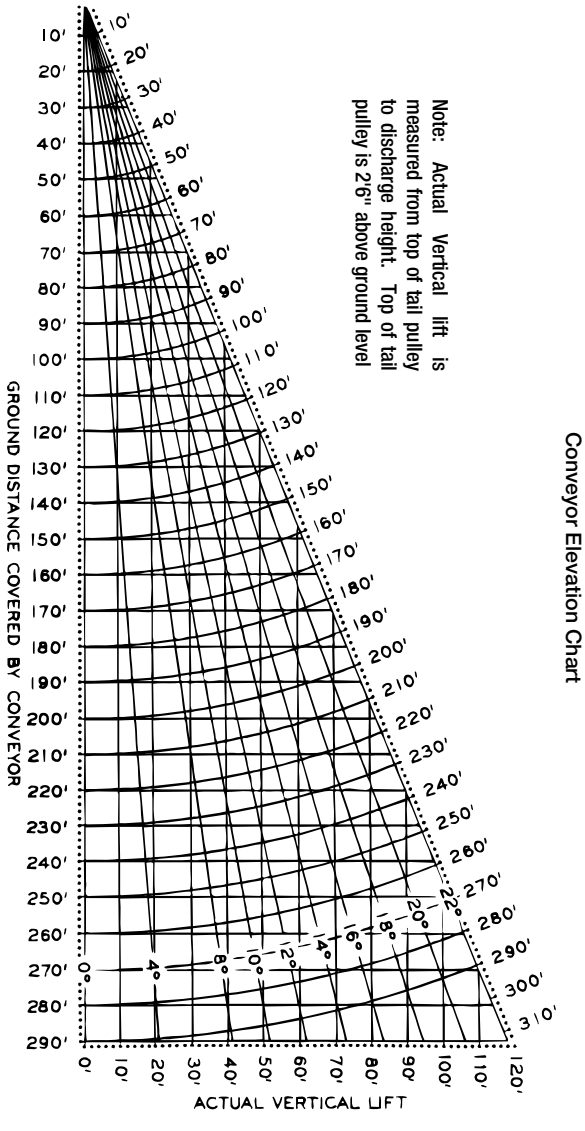
Note: Total HP = E + F = G. If "G" is greater than $^{2/3}$ (E + F) use a backstop. Add $^{1/10}$ HP per foot of skirtboard when skirtboard is on both sides of conveyor. HP to accelerate load is $^{1/2}$ (E + F). On downhill conveyor "G" is negative. Use at least (E + F) to prevent over speeding. Use a spring-set electric release brake motor.

To Find the Approximate Length of Belt
In a Roll When Closely Coiled

RULE: Add together the diameter of the roll and the diameter of the center hole, both in inches; multiply by the number of coils in the roll by 0.131. The result will be the approximate length in feet regardless of the thickness of the belt.

EXAMPLE: How many feet of belting in a roll 48" in diameter with a 6" center hole and 60 coils? 48 + 6 = 54; 54 x 60 = 3240; 3240 x 0.131 = 424.44 or about 424' 5".

Conveyor Elevation Chart



Conveyor Capacity Chart
Material Weight in Pounds Equals
Conveyor Capacity in TPH

To determine the amount of material in TPH being handled by a belt conveyor, it is only necessary to know the belt speed and then weight the material on a certain length of the belt as specified in the table below. First, determine the belt speed, then refer to the table; the figure in the column opposite the belt speed will show the length of material on the belt to be weighed. Each pound of material on this length of belt represents one ton- per-hour of material being handled by the conveyor.

Belt Speed FPM	*Length of Material on Belt to be Weighed*	*Belt Speed FPM*	*Length of Material on Belt to be Weighed*
200	6'–0"	350	10'–6"
210	6'–3-5/8"	360	10'–9-5/8"
220	6'–7-1/4"	370	11'–1-1/4"
230	6'–10-3/4"	380	11'–4-3/4"
240	7'–2-3/8"	390	11'–8-3/8"
250	7'–6"	400	12'–0"
260	7'–9-5/8"	410	12'–3-5/8"
270	8'–1-1/4"	420	12'–7-1/4"
280	8'–4-3/4"	430	12'–10-3/4"
290	8'–8-3/8"	440	13'–2-3/8"
300	9'–0"	450	13'–6"
310	9'–3-5/8"	460	13'–9-5/8"
320	9'–7-1/4"	470	14'–1-1/4"
330	9'–10-3/4"	480	14'–4-3/4"
340	10'–2-3/8"	490	14'–8-3/8"

Example: Assume belt speed is 200 FPM. Refer to the table and find belt speed of 200 - the figure opposite shows length of belt for calibration: 6'-0". Stop conveyor and measure off 6' on belt. Remove all material between marks. Weigh this material and assuming the weight is 170 lbs., the belt is delivering 170 TPH.

Portable and Radial Stacking Conveyor Stockpile Tonnage

Conveyor Length	Arc Radius of Pile	Height of Pile	Base Radius of Pile	Conical Pile	Total Capacity Including Ends - Included Angle of Pile Top figure is tons - Bottom figure is cubic yards					
					30°	45°	60°	90°	120°	180°
30'	29'-6"	11'	15'	130	258	323	387	515	644	900
				96	191	238	285	380	474	663
40'	39'	14'	19'	245	537	673	809	1,080	1,352	1,896
				196	398	499	600	803	1,005	1,409
50'	48'-6"	17'-6"	23'	485	995	1,250	1,505	2,015	2,525	3,545
				359	740	931	1,121	1,502	1,883	2,645
60'	58'	20'-6"	27'	783	1,629	2,052	2,475	3,321	4,167	5,859
				580	1,204	1,516	1,828	2,452	3,076	4,324
70'	67'-6"	24'-6"	32'-6"	1,359	2,762	3,466	4,169	5,576	6,983	9,797
				1,004	,2048	2,570	3,092	4,136	5,180	7,268
80'	77'	27'-6"	36'-6"	1,918	3,943	4,956	5,968	7,993	10,018	14,068
				1,421	2,921	3,671	4,421	5,921	7,421	10,421
100'	96'-6"	32'-6"	43'	3,146	6,686	8,456	10,226	13,766	17,306	24,386
				2,331	4,959	6,273	7,587	10,215	12,843	18,099
120'	115'-6"	38'-6"	51'	5,243	11,183	14,153	17,123	23,063	29,003	40,883
				3,884	8,294	10,499	12,704	17,114	21,524	30,344
150'	144'	47'-6"	63'	9,871	21,181	26,836	32,491	43,801	55,111	77,731
				7,312	15,682	19,867	24,052	32,422	40,792	57,532

Tons based on 100 lbs per cu. ft. material, conveyor incline 18°, stockpile angle of repose 37°. Radial stackers not transportable as portable conveyors.

Dumping Angles

Angles at which materials will slide from tipped container.

Ashes, dry	33°	Earth, loose	28°
Ashes, moist	36°	Earth, compact	50°
Ashes, wet	30°	Gravel	40°
Asphalt	45°	Ore, dry	30°
Cinders, dry	33°	Ore, damp	37°
Cinders, moist	34°	Rubble	45°
Cinders, wet	31°	Sand, dry	35°
Clay	45°	Sand, damp	40°
Coal, hard	24°	Sand,w/crushed stone	27°
Coal, soft	30°	Stone	30°
Coke	23°	Stone, broken	27°
Concrete	30°	Stone, crushed	30°

Conical Stockpile Volume

Height	Diameter	Cubic Yds.	Tons	Live Yds.	Live Tons
10'	26'-6"	68	92	17	23
15'	39'-10"	230	310	58	78
20'	53'-0"	545	735	136	184
25'	66'-4"	1,065	1,440	267	360
30'	79'-6"	1,845	2,490	460	623
35'	92'-10"	2,930	3,955	732	988
40'	106'-0"	4,370	5,900	1,092	1,475
50'	132'-8"	8,540	11,525	2,134	2,882
60'	159'-2"	14,755	19,915	3,866	4,980
70'	186'-0"	23,375	31,555	5,865	7,905
80'	212'-2"	34,970	47,210	8,740	11,800
90'	238'-10"	49,795	67,225	12,450	16,805
100'	265'-4"	68,300	92,210	17,080	23,050

Based on 37° angle of repose; 100 lbs/cu. ft. material. Above table is approximate for use as a guide only.

To Find the Volume of a Stockpile

Use the formula: Volume = .2618 x D^2 x h

Example: To find the volume of a 10' stockpile that has a 26'-6" diameter.

Volume = .2618 x (26'-6")^2 x 10
Volume = 1838.49 cu. ft.
Volume (in cu. ft.) x weight/cu. ft. ÷ 2000 = tons
Volume (in cu. ft.) ÷ 27 = Volume (in cu. yds.)

Vibrating Grizzly Feeder Capacities

Width	*Max. Capacity TPH*	*Capacity Tonnes*	*Sheave Speed Range (RPM)*	*HP*
30"	150-300	136-272	600-900	25
35"	250-500	226-453	600-900	30
42"	300-600	272-544	600-900	40
52" Std	400-700	362-634	600-900	40
52" HD	800-1000	726-907	600-800	50
52" x 24'	800-1000	726-907	600-800	60
62" x 24'	1000-2000	907-1814	600-800	60

Advantage® Feeder Capacities

Width	35"	42"	52"	60"
Capacity TPH (MPH)	250-500 (226-452)	350-700 (317-635)	500-1000 (453-907)	600-1200 (544-1,089)
HP	30	40	40	40

Horsepower is rated at 1200 rpm motor speed.

Note: Approximate capacity through grizzly is 5 tph x sq ft of grizzly area x nominal opening. Calculations based on 100 lb/ft3 material weight.

Example: 42" feeder, 60" grizzly, 4" nominal opening. 5 tph x 17.5 sq ft grizzly area x 4" nominal opening = 350 tph.

This capacity will vary greatly from shot rock to gravel. Rates based on level operation.

Heavy Duty Reciprocating Feeder Capacities

Size	20"	30"	40"
Capacity* TPH	Up to 175	Up to 425	Up to 575
HP, RPM	5-50	10-50	15-50

*Based on 20" depth of material on 20" feeders, 30" depth on 30" and 40" feeders.

Medium Duty Reciprocating Feeder Capacity

Size	18"	24"	30"	36"	42"
Capacity TPH*	140	220	290	360	550
HP-RPM	3-70	3-70	3-70	5-70	5-70

*Based on standard speed, maximum stroke, 12" gate opening for 18" feeder, 16" for 24", 30" & 36"; 19" for 42".

Actual capacities dependent upon type and characteristics of material. Capacities reduced considerably when handling coarse or sticky material.

Capacities of Apron Feeders in Tons-Per-Hour

Capacities given are based on quarry run material weighing 100 lbs per cubic foot - depth of material is equal to half the feeder width uniformly loaded. Values given assume uniform loading to 75% of the maximum cubical contents. For other weights of material and other travel speeds, these values will increase or decrease in direct proportion.

The maximum capacity must be used as a basis in selecting the size of the apron, even though this maximum rate exists for a few seconds only. The average or minimum hourly rate must not be used.

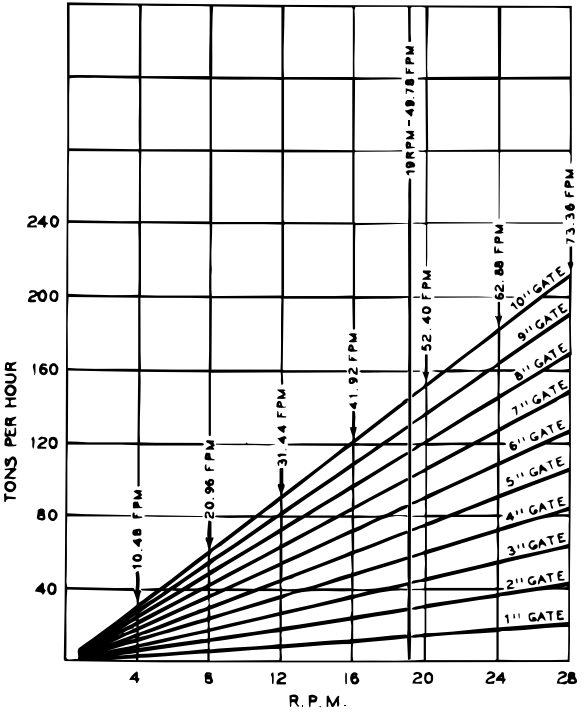
FPM Flight Travel	30" Wide		36" Wide		42" Wide		48" Wide	
	Cubic Yards	Tons	Cubic Yards	Tons	Cubic Yards	Tons	Cubic Yards	Tons
10	51	69	75	101	105	142	120	162
15	78	105	112	151	157	212	218	293
20	104	140	149	201	210	283	288	390
25	128	173	187	252	262	354	360	487
30	156	211	225	304	314	424	433	584
35	182	246	262	354	366	494	505	683
40	208	280	299	404	417	563	576	779
45	234	315	335	453	468	632	646	874
50	258	349	372	503	520	701	717	970
55	286	386	411	556	575	776	793	1072
60	311	421	448	605	626	845	864	1168

Note: Where there is a large percentage of maximum size lumps, the capacity will be greater. Tonnage based on 35 FPM operating speed. Inclination recommended 8°-12° from the horizontal. It is always more economical to carry a thick bed of material at a slow speed than a thin bed at a high speed. Sizes available: 30" x 8'; 36" x 8' & 12'; 42" x 10' & 14'. 42" & 48" feeders available as portable ground-level feed units. 42" in 30', 35 & 40' lengths; 48" feeder available in 45' length.

Capacity Chart
18" Roller Belt Feeder
with Variable Speed Power Source

Based on 100 lbs per cu. ft.
10" head pulley

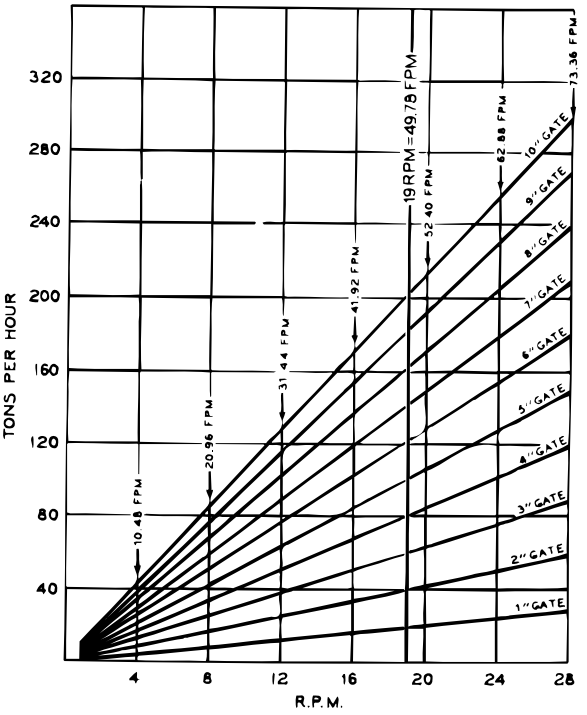
Drive Speeds - Fixed and maximum for Variable Speed Power Source - Standard 19 RPM (49.78 FPM) Optional 28 RPM (73.36 FPM)



Capacity Chart
24" Roller Belt Feeder
with Variable Speed Power Source

Based on 100 lbs per cu. ft.
10" head pulley

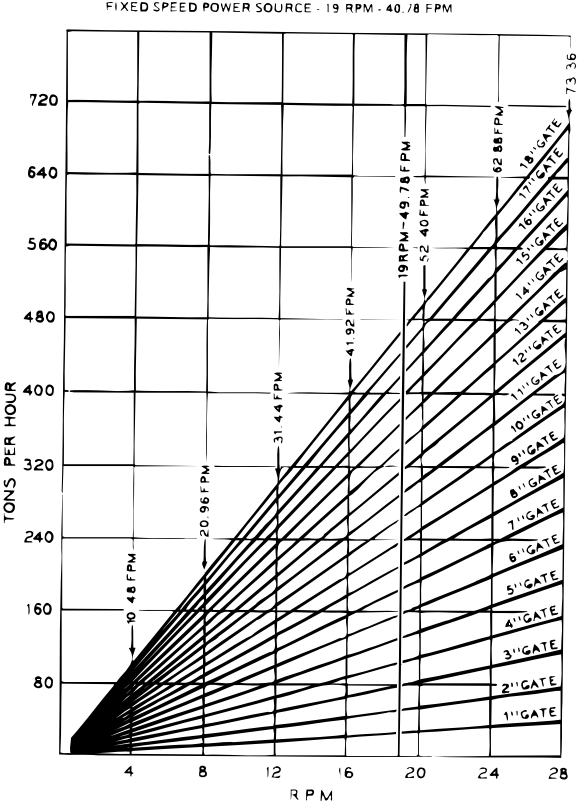
Drive Speeds - Fixed and maximum for Variable Speed Power Source - Standard 19 RPM (49.78 FPM) Optional 28 RPM (73.36 FPM)



Capacity Chart
30" Roller Belt Feeder
with Variable Speed Power Source

Based on 100 lbs per cu. ft.
10" head pulley

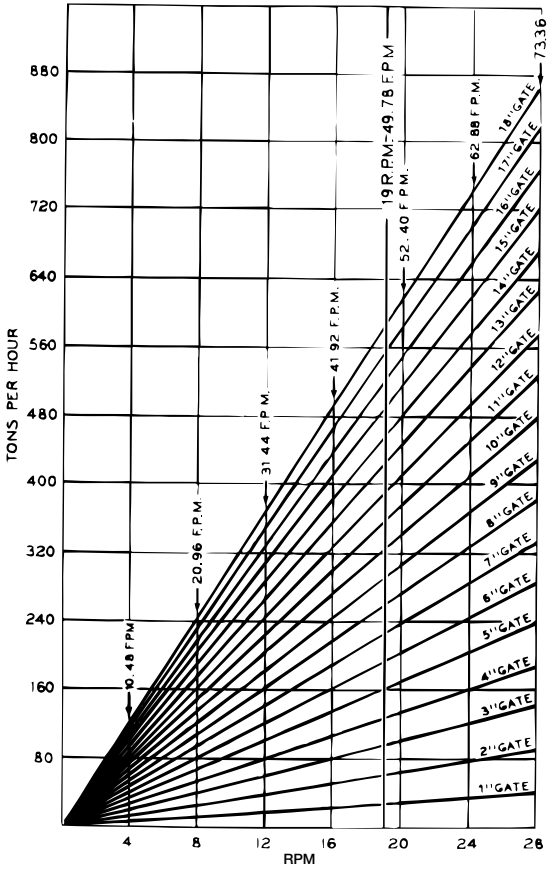
Drive Speeds - Fixed and maximum for Variable Speed Power Source - Standard 19 RPM (49.78 FPM) Optional 28 RPM (73.36 FPM)



Capacity Chart
36" Roller Belt Feeder
with Variable Speed Power Source

Based on 100 lbs per cu. ft.
10" head pulley

Drive Speeds - Fixed and maximum for Variable Speed Power Source - Standard 19 RPM (49.78 FPM) Optional 28 RPM (73.36 FPM)



Tests Used to Determine Physical Properties of Rock

Material tests follow ASTM procedure and include abrasion, compressive strength, toughness, the Burbank test, the L.A. "Rattler" test, and specific gravity.

Chemical tests for abrasive effect include:

Abrasives	Related to Abrasive Effect
Silica Dioxide—SiO_2	Magnesium Carbonate—$MgCO_3$
	Calcium Carbonate—$CaCO_3$

Iron Oxide—FeO & Aluminum Oxide—Al_2O_3

Abrasive test data is needed primarily in the consideration of impact or grinding type crushers and relates to the maintenance cost data. Where pressure crushers are involved, testing for abrasives is normally unnecessary, although a high abrasive content will cause more crusher wear. Samples sent to the factory for chemical analysis only should be 1 to 2 lbs. and must be representative of the quarry. (Note: If a gradation and/or crusher test is to be run also, representative sample should be 100-250 lbs.)

Rock Compressive Strength (ASTM C170)

5,000-10,000 PSI—Soft; 10,000-20,000 PSI—Medium; 20,000-30,000 PSI—Hard; 30,000-45,000 PSI—Very Hard; over 45,000 PSI—Extremely Hard.

Generally rock up to 40,000 PSI with acceptable hardness and toughness value is considered suitable for reduction in Cedarapids compression crushers. The choice of impact or grinding type crushers will be dependent on abrasive content.

It is possible to apply Cedarapids crushers in material over 40,000 PSI but only after consultation with the factory. A solid 12" cube sample should be sent for analysis for compressive strength.

Hardness (Mohs scale) and related material toughness provide an index for application of impact and grinding mills.

Both hardness and toughness (ASTM D-3) indices also will be considered in pressure crushers in combination with compressive strength.

Procedures used in the various tests ore:

Compressive Strength (ASTM C170)

1. Prepared sample—cylinder of rock approximately 2" cubed.
2. Cube of rock is placed between a special bearing block and the head of a suitable universal testing machine.
3. Unit crushing strength is calculated in lbs. per square inch.

Toughness Test (ASTM D-3)

1. Sample—Cylinder 25mm high and 25mm in dia.
2. Steel plunger with spherical lower end resting on sample is subject to impact of a 2 kg. hammer. The energy of the blow is increased by increasing the height of fall of the hammer 1cm. after each blow.
3. The height of fall in centimeters at failure of the specimen is called toughness. H (In. Cm) = Toughness.

"Rattler" Test by Los Angeles Machine (ASTM C131)

1. Size of sample – 5000 grams of clean, dry aggregate, properly graded (A).
2. Sample placed in machine which is then rotated for 500 revolutions at 30 to 33 R.P.M.
3. Aggregate then removed and screened on a No. 12 sieve. Material retained on screen then washed, dried and weighed (B).
4. Percentage of wear = (A-B)÷A

Specific Gravity Test (ASTM C127, C128)

1. Size of sample - 5 kg. plus 3/8" aggregate.
2. Wash to remove dust—then dry at 110° C temperature.
3. Immerse in 15° to 25°C water for 24 hrs. and then weigh (B).
4. Determine weight of sample in water (C).
5. Dry again at 110° C temp. and weigh (A).
6. Bulk specific gravity = A ÷ (B-C)
7. Apparent specific gravity = A ÷ (A-C)

Some of the more common test procedures for aggregate quality, used by highway department testing laboratories, etc., but not normally taken or evaluated by Cedarapids include:

Absorption Test

1, 2, 3, 4, 5, and 6. Same as specific gravity test above.

7. Absorption, per cent (%) = (B-A x 100) ÷ A

Burbank Wear Test

1. Prepare four charges of 400 grams of properly graded 3/4" x 3/8" rock that has been dried.
2. Weigh steel paddle to .000x of gram.
3. Run each charge of rock for 15 minutes in Burbank machine and remove. Run same steel paddle in machine for all four charges (1 hour).
4. Weigh paddle to .000x of gram and calculate weight loss. Weight loss in grams is the Abrasion Index Number.

Hardness of Rocks

Soft	*Medium*	*Hard*	*Very Hard*
Asbestos rock	Limestone	Granite	Iron Ore
Gypsum rock	Dolomite	Quartzite	Granite
Slate	Sandstone	Iron ore	Granitic Gravel
Talc		Trap rock	Trap Rock
Soft Limestone		Gravel	

Mohs Scale of Hardness

1. Talc
2. Gypsum
3. Calcite
4. Fluorite
5. Apatite
6. Orthoclase
7. Quartz
8. Topaz
9. Corundum
10. Diamond

Testing (you can do in the field):

Scratched With:

Fingernail.....Little over 2
Copper Coin.....About 3
Pocket Knife.....Little over 5
Window Glass.....5-1/2
Steel File.....6-1/2

Typical Toughness of Various Kinds of Rock
From Drop Hammer Tests

Variety of Rock	Toughness Limestone= 1
Fresh Diabase (Trap)	3.0
Pyroxene Quartzite	2.7
Sandstone	2.6
Altered Diabase	2.4
Fresh Basalt	2.3
Hornblende Schist	2.1
Diorite	2.1
Hornblende Granite	2.1
Rhyolite	2.0
Quartzite	1.9
Biotite Gneiss	1.9
Augite Diorite	1.9
Altered Basalt	1.7
Feldspathic Sandstone	1.7
Gabbro	1.6
Chert	1.5
Calcareous Sandstone	1.5
Granite	1.5
Slate	1.2
Peridotite	1.2
Granite Gneiss	1.2
Andesite	1.1
Limestone	1.0
Mica Schist	1.0
Amphibolite	1.0
Dolomite	1.0
Biotite Granite	1.0
Augite Syenite	1.0
Hornblende Gneiss	1.0

Gradation – Typical Quarry Shot (Coarse) - Percent Passing					
20"	70.0	2-1/2"	20.1	1/8"	3.5
16"	61.0	2"	17.7	8M	3.0
14"	56.0	1-3/4"	16.2	10M	2.7
12"	52.0	1-1/2"	14.9	1/16"	2.4
10"	46.0	1-1/4"	13.5	16M	2.0
8"	41.0	1"	12.0	30M	1.3
6"	34.0	7/8"	11.0	40M	1.1
5"	30.5	3/4"	9.8	50M	0.9
4-1/2"	28.6	5/8"	9.0	80M	0.6
4"	26.7	1/2"	8.1	100M	0.4
3-1/2"	24.5	3/8"	6.6	140M	0.2
3"	22.5	1/4"	5.4	200M	0.0
2-3/4"	21.3	4M	4.3		

Typical Quarry Gradation from Corps of Engineers			
Percent Passing			
Size	*Limestone Well Shot*	*Limestone Poor Shot*	*Granite*
24"	100.0	66.0	94.0
17"	93.7		
12"	93.1	43.0	54.0
8-1/2"	58.8		
6"	48.2	30.0	33.0
4-1/2"	37.9		
3"	29.2	19.0	28.0
1-1/2"	14.8	13.0	15.0
1"	10.0	11.0	12.0
3/4"	7.6	9.0	10.0
3/8"	4.0	7.0	8.0

Pit Run Screen Analysis - Example

Size	*Location Number*								
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
24"	100								
20"	98						100		
12"	97					100	95		
8"	94				100	98	89		
6"	86				95	90	82	100	
5"	78				90	85	78	98	
4"	75				87	80	75	86	
3-1/2"	73				85	76	70	75	
3"	68				80	74	65	72	
2-1/2"	65	100			78	72	60	68	
2"	62	99		100	75	70	58	66	
1-1/2"	58	96	100	99	73	65	56	62	100
1"	52	90	94	90	70	60	55	53	96
3/4"	50	84	88	84	66	55	52	47	96
1/2"	42	76	82	78	62	45	50	41	89
3/8"	40	70	78	73	58	42	45	33	84
1/4"	35	62	72	72	54	38	40	28	76
4M	32	58	66	70	50	35	38	20	68
8M	30	49	59	64	42	33	32	17	53
16M	25	40	54	54	35	30	30	14	39
20M	19	36	40	49	30	28	26	13	32
30M	15	29	25	41	22	25	20	12	27
40M	9	15	19	38	16	22	18	10	16
50M	5	12	12	15	9	18	15	9	11
100M	3	9	6	2	6	15	10	5	3
200M	2	6	4	1	3	12	6	4	3
Pan	1	4	2	1	1	5	3	3	6

Note: The above pit run screen analyses do not represent "typical" sand and gravel analyses from an area, but should be used as a guide only. Final equipment selection must be based on screen analyses from the site of the source material.

Pit Run Screen Analysis - Example

Size	Location Number								
	10	11	12	13	14	15	16	17	18
24"									
20"									
12"									
8"									
6"							80	95	98
5"							78	95	97
4"							75	93	95
3-1/2"							74	93	90
3"						100	73	92	84
2-1/2"						96	70	91	76
2"		100		97	100	90	67	91	71
1-1/2"	100	87	100	92	83	76	65	90	65
1"	89	87	87	86	78	64	60	88	52
3/4"	81	85	85	78	68	55	50	85	44
1/2"	74	81	75	69	60	47	42	80	37
3/8"	68	77	66	60	52	42	40	75	35
1/4"	61	71	53	54	46	35	38	70	34
4M	56	65	43	47	41	32	35	65	33
8M	46	49	24	40	29	24	29	50	31
16M	36	33	12	29	20	14	25	45	30
20M	33	27	10	21	16	12	23	40	26
30M	27	22	6	19	13	8	22	38	21
40M	19	16	5	11	11	6	20	30	15
50M	14	13	2	5	3	3	15	22	8
100M	4	4	1	3	2	1	12	8	4
200M	2	2	1	1	1	1	8	6	3
Pan	6	3	1	1	1	1	2	3	2

Location Information:

1. WI "Boney"
2. Northern IL
3. Northern IL
4. TX
5. MN
6. New England "Boney"
7. New England
8. FL Coral Rock
9. Central MI
10. East Central MI
11. Central IN
12. Central IN
13. Southeast IN
14. Southwest OH
15. Western OH
16. Southern CA
17. Southern CA
18. San Diego, CA

Sizes of Coarse Aggregates

Size No.	Nominal Sq. Openings (1)	Amounts finer than each labratory sieve (square openings), percentage by weight														
		4	3-1/2	3	2-1/2	2	1-1/2	1	3/4	1/2	3/8	No 4	No 8	No 16	No 50	No 100
1	3-1/2 to 1-1/2	100	90-100		25-60		0-15		0-5							
2	2-1/2 to 1-1/2			100	90-100	35-70	0-15		0-5							
24	2-1/2 to 3/4			100	90-100		25-60		0-10	0-5						
3	2 to 1				100	90-100	35-70	0-15		0-5						
357	2 to No 4				100	95-100		35-70		10-30		0-5				
4	1-1/2 to 3/4					100	90-100	20-55	0-15		0-5					
367	1-1/2 to No 4					100	95-100		35-70		10-30	0-5				
5	1 to 1/2						100	90-100	20-55	0-10	0-5					
56	1 to 3/8						100	90-100	40-75	15-15	0-15	0-5				
57	1 to No 4						100	95-100		25-60		0-10	0-5			
6	3/4 to 3/8							100	90-100	20-55	0-15	0-5				
67	3/4 to No 4							100	90-100		20-55	0-10	0-5			
68	3/4 to No 8							100	90-100		30-65	5-25	0-10	0-5		
7	1/2 to No 4								100	90-100	40-70	0-15	0-5			
78	1/2 to No 8								100	90-100	40-75	5-25	0-10	0-5		
8	3/8 to No 8									100	85-100	10-30	0-10	0-5		
89	3/8 to No 16									100	90-100	20-55	5-30	0-10	0-5	
9	No 4 to No 16										100	85-100	10-40	0-10	0-5	
10	No 4 to 0 (2)										100	85-100				10-30

(1) In inches, except where otherwise indicated. Numbered sieves are those of the United States Standard Sieve Series.
(2) Screenings.

Reprinted by permission from AASHTO Designation M43 - Standard Sizes of Coarse Aggregate for Highway Construction. To convert from inches to millimeters, multiply by 25.4
Taken from the Asphalt Institute Manual Series No. 5 (MS-5) seventh edition.

Concrete Aggregates

ASTM C33-71a
Fine AGG Grading

Sieve	*%Passing*
3/8"	100
#4M	95-100
#8M	80-100
#16M	50-85
#30M	25-60
#50M	10-30
#100M	2-10

Not more than 45% shall be retained between any two consecutive sieves.

Fineness Modulus (FM) shall not be less than 2.3 or more than 3.1.

For specific data see ASTM Book of Standards.

The Fineness Modulus is an empirical factor obtained by adding the total percentages of a sample of aggregate retained on each of a specified series of sieves and dividing the sum by 100.

It is a definite indication of the surface area of the aggregate and relates to the workability of the mixture.

Sieve sizes used are No. 100 (149 micron), No. 50 (297 micron), No. 30 (596 micron), No. 16 (1.19 mm), No. 8 (2.38 mm), No. 4 (4.76 mm) and 3/8", 3/4", 1-1/2" and larger, increasing in the ratio of 2 to 1.

Energy Required to Crush Small Sizes

More energy, relatively speaking, is required to crush quarried stone to various sizes. Below are some average figures from a member company as reported to a National Crushed Stone Association workshop.

Crushing Stage	*Product Size*	*Connected HP/Ton*
Primary	minus 10"	0.5
Coarse Secondary	minus 4"	0.5
Fine Secondary	minus 2"	1.0
Tertiary	minus 1/2"	1.5 - 2.0
Tertiary	minus 3/16"	4.0

Quantity of Calcium Chloride Per Mile of Road for Dust Laying

Width of Road - Ft.			14	16	18	20	24	30
Square Yds per Lin. Ft.			1.5	1.7	2.0	2.2	2.6	3.3
Square Yds. per Mile			8213	9387	10560	11733	14080	17600
Tons $CaCl_2$ Per Mile	Lbs. $CaCl_2$ per Sq. Yd.	1	4.10	4.69	5.28	5.87	7.04	8.8
		1-1/2	6.16	7.04	7.92	8.80	10.56	13.2
		2	8.21	9.38	10.56	11.74	14.08	17.6

Recommended Procedure: Apply 1 lb. $CaCl_2$ per square yard as initial treatment, then 1/2 lb. per square yard applications as needed

Weights of Various Materials

Material	Average Per Cu Ft, Lbs	Average Per Cu Yd, Lbs
ASHES	40	1080
BASALT		
Broken	122	3300
Solid	188	5076
BRICK		
Common Red	120	3240
Fire Clay	150	4050
Silica	128	3456
Chrome	175	4725
Magnesia as brick or fused in furnace	160	4320
CALICHE	90	2430
CEMENT		
Portland	100	2700
CINDERS	30	810
CLAY		
Dry Lumps	67	1822
Wet Lumps	100	2700
FINE GROUND CLAYS, SILICA, CEMENT, ETC		
Fire Clay	85	2295
Silica Cement	75	2025
Magnesia Cement	127	3429
Chrome Cement	135	3645
Grain Magneisite (as shipped)	112	3024
COAL AND COKE		
Anthracite	54	1458
Bituminous	49	1323
Charcoal	13	351
Coke	263	710
CONCRETE		
Cinder	110	2970
Stone or Gravel	145	3915
EARTH		
Loam, Dry, Loose	76	2052
Loam, Packed	95	2565
Loam, Soft, Loose, Mud	108	2916
Loam, Dense, Mud	125	3375
GRANITE, Crushed	103	2778
GRAVEL		
Loose	100	2700
Gravel and Sand	111	3000
GRAVEL, SAND AND CLAY, STABILIZED		
Loose	100	2700
Compacted	150	4050
GYPSUM, Crushed	100	2700
HEMATITE, Broken	210	5430
LIME		
Quick, Loose Lumps	53	1431
Quick, Fine	75	2025
Stone, Large Rocks	168	4536
Stone, Irregular Lumps	96	2592
LIMESTONE, Crushed	97	2625
LIMONITE, Broken	154	4159
MAGNETITE, Broken	205	5528

Weights of Various Materials

Material	Average Per Cu Ft, Lbs	Average Per Cu Yd, Lbs
MASONRY		
Granite or Limestone	165	4455
Mortar, Rubble	154	4158
Dry	138	3726
Sandstone, Dressed	144	3888
METALS		
Aluminum	165	4455
Brass, Cast	534	14418
Bronze	509	13743
Copper, Cast	556	15012
Iron, Cast	450	12150
Iron, Wrought	485	13095
Lead, Cast	708	19116
Lead, Rolled	711	19197
Steel, Cast	490	13230
Steel, Rolled	495	13365
Tin, Cast	459	12393
Zinc, Cast	440	11880
MUD		
Fluid	108	2916
Packed	110	3200
PHOSPHATE ROCK, Broken	110	2970
ROCK		
Chalk	137	3699
Granite	175	5725
Gypsum	159	4298
Sandstone	147	3969
Pumice Stone	40	1080
Quartz	165	4455
Salt, Coarse	45	1215
Salt, Fine	49	1323
Shales	162	4374
Slate, American	175	4725
SAND		
Dry and Loose	100	2700
Dry and Packed	110	2970
Wet and Packed	130	3510
Gravel Packed	118	3186
SHALE, Broken	90	2430
SLAG, Broken	110	2970
STONE, Crushed	100	2700
TRAP ROCK, Broken	109	2950

Weights and Measures - United States

Measures of Length

1 mile =	8 furlongs	1 chain =	4 rods
	80 chains		22 yards
	320 rods		66 feet
	1760 yards		100 links
	5280 feet	1 rod =	5.5 yards
1 furlong =	10 chains		16.5 feed
	220 yards	1 yard =	3 feet
	6.06 rods		36 inches
1 station =	33.3 yards	1 foot =	12 inches
	100 feet		

Square Measure

1 sq. foot =	144 sq. inches	1 sq. mile =	640 acres
1 sq. yard =	9 sq. feet	1 township =	36 sq. miles
1 sq. rod =	30-1/4 sq. yards		
1 acre =	43560 sq. feet		
	4840 sq. yards		
	160 sq. rods		

Cubic Measure

1 cubic yard= 27 cubic feet
1 cord (wood)= 4 x 4 x 8 ft = 128 cu. feet
1 ton (shipping) = 40 cu. feet
1 cubic foot = 1728 cubic inches
1 Cubic Foot = 7.481 gallons
1 bushel = 2150.42 cubic inches
1 gallon = 231 cubic inches

Weights (Commercial)

1 long ton =	2240 lbs	1 pound =	16 ounces
1 short ton =	2000 lbs	1 ounce =	16 drams

Troy Weight (For Gold and Silver)

1 pound =	12 ounces	1 ounce =	20
	5760 grams	pennyweights	
1 pennyweight =	24 grains		480 grains

Avoirdupois Weight (Other than drugs, gold, silver)

1 dram =	27.34 grains	1 quarter =	25 pounds
1 ounce =	16 drams	1 short ton =	2000 pounds
1 pound =	16 ounces	1 long ton =	2240 pounds
1 lb avdp =	7000 grains		
	453.59 grams		
	1.2153 lb. troy		
	1.2153 lb. apoth		

1 grain = 1 grain troy = 1 grain apoth

Dry Measure

2 pints = 1 quart = 67.2 cu. in.
8 quarts = 1 peck = 537.6 cu. in
4 pecks = 1 bushel = 2150.4 cu. in.
1 bushel = 1.2334 cu. ft.

Liquid Measure

1 gill =	4 fluid oz.
1 pint =	4 gills
1 quart =	2 pints
1 gallon =	4 quarts
	231 cubic in.
1 barrel =	31.5 gallons (Petroleum)
1 barrel =	42 gallons

Weights and Measures - Metric System

The metric system is a decimal system using the meter (39.37 inches) and gram (0.3527 ounces) as basic units. The liter (1.0567 liquid quarts or 0.9081 dry quarts) derives from meter measure. Certain prefixes denote multiples of the bases: decca- (10); hecto- (100); kilo- (1000); myria- (10,000); mega- (1,000,000). Conversely, other prefixes denote divisions of the bases: deci- ($^1/_{10}$); centi- ($^1/_{100}$); milli- ($^1/_{1000}$); micro- ($^1/_{1000000}$).

Metric Tables

The most commonly used names are printed in bold.

1. Measurements of Length

10 *millimeters* (mm) = 1 *centimeter* (cm) = 0.3937 inches
10 centimeters = 1 decimeter (dm) = 3.937 inches
10 decimeters = 1 *meter* (m) = 39.37 inches or 3.28 feet
10 meters = 1 decameter (dkm) = 393.7 inches
10 decameters = 1 hectometer (hm) = 328 feet, 1 inch
10 hectometers = 1 *kilometer* (km) = 0.62137 miles
10 kilometers = 1 myriameter (mym) = 6.2137 miles
The *micron* (μ) is one millionth of a meter or one thousandth of a millimeter.

2. Measures of Surface

100 square millimeters (mm^2) = 1 square centimeter (cm^2)
100 square centimeters = 1 square decimeter (dm^2)
100 square decimeters = 1 square meter (m^2)
100 square meters = 1 square decameter (dkm^2)
100 square decameters = 1 square hectometer (hm^2)
100 square hectometers = 1 square kilometer (km^2)

3. Land Measures

1 square meter (m^2) = 1 centiare (ca) = 1550 square inches
100 centiares or 100 m^2 = 1 *are* (a) = 119.6 square yards
100 ares or 10,000 m^2 = 1 *hectare* (ha) = 2.471 acres
1 square kilometer (km^2) = 1,000,000 m^2 = .3861 sq. miles
The *square kilometer* is used in surveys on a large scale, or in maps or charts that show roads, plans of towns, contour lines, etc. The *hectare* is used for field measurements, like our *acre*. For city lots and the like, the *are* is generally used.

4. Measures of Capacity

The standard unit of capacity is the *liter*, equal to 1 cubic decimeter or 0.9081 dry quart or 1.0567 liquid quarts.
10 milliliters (ml) = 1 *centiliter* (cl) = 0.338 fluid oz.
10 centiliters = 1 deciliter (dl) = 6.1025 cubic inches
10 deciliters = 1 *liter* (l) = 0.9081 dry quart or 1.0567 liquid quart 10 liters = 1 decaliter (dkl) = 0.284 bushel or 2.64 gallons
10 decaliters = 1 *hectoliter* (hl) = 2.838 bushels or 26.418 gallons
10 hectoliters = 1 kiloliter (kl) = 35.315 cubic feet or 264.18 gallons

5. Weights

The standard unit of weight is the *gram*, equal to 15.432 grains.
10 *milligrams* (mg) = 1 *centigram* (cg) = 0.1543 grains
10 centigrams = 1 decigram (dg) = 1.5432 grains
10 decigrams = 1 *gram* (g) = 15.432 grains
10 grams = 1 decagram (dkg) = 0.3527 ounces
10 decagrams = 1 hectogram (hg) = 3.5274 ounces
10 hectograms = 1 *kilogram* (kg) = 2.2046 pounds
10 kilograms = 1 myriagram (myg) = 22.046 pounds
10 myriagrams = 1 quintal (q) = 220.46 pounds
10 quintals = 1 *metric ton* (MT) = 2204.6 pounds

6. Measures of Volume

The standard unit of volume is the *cubic meter*, equal to 1.308 cubic yards.
1000 *cubic millimeters* (mm^3) = 1 *cubic centimeter* (cm^3)
1000 cubic centimeters = 1 *cubic decimeter* (dm^3)
1000 cubic decimeters = 1 *cubic meter* (m^3), or 1 stere (st)
The *stere* is used for firewood. 1 stere = 0.2759 cord; 1 decistere = 1/10 stere;
1 decastere = 10 stere

Metric Equivalents of U.S. Customary Measures and Weights

(Based on National Bureau of Standards)

Length

Centimeters = 0.3937 inches	Inch = 2.54 centimeters
Meter = 3.281 feet	Feet = 0.3048 meters
Meter = 1.0936 yards	Yard = 0.9144 meters
Kilometer = 0.6214 miles	Mile = 1.6093 kilometer

Area

Sq. cm = 0.1550 sq. in.	Sq. In. = 6.4516 sq. cm
Sq. meter = 10.764 sq. feet	Sq. Feet = 0.0929 sq. meters Sq.
kilometer = 0.3861 sq. miles	Sq. Mile = 2.590 sq. kilometers

Volume

Cubic cm = 0.06102 cu. in.	Cu. inch = 16.387 cu. cm
Cubic m = 35.31 cu. feet	Cu. foot = 0.02832 cu. meters
Cubic m = 1.308 cu. yards	Cu. yard = 0.765 cu. meters

Capacity

Liter = 61.025 cu. inches	Cu. inch = 0.0164 liters
Liter = 0.0353 cu. feet	Cu. foot = 28.32 liters
Liter = 0.2642 gallons (U.S.)	Gallon = 3.785 liters
Liter = 0.0284 bushel (U.S.)	Bushel = 35.24 liters

Liter = 1000.027 cu. cm
Liter = 1.0567 quart (liquid) or 0.9081 quart (dry)
Liter = 2.2046 pounds of pure water @ 4°C = 1 kg

Weight

Gram = 15.4324 grains	Grain = 0.0648 gram
Gram = 0.03532 oz. avdp.	Oz. Avdp = 28.35 grams
Kilogram = 2.2046 lb avdp.	Lb. Avdp = 0.4536 kilogram
Kilogram = 0.00110 ton (short)	Ton (short) = 907.2 kilograms

Pressure

Kg/cm^2 = 14.223 lbs/in^2	Lbs/in^2 = 0.0703 kg/cm^2
Kg/m^2 = 0.2048 lbs/ft^2	Lbs/ft^2 = 4.882 kg/m^2

Kg/cm^2 = 0.9679 normal atmosphere
Normal atmosphere = 1.0332 kg/cm^2
Normal atmosphere = 1.0133 bars
Normal atmosphere = 14.696 lbs/in^2
Normal atmosphere = 1.0133 x 10^5 Pascal

Conversion Factors to Obtain Metric Equivalents

To Convert From	to	Multiply By
acre-foot	cubic meter (m^3)	1.233
acre	square meter (m^2)	4.047
barrel (42 gallon petroleum)	cubic meter (m^3)	.159
board-foot	cubic meter (m^3)	.0024
foot	meter (m)	.305
$foot^3$/minute	$meter^3$/second (m^3/s)	.0005
$foot^3$/minute	$meter^3$/second (m^3/s)	.0283
$foot^3$	$meter^3$ (m^3)	.0283
$foot^2$	$meter^2$ (m^2)	.093
foot/hour	meter/second (m/s)	.00008
foot/minute	meter/second (m/s)	.0051
foot/second	meter/second (m/s)	.305
foot-pound (force)	joule (J)	1.356
gallon (U.S. liquid)	$meter^3$ (m^3)	.0038
gallon/minute	$meter^3$/second (m^3/s)	.00006
horsepower (550 ft-lbs)	Watt (W)	745.7
horsepower (U.S.)	HP (metric)	1.0139
horsepower (metric)	HP (U.S.)	.9863
inch	meter (m)	.025
$inch^2$	$meter^2$ (m^2)	.0006
$inch^3$	$meter^3$ (m^3)	.00002
mile (U.S. statute)	meter (m)	1,609
mile/hour	meter/second (m/s)	.447
mile/hour	kilometer/hour (km/h)	1.609
ounce (force)	newton (N)	.278
ounce (mass)	kilogram (kg)	.0284
ounce (fluid)	$meter^3$ (m^3)	.00003
pint (liquid)	$meter^3$ (m^3)	.0005
pound (force)	newton (N)	4.448
pound (force)-inch (torque)	newton-meter (N•m)	.113
pound (force)-foot (torque)	newton-meter (N•m)	1.356
pound (mass)	kilogram (kg)	.453
pound (mass)/$foot^2$	kilogram/$meter^2$ (kg/m^2)	4.882
pound (force)/$foot^2$	pascal (Pa)	47.88
pound (mass)/minute	kilogram/second (kg/s)	.0076
pound (mass)/$foot^3$	kilogram/$meter^3$ (kg/m^3)	16
ton (short, 2000 lb m)	tonnes	.907
ton (short, 2000 lb m)	megagram (Mg)	.91
	(Same as metric tons)	
yard	meter (m)	.914
$yard^2$	$meter^2$ (m^2)	.836
$yard^3$	$meter^3$ (m^3)	.765
$yard^3$/minute	$meter^3$/second (m^3/s)	.0127

Measures of Area

U.S. to Metric

Square Mile x 2.59 = Square kilometers
Acres x .00405 = Square kilometers
Acres x .4047 = Hectares
Square yards x .8361 = Square meters
Square feet x .0929 = Square meters
Square inches x 6.452 = Square centimeters
Square inches x 645.2 = Square millimeters

Metric to U.S.

Square kilometers x .3861 = Square miles
Square kilometers x 247.11 = Acres
Hectares x 2.471 = Acres
Square meters x 1.196 = Square yards
Square meters x 10.764 = Square feet
Square centimeters x .155 = Square inches
Square millimeters x .00155 = Square inches

Measurement of Volume

U.S. to Metric

Cubic yards x .765 = Cubic meters
Cubic feet x .0283 = Cubic meters
Cubic inches x 16.383 = Cubic centimeters

Metric to U.S.

Cubic meters x 1.308 = Cubic yards
Cubic meters x 35.3145 = Cubic feet
Cubic centimeters x .06102 = Cubic inches

Liquid Measure

U.S. to Metric

U.S. gallons x .8333 = Imperial gallons
Gallons x 3.785 = Liters
Quarts x .946 = Liters

Metric to U.S.

Imperial gallons x 1.2009 = U.S. gallons
Liters x .2642 = Gallons
Liters x 1.057 = Quarts

Measures of Weight

Pounds x .453 = Kilograms
Kilograms x 2.2046 = Pounds

Decimal Chart - Millimeters to Inches

mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
.001	.00004	.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.002	.00008	.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.003	.00012	.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.004	.00016	.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.005	.00020	.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.006	.00024	.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.007	.00028	.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.008	.00032	.08	.00315	.28	.01102	.48	.01890	.68	0.2677	.88	.03465
		.09	.00354	.29	.01142	.49	.01929	.69	0.2717	.89	.03504
		.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
		.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
		.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
		.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
		.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.009	.00035	.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
		.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
		.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
		.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
		.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
		.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

Metric Equivalents 1'-10'

Feet	Meters	Inches
1	.3048	12
2	.6096	24
3	.9144	36
3.281	1.0	39.36
4	1.219	48
5	1.53	60
6	1.88	72
6.562	2.0	78.72
7	2.18	84
8	2.44	96
9	2.74	108
9.843	3.0	118.08
10	3.05	120

Conversions

Inches x 25.4 = millimeters
Inches x 2.54 = centimeters
Feet x 304.8 = millimeters
Feet x 30.48 = centimeters
Yard x .9144 = meters
Meters x 1.0936 = yards
Miles x 5,280 = feet
Miles x 1760 = yards
Miles x 1.6098 = kilometers
Millimeters x .03937 = inches
Meters x 3.281 = feet
Kilometers x 3280.9 = feet
Pounds x .4536 = kilograms
Kilograms x 2.2046 = pounds
Tons x .907 = metric tons
Cubic feet x .0253 = cubic meters
Cubic yards x .7645 = cubic meters

Common Fractions Equivalents in Inches and Millimeters

16th	32nd	64th	Inches	mm	8th	16th	32nd	64th	Inches	mm	8th	16th	32nd	64th	Inches	mm	Inches	mm	Inches	mm
		1	.015625	.397					.35433	9.0				22	.6875	17.463	1.00	25.4	2.08661	53
	1	2	.03125	.794				23	.359375	9.128			11		.703125	17.859	1.02362	26	2.12598	54
			.03937	1.0	3	6	12	24	.375	9.525					.70866	18.0	1.06299	27	2.16535	55
		3	.046875	1.191				25	.390625	9.922				23	.71875	18.256	1.10236	28	2.20472	56
	1	4	.0625	1.588					.3937	10.0					.734375	18.653	1.14173	29	2.24409	57
		5	.078125	1.984				26	.40625	10.319				24	.74803	19.0	1.18110	30	2.28346	58
			.07874	2.0				27	.421875	10.716	6	12			.75	19.050	1.22047	31	2.32283	59
	3	6	.09375	2.381					.43307	11.0				48	.765625	19.447	1.25984	32	2.36220	60
		7	.109375	2.778				28	.4375	11.113			25	50	.781250	19.844	1.29921	33	2.40157	61
			.11811	3.0				29	.453125	11.509					.7874	20.0	1.33858	34	2.44094	62
1	4	8	.125	3.175				30	.16875	11.906				51	.796875	20.241	1.37795	35	2.48031	63
		9	.140625	3.5272					.47244	12.0		13	26	52	.8125	20.638	1.41732	36	2.50	63.5
	5	10	.15625	3.969				31	.484375	12.303					.82677	21.0	1.45669	37	2.51968	64
			.15748	4.0	4	8	16	32	.5	12.700			53		.828125	21.034	1.49606	38	2.55905	65
		11	.171875	4.366					.51181	13.0			27	54	.84375	21.431	1.50	38.1	2.59842	66
	6	12	.1875	4.763				33	.515625	13.097				55	.859375	21.828	1.53543	39	2.63779	67
			.19685	5.0			17	34	.53125	13.494					.86614	22.0	1.57480	40	2.67716	68
		13	.203125	5.159				35	.546875	13.891	7	14	28	56	.875	22.225	1.61417	41	2.71653	69
	7	14	.21875	5.556					.55118	14.0				57	.890625	22.622	1.65354	42	2.75590	70
		15	.234375	5.953		9	18	36	.5625	14.288					.90551	23.0	1.69291	43	2.79527	71
			.23622	6.0				37	.578125	14.684			29	58	.90625	23.019	1.73228	44	2.83464	72
2	8	16	.25	6.350					.59055	15.0				59	.921875	23.416	1.77165	45	2.87401	73
		17	.265625	6.747			19	38	.59375	15.081			30	60	.9375	23.813	1.81102	46	2.91338	74
			.27559	7.0				39	.609375	15.478		15			.94488	24.0	1.85039	47	2.95275	75
	9	18	.28125	7.144	5	10	20	40	.625	15.875				61	.953125	24.209	1.88976	48	2.99212	76
		19	.296875	7.541					.62992	16.0			31	62	.96875	24.606	1.92913	49	3.00	76.2
	10	20	.3125	7.938				41	.640625	16.272					.98425	25.0	1.96850	50	3.03149	77
5			.31496	8.0			21	42	.65625	16.669				63	.984375	25.003	2.00	50.8	3.07086	78
		21	.328125	8.334					.66929	17.0							2.00787	51	.011023	79
	11	22	.34375	8.731				43	.671875	17.066							2.04724	52	3.14960	80

Temperature Conversion Table

To convert from C to F, locate C in center column and read F value in column to the left. To convert from F to C, located F in center column and read C value in column to the right. For other temperatures: °C = 5/9 (°F-32); °F = 9/5 (°C-32).

F	C		F	C		F	C		F	C	
	F	C		F	C		F	C		F	C
-40.0	-40	-40.0	161.6	72	22.2	359.6	182	83.3	860	460	237.8
-36.4	-38	-38.9	165.2	74	23.3	363.2	184	84.4	878	470	243.3
-32.8	-36	-37.8	168.8	76	24.4	366.8	186	85.6	896	480	248.9
-29.2	-34	-36.7	172.4	78	25.6	370.4	188	86.7	914	490	254.4
-25.6	-32	-35.6	176.0	80	26.7	374.0	190	87.8	932	500	260.0
-22.0	-30	-34.4	179.6	82	27.8	377.6	192	88.9	950	510	265.6
-18.4	-28	-33.3	183.2	84	28.9	381.2	194	90.0	968	520	271.1
-14.8	-26	-32.2	186.8	86	30.0	384.8	196	91.1	986	530	276.7
-11.2	-24	-31.1	190.4	88	31.1	388.4	198	92.2	1004	540	282.2
-7.6	-22	-30.0	194.0	90	32.2	392.0	200	93.3	1022	550	287.8
-4.0	-20	-28.9	197.6	92	33.3	395.6	202	94.4	1040	560	293.3
-0.4	-18	-27.8	201.2	94	34.4	399.2	204	95.6	1058	570	298.9
+3.2	-16	-26.7	204.8	96	35.6	402.8	206	96.7	1076	580	304.4
6.8	-14	-25.6	208.4	98	36.7	406.4	208	97.8	1094	590	310.0
10.4	-12	-24.4	212.0	100	37.8	410.0	210	98.9	1112	600	315.6
14.0	-10	-23.3	215.6	102	38.9	413.6	212	100.0	1130	610	321.1
17.6	-8	-22.2	219.2	104	40.0	417.2	214	101.1	1148	620	326.7
21.2	-6	-21.1	222.8	106	41.1	420.8	216	102.2	1166	630	332.2
24.8	-4	-20.0	226.4	108	42.2	424.4	218	103.3	1184	640	337.8
28.4	-2	-18.9	230.0	110	43.3	428.0	220	104.4	1202	650	343.3
32.0	0	-17.8	233.6	112	44.4	431.6	222	105.6	1220	660	348.9
35.6	+2	-16.7	237.2	114	45.6	435.2	224	106.7	1238	670	354.4
39.2	4	-15.6	240.8	116	46.7	438.8	226	107.8	1256	680	360.0
42.8	6	-14.4	244.4	118	47.8	442.4	228	108.9	1274	690	365.6
46.4	8	-13.3	248.0	120	48.9	446.0	230	110.0	1292	700	371.1
50.0	10	-12.2	251.6	122	50.0	449.6	232	111.1	1310	710	376.7
53.6	12	-11.1	255.2	124	51.1	453.2	234	112.2	1328	720	382.2
57.2	14	-10.0	258.8	126	82.2	456.8	236	113.3	1346	730	387.8
60.8	16	-8.9	262.4	128	53.3	460.0	238	114.4	1364	740	393.3
64.4	18	-7.8	266.0	130	54.4	464.0	240	115.6	1382	750	398.9
68.0	20	-6.7	269.6	132	55.6	467.6	242	116.7	1400	760	404.4
71.6	22	-5.6	273.2	134	56.7	471.2	244	117.8	1418	770	410.0
75.2	24	-4.4	276.8	136	57.8	474.8	246	118.9	1436	780	415.6
78.8	26	-3.3	280.4	138	58.9	478.4	248	120.0	1454	790	421.1
82.4	28	-2.2	284.0	140	60.0	482.0	250	121.1	1472	800	426.8
86.0	30	-1.1	287.6	142	61.1	500.0	260	126.7	1490	810	432.2
89.6	32	0	291.2	144	62.2	518	270	132.2	1508	820	437.8
93.2	34	+1.1	294.8	146	63.3	536	280	137.8	1526	830	443.3
96.8	36	2.2	298.4	148	64.4	554	290	143.3	1544	840	448.9
100.4	38	3.3	302.0	150	65.6	572	300	148.9	1562	850	454.4
104.0	40	4.4	305.6	152	66.7	590	310	154.4	1580	860	460.0
107.6	42	5.6	309.2	154	67.8	608	320	160.0	1598	870	465.6
111.2	44	6.7	312.8	156	68.9	626	330	165.6	1616	880	471.1
114.8	46	7.8	316.4	158	70.0	644	340	171.1	1634	890	476.7
118.4	48	8.9	320.0	160	71.1	662	350	176.1	1652	900	482.2
122.0	50	10.0	323.6	162	72.2	680	360	182.2	1670	910	487.8
125.6	52	11.1	327.2	164	73.3	698	370	187.8	1688	920	493.3
129.2	54	12.2	330.8	166	74.4	716	380	193.3	1706	930	498.9
13.28	56	13.3	334.4	168	75.6	734	390	198.9	1724	940	504.4
136.4	58	14.4	338.0	170	76.7	752	400	204.4	1742	950	410.0
140.0	60	15.6	341.0	172	77.8	770	410	210.0	1760	960	515.6
143.6	62	16.7	345.2	174	78.9	788	420	215.6	1778	970	521.1
147.2	64	17.8	348.8	176	80.0	806	430	221.1	1796	980	526.7
150.8	66	18.9	352.4	178	81.1	824	440	226.7	1814	990	532.2
154.4	68	20.0	356.6	180	82.2	842	450	232.2	1832	1000	537.7
158.0	70	21.1									

Recommended Maximum Torque Values

Use the following torque charts to avoid overstressing standard nuts and bolts used on Cedarapids equipment. These specifications should be followed unless specific torques are given in our equipment manual. Cedarapids uses Grades 2, 5, and 8. The maximum torque values are based on 75% of the specified minimum proof strength of the bolt steel in order to provide a safety factor. The term "lube" includes the application of thread lubricants, cadmium plating, and the use of hardened washers.

Steel type and hardness range are as follows: For SAE Grade 2 plain low carbon (1018 or 1020) steel, hardness is Rockwell "B" 85-100. For SAE Grade 5 plain medium carbon (1035, 1038, & 1045), hardness is Rockwell "C" 19-30. For SAE Grade 8 medium carbon alloy (4140, 8642 & 5147), hardness is Rockwell "C" 32-38. All SAE bolt head symbols are listed on the Torque Chart next to the SAE grade.

ASSUMPTIONS:

(1) The maximum torque values are based on 75% of the specified proof strength.

(2) The term "lube" includes the application of thread lubricants, cadmium plating, and the use of hardened washers; regardless of whether standard or lock nuts are used.

Recommended Maximum Torque Values (±5%)

Dia. inches	N threads/in.	SAE Grade 2			SAE Grade 5			SAE Grade 8			At inches²	Sp (ksi) Grade 2	Sp (ksi) Grade 5	Sp (ksi) Grade 8
		Torque–ft/lbs		Clamp Load–lbs	Torque–ft/lbs		Clamp Load–lbs	Torque–ft/lbs		Clamp Load–lbs				
		Dry	Lube		Dry	Lube		Dry	Lube					
1/4	20	5	4	1312	8	6	2027	12	9	2862	0.0318	55	85	120
	28	6	5	1502	10	7	2321	14	11	3276	0.0364	55	85	120
5/16	18	11	9	2162	17	13	3341	25	19	4716	0.0524	55	85	120
	24	12	10	2393	19	15	3698	27	21	5220	0.0580	55	85	120
3/8	16	20	15	3197	31	24	4941	44	34	6975	0.0775	55	85	120
	24	23	17	3622	35	27	5597	49	38	7902	0.0878	55	85	120
7/16	14	32	25	4385	49	38	6777	70	54	9567	0.1063	55	85	120
	20	36	27	4896	55	42	7567	78	60	10683	0.1187	55	85	120
1/2	13	49	38	5853	75	58	9046	106	82	12771	0.1419	55	85	120
	20	55	42	6596	85	65	10194	120	92	14391	0.1599	55	85	120
5/8	11	97	75	9323	150	115	14408	212	163	20340	0.2260	55	85	120
	18	110	85	10560	170	131	16320	240	185	23040	0.2560	55	85	120
3/4	10	172	132	13778	266	205	21293	376	289	30060	0.3340	55	85	120
	16	192	148	15386	297	229	23779	420	323	33570	0.3730	55	85	120
7/8	9	167	128	11435	430	330	29453	606	466	41580	0.4620	33	85	120
	14	184	141	12598	473	364	32449	668	514	45810	0.5090	33	85	120
1	8	250	192	14999	644	495	38633	909	699	54540	0.6060	33	85	120
	14	273	210	16409	704	542	42266	995	765	59670	0.6630	33	85	120
1-1/8	7	354	272	18884	794	611	42347	1288	990	68670	0.7630	33	74	120
	12	397	306	21186	891	685	47508	1445	1111	77040	0.8560	33	74	120
1-1/4	7	500	384	23983	1120	862	53780	1817	1398	87210	0.9690	33	74	120
	12	553	426	26557	1241	954	59552	2012	1548	96570	1.0730	33	74	120
1-3/8	6	655	504	28586	1469	1130	64103	2382	1832	103950	1.1550	33	74	120
	12	746	574	32546	1673	1287	72983	2712	2086	118350	1.3150	33	74	120
1-1/2	6	869	669	34774	1949	1500	77978	3161	2432	126450	1.4050	33	74	120
	12	978	752	39130	2194	1687	87746	3557	2736	142290	1.5810	33	74	120
1-3/4	5	1372	1055	47025	2286	1758	78375	4988	3837	171000	1.9000	33	55	120
2	4.5	2063	1587	61875	3438	2644	103125	7500	5769	225000	2.5000	33	55	120
2-1/4	4.5	3016	2320	80438	5027	3867	134063	10969	8438	292500	3.2500	33	55	120
2-1/2	4	4125	3173	99000	6875	5288	165000	15000	11538	360000	4.0000	33	55	120
2-3/4	4	5592	4302	122018	9321	7170	203363	17794	13688	388238	4.9300	33	55	105
3	4	7388	5683	147758	12313	9472	246263	23507	18082	470138	5.9700	33	55	105

Recommended Maximum Torque Values (±5%) - Metric

Dia. mm	Pitch mm	Property Class = 8.8			Property Class = 10.9			Property Class = 12.9			At inches²	Sp (ksi) 8.8	Sp (ksi) 10.9	Sp (ksi) 12.9
		Torque–ft/lbs		Clamp Load–lbs	Torque–ft/lbs		Clamp Load–lbs	Torque–ft/lbs		Clamp Load–lbs				
		Dry	Lube		Dry	Lube		Dry	Lube					
10	1.5	37	29	5671	53	41	8115	62	48	9484	.0899	84	120	141
	1.25	39	30	5985	56	43	8564	66	51	1009	.0949	84	120	141
12	1.75	65	50	8241	93	71	11793	109	83	13782	.1306	84	120	141
	1.25	71	55	9004	101	78	12885	119	91	15058	.1427	84	120	141
14	2	104	80	11289	148	114	16155	173	133	18880	.1789	84	120	141
	1.5	112	86	12180	160	123	17430	187	144	20370	.1930	84	120	141
16	2	161	124	15321	230	177	21925	269	207	25625	.2428	84	120	141
	1.5	172	132	16356	246	189	23406	287	221	27354	.2592	84	120	141
18	2.5	230	177	19472	318	245	26936	372	286	31479	.2983	87	120	141
	1.5	258	199	21875	357	275	30261	418	321	35365	.3352	87	120	141
20	2.5	325	250	24765	450	346	34258	525	404	40036	.3794	87	120	141
	1.5	360	277	27467	499	384	37996	583	448	44405	.4208	87	120	141
22	2.5	443	341	30694	613	471	42459	716	551	49621	.4703	87	120	141
	1.5	486	374	33694	673	518	46610	786	605	54472	.5162	87	120	141
24	3	562	432	35661	777	598	49331	908	698	57652	.5464	87	120	141
	2	612	471	38890	847	652	53797	990	762	62872	.5958	87	120	141
27	3	823	633	46476	1139	876	64292	1331	1024	75136	.7121	87	120	141
	2	889	683	50152	1229	945	69377	1436	1105	81079	.7684	87	120	141

Trigonometric Functions

Angle	Sin	Cos	Tan	Angle	Sin	Cos	Tan
0	0.000	1.000	0.000	46	0.719	0.695	1.04
1	0.017	0.999	0.017	47	0.731	0.682	1.07
2	0.035	0.999	0.035	48	0.743	0.669	1.11
3	0.052	0.999	0.052	49	0.755	0.656	1.15
4	0.070	0.998	0.070	50	0.766	0.643	1.19
5	0.087	0.996	0.087	51	0.777	0.629	1.23
6	0.105	0.995	0.105	52	0.788	0.616	1.28
7	0.112	0.993	0.123	53	0.799	0.602	1.33
8	0.139	0.990	0.141	54	0.809	0.588	1.38
9	0.156	0.988	0.158	55	0.819	0.574	1.43
10	0.174	0.985	0.176				
11	0.191	0.982	0.194	56	0.829	0.559	1.48
12	0.208	0.978	0.213	57	0.839	0.545	1.54
13	0.225	0.974	0.231	58	0.848	.0530	1.60
14	0.242	0.970	0.249	59	0.857	0.515	1.66
15	0.259	0.966	0.268	60	0.866	0.500	1.73
16	0.276	0.961	0.287	61	0.875	0.485	1.80
17	0.292	0.956	0.306	62	0.883	0.469	1.88
18	0.309	0.951	0.325	63	0.891	0.454	1.96
19	0.326	0.946	0.344	64	0.898	0.438	2.05
20	0.342	0.940	0.364	65	0.906	0.423	2.14
21	0.358	0.934	0.384	66	0.914	0.407	2.25
22	0.375	0.927	0.404	67	0.921	0.391	2.36
23	0.391	0.921	0.424	68	0.927	0.375	2.48
24	0.407	0.914	0.445	69	0.934	0.358	2.61
25	0.423	0.906	0.466	70	0.940	0.342	2.75
26	0.438	0.898	0.488	71	0.946	0.326	2.90
27	0.454	0.891	0.510	72	0.951	0.309	3.08
28	0.469	0.883	0.532	73	0.956	0.292	3.27
29	0.485	0.875	0.554	74	0.961	0.276	3.49
30	0.500	0.866	0.577	75	0.966	0.259	3.73
31	0.515	0.857	0.601	76	0.970	0.242	4.01
32	0.530	0.848	0.625	77	0.974	0.225	4.33
33	0.545	0.839	0.649	78	0.978	0.208	4.70
34	0.559	0.829	0.675	79	0.982	0.191	5.14
35	0.574	0.819	0.700	80	0.985	0.174	5.67
36	0.588	0.809	0.727	81	0.988	0.156	6.31
37	0.602	0.799	0.754	82	0.990	0.139	7.12
38	0.616	0.788	0.781	83	0.993	0.122	8.14
39	0.629	0.777	0.810	84	0.995	0.105	9.51
40	0.643	0.766	0.839	85	0.996	0.087	11.43
41	0.656	0.755	0.869	86	0.998	0.070	14.30
42	0.669	0.743	0.900	87	0.999	0.052	19.08
43	0.682	0.731	0.933	88	0.999	0.035	28.64
44	0.695	0.719	0.966	89	0.999	0.017	57.28
45	0.707	0.707	1.000	90	1.000	0.000	Infinity

Explanation of Aggregate and Bitumens Terms

ABRASIVES - A substance for abrading as for grinding polishing etc. Practically every nonmetallic mineral is highly abrasive. A great variety of silica and silicate minerals are mined commercially for their abrasive value in their natural state

AGGREGATE - The mineral material, such as sands, graved shells, slags or broken stone or combinations thereof with which cement or bituminous material is mixed to form a mortar or concrete. Fine Aggregate may be considered as the material that will pass a 1⁄4 inch screen. Coarse Aggregate as the material that will not pass a 1⁄4 inch screen.

AGRICULTURAL LIMESTONE - Ground and pulverized forms of limestone used for direct application to the soil.

ALUMINOUS SILICATES - Several nonmetallics in this group are sometimes mined domestically - andalusite, sillimanite, kyanite, dumortierite, mullitet, topaz, etc. Kyanite (which see) is the only one reporting any data. Usually associated in nature with other minerals they convert to mullite for refractory purposes.

AMBER - Many types of plants, particularly fir trees and pine trees give off a sticky substance called resin which soon dries and hardens. Hard fossil resin from ancient trees is known as Amber and is composed of carbon, oxygen, hydrogen and a trace of sulfur. Amber, because of its organic origins is not a true mineral.

Amber in the state of Kansas is called jelinite. It is yellow to brownish in color is clouded or translucent and has a resinous to waxy lusters. Many specimens show a banded structure and can be scratched by a copper penny but not by the fingernail. It is brittle, breaks with a shell-like (conchoidal) fracture and is very light in weight - only slightly heavier than water. It burns readily giving a smoky flame. Amber in Kansas has been found in lignite beds of cretaceous age, where it occurs as rounded and irregular masses from the size of a pea to four inches in diameter.

AMPHIBOLITE - A metamorphic rock consisting chiefly of hornblende or of some member of the amphibole group. It is, as a rule, a synonym of hornblende schists but is preferable to the latter when the schistosity is not marked. (Kemp)

ANDESITE - A volcanic rock of porphyritic or felsitic texture whose crystallized minerals are plagioclastic and one or more of the following: biotite, hornblende and augite. (Kemp)

ANHYDRITE - Anhydrite, which is composed of calcium sulfate ($CaSo_4$) is one of the three main evaporite deposits; the other two being gypsum and halite. It occurs commonly as gray, crystalline masses, although some anhydrite has a fibrous structure. It may occur as individual crystals in other rocks - particularly in dolomite. It has a glossy luster, is translucent and is harder and heavier than gypsum, for although it can be scratched easily with a knife it cannot be scratched with the fingernail. Anhydrite may change to gypsum if water is added as for example, at surface exposures fine-grained dolomite and anhydrite look similar but can be distinguished from one and other in that hydrochloric acid will not act on anhydrite. Some anhydrites are found in deposits of Permian Age associated with beds of gypsum, dolomite and red silt. It is also found in the ceilings of some gypsum caves

APLITE - A fine-grained granite consisting chiefly of quartz and feldspar. Two firms produce it from mines in Virginia. It is said to have potential markets in the glass field.

ARAGONITE - Aragonite has the same chemical composition as calcite ($CaCo_3$) but it differs from calcite in having poorer cleavage and in having a different crystal form Its crystals commonly occur as radiating groups of fibrous or needlelike shapes- like calcite, aragonite fizzes and dissolves readily in dilute hydrochloric acid and can be scratched with a knife but not with a copper coin. This mineral, which is colorless to white, gray, yellow, green, brown, and violet, is ordinarily found as a vein mineral in cave deposits, and as the pearly layer of many types of shells. Aragonite is much less common than calcite because it changes easily to calcite without altering its external shape. It is difficult to identify in the field. The mineral has been reported in several places, as nodules in a clay deposit, and in a sand pit, as small vugs in a quarry and in many septarian concretions in the cretaceous shales of Western Kansas.

ARTIFICIAL SANDS - Commonly called crusher screenings, they are the fine materials produced when gravel or stone is crushed. These screenings vary considerably as to angularity and gradation, depending upon the type of rock crushed, but fairly well-graded sands can be produced in this way. Most crusher screenings range in gradation from 1⁄4 inch down to and including 0 to 6% passing the 200 mesh sieve, although in most cases they are deficient in the No. 40 to No. 80 mesh size.

ASBESTOS (Mineral) - A grayish or greenish variety of amphibole, occurring in long, delicate fibers, or in fibrous masses. It is noncombustible, nonconducting, and chemically resistant.

ASPHALT - A complex compound of various hydrocarbons, part of which are oxygenated. Related in origin to petroleum. Is brown or brownish black in color, and is also called mineral pitch. Same as asphaltum.

ASPHALT CEMENT - Refined asphalt or a combination of refined asphalt and flux, of suitable consistency for paving purposes. It has a normal penetration of between 5 and 350.

ASPHALTED CONCRETE - A mixture of asphalt cement with coarse graded mineral aggregate. It is used in the construction of asphalt bases, binder courses and surface courses. The most common mineral constituents of asphaltic concrete are a combination of broken stone, broken slag or gravel with sand and mineral filler, except that the mineral filler is usually left out of base and binder course mixtures.

ASPHALT ROCK - Asphalt is a solid or nearly solid organic substance composed of carbon and hydrogen, which is formed when the lighter parts of petroleum evaporate and the heavy tarry residue remains behind. Natural asphalt, that is made by nature and not in an oil refinery, is found in the pores of some limestone and sandstone. It occurs in rocks of the Pennsylvanian Age and in small amounts in cretaceous sandstone. Since many porous sandstones and limestones do not have asphalt in them, particularly where the rocks outcrop and weathering has a chance to act on them. Much exploration must be done in order to find a good deposit of asphalt rock. This is usually done by digging small pits or quarries, or by drilling shallow test holes .

BANK GRAVEL - Gravel found in natural deposits, usually more or less intermixed with fine material, such as sand or clay, or combinations thereof, gravelly clay, gravelly sand, clayey gravel and sandy gravel, indicate the varying proportions of the materials in the mixture.

BANK SANDS - Sand pits containing sand with little or no gravel. This sand contains from 0 to 12% clay and silt and has a gradation suitable for sand asphalt, a bituminous mix.

BARITE - Barite (barium sulfate, $BaSO_4$) is a common mineral, but it is not found as a rule in large quantities because of its high density. It is sometimes called “heavy spar.” It occurs as flat tabular crystals, either singly or in groups, and it also occurs in granular or earthy forms. The individual crystals are transparent to opaque and have a glassy luster and Perfect cleavage in two directions.

Barite is usually colorless or white, but may be light shades of blue, yellow, or red. It can be scratched with a knife, but not with the fingernail. In appearance, it resembles gypsum, calcite, or celestite. However, aside from its relatively heavy weight, it can be distinguished from gypsum by its greater hardness and from calcite because it does not fizz in hydrochloric acid. A flame test is the best means of distinguishing between barite and celestite. If powdered barite is heated on a clean platinum wire in a Bunsen burner, the flame will become green, but celeste will turn the flame bright red.

Barite is used in paint pigments, as a filler in paper and cloth, in making glazes for pottery, and in the refining of sugar.

BASALT - A word of ancient but uncertain etymology. It is employed as a rock name in its restricted sense for porphyritic and felsitic rocks consisting of augite, olivine, and plagioclase with varying amounts of glassy base which may entirely disappear. In a broader sense the basalt or basaltic group is used to include all the dark, basic, volcanic rocks, such as the true basalts; the nepheline-, leucite-, and melilite-basalts; the augites and limburgites; the diabases, and melaphyres.

BASE COURSE - The first or lowest course of a road, as of a foundation. Also called Foundation course.

BATCH - A charge placed in a pugmill of Bituminous mixing plant.

BAUXITE (Mineral) - A ferruginous aluminum hydroxide, essentially $Al_2O_32H_2O$, but consisting of several minerals occurring in oolitic masses and in earthy form. It is a nonmetallic clay mineral and has several industrial applications.

BENTONITE - Bentonite is a clay formed by chemical alteration of volcanic ash. It is particularly interesting because of its properties of swelling when water is added. It may swell to as much as 15 times its original bulk, and it forms a milky cloud in the water. Some bentonites can be identified by their waxy or soapy appearance. Some thin deposits are interbedded with chalk and chalky shale.

BINDER - A foreign material introduced into the mineral portion of the wearing surface for the purpose of assisting the road material to retain its integrity under stress, as well as, perhaps, to aid in its first construction.

BINDER SOIL - That material which consists primarily of fine soil particles (fine sand silt, true clay and colloids) and has good binding properties This material is commonly referred to as clay binder.

BLOW SANDS - This sand is used chiefly as a blend to fill in the gradation between No. 40 and No. 100 mesh that may be deficient in other sands used for bituminous construction.

BORAX AND BORON - The extremely versatile chemical boron is found in many minerals, of which borax, kernite and colemanite are currently most important, **Boron** is a nonmetallic element occurring only in combination, as in borax. (Borax—a crystalline, slightly alkaline borate of sodium, Na_2B_4O, used as a flux, cleansing agent, antiseptic, etc.) Boron is used in glass-making, ceramics, metallurgy, soil fertilization, cosmetics, detergents, antiseptics, atomic energy and hundreds of other industries .

BOULDER or BOWLDER - A fragment of rock brought by natural means from distance (though this notion of transportation from a distance is not always in later usage, involved) and usually large and rounded in shape. Cobble stones taken from riverbeds are, in some American localities, called bowlders.

BOULDER CLAY - Boulder clay is an extremely varied deposit consisting, as the name suggests, of particles of all sizes, from large boulders to clay. It is a typical product of glacial action and is often called glacial till. Boulder clay forms low, rounded, rolling hills covered with loess, soil and vegetation. The boulders and pebbles, which have been carried by ice from both local and distant rocks, are of many different types. They include limestone, sandstone, quartzite, granite, basalt, and many others. Most of them have been deeply weathered since they were left by the melting of the ice sheet; they have been so much weathered that a “hard granite” can be crumbled with bare hands. Upon close examination, some of the Pebbles and boulders are seen to be scratched and polished from rubbing against other rocks in the ice.

BRECCIA - A fragmental rock whose components are angular and therefore, as distinguished from conglomerates, are not waterworn. There are friction or fault breccias, talusbreccias and eruptive breccias. (Kemp)

BROMINE - An element, normally a deep-red caustic liquid emitting an irritating, reddish-brown, ill-smelling vapor. Responsible for “knock-free” gasoline, bromine is also used in medicine, photographic agents, dyes, chemicals, soil fumigation, etc.

CALCITE - Calcite (calcium carbonate, CaCO), is the important mineral in limestone and is therefore, one of the most common minerals, and contains 56% lime, CaO. Generally it is white or colorless but it may be tinted gray, red, green, or blue. It occurs in many varieties of crystal forms (more than 300 have been described). Calcite can be scratched by a knife, but not by the fingernail, and it fizzes freely in cold hydrochloric acid. If a large crystal of calcite is shattered with a hammer, it breaks into smaller rhomb-shaped blocks because it has Perfect cleavage in three directions.

Besides being the important mineral in limestone, calcite occurs as a common cementing material in some sandstones. It is found in many calcareous shales and clays and as veins in some igneous rocks in the cretaceous niobra chalk and other cretaceous rocks, it is found in rather large veins. Calcite is an important part of many concretions; brown calcite and colorless to yellow calcite crystals are common in some septarian concretions of shale. Tiny calcite crystals form the lining of geodes in certain Permian limestones and shales and they coat the insides of many fossil shells. Good calcite crystals are found in some lead and zinc mines, most of these are pale yellow and some are quite large.

CALICHE—1. (Mex.) Feldspar; a white clay. 2. (Mexico and Southwest U. S.) Gravel, sand, or desert debris cemented by porous calcium carbonate; also the calcium carbonate itself.

CALCIUM CHLORIDE—A crystalline compound, $CaCl_2$, used in its anhydrous state as a white porous solid as a drying agent to lay dust. It is also used for highway ice and dust control.

CELESTITE—Celestite (strontium sulfate, $SrSO_4$) is similar to barite in appearance, in geologic occurrence and in crystal form. It has a glassy luster and its crystals are colorless, white, or a faint blue or red. This mineral is also found as radiating pink fibers, as vein fillings, and as scattered particles. Celestite cannot be scratched by the fingernail, but can be scratched by a penny. It differs from barite in its lighter weight and in its property of coloring a flame red. Celestite has been found in solid blue crystals and as pink to white radiating fibers. It also has been found as pink crystals and as veins and has been found at the top of Permian Rocks below cretaceous sands and shales.

CERUSSITE—Cerussite (lead carbonate, $(PbCO_2)$ occurs as granular masses and as platy crystals which commonly cross each other to form a lattice-like effect. Cerussite has a brilliant, glassy luster, is colorless or white and can be scratched by a penny but not by the fingernail. It fizzes in cold hydrochloric acid and is very heavy for a nonmetallic mineral. Small amounts of cerussite are occasionally found as a result of the chemical change of galena (lead sulfide) in the near surface parts of lead deposits.

CHALCOPYRITE - An important ore of copper where it occurs in abundance, chalcopyrite or copper pyrite is a sulfide of copper and iron ($CuFeS_2$). It is a brassy yellow mineral that makes a greenish black streak and has a bright metallic luster. It is brittle, may be tarnished, can be scratched by a knife but not by a penny. It occurs normally as four sided pyramid-like crystals but the crystals are usually poorly formed when the mineral occurs as massive sulfide ore. Chalcopyrite is very similar in appearance to pyrite, but is softer than pyrite (pyrite cannot be scratched by a knife) and it has a greenish sheen which pyrite does not have. Chalcopyrite is sometimes found with dolomite crystals and with lead and zinc ores and is sometimes associated with barite.

CHATS - (Northumb) Small pieces of stone with ore. (Eng.) A low grade of lead ore. Also middlings which are to be crushed and subjected to further treatment. The mineral and rocks mixed together which must be crushed and cleaned before sold as mineral. Chats are not the same as tailings, as the latter are not thrown aside to keep for future milling.

CHERT - A compact, siliceous rock formed of chalcedonic or opaline silica, one or both, and of organic or precipitated origin. Chert occurs distributed through limestone, affording cherty limestones. Flint is a variety of chert. Chert is especially common in the Carboniferous rocks of southwest Missouri. See also Hornstone.

CHIPS - 100% fractured stone usually passing 1⁄2-inch square mesh sieve but retained on No. 8 sieve. Applied over seal coats, broomed and rolled to provide a skid-proof surface and to prevent bleeding on bituminous roads.

CLAY - An earth material of extremely fine texture, **smaller** than .005 millimeters in Particle size, and is plastic and swells when wet. Pure clay is not a good stabilizing agent because of its plasticity index.

CLOSED CYCLE SYSTEM - A series of conveyors and/or elevating devices which return oversize material back to a crusher for further reduction. COAL LIGNITE - Lignite ranges in appearance from a light brown to a dark brown, compact, dull, earthy mass to a bright, black, banded mass, and it yields a brown powder when ground or when rubbed over a rough white surface. As American lignite comes from the mine, it contains 30 to 40% moisture. When exposed to the air, it soon slacks or falls to pieces because of loss of moisture. If it is not stored properly, it will take fire spontaneously. Although there are thousands of square miles of lignite deposits in the United States, production of this rank of coal is not yet important nationally. It is difficult to store and its heating value is low, making it uneconomical to ship very far. However, lignite can be dried, briquetted or made into gas suitable for the reduction of iron ore, the production of synthetic liquid fuels and other uses.

SUB BITUMINOUS COAL - Sub-bituminous coal is black; and as it is mined, it looks a great deal like the bituminous coal seen in coal yards. It contains from 15 to 30 % moisture. The range of heating value of sub-bituminous “A” coal is the same as that of high volatile “C” bituminous coal.

Sub-bituminous coal is entirely non-coking. Like lignite, it weathers or slacks rapidly upon exposure to air and is subject to spontaneous combustion if not stored properly. Because of the same disadvantageous features as lignite, it is used principally in the areas where it is mined.

BITUMINOUS COAL - Bituminous coal is the most abundant and widespread rank of coal in the United States. It is the coal used most commonly for industrial, power, railroad, and heating purposes. Bituminous coal may be either coking or non-coking. This property is not based on the rank of the coal, but rather on whether it will produce a coke when Processed in a coke oven. Nearly all eastern bituminous coals have coking properties, but many of the western bituminous coals are non-coking or free burning.

A coking, or, as it is sometimes called, caking coal is one that softens and runs together when it becomes almost hot enough to take fire. As it is heated further, some degradation of coal substance occurs, and the volatile matter escapes as a gas. When the coal is heated red hot in a sealed oven where there is little or no air, a dull gray porous mass called coke remains after the volatile liquids and gases have been driven off. Because coke consists largely of fixed carbon, the coking process is often called “carbonization.” Coke and the gases liberated have many important uses.

Most bituminous coals appear black and lustrous in the pile: but, if you look at them closely, you will observe a banded structure with alternate layers of bright, glossy coal and of dull grayish black coal. In some coals, this dull material predominates and these coals have a dull grayish black appearance.

ANTHRACITE - Anthracite, sometimes called hard coal, has a brilliant luster and a uniform texture. If you handle anthracite, it will not soil your fingers as does coal of lower ranks. Anthracite has a higher Percentage of fixed carbon and a lower percentage of volatile matter than the lower rank coals. It burns slowly with a pale blue flame free from smoke. Most anthracite has a somewhat lower heating value than the highest grade bituminous coals, but its lack of soot and the fact that it will burn longer without attention make anthracite an ideal domestic fuel.

COMMON BANDED COAL - Common banded coal, sometimes called bright coal, is the variety that includes most coals. It is composed of both anthraxylon and attritus in varying proportion and has a bright luster.

SPLINT COALS - Splint coals are composed almost wholly of attritus, with only a little anthraxylon. The coal is a dull grayish black and is hard and tough. When mined, it breaks into block lumps because of this characteristic, it is called “block coal” in some mining regions. Splint coal is good for steam power plants. When heated, it is inclined to splinter and makes a better coke when used in blends with banded coal.

CANNEL COAL - Cannel coals are made up entirely of attritus, often rich in spores. Spores are the reproductive organs of the lower plants that do not produce seeds. Cannel coals are often rich in volatile matter and burn with a long yellow flame. They used to be called “candle” coals because of the appearance of the flame and because many of them can be lighted with a match or a piece of burning paper. It usually occurs in small lenses or deposits in beds of other coals and must be separated from the other coal during mining. In the original coal swamps, the spore and seed case of plants and finely divided particles of woody material floated upon the open water until they became waterlogged, sank to the bottom and finally changed into cannel coal.

BOGHEAD COAL - Boghead coal is a variety of bituminous or subbituminous coal that looks and burns much like cannel coal. It is made up largely of the remains of algae water plants that form the greenish or brownish scum you often see on fresh water ponds and reservoirs in summer and fall. It is rich in volatile

hydrocarbons that produce illuminating gas. When distilled, it yields a great deal of tar and oil. Like cannel coal, it is usually found in small deposits or lenses.

CORAL - The solid secretion of coral polyps, composed almost wholly of calcium carbonate, which forms reefs and treelike and globular masses.

CONGLOMERATE - An aggregate of rounded and water-worn pebbles and bowlders cemented together into a coherent rock. Deposited by streams or waves, generally with some sorting and stratification. Compare Breccia. Conglomerate is a hardened, generally cemented gravel, and like sand, silt, and clay, has been formed by the breaking down of older rocks and by later re- disposition. Commonly it is found interbedded with layers of sandstone. It also occurs at the base of many Pennsylvanian formations. Conglomerate and gravel are used in making concrete, in surfacing roads and as railroad ballast.

CONVEYORS - A device consisting of a steel frame equipped with rollers and pulleys over which a continuous rubber belt travels and used for delivery of material from one portion of a plant to another. Note: Conveyors are further described by a word describing their use i.e., a “feed” conveyor usually feeds material into a plant, crusher or on to a screen, A “delivery” conveyor usually delivers material from any of components to another component, or to a truck or stockpile.

DIABASE - A basic igneous rock usually occurring in dikes or intrusive sheets, and composed essentially of plagioclase feldspar and augite with small quantities of magnetite and apatite. The plagioclase forms lath-shaped crystals lying in all directions among the dark irregular augite grains, giving rise to the peculiar diabasic or ophitic texture, which is a distinctive feature in the coarser-grained occurrences (U. S. Geol. Surv.). Diabase is often used as a prefix for double names, as diabase-aphanite, diabase-gabbro, etc . (Kemp)

DIORITE - A granitoid rock composed essentially of hornblende and feldspar which is mostly or wholly plagioclase, with accessory biotite and (or) augite. Minute grains of magnetic and titanite may be visible. Quartz may be present in considerable amount, in which case the rock is called quartz diorite. Quartz diorites grade into tonalites and granodiorites. (U. S. Geol. Surv.)

DOLOMITE - Dolomites are fine to **coarse grained rocks** which in the pure state are light colored. On weathering, they tend to become buff or tan because of impurities which consist commonly of small amounts of pyrite, siderite, or marcasite or of iron in the dolomite crystals. Dolomites may be formed much as limestones are formed; for example, by chemical precipitation, or by the action of waves and streams on older dolomites. They are also converted from limestone by a process appropriately called dolomitization. This involves the replacement of calcium by magnesium or the solution and removal of the calcium carbonate. The change may take place before or after the rock has been solidified, and is caused by the action of sea water, ground water, or hot mineral water. Dolomite is used in most of the ways that limestone may be employed and in addition, it is a possible source of magnesium. The mineral dolomite is composed of calcium magnesium carbonate ($CaMg(CO_3)_2$) and is closely related to calcite. In large masses, the mineral forms the rock called dolomite. It may be white, gray, greenish gray, brown, or pink, and has a glassy to pearly luster. It occurs in coarse to fine grained granular masses and in crystals. Most dolomite crystals are rhomb-shaped like calcite cleavage blocks, but unlike most other minerals, the crystal faces are typically curved. Dolomite is slightly harder than calcite, although it can be easily scratched by a knife. It will not fizz in cold hydrochloric acid unless first ground to a powder or the acid heated.

EPSOMITE - Epsom salts are recovered from lake bed deposits or by chemical treatment of rocks such as dolomite or talc that contain magnesite. Washington is the major producer, having several lake deposits. Medicinals use the purified chemical grade, while the technical grade goes into fertilizers, enamels, paints and soaps.

EVAPORITES - Rocks formed by the evaporation of water are known as evaporites. This evaporation may take place either in shallow basins on the land or in the sea, however, the rocks which were laid down under the sea form the thicker and more widespread deposits. Rocks formed in this way include deposits of gypsum, anhydrite, and common salt or halite. Sea water contains many salts in solution. These are brought into the ocean by rivers which are continually wearing down or eroding the land surfaces, and dissolving the salts. When the sea water evaporates, the salts settle to the bottom. The less soluble— those that dissolve less readily in water—are deposited first during the evaporation process. Calcium sulphate, the compound that forms gypsum and anhydrite, is among the least soluble and consequently is one of the first deposited after dolomite. Next in order of solubility and hence deposition is sodium chloride or common table salt. Evaporite deposits are described more fully under the separate mineral names gypsum, anhydrite, and halite. The evaporites formed on the land are neither so thick nor so common as those formed under the sea.

FEEDER - A device placed under a hopper which conveys material into a plant, crusher or onto a conveyor at a uniform rate. The two types most commonly used are reciprocating (back and forth motion) and continuous steel apron type.

FELDSPAR - A general name for a group of abundant rock forming minerals, the names and compositions of which are as follows: Orthoclase, Microcline, Anorthoclass. Plagioclass, Oilgoclass, Andesine, Labradorite, Bytownite, Ceisian, and Hyalophane. The name is often pre-mixed to the names of those rocks that contain it such as feldspar-porphyry, feldspar-basalt, etc. FELDSPAR - The term feldspar applies not merely to one but to all members of a group of minerals composed of aluminum silicates carrying principally sodium, calcium or potassium. The feldspars are light in color (pink, green, white, and gray), have a glassy or satiny luster and have a good cleavage in two directions, almost at right angles to each other. They cannot be scratched by a knife. Most feldspars occur in igneous rocks. Feldspar pebbles may be distinguished from quartz pebbles by the good cleavage.

FILLER - Relatively fine material used to fill the voids in aggregate .

FINE GRADE AGGREGATES - Material which will pass a No. 10 mesh screen and retained on No. 200.

FINISHED PRODUCT - The resultant material after it has been processed (crushed, screened, sometimes washed) to the desired size and specifications.

FIRE CLAY - Clay capable of enduring high heat without fusing, and hence used for firebrick.

FLUORSPAR: FLUORITE - The mineral calcium fluoride, CaF . Color commonly purple, green, or white. It is the fourth in the scale of hardness, or next higher than calcite, and may be scratched by a steel point.

FULLERS EARTH - A clay-like earthy substance used in fulling cloth, as a filter medium, and as a catalyst.

GABBRO - A finely to coarsely crystalline igneous rock composed mainly of lime-soda feldspar (labradorite or anorthite) pyroxene, and frequently olivine. Magnetite or ilmenite, or both, and apatite are accessory minerals. It is generally dark colored. Gabbros composed largely or wholly of feldspar are called anorthosites, and those containing othorhombic pyroxene are often called norites. (U. S. Geol. Surv.)

GALENA - Galena, the principle ore of lead, is composed of lead sulfide (PbS). It is found in dark gray, lead colored, cube shaped crystals which break into cubic, right angled fragments. Some galena crystals are very large. Galena is heavy, has a metallic luster on fresh surfaces, a gray-black streak and is so soft that it will mark on paper.

GARNET - Garnets are a group of minerals whose crystals have many faces all of about equal size. They have a glassy luster and are hard enough to scratch window glass. Most garnets are red to brown, but some are black, green, or colorless. In chemical composition, they are silicates of calcium, magnesium, iron, manganese, aluminum, and chromium in various combinations, the aluminum silicate varieties predominating.

GNEISS - A layered crystalline rock with a more or less well developed cleavage, but without the fissility of schist. (U. S. Geol. Surv.) The commonest varieties are mica-gneiss, consisting of feldspar, quartz, and mica; and hornblende-gneiss, consisting of feldspar, quartz, and hornblende.

GLOSLARITE - Gloslarite ($ZnSO_4 7H_2O$) is zinc sulphate containing water and is formed by chemical action on sphalerite. It is sometimes found as long, slender, needle-like crystals.

GRADED AGGREGATE - A term describing a mineral aggregate in which there is a continuous grading in the sizes of mineral fragments from coarse to fine, the coarser sizes being many times the diameter of the finer sizes.

GRANITE - A granular igneous rock composed essentially of quartz, orthoclase or microcline, and mica. Commonly a part of the feldspar is plagioclase. The mica may be either biotite or muscovite or both. Hornblende is a common and augite an uncommon component. Apatite, zircon, and magnetite are always present, generally as very small portions. Commercially, almost all compact igneous rocks are called granite as distinguished from slate, sandstone, and marble.

GRAVEL - Small stones and pebbles or a mixture of sand and small stones; more specifically, fragments of rock worn by the action of air and water, larger and coarser than sand.

GRAVEL - The term gravel, used loosely, usually means a rock composed of particles ranging from sand to pebble size or larger (2 to 64 mm). Gravel deposits vary greatly in mineral composition, size, shape, and color. There are gravels which consist mainly of just one mineral, as chert or flint weathered from the Pennsylvanian and Permian Rocks, or feldspar, agate, clear transparent quartz, native copper, granite, basalt (a fine grained rock) and other igneous rocks.

GRAVEL PIT SANDS - Produced by separating sand (material passing No. 4 sieve) from gravel with a mechanical screen. This type of sand sometimes contains quantities of clay and has a fairly complete gradation ranging from coarse to very fine.

GREENSAND - A sedimentary deposit consisting of dark greenish grains of glauconite, often mingled with clay or sand. It is primarily used for water softening and purification. Also, agricultural use is a new development.

GRIT - 1. In petrology, a sandstone composed of coarse, angular grains and very small pebbles. **2.** An artificial stone for sharpening tools. Standard grades are coarse, medium and fine. Coarse stones cut very readily, but leave a rough edge. Medium stones do not cut as fast as coarse stones but leave a smoother edge. Fine stones are still slower cutting, but are useful where extremely fine edges are desired. **3.** Rough, hard particles; sand or gravel. **4.** Degree of hardness with openness of texture or composition; allied to buhrstone and the like.

GUMBO - 1. A name current in Western and Southern States for those soils that yield a sticky mud when wet. (Southwest Mo.) A putty-like clay associated with lead and zinc deposits. (Tex) A clay encountered in drilling for oil and sulphur. **2.** The stratified portion of the lower till of the Mississippi

GYPSUM - Hydrous calcium sulphate. ($GaSO_4 2H_2O$) Contains 32.5% lime, 46.6% sulphur trioxides and 20.9% water. Some crystals are 3 or 4 feet long and clear throughout .

HEMATITE - Hematite is a compound of iron and oxygen (Fe_2O_3) which may be either red or earthy or black with a dull or metallic luster. Both types have a red-brown or Indian-red streak by which the mineral is readily identified. The earthy variety marks paper easily.

HEMIMORPHITE - Hemimorphite, sometimes called calamine is a silicate of zinc containing water. Its chemical formula can be written H_2ZnSiO_2. It is a white mineral which is found in radiating crystal groups and in globular forms. Its hardness is such that it can be scratched by a knife but not by a Penny. Hemimorphite usually occurs with zinc ores.

HORNBLENDITE - A granitoid, igneous rock, consisting essentially of hornblende and analogous to pyroxenite. (Kemp)

HORNSTONE: CHERT - An impure flint or chalcedony with splintery fracture, more brittle than flint.

ILMENITE - Ilmenite is an iron black mineral composed of iron, titanium, and oxygen (FeTiO). It makes a brownish-black streak and it cannot be scratched by a knife. Most large specimens of ilmenite are dense, granular masses, but the mineral may occur as platy crystals and as grains in sand. Where ilmenite is mined as an ore, as in New York State, it is desired for its titanium content. The titanium, as the oxide, is used in paint manufacture.

JASPEROID - Jasperoid is metamorphosed sedimentary rock in which the lead and zinc ores of the Tri-State mining area of Kansas are commonly found. A gray to black mottled chert, coarser grained than ordinary chert, it is the cementing material around angular pieces of the original light-colored broken chert.

JAW CRUSHER - A crusher which breaks material by squeezing it between two jaw plates, one movable and one stationary.

KAOLIN - A very pure white clay, used to form the paste of porcelain. Paper, rubber, refractories and pottery industries are the principal consumers, while it is also used with cement, high-grade tile, fertilizers, chemicals, insecticides, paint, linoleum, etc.

KYANITE - (Data is restricted) Var. of cyanite. Mined commercially in Virginia and Carolina.

LAKE OR BEACH SANDS - Fine granular sand composed chiefly of round, smooth particles, and are usually blended with coarse sands to complete the gradation for bituminous construction.

LAVA ROCK - When volcanoes erupt quietly instead of explosively, molten rock pours out in a thick liquid state. The solidified material formed by cooling of the lava commonly has a ropy appearance; it is a dark fine-grained rock called lava rock. Boulders and pebbles of lava rock occur in stream deposits and in boulder clay and related deposits of some glaciated regions.

LIME - An alkaline earth consisting of the oxide of calcium. Artificially made by cabining or burning limestone or marble. Lime made from dolomitic limestone contains a considerable percentage of magnesia and is slower setting.

LIME ROCK - Any rock or stratum in which limestone is a prominent ingredient. Limestone.

LIMESTONE - The general name for sedimentary rocks composed essentially of calcium carbonate.

LIMESTONE & DOLOMITE - Limestone and Dolomite are two very closely related rocks. The former, in a pure state, consists of grains of the mineral calcite and the latter of grains of the mineral dolomite. To be scientifically correct, the term dolomite should be used only when speaking of the mineral, but through common usage dolomite as a rock is now generally accepted.

Calcite consists of calcium carbonate and is one of the most common minerals known. The mineral dolomite is made of calcium magnesium carbonate and is also quite common. These two minerals are often found together in the same deposits and whether the rock is classed as a limestone, a dolomitic limestone, or a dolomite depends on the proportion of each mineral. The two minerals can be told apart by the way hydrochloric acid reacts on each. Cold dilute hydrochloric acid will fizz when it is put on limestone; in order to react in the same manner with dolomite, either the dolomite must be powdered or the hydrochloric acid must be heated. Pure limestones are white or almost white. Because of impurities such as clay, sand, organic remains iron, and other materials, many limestones exhibit different colors, especially on weathered surfaces. Limestones may be crystalline or granular depending on the method of formation and crystals of calcite, quartz, or dolomite may line small cavities or geodes in the rock. Chert balls or nodules are common in limestone layers.

LIMONITE - Limonite, a compound of iron, oxygen and water ($2Fe_2O_3$-$3H_2O$) is a yellowish-brown to dark brown or black noncrystalline mineral. It is formed by the alteration of other minerals that contain iron. Limonite has a characteristic yellow-brown streak but its hardness depends on the form in which it occurs. The yellow-brown earthy form of limonite, really a mixture of limonite and clay. Called yellow ochre, is so soft that it easily leaves a mark on paper. The dark brown to black variety (bog iron ore) is so hard it cannot be scratched by a knife. Small quantities of limonite give a yellowish or buff color to most sandstones and to many clays, shales, and limestone. As a scum on quiet water, it may be mistaken for oil. It is an iron ore of minor importance in some states.

LITHIUM (Chem.) - A soft silver-white metallic element. Spodumene is recovered in North Carolina. South Dakota and Maine. Crude sodium lithium phosphate is produced in California. Amblygonite is mined in South Dakota and lepidolite in New Mexico. Other lithium minerals are under investigation. It is used for lithium greases, ceramics, porcelain elements and glass.

LOESS - In geology, a yellowish, fine-grained, slightly calcareous, loamy clay, commonly unstratified but having same vertical jointing, believed to be a deposit of wind-blown dust. (La Forge.)

LACNESITE - Native magnesium carbonate, MgCO . Purities range from 82 to 96% MgO. Domestic supply is deemed sufficient for the normal needs of the steel, metallurgical and miscellaneous refractory trades, which use magnesite in the form of grain, mortars, ramming mixes and brick. Brinedolomite and other brine magnesite production now totals about half the national potential. Calcined magnesite products are used for insulation, chemical, building and fertilizer purposed

MAGNETITE - Magnetite (iron oxide Fe_3O_4) is so named because it is readily attracted by a weak magnet and because some magnetic specimens called lodesterres are, in themselves, magnets. The mineral is black, has metallic luster and makes a black streak. It is so hard that it cannot be scratched by a knife. It is found as granular masses, but especially in igneous

rocks, it commonly occurs as individual crystals, most of which have eight triangular faces and are called octahedrons. Magnetite is an important ore of iron. Occasional grains of magnetite may be found in many river sands.

MARBLE - In lithology, a metamorphosed and recrystallized limestone. In the trade, the name is applied to any limestone that will take a polish. The following are some of the principal marbles: Bardiglio, bird's eye, black and gold, boagard, breccia, calico, campan, cipolino, eolian, fior di persicor, fire, forest griotte, landscape, lumachelle, mischio, nero antico de prato onyx, porter, rosso antico, ruin, St. Anne, St. Baume, stalactitic and stalagmitic statuary, verdantique and winooski.

MARCASITE - Marcasite, sometimes called white iron pyrite, is a mineral composed like pyrite or iron sulfide (FeS). On fresh surfaces, it is pale yellow to almost white and has a bright metallic luster, it tarnishes to a yellowish or brownish color and gives a black streak. It is a brittle mineral which cannot be scratched by a knife. The thin, flat tabular crystals when joined in groups are called "cockscombs". When combined into balls or nodules, or into more complicated groups, they make marcasite rosettes. The mineral can be distinguished from pyrite by its lighter color and by its crystal form. Marcasite weathers readily to form limonite and melanterite.

MASTIC - A mixture of bituminous material and fine mineral matter suitably made for use in highway construction and for application in a heated condition.

MEERSCHAUM - Also called sepiolite, this lightweight white clay mineral is used mostly in making smokers requisites, pipes, etc. There are scattered deposits in the United States. It has potential use as electrical insulation, toothpaste, oil absorbent, etc.

MELANTERITE - Melanterite, or copperas, is a sulfate of iron with water ($FeSO_4$-$7H_2O$) occurring as very fine, fibrous masses that are hard to preserve. It is greenish-white to white and has a sweet, metallic, bitter taste. It is formed by chemical action on pyrite or marcasite under damp conditions, such as on the walls of underground mines and in coal seams.

MICA - Mica is the name of a group of several minerals which are unusual because they split into thin, flat, flexible, or elastic sheets. The type of splitting is due to the fact that micas have one perfect cleavage. They are composed of aluminum silicates of many elements. Muscovite, or common "white" mica, is transparent and colorless. It can be seen as tiny, flat shining flakes in sandstones, siltstones, and shales, and as small crystals in boulders of metamorphic and igneous rocks. Biotite (black mica) may be seen in some tertiary and quaternary sands. The color of biotite is caused by iron. Phlogopite mica is yellowish- brown, has a copper-like luster on the cleavage surface and often is mistaken for flakes of gold.

MINERAL DUST - A finely powdered rock dust, Portland Cement, or other artificially or naturally powdered mineral dust, 80 to 100% of which will pass a No. 200 mesh sieve.

MINERAL EARTH PIGMENTS - Pigments used in paints follow closely the construction picture in production. The natural mineral iron-oxide group, prepared for market by washing, drying, grinding blending and calcining, account for 55% of the total. Chemically manufactured iron-oxide pigments (referred to as pure or synthetic), produced by calcination or controlled oxidation, make up the rest.

MINERAL-FILLED ASPHALT - Asphalt cement containing an appreciable percentage (usually between 10 and 50% by weight) of very finely divided mineral matter passing the 200 mesa sieve.

HARDNESS OF MINERALS - Some minerals are very soft; others are very hard. The degree of hardness is an aid in identifying the minerals. Diamonds are harder than quartz and will therefore, scratch quartz; quartz will scratch calcite; calcite will scratch gypsum and so on. An easy way of estimating the hardness of a mineral in the field is by trying to scratch it with such common objects as a fingernail, a copper penny, a pocket knife blade, and a piece of window glass. Glass the hardest of the four, will scratch the most minerals, the knife is next in hardness; then in order comes the copper cent, and the fingernail.

CLEAVAGE AND FRACTURE OF MINERALS - Some minerals when struck a sharp blow, break only along certain lines, while other minerals break just as easily in one direction as in another. When a mineral has a tendency to break along certain planes, it is said to have Cleavage, which is the result of the arrangement of the molecules and atoms. Minerals may have only one plane of weakness or cleavage, or they may have two, three, or more. The second type of breaking, that which is not determined by any arrangement of molecules is called fracture and this also varies among different minerals. Various types of fractules are described as smooth, uneven, ragged, and shell like.

MINERAL WOOL - Produced from rock, slag and glass, this insulating material has been growing in use. Major fields of use include structural insulation, equipment insulation and industrial insulation.

NEPHELINE SYENITE - This quartz-free crystalline rock consisting mostly of nephelite, albite and microcline feldspar is found in New Jersey, Arkansas and other states, but usually has too much iron for ceramic purposes,

OBSIDIAN - 1. Extrusive igneous rocks which have cooled either without crystallization or with only partial crystallization. (U. S. Geol. Surv.) **2.** A general name for volcanic glass. When used alone it implies a rhyolite-glass, but it is now much employed with a prefix as andesite-obsidian, basalt-obsidian. (Kemp)

OLIVINE - Comprising fayalite, olivine and forsterite, this mineral group is found in many rocks. Large concentrations, called "dunite," are mined or quarried commercially in North Carolina and Washington to make refractory brick and cements and foundry sand.

OOLITE - A rock consisting of small round grains, usually carbonate of lime, cemented together.

OPAL - Opal consists of silicon dioxide, like quartz, plus an indefinite amount of water (SiO_2 -nH_2O). It never forms as crystals, but probably is deposited as a jelly-like substance which later hardens. The mineral may be white, yellow, red, brown, green, gray, blue, or transparent and colorless. Precious opal shows a beautiful display of colors and is highly prized as a gem stone. Opal cannot be scratched by a knife, but is slightly softer than quartz. It is found as a lining or filling in cavities in some rocks, as a deposit formed by many hot springs, and as the petrifying material in much fossil wood.

OVERBURDEN - The waste which overlies the good stone in a quarry, Worthless surface material covering a body of useful mineral .

OVERSIZE - Material which will not pass a desired size of square opening screen wire and therefore must be crushed or recrushed .

PEA GRAVEL - Any clean gravel, whether bank or river gravel, having a gradation of from 1⁄4 to 1⁄2-inch or which approximate a pea in grain size.

PEAT - Semi-carbonized vegetable tissue formed by partial decomposition in water of various plants, asp. mosses of the genus Sphagnum. Used in this country for soil improvement and mixed fertilizers.

PEBBLES - 1. A small roundish stone, especially one worn round by the action of water; a pebble stone; also a gem occurring in the form of pebbles.

2. Transparent, colorless quartz; rock crystal; as Brazilian pebble.

PERIDOTITE - A granular igneous rock composed essentially of olivine, generally with some form of pyroxene, and with or without hornblende, biotite, chromite, garnet, etc. (La Forge)

PERLITE - 1. Volcanic glass with concentric, shelly texture and usually with a notable percentage of water. 2. Also called Pearlite or Pearlstone. A eutectoid of cementite and crystallized iron formed by slow cooling of molten steel.

PHOSPHATE ROCK - A rock consisting of calcium phosphate, usually together with calcium carbonate and other minerals, used in making fertilizers.

PSILOMELANE - Psilomelane is an oxide of manganese (MnO). It is a black mineral that makes a very dark brown to black streak, is much harder than pyrolusite it cannot be scratched by a knife. An earthy form of psilomeiane, however, is known as wad, and it is soft enough to soil the fingers. Wad forms the coating around some pebbles in gravel deposits, and it also occurs as soft black lumps in gravels.

PUMICE - An excessively cellular, glassy lava, generally of the composition of rhyolite (Kemp). A sort of volcanic froth. Its color is generally whitish or light gray. It is very light and will float on water. Pumice stone.

PYRITE - Pyrite (iron sulfide, FeS) is a pale, brass yellow, opaque mineral that is brittle and has a metallic luster. It makes a black streak and is so hard that it can scratch glass. Many pyrite crystals are cube shaped like galena, but they also occur in other forms. Pyrite is also found as granular masses, as cones and globules, and as nodules in shale, limestone and sandstone. It is called "fool's gold" because it is yellow but pyrite is brittle, has a greenish tinge, and tarnishes, whereas gold is softer, leaves a yellow streak instead of a black one, and does not tarnish easily. Pyrite occurs in rocks of all ages and is abundant in some coal deposits and veins. It is also found with gypsum in the dark shades. It is produced as a by-product of coal near Pittsburgh and is used in making sulfuric acid.

QUARTZ - Quartz, the most common of all minerals, is composed of silicon and oxygen (SiO_2) and is found in many different varieties. When pure, it is colorless but it also assumes various shades of yellow, pink, purple, brown, green, blue, or gray. One of the hardest of minerals, it will easily scratch window glass. It has no good cleavage and has a glassy to greasy luster. There are two main types of quartz, the coarsely crystalline and the fine or cryptocrystalline forms. The crystals of the first type are six sided Prisms with pyramids capping one or both ends. Well-formed, colorless quartz crystals of this type are found in geodes and as linings on the inside of some fossils. Quartz crystals with a bluish cast are found in some granites. Nearly all sands and sandstones are composed of tiny worn particles of crystalline quartz. The second main type of quartz is called cryptocrystalline because the crystals are so small that they cannot be seen without a microscope. One of the best known varieties in this group is flint or chert. Chert is dull gray, brown, or black. It breaks with a shell-like fracture and the edges of the broken pieces are sharp. Chalcedony is a cryptocrystalline quartz with a waxy luster that forms banded layer s or globular masses. Agate is a many-colored form of Chalcedony which has been deposited in cavities or veins.

QUARTZITE - Quartzite is a rock consisting of quartz sandstone so thoroughly cemented with silica that the rock breaks through the grains as easily as around them. It is distinguished from sandstone not only because it breaks through the grains, but also because it cannot be scratched with a knife. Quartzites may be either metamorphic or sedimentary in origin and the two types are so similar in appearance that in many cases they cannot be told apart. Metamorphic quartzites are caused by intense folding of the rock or by solutions from nearby igneous intrusions or both. Quartzite boulders are common in the boulder clay of the glaciated area. The rock making up these boulders is red, brownish-red, or purple, and it breaks with a splintery fracture. Quartzite, because it is so hard and resistant, can be used as a railroad ballast and in the construction of dams. It is used in some places as road material and as building stone.

RIVER GRAVEL - Found in almost any stream or river and consists of partly rounded and smooth fragments of rock intermixed with river sand and is usually free from clay and silt. That part, consisting of particles larger than 1⁄4-inch is classified as river gravel.

RIVER SAND - Due to action of water and the rolling of one particle of sand over another, does not have a high percentage of sharp angular grains and is usually free from clay and very fine sizes.

RHYOLITE - A felsophyric to vitreous igneous rock composed essentially of quartz and alkali feldspar, or of rock glass having substantially the same composition, with or without biotite, hornblende, or pyroxene; liparite. (La Forge). Rhyolite is current in America, whereas liparite and quartz-trachyte are more used abroad. A lava, usually of light color, corresponding in chemical composition to granite. The same molten liquid that at great depth within the earth solidifies as granite would, if it flowed out on the surface, cool more quickly and crystallize less completely as rhyolite. (Ransome)

ROLL CRUSHER (Double) - A crusher which breaks material by squeezing it between two revolving metal cylinders, with axes parallel to each other and separated by a space equal to the desired size of finished product.

SALINES - Chemical salts in their natural state are recovered by mining, brine saturation and other methods. A score or more types of sodium compounds exist in minerals, some mined in large quantities. See boron, bromine, calcium chloride, salt, sodium compounds, magnetite, etc.

SALT (Sodium chloride NaCl) - Any of a class of compounds formed when the acid hydrogen of an acid is partly or wholly replaced by a metal or a metal-like radical.

SANDS & SANDSTONES - Sands are loose, unconsolidated rocks having particle sizes between those of silt and pebbles (1/16 to 12mm). When held together by chemical cement or by clay, they are called sandstones. These rocks result from the breaking down or weathering of older rocks, and from the transportation and sorting of the rock fragments by moving water or by wind. Sand mostly consists of grains of quartz, but some of it may contain large amounts of feldspar. Sand occurs almost everywhere along large stream valleys, in regions of old glacial drainage or out wash. Sandstones, like sand, consist largely of quartz grains, but sandstones are held together by some natural cement or matrix such as calcium carbonate, iron oxide, or clay, and the rocks can be classified according to the type of cement. Interesting collections of sandstones in which the grains are cemented by different types of material have been made. In places, sandstones occurs interbedded with shale and limestone, in other places, it occurs as channel deposits cutting through shale and limestone. Sandstone that is buff or brownish in color is cemented with iron oxide. There are areas of sandstone cemented by calcite (calcium carbonate) in crystals so large that wide areas of the rock reflect light in a manner known as "luster mottling." This rock is sometimes called "quartzite" because it is very hard, but it is not a true quartzite. In other areas, soft, crumbly sandstones from the cretaceous age form cliffs and box canyons.

SAND CLAY - (Road Surface) A surface composed of a mixture of sand and clay where the two materials have been blended, so that their opposite qualities tend to maintain a condition of stability, under varying moisture content. Some deposits are found in nature, but the bulk of such surfaces are prepared artificially.

SANDSTONE - An indurated sedimentary rock formed of coherent or cemented sand. The following are common varieties: Asphaltic sandstone, Bluestone, Brownstone, Building sandstone, Flagstone, and Freestone.

SCALPING SCREEN - A vibrating or revolving screen which separates various sizes of materials for delivery to one or more crushers and bypasses small sizes around the crushers.

SERPENTINE - 1. In mineralogy, a hydrous magnesium silicate ($H_4Mg_3Si_2O_9$), commonly green, greenish-yellow, or greenish-gray, and massive, fibrous, lamellar, or occurring as pseudomorphs. It is an important constituent of some metamorphic rocks and is everywhere secondary, after olivine, amphibole, pyroxene, etc. **2.** In petrology, a metamorphic rock composed chiefly or wholly of the mineral serpentine. (La Forge)

SCHIST - A crystalline rock that can be readily split or cleaved because of having a foliated or parallel structure, generally secondary and developed by shearing and recrystallization under pressure. (La Forge)

SCREENINGS - Fine material that passes through a screen when screening for lump material.

SHALE - A hardened, compacted clay or silt which breaks along bedding planes is called shale. The particles that make up a shale are too small to be seen without a microscope. Shales have a leaflike bedding and weather into thin slabs or plates some of which are no thicker than paper. When shales weather, they form clays or muds. Shales and clays are easily eroded or worn away. Consequently the best exposures are found underneath ledges of harder, more resistant rocks such as limestones and sandstones. Most shales are soft enough to be cut with a knife and are rather brittle or crumbly. The usual color is gray, but black, green, red, or buff shales are common. Many shales contain nodules of pyrite, selenite crystals, or in concretions of various forms. Shale and clay together make up about 80% of the sedimentary rocks of the earth's crust. Some black, very thin bedded shales are often called slate because they have the same color as many slates and because they break into thin, hard platy sheets. Slate, however, is a metamorphic rock formed when shale is Put under great heat and pressure.

SHELL - The term "Shell Aggregate" applies to oyster, clam shells, etc., used for road surfacing material. These shells are crushed in an ordinary stone crusher. It is difficult to crush this material to a given specification, and it does not produce a strong pavement unless a suitable gradation is produced through the introduction of other aggregates, such as sand and stone.

SIDERITE - Siderite which is a common mineral, is composed of iron carbonate ($FeCO_3$). It is light to dark brown, and some of it occurs as rhomb-shaped crystals with curved faces (like dolomite). Most siderite, is granular or earthy. The mineral cannot be scratched by a penny, but can be scratched by a knife. It fizzes in hot hydrochloric acid, but reacts slowly in cold acid. Weathered surfaces change to limonite and turn dark brown.

SILICA - An oxide of silicon. (SiO_2). Occurs in nature as a mineral of economic importance in quartz, chalcedony, chert, flint, opal, diatomaceous earth and sandstone. The most abundant constituent of the earth's crust. See also Agate, Quartz. Also known as silex, and used for lining tube mills.

SILT AND SILTSTONE - Silt is a common sedimentary rock composed of tiny particles smaller than sand size, yet larger than clay size (1⁄16 to 1⁄256 mm). It is found in stream deposits and lake beds, but it occurs chiefly as a wind blown deposit called loess. It is typically a yellowish buff porous silt that crops out with steep faces along hillsides and valley walls. Much loess contains white or cream colored concretions an inch or two in diameters

which are composed of calcium carbonate and have been caned Kindehen (little children) of the loess. Small white shells of snails may also be found in the loess.

Some of the finest and thickest soils in the world are formed in the upper part of thick deposits of loess. As wind moves small Particles only, a soil built up from deposits of this kind is free from rocks and large pebbles. Loess deposits have been built up by successive dust storms. Consolidated or compacted silt is known as siltstone. This rock may be found as thin, flabby beds in many of the Pennsylvanian formations. Many siltstones and fine sandstones contain layers rich in tiny flakes of mica, which glitter in the sun. The mica is concentrated along the bedding planes where the rock breaks easily.

SIZING SCREEN - A vibrating or revolving screen which separates various sizes of materials for delivery as finished products into hoppers, trucks or onto conveyors.

SLAG - A by-product of blast furnace operation. A good quality slag makes an excellent paving material and can be crushed into almost any gradation, although most slags are quite porous.

SLATES - A dense, fine-textured metamorphic rock whose separate minerals are indistinguishable to the unaided eye, and which has an excellent parallel cleavage, so that it breaks into thin plates or pencil-like shapes. A coal miner's term for any shale or slate accompanying coat also sometimes applied to bony coal.

SMITHSONITE - Smithsonite (zinc carbonate, $ZnCO_3$), is commonly brown in color, but it may be green, blue, pink, or white. Although, it does occur as rough, curved, rhomb-shaped crystals, its occurrence as rounded, globular forms or as honeycomb masses is more common. Smithsonite is harder than most carbonate minerals; it cannot be scratched by a penny, but it can be scratched by a knife. It fizzes in cold hydrochloric acid.

SODIUM COMPOUNDS - Natural soda ash, and trona used in many industries as sodium carbonates are produced in California and Wyoming.

SPHALERITE - Sphalerite, also called zine blende, black jack and mock lead, is composed of zinc sulfide (ZnS), and is the most important ore of zinc. Sphalerite when Pure is nearly colorless, but it is commonly brown, yellow, black, or dark red because of impurities. It has a white to dark brown streak which is always much lighter than the color of the specimen. As a rule, the mineral crystals are shaped like triangular pyramids, with three sides and a base: because it has good cleavage in six directions sphalerite will break into twelve-sided blocks. It has a brilliant, resinous, or almost metallic luster, and is harder than a penny but can be scratched with a knife. Some sphalerite is found as massive deposits varying from coarse to fine-grained. In hydrochloric acid it dissolves and forms hydrogen sulfide which has an unpleasant odor. Sphalerite is easily identified by its cleavage and resinous luster.

STONE - Concreted earthy or mineral matter. A small piece of rock. Rock or rock-like material for building. Large natural masses of stone are generally called rocks: small or quarried masses are called stones: and the finer kinds, gravel or sand.

STONE-SAND - Refers to the product (usually less than 1⁄4-inch in dia.) produced by the crushing of rock. This material is usually highly processed, and should not be confused with screenings.

SUB GRADE - The upper surface of the native foundation on which is placed the road material or artificial foundation, in case the latter is provided.

SUB-SOIL - 1. Broadly and loosely, the part of the regolith (earth mantle) which lies beneath the true soil and which contains almost no organic matter. 2. More precisely, a layer of the regolith, grading into the soil above and into

unmodified rock waste below, which is less oxidized and hydrated than the soil proper and contains almost no organic matter, but is somewhat charged with and indurated by iron oxides and clay that has been leached down from the overlying soil.

SYENITE - Any granular igneous rock composed essentially of orthoclase, with or without microcline, albite, hornblende, biotite, augite, or corundum. (La Forge) . In mica syenites hornblende is replaced by biotite and in augite syenites it is replaced by augite. If a small quantity of quartz is present it is called quartz syenite. In nepheline syenite the feldspar is partly replaced by nepheline. (U. S. Geol. Surv.)

TAILINGS - Stones which after going through the crusher, do not pass through the largest openings of the screen.

TALC (Mineral) - A soft mineral of a soapy feel, in composition an acid magnesium metasilicate, $H_2Mg_3(SiO_3)_4$. New York, California and North Carolina account for 64% of the output.

TOPSOIL - (Road Surface) A variety of surfacing used principally in the southeastern states, being the stripping of certain topsoils which contain a natural sand-clay mixture. When Placed on a road surface, wetted and puddled under traffic it develops considerable stability.

TRACHYTE - Any aphanitic, aphanophyric, or glassy igneous rocks composed essentially of alkali feldspar, with or without mica, amphibole, pyroxene, and other accessories, or of rock glass having essentially the same composition . (La Forge) It was formerly used for both rhyolite and trachyte proper, as a field term for light-colored lavas and porphyries. Compare Acmite-trachities and Pantellerites. (Kemp)

TRAP - Includes the dark-colored, fine-grained and dense igneous rocks composed of the ferromagnesian minerals, basic feldspars, and little or no quartz. The ordinary commercial variety of trap is basalt, diabase, or gabbro.

TUFF - A sedimentary rock composed of fine material - volcanic dust, so-called ash and cinders, and lapilli - explosively ejected from a volcano. Tuff may or may not be deposited in water- it may be either heterogeneous or rather well sorted, and it may be either incoherent or indurated. (La Forge)

URANIUM (Chemical) - A radioactive element of the chromium group, found in combination in pitchblende and certain other rare minerals, and reduced as a heavy, hard, nickel-white metal .

VOLCANIC ASH - Volcanic ash or volcanic dust (in some places called “silica” although this name is not exactly accurate) consists of tiny glass or congealed lava fragments which have been blown into the atmosphere during the eruptions of volcanoes. It is a type of extrusive rock, that has been forced out or extruded onto the earth’s surface. Under a microscope or a hand lens, ash is seen to contain small curved pieces of glass which are the broken walls of bubbles of the lava rock which burst from the volcano. Ash can easily be distinguished from other rocks, principally sand, by its white to bluish gray color. Its glassy surfaces sparkle in the sun, and its particles do not dissolve in acid as do particles of limestone and chalk. It is used for many purposes: in toothpastes and powders, as abrasives, cleaning compounds, glazes for pottery in filters, and in the manufacture of cement and road asphalt.

Screening Terms

AMPLITUDE - Distance or stroke travelled by the screen surface between its highest and its lowest positions.

AVERAGE SCREENING - Materials ranging between 3⁄8” and 4". BLINDING - Reduction of the effective area of a screen opening, caused by moist fines building up on the inner surface of the wire until the opening is wholly or partially closed.

COARSE SCREENING - Materials above 4".

CRITICAL MATERIAL - Same as “near size.”

FINE SCREENING - Materials below 3⁄8”.

FREQUENCY - Number of Pulsations Per minute produced by the vibrator.

NEAR SIZE - Material less than 1.5 times and more than 0.5 times the width of the screen opening.

OVERSIZE - Particles which will not pass through the screen openings: these are discharged off the end of the deck.

PARTICLE - An individual piece of rock, gravel or other material in the screen feed.

PEGGING - Obstruction of an opening by a particle becoming stuck in the opening it has entered but cannot pass through.

SCALPING - An operation in which 85 to 95% of feed material is considerably smaller than the screen opening.

SCREENING EFFICIENCY - Ratio of screen undersize actually passing the screen openings to the total undersize in the feed.

UNDERSIZE - Those particles small enough to pass through the screen openings.

WEDGING - Same as Pegging.

Metallurgical Terms

BENEFICIATION - Upgrading ores by breaking them into particles and removing the waste.

CLARIFIER - Large tanks used for cleaning water or solutions of foreign matter by settling. Chemical flocculents may be added to speed settling.

CLASSIFIER - A device in which particles of mixed size and weight are sorted by settling through a fluid.

GRAVITY SEPARATION - Separation of mineral particles by difference in specific gravity: jigs, tables, spirals are common machines .

JIG - A machine for making gravity separation in water on a pulsating screen.

TRIPPER - A mobile mechanical device for continuously discharging and distributing aggregate from a belt conveyor into a line of bins or stockpiles.

Open Pit Terms

BACKBREAK - Undesirable blasting effect where ground is broken behind the line of blastholes.

BENCH - Mining terrace.

BLOCKHOLDING - Breaking of big rocks by drilling them for dynamite.

BURDEN - Rock between the open bank and the line of blastholes.

CASING - Pipe placed in drill hole to keep it from caving.

CHAMBER - Enlarged portion of a blasthole made by blasting. Purpose is to make room for larger dynamite charge for main blast.

CHURN DRILL - Drill head is lifted by rope and dropped successively to make hole (old fashioned).

DECK LOADING - Explosive is placed in bottom of hole and another charge is placed higher up. Hole is "stemmed" between two charges and on top of "deck" charge.

DETONATOR - Fuse for setting off dynamite, percussion cap.

DOWN-THE-HOLE-DRILL (DHD) - A drill in which mechanism enters and follows down drill hole as it is developed.

DRAGLINE - A long-boomed excavator with a bucket filled by dropping and dragging by rope towards the machine.

JET PIERCING - Method of making blastholes on iron ranges. Combustion of kerosene and oxygen makes hot flame which spalls rock.

MATERIALS HANDLING - Methods of transporting broken or crushed ore from one point to another.

PRIMACORD - Trade name for instantaneous fuse.

SLOPE STABILITY - Degree to which overburden or rock maintains a particular grade or angle when open to the elements.

SLUDGE - Mixture of drill cuttings and water from drill holes. Used for sampling ore grade or for stemming blastholes.

SLURRY-TYPE EXPLOSIVE - Viscous explosive charged into plastic bags to fill contour of drillhole (new).

SPRINGING - Enlarging blasthole by small preliminary blast.

SPUDDING-IN - Starting a drill hole.

STEMMING - Material used to confine explosives in hole, such as drill cuttings or water.

STRIPPING - Removing waste overlying ore body.

TOE - Burden of rock between bottom of blasthole and free face.

WAGON DRILL - Compressed-air rock drill on wheels or "Cat" tracks.

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