BULLETIN No. 44

LUFKIN FOUNDRY & MACHINE COMPANY — LUFKIN

Alundum

For Steel and Steel Alloys

Crystolon

For Cast Iron, Brass, Bronze

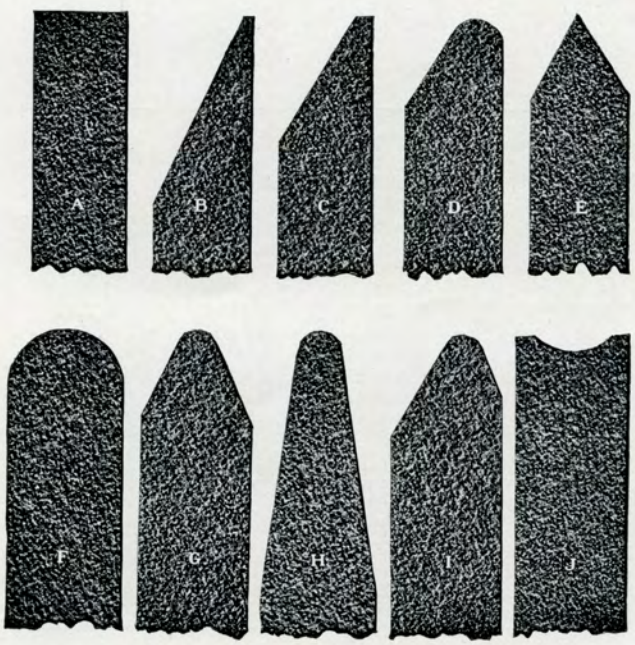
TRADE MARK — NORTON — REGISTERED

The cutting materials used in Norton Grinding Wheels are Alundum and Crystolon. Both are electric furnace products but radically different in chemical composition—different in structure and character of fracture of the grain. With these modern efficient cutting materials, we are able to meet every grinding requirement.

Alundum has that peculiar combination of hardness, sharpness and temper, or character of fracture, which makes it the most efficient cutting material known on materials of high tensile strength, particularly all kinds of steel. It is adapted for grinding more kinds of metal and under a wider range of conditions than any other material used in grinding wheel manufacture.

Crystolon, owing to its properties of extreme hardness, sharpness and brittleness, is highly efficient for grinding and polishing on such metals as cast iron, chilled iron, brass and bronze; also, marble, granite and pearl—in general, materials of low tensile strength.

The Norton Company's electric furnace plants for the manufacture of Alundum and Crystolon are located at Niagara Falls, N. Y., and Chippawa, Canada. The current for operating the furnaces is furnished by the hydraulic power plants of Niagara.



Wheel Faces

The illustration shows diagrams of different shapes of wheels. In ordering give the number on the diagram to show what face is required. If special shapes are required a diagram should accompany the order. All wheels furnished with square face, unless otherwise ordered.

Lufkin Foundry & Machine Co.

Lufkin, - - Texas

NORTON GRINDING WHEELS

Alundum—Crystolon

GRADE LIST OF NORTON GRINDING WHEELS

E—Soft
F
G
H
I—Medium Soft
J
K
L
M—Medium
N
O
P
Q—Medium Hard
R
S
T
U—Hard
V
W
X
Y—Very Hard
Z

Elastic Wheels are Graded as Follows:

1 —Soft	3
1½	4
2	5
2½	6—Hard

SUGGESTIONS FOR ORDERING

Production and economy in grinding depend almost entirely on securing and using a grinding wheel of the proper grain and grade for the kind of work being ground.

The rigid grain and grade depends on many things. When ordering wheels you should always give the following conditions, unless you know through past experience the exact grain and grade required for your work:

Kind of material: whether iron—cast, wrought, or malleable—brass, composition, hard steel or soft steel.

Description of article—whether heavy or light; whether the wheel contact will be broad or narrow.

Speed of wheel spindle, and if it is cylindrical grinding, speed of work. Slight differences in speed cause wide differences in the working of wheels. A change of speed may cause its success or failure.

State whether wet or dry grinding.

Do not fail to give the diameter of wheel, thickness and size of hole, and if special faces state the kind of face. If you have been using one that is perfectly satisfactory specify grain and grade, also the order number of the last wheel used.

The tag which comes with the wheel should always be preserved and referred to when reordering. This tag gives the grain and grade of the wheel and both the customer's and our order numbers.

If you desire to duplicate a wheel, it is a good policy to either refer to our order number, send us the old tag or give us all the particulars stated on tag. If for any reason, no information can be given but our number, we can readily duplicate the wheel.

Soft wheels are used on hard materials like hardened steel; on softer materials, like mild steel and wrought iron, harder grades can be used, the grains not dulling so quickly.

The area of surface to be ground in contact with the wheel is of the utmost importance in determining grade. A strongly bonded wheel must be used if it is a point contact—like grinding a ball. If we have a broad contact where the work brings a large part of the wheel into operation, softer grades must be used.

Vibration in grinding machines necessitates the use of harder wheels. A softer grade of wheel can be used more efficiently on rigid machines.

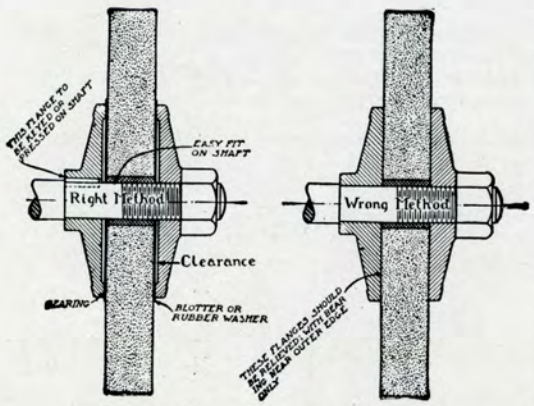
The R. P. M. at which wheels are run is dependent on conditions and style of machine and the work to be ground.

TABLE OF GRINDING WHEEL SPEEDS

Diameter Wheel	Rev. per Min. for Surface Speed of 4000 feet, or 1200 Meters	Rev. per Min. for Surface Speed of 5000 feet, or 1500 Meters	Rev. per Min. for Surface Speed of 6000 feet, or 1800 Meters
1 inch	15,279	19,099	22,918
2 "	7,639	9,549	11,459
3 "	5,093	6,366	7,639
4 "	3,820	4,775	5,730
5 "	3,056	3,820	4,584
6 "	2,546	3,183	3,820
7 "	2,183	2,728	3,274
8 "	1,910	2,387	2,865
10 "	1,528	1,910	2,292
12 "	1,273	1,592	1,910
14 "	1,091	1,364	1,637
16 "	955	1,194	1,432
18 "	849	1,061	1,273
20 "	764	955	1,146
22 "	694	868	1,042
24 "	637	796	955
26 "	586	733	879
28 "	546	683	819
30 "	509	637	764
32 "	477	596	716
34 "	449	561	674
36 "	424	531	637

NORTON GRINDING WHEELS

Mundum—Crystolon



Correct Method of Mounting

We consider the method as shown in the illustration superior to any other. The grinding machine should be of rigid construction, with large spindles, well fitted bearings and securely fastened on firm foundations. A protection hood should surround the wheel. The following sizes of spindles are recommended, except where the grinding wheels are extra thick.

Size of Spindles

Wheel	Spindle
6 inch diameter and less	½ inch
8 inch diameter and less	⅝ inch
10 inch diameter and less	¾ inch
12 inch diameter and less	1 inch
14 inch diameter and less	1¼ inch
16 inch diameter and less	1½ inch
18 to 24 inch diameter	1¾ inch
22 to 24 inch diameter	2 inch
Larger than 24 inch diameter	2¼ to 3 inch

Flanges at least one-half the diameter should be used; never less than one-third. They should be relieved with true bearing at the outer edge. Inner flange always fixed on the spindle—never loose.

Wheels for Saw and Knife Sharpening

As a guide for those who are not familiar with the grains and grades commonly used for saw and knife sharpening, we give the following rule:

Wheels ½ inch thick and thicker, grain 46, grade M.

Wheels thinner than ½ inch, grain 50, grade M; or elastic wheel, grain 50, grade 3.

For band saw lap grinding, grain 46, grades K or L.

For grinding planer knives, free hand grinding, grain 46, grade M, is recommended.

For automatic grinding of planer knives, grain 30 or 36, grade K.

The above recommendations usually meet all requirements when wheels are used under the proper conditions as relates to speeds and feeds. Coarser or finer and harder or softer wheels can be readily furnished, as required.

PRICE LIST OF REGULAR WHEELS

	Thickness of Wheels in Inches																	
in in.	¼	⅜	½	⅝	¾	⅞	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	4
1	.25	.30	.30	.35	.35	.40	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	1.00
1½	.30	.35	.40	.45	.45	.50	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95	1.00	1.10
2	.35	.45	.50	.55	.55	.60	.60	.65	.70	.75	.80	.85	.90	.95	1.00	1.05	1.10	1.20
2½	.40	.55	.65	.70	.75	.80	.85	.95	1.05	1.15	1.25	1.35	1.45	1.55	1.65	1.75	1.85	2.05
3	.50	.65	.80	.90	.95	1.05	1.10	1.25	1.40	1.55	1.70	1.85	2.00	2.15	2.30	2.45	2.60	2.90
3½	.60	.80	.95	1.05	1.15	1.25	1.35	1.55	1.75	1.95	2.15	2.35	2.55	2.75	2.95	3.15	3.35	3.75
4	.75	.95	1.10	1.25	1.35	1.50	1.60	1.85	2.10	2.35	2.60	2.85	3.10	3.35	3.60	3.85	4.10	4.60
4½	.90	1.10	1.25	1.40	1.55	1.70	1.85	2.15	2.45	2.75	3.05	3.35	3.65	3.95	4.25	4.55	4.85	5.45
5	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.60	3.00	3.40	3.80	4.20	4.60	5.00	5.40	5.80	6.20	7.00
6	1.40	1.60	1.75	2.10	2.40	2.75	3.05	3.70	4.35	5.00	5.65	6.30	6.95	7.60	8.25	8.90	9.55	10.85
7	1.85	2.00	2.15	2.60	3.00	3.45	3.85	4.70	5.55	6.40	7.25	8.10	8.95	9.80	10.65	11.50	12.35	14.05
8	2.10	2.35	2.60	3.10	3.60	4.10	4.60	5.60	6.60	7.60	8.60	9.60	10.60	11.60	12.60	13.60	14.60	16.60
9	2.50	2.80	3.10	3.70	4.25	4.85	5.40	6.55	7.70	8.85	10.00	11.15	12.30	13.45	14.60	15.75	16.90	19.20
10	3.00	3.35	3.65	4.35	5.00	5.70	6.35	7.70	9.05	10.40	11.75	13.10	14.45	15.80	17.15	18.50	19.85	22.55
12	3.60	3.80	4.00	5.00	6.00	6.70	7.40	9.00	10.70	12.75	14.00	15.70	17.40	19.00	20.75	22.50	24.25	27.50
14	4.05	5.15	6.25	7.35	8.45	9.55	10.65	12.85	15.05	17.25	19.45	21.65	23.85	26.05	28.25	30.45	32.65	37.05
16	.....	.....	.....	.....	10.85	12.30	13.70	16.55	19.40	22.25	25.00	27.95	30.80	33.65	36.50	39.35	42.20	47.90
18	.....	.....	.....	.....	13.25	15.15	17.00	20.75	24.50	28.25	32.00	35.75	39.50	43.25	47.00	50.75	54.50	62.00
20	.....	.....	.....	.....	.....	.....	20.25	24.75	29.25	33.75	38.25	42.75	47.25	51.75	56.25	60.75	65.25	74.25
22	.....	.....	.....	.....	.....	.....	25.00	31.00	37.00	43.00	49.00	55.00	61.00	67.00	73.00	79.00	85.00	97.00
24	.....	.....	.....	.....	.....	.....	29.00	36.00	43.00	50.00	57.00	64.00	71.00	78.00	85.00	92.00	99.00	113.00
26	.....	.....	.....	.....	.....	.....	.....	43.00	51.00	59.00	67.00	75.00	83.00	91.00	99.00	107.00	115.00	131.00
30	.....	.....	.....	.....	.....	.....	.....	.....	61.00	72.00	83.00	94.00	105.00	116.00	127.00	138.00	149.00	171.00

NORTON GRINDING WHEELS. Alundum-Crystolon

SELECTION OF GRADES

Conditions under which grinding wheels are used vary to such an extent that no absolute rule can be given for selecting the right grades for the work.

The kind of grinding machine, wheel speed, work speed, character of material to be ground—whether to be ground wet or dry, contact of wheel and work—whether broad or narrow—must be taken into consideration.

Different shapes of work, different kinds of metal, require different cutting edges as well when grinding, as when turning; therefore, different grades and grains of wheels are required for different kinds of work.

It is more satisfactory in the majority of cases to leave this selection to the experienced manufacturer, after giving as complete detailed description as possible of the requirements.

The following table will give an approximate idea of what is most commonly furnished for grinding each kind of material under ordinary conditions. It is intended merely as a guide to assist dealers when selecting wheels from their stocks.

There are no wheels so constructed that all materials can be ground equally well with one wheel.

Table for Selection of Grades

Class of Work	Alundum		Crystolon	
	Grain	Grade	Grain	Grade
Aluminum castings	36 to 46	3 to 4 Elas	20 to 24	P to R
Brass or Bronze castings (large)			20 to 24	Q to R
Brass or Bronze castings (small)			24 to 36	P to R
Brick, fire			16 to 20	P to Q
Brick, pressed			16 to 20	O to P
Car wheels, cast iron			16 to 24	P to R
Car wheels, chilled	20	Q	16 to 24	O to Q
Cast iron, cylindrical	24 comb.	J to K	30 to 46	J to L
Cast iron, surfacing	20 to 46	H to K	16 to 30	J to L
Cast iron (small) castings	24 to 30	P to R	20 to 30	Q to S
Cast iron (large) castings	16 to 20	Q to R	16 to 24	Q to S
Chilled iron castings	20 to 30	P to U	20 to 30	Q
Dies, chilled iron			20 to 30	O to Q
Dies, Steel	36 to 60	J to L		
Drop forgings	20 to 30	P to R		
Hammers, cast steel	30	P		
Hollowware, inside grinding			30	Q
Hollowware, thin edges			24	U
Internal grinding of Automobile Cylinders (cast iron)			30 to 60	I to L
Internal grinding, hardened steel	46 to 60	J to M		
Knives (paper), automatic grinding	36 to 46	J to K		
Knives (planer), automatic grinding	30 to 46	J to K		
Knives, leather shaving	60	N to O		
Knives, leather splitting	24 to 30	1 to 2 Elas.		
Knives, moulding bits, etc	46 to 60	3 Elas.		
	46 to 60	M		
Knives (planing mill), hand grinding	46 to 60	J to M		
Knives, shear and shear blades	30 to 60	J to M		
Knives, shoe	60	M		
Lathe centers	46 to 120	J to M		
Lathe and planer tools	20 to 24	P. Sil.		
	20 to 36	O to P		
Machine shop use, general	20 to 36	O to Q		
Malleable iron castings (large)	14 to 20	P to U	16 to 20	R to S
Malleable iron castings (small)	20 to 30	P to R	20 to 30	Q to S
Marble, finishing			150 to F	M
Marble, roughing			16 to 46	M
Marble, coping			36 to 46	O to S
Marble, moulding			4	O
Milling cutters, automatic or semi-automatic grinding	46 to 60	H to M		
Milling cutters, hand grinding	46 to 60	J to M		
Nickel castings	20 to 24	P to Q	20 to 24	R
Pearl grinding, roughing			30 to 50	P to U
Pearl grinding, finishing			100 to 150	M to P
Plow bodies (cast iron), surfacing			24	R
Plows (steel), jointing	20 to 24	R to S		
Plow points (chilled iron), surfacing			20 to 30	Q to S
Plows (steel), surfacing	16 to 24	Q to S		
Porcelain, roughing			36 to 50	O to R
Pulleys (c. i.), surfacing faces of			30 to 36	K to L
Radiators (cast iron), edges of			24 to 30	R to S
Razors, grinding and concaving	46 to 120	H to O		
Reamers, taps, milling cutters, etc., hand grinding	46 to 60	K to O		
Reamers, taps, milling cutters, etc., special machines	46 to 60	J to M		
Rolls (cast iron), wet	24 to 36	J to M	24 to 36	J to M
Rolls (chilled iron), finishing	70	1½ to 2 Elas.	70 to 80	1½ to 2 Elas.
Rolls (chilled iron), roughing			30 to 46	2 to 3 Elas.
Rubber	30 to 50	J to K	30 to 50	K to M
Sad irons finishing			80 to 120	Q to R
Sad irons, roughing			20 to 30	Q to S
Saws, gumming and sharpening	36 to 50	M to N		
Saws, cold cutting-off	60	O to Q		
Shovels, edging	24	Q		
Spiral springs, ends of	16 to 20	Q to R		
Steel (soft), cylindrical grinding	24 comb.	L to N		
	46 to 60	L to N		
Steel (soft), surface grinding	24 to 36	H to K		
Steel (hardened), cylindrical grinding	24 comb.	K		
	46 to 60	J to L		
Steel (hardened), surface grinding	36 to 46	H to K		
Steel, large castings	12 to 20	Q to U		
Steel, small castings	20 to 30	P to R		
Steel (manganese), safe work	16 to 46	L to P		
Steel (manganese), frogs and switches	14 to 16	Q to U		
Structural steel	16 to 24	P to R		
Stove castings	20 to 36	P to Q	20 to 36	Q to R
Twist drills, hand grinding	46 to 60	M		
Twist drills, special machines	36 to 60	K to M		
Wagon springs, ends of	20 to 30	P to R		
Wire, ends of	36 to 80	Q to R		
Wrought iron	12 to 30	P to U		
Woodworking tools	46 to 60	K to M		