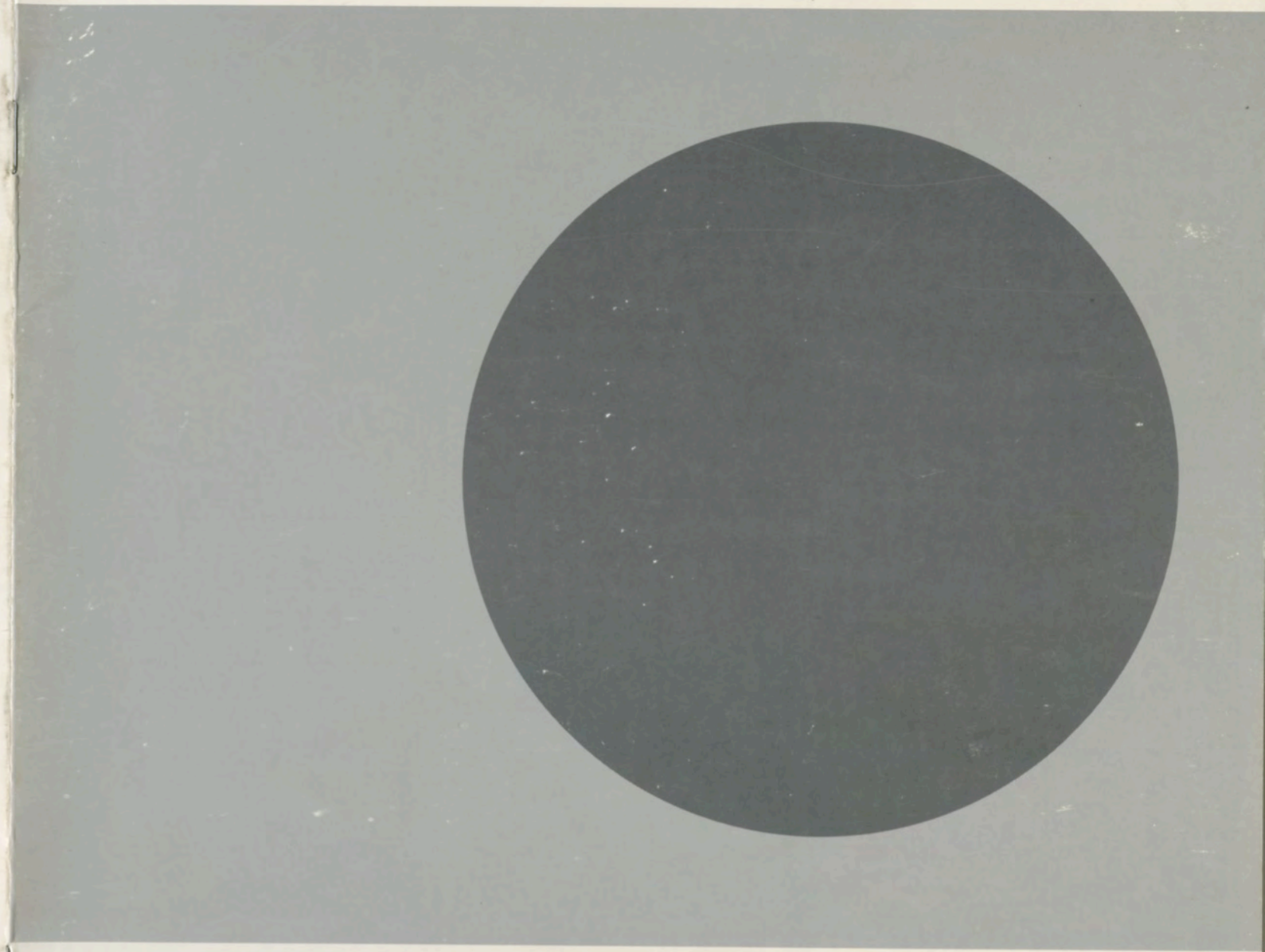
An Introduction to . . .



CMA CAE

Canada's Sole Producer of Steel Shot & Grit

The Facility

Opened in 1977, this modern steel shot and grit plant located in Welland, Ont., (42,000 square feet, 26.5 acres) with an annual production capacity of 20,000 tons, had anticipated the special needs of Canadian industry and the advantageous location has maintained the support of a selective U.S. market.

In the ensuing growth years, Cleveland-CAE Metal Abrasive Div. (a wholly-owned subsidiary of CAE Industries Ltd., Toronto, Canada) has achieved a leadership position in the manufacture — melting, atomizing, screening, crushing, heat treating and packaging — of consistently high-quality steel abrasives with experienced application-oriented distributors throughout Canada and the United States.

We maintain warehouse stock in: —

Welland, Ontario	Edmonton, Alberta
Montreal, Quebec	Vancouver, B.C.
Winnipeg, Manitoba	Buffalo, New York
Pittsburg, Penn.	Detroit, Michigan

A personal invitation is extended to you to visit our plant. Please call the sales department at 416-735-4691 and arrange a tour.

The Industries Served

- Automotive
- Shipyard
- Aircraft
- Waterheater
- Structural
- Steel
- Pipeline
- Foundry
- Mining

Steel shot and grit's primary function in any (or all) of these industries is to singly (or collectively):—

CLEAN — PEEN — ETCH

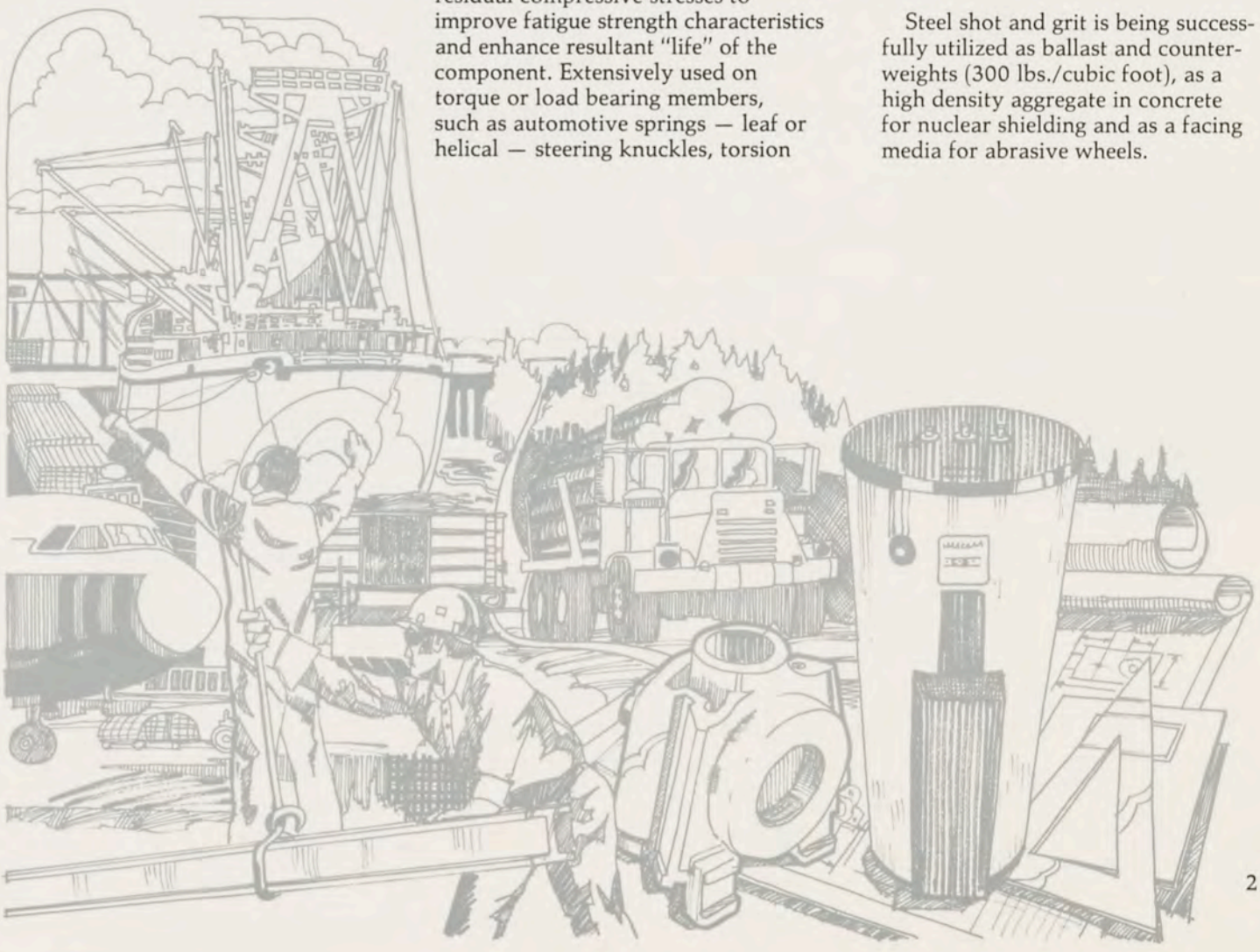
— in the CLEANING mode — for the surface cleaning of ferrous and non-ferrous castings to remove contaminants — burned-in sand or heat treated scale and the removal of mill scale and rust from slabs, billets, bars, plate, structural and wire stock.

— in the PEENING mode — to impart residual compressive stresses to improve fatigue strength characteristics and enhance resultant "life" of the component. Extensively used on torque or load bearing members, such as automotive springs — leaf or helical — steering knuckles, torsion and sway bars, camshafts, crankshafts, gears and railroad wheels. Used to "jig form" sheet aluminum, typically aircraft wing components.

— in the ETCHING mode — a displacement process to establish a pre-determined textured profile.

- in the steel/automotive industry, to etch forming rolls to induce a reflective (or reverse) surface profile on cold roll sheet steel for automotive panels.
- in the water heater industry, to etch tank surfaces to optimize frit or enamel adhesion.
- in the printing industry, to etch shafts prior to rubber replacement.
- in general industry, to enhance bonding of compatible materials — metal spraying, fiberglass, rubber vulcanization.

Steel shot and grit is being successfully utilized as ballast and counterweights (300 lbs./cubic foot), as a high density aggregate in concrete for nuclear shielding and as a facing media for abrasive wheels.



The Product

Produced to the specification and recommended practice of The Society of Automotive Engineers (SAE J-827, J-444) and The Steel Founders Society of America (SFSA Designation 20-66).

Production Criteria

Types

SHOT — the most popular, accounting for 70% of output. Average hardness 45-46 R_C

GRIT — the angular configuration providing more rapid cleaning action. Note the three hardness availability $45R_C$,$55R_C$,$66R_C$ Used in etching and cleaning operations.

BLENDS — a most successful union of shot and grit (50/50) to accomplish the demanded surface finish. Of special interest to structural steel fabricators and foundries with multiple port/orifice casting cleaning problems.

Recommended BLENDS sizing: —

S-550/GR-12	S-280/GR-25
S-330/GR-18	S-390/GR-16
S-460/GR-14	S-230/GR-25

Sizing

See Abrasive Selection Chart.(pg. 5)

Chemical Composition

Carbon	0.85-1.20
Silicon	0.40-1.50
Sulfur	0.05 (max)
Phosphorous	0.05 (max)

Identification

Shot — use prefix "S" with appropriate size (page 5)
Example: S-550 S-460 S-280
Hardness: 40-50R_C

Grit — use prefix "G" accompanied by letter to designate hardness and numerals to identify size (page 5)
viz. "R" 40-50R_C
"I" 50-60R_C
"FH" 66R_C+
Example: GR-18 GI-25 GFH-40

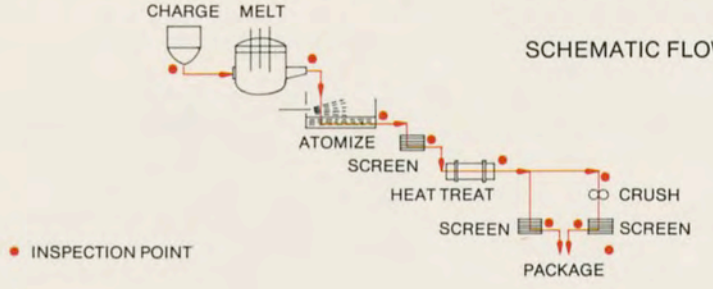
Microstructure

Fine tempered martensite (and bainite).

Quality Control

To achieve, and maintain the high standards, the product is continuously monitored by laboratory technicians at various stages during the manufacturing process, from the incoming raw materials to the final packaging/shipping stage to ensure the finished product meets your specified requirements.

SCHEMATIC FLOW DIAGRAM



1. During the melting phase the molten metal is chemically analyzed and the necessary ferro-alloy additions completed.

2. Atomizing, using aerated water jets.

3. Pre-screening (spiralling) is completed prior to heat treating.

4. Both types — shot and grit — are then batch programmed in annealing/ tempering furnaces to desired hardness and final screening.

5. This test equipment adds to your assurance of receiving steel shot and grit of the highest quality and having the most consistent economical performance characteristics by simulating field conditions.

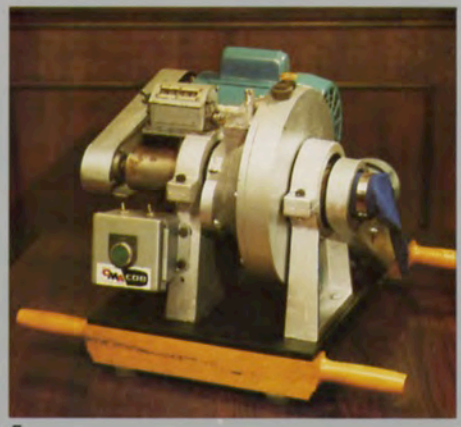
6. The finished product, now ready for shipment in either: —
1 ton — 40 x 50 lbs. bags, boxed, banded and palletized or
1 ton — 45 Imp. gallon (55 U.S. gallon) palletized drum.

1.

2.

3.

4.



5.

6.

Cleveland-CAE Metal Abrasive Div.

SAE Shot and Grit Size Specifications

ASTM Mesh No.	Opening		S-780		S-660		S-550		S-460		S-390		S-330		S-280		S-230		S-170		S-110	
	mm	in.	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit	Shot	Grit
7	2.83	0.111	All Pass																			
8	2.38	0.0937		All Pass	All Pass																	
10	2.00	0.0787	85% min.			All Pass	All Pass		All Pass													
12	1.68	0.0661	97% min.	80% min.	85% min.			All Pass	5% max.		All Pass											
14	1.41	0.0555		90% min.	97% min.	80% min.	85% min.			All Pass	5% max.		All Pass									
16	1.19	0.0469				90% min.	97% min.	75% min.	85% min.			All Pass	5% max.		All Pass							
18	1.00	0.0394						85% min.	96% min.	75% min.	85% min.			All Pass	5% max.		All Pass					
20	.84	0.0331									96% min.		85% min.				10% max.		All Pass			
25	.71	0.0280								85% min.		70% min.	96% min.		85% min.	All Pass			10% max.			
30	.60	0.0232													96% min.		85% min.				All Pass	
35	.50	0.0197															97% min.				10% max.	
40	.42	0.0165										80% min.		70% min.				All Pass	85% min.			
45	.35	0.0138																	97% min.			
50	.30	0.0117												80% min.		65% min.				All Pass	80% min.	
80	.18	0.007														75% min.		65% min.			90% min.	All Pass
120	.12	0.0049																75% min.		60% min.		
200	.07	0.0029																		70% min.		55% min.
325	.04	0.0017																				65% min.
			G-12		G-14		G-16		G-18		G-25		G-40		G-50		G-80		G-120		G200	

P.O. BOX 634 650 RUSHOLME ROAD WELLAND, ONTARIO, CANADA L3B 5R4 PHONE (416) 735-4691

The Selection & Application...

Some Considerations

The required "finish", together with the "throwing" equipment's capability, always dictates the shot/grit size, and hardness selection, whether cleaning, peening or etching.

Cleaning, peening, etching is accomplished with kinetic energy (mass - velocity/velocity) so airblast equipment (hoses and nozzles) with a metal abrasive delivery rate of 60/70 lbs/minute should not be compared with the 350 lbs/minute at approximately 170 miles per hour for a centrifugal wheel operation.

Equipment adjustment (air pressure, angle of impingement, throw distance in air blast operations, the "hot spot" targeting, full ammeter or wheel loading and motor horse power in centrifugal wheel installations) is of paramount importance in the achievement of desired results.

No matter what the original size material, the larger pellets in the work mix accomplish the cleaning challenge while the relatively smaller pellets provide the needed coverage.

Regular shot/grit additions are imperative to the achievement of consistent economical results.

Always use the smallest size to accomplish the required "finish".

Too coarse (or too fine) work mix can increase cycle time by 30%, and produce an inconsistent finish.

IMPACT VALUES

SAE Shot Size (Mid-Range)	Approx. Shot Pellets Per Pound	Approx. Relative Impact Value
S-780	8,000	800
S-660	14,000	500
S-550	26,000	300
S-460	45,000	165
S-390	65,000	100
S-330	110,000	60
S-280	210,000	36
S-230	360,000	22
S-170	520,000	12
S-110	1,700,000	5
S- 70	6,000,000	1

NOTE: Comparable relative impact values of adjacent sizes. Number of pellets/pound of adjacent sizes.

Seven out of ten abrasive users lose 10 to 20% of usable abrasive through improper separation control.

Wear parts replacement (control cages, vanes, impellers) is increased 50% with a work mix having 2% sand inclusions.

An increase in separator refuse take-out by just one size can mean up to 20% more consumption. Two sizes means 40% more consumption.

Good housekeeping policies and accurate record keeping contribute to economics in any operation.

If you have a problem, we have the answer. Please give us a call. 416-735-4691.

Subsidiary Companies

CAE ELECTRONICS LTD.
Montreal, Que.
designer and manufacturer of commercial and military aircraft simulators, supervisory control and data acquisition systems.

CAE ELECTRONICS
GmbH
Stolberg, Aachen,
West Germany
commercial and military aircraft simulator and communications systems maintenance.

NORTHWEST
INDUSTRIES LIMITED
Edmonton, Alta.
aircraft maintenance, repair, overhaul and modification.

CAE FIBERGLASS
PRODUCTS DIV.
Guelph, Ont.
filamount wound fibreglass tanks and pipes.

CAE AIRCRAFT LTD.
Winnipeg, Man.
airframe components. Aircraft repair and overhaul.

CAE METALS LTD.
Welland, Ont.
a management company with responsibility for several CAE metals companies.

CANADIAN BRONZE
COMPANY LIMITED
Winnipeg, Man.
bronze and aluminum foundry.

USP INDUSTRIES INC.
Lennoxville, Que.
slotted, conically drilled and perforated screen plates serving pulp and paper, mining, brewery, food processing and textile industries.

CAE MACHINERY LTD.
Vancouver, B.C.
serving forest products industry — producing bandmills, log carriers, flakers, chippers, hogs, lumber and log sorters. Ferrous foundry.

WEBSTER MFG.
(LONDON) LIMITED
London, Ont.
zinc diecast products

ACCURCAST DIE CASTING
LIMITED
Wallaceburg, Ont.
aluminum diecast products.

CAE MAGNESIUM PRODUCTS DIV.
Strathroy, Ont.
magnesium diecast products.

CAE-MONTUPET DIECAST LTD.
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aluminum diecast engine components.

CAE-MORSE DIV.
Montreal, Quebec
distributors of industrial machinery and equipment.

CAE JOURNAPAK DIV.
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CLEVELAND-CAE
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steel shot and grit.

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