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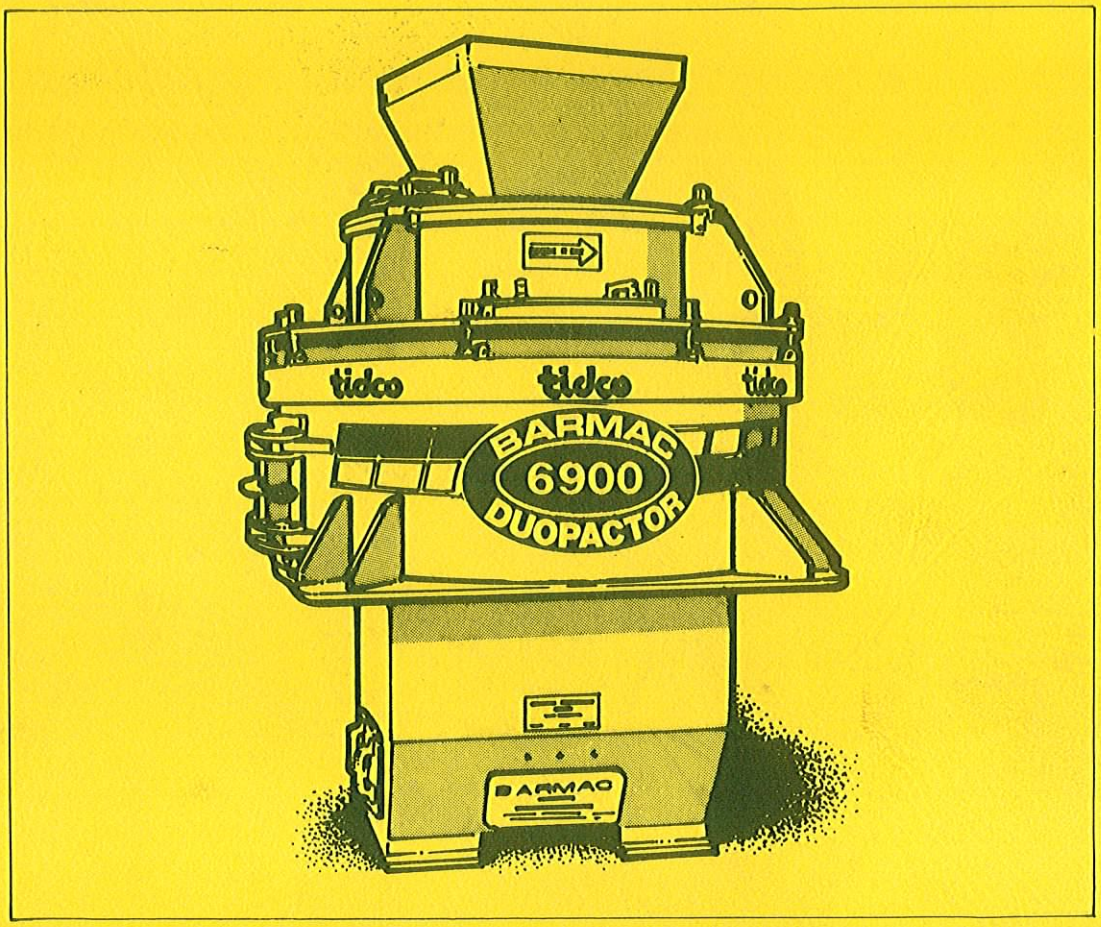
BARMAC



6900 DUOPACTOR

Rock-on-Rock Crusher

BARMAC DUOPACTOR

INTRODUCTION

The Tidco Barmac Duopactor rock-on-rock crusher uses a field proven rock lined rotor that acts as a high velocity dry stone pump hurling a continuous rock stream into a stone lined crushing chamber.

Material fed into the top of the machine is accelerated in the Barmac patented rock lined rotor, achieving exit velocities of up to 100 metres per second. The rotor continuously discharges into the crushing chamber. This process replenishes the rock lining, while at the same time maintaining a rock-on-rock chain reaction of crushing and grinding.

A second stream of material in a controlled quantity can be cascaded into the crushing chamber turbulence causing a supercharging of the particle population within the chamber, improving the energy transfer. This, in combination with other variables, enhances power efficiency, reduces wear, plus provides an efficient means of controlling the grinding and crushing action, to either maximise or minimise fines.

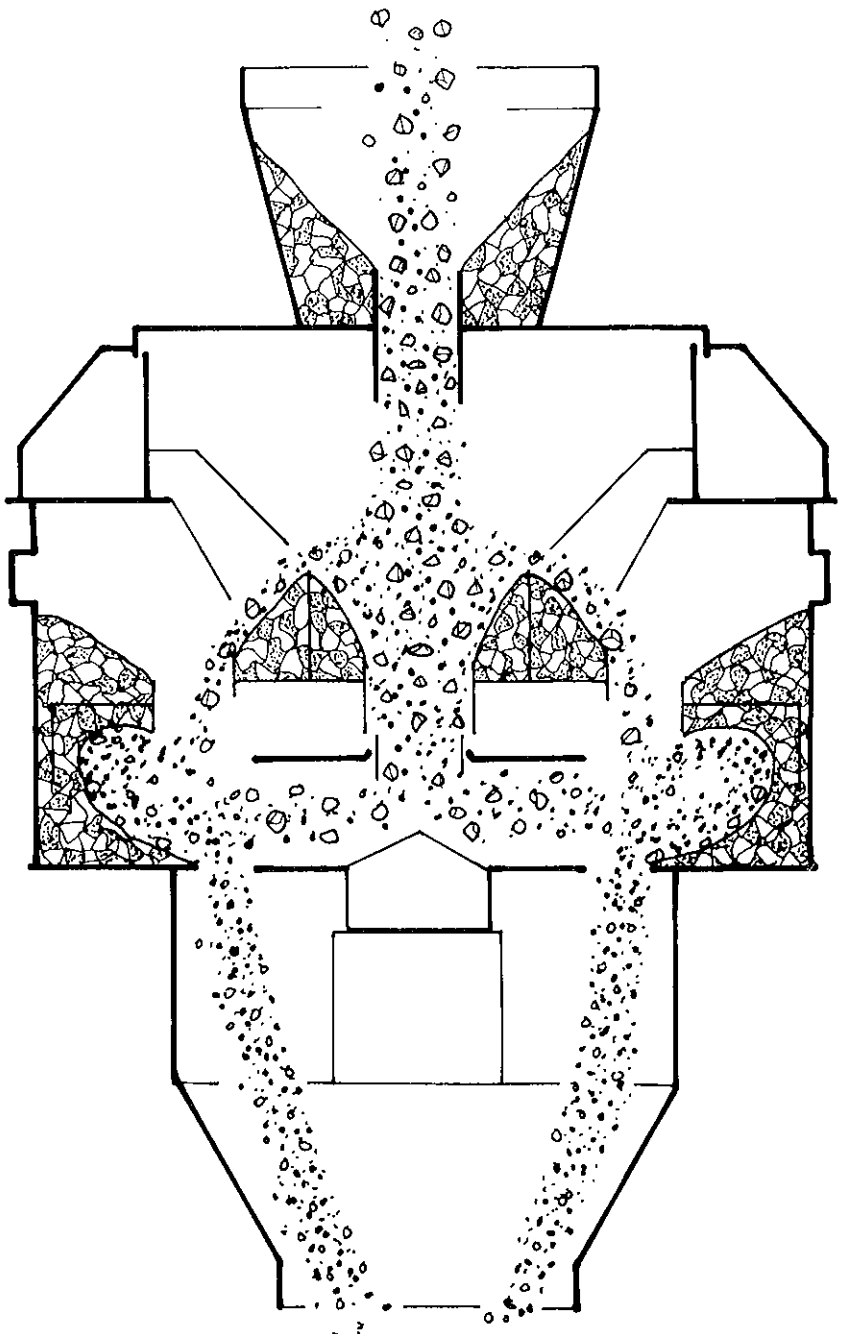
Attrition energies generated within the crushing chamber are many times greater than the energy levels typical of conventional impact crushers and grinding mills. This provides significant power savings when producing fine products.

The adoption of autogenous rock-on-rock design principles throughout the machine reduces wear costs to an absolute minimum — thus eliminating the economic and maintenance problems associated with conventional impactors. Optimum product specifications are achieved at a very low cost per tonne.

The Duopactor can be used to efficiently shape, crush or mill, to remove deleterious material or to achieve ultra-fine reduction of ores for mineral beneficiation. It is ideal for use in conjunction with cyclones for dry fines recovery.

The Tidco Barmac 6900 Duopactor utilises the overflow of normal rotor feed to provide the cascade material. The quantity fed through the rotor is controlled by varying the size of the feed control tube to achieve the required motor current, and all further feed will automatically overflow as the cascade into the crushing chamber. Adjustments to the grading of the final product can be made by changing the ratio of the two feed quantities, either by altering the total quantity or by restricting the rotor feed tube, and also by choice of rotor rpm.

TIDCO BARMAC DUOPACTOR



CUT-AWAY: 6900 DUOPACTOR

BARMAC CRUSHING PRINCIPLE

Within the Rotor

Grinding commences when rock enters the rotor. It is thrown centrifugally from the distributor plate along an arm of trapped rock. Reduction begins as material is forced along the rock bed, being ground under intense acceleration. (See opposite, fig. 1).

Within the Crushing Chamber

The action within the chamber is ***not*** that of breaking rock against a fixed anvil, ***nor*** strictly of throwing rock against a bed of rock. The action involves the collision of rock held in suspension, and is most efficient when the crushing chamber is relatively full of turbulent rock.

Impact commences immediately on rock leaving the rotor portals, enabling even fines to be further reduced and shaped. A direct impact of one rock at high velocity against another, causes one or both to shatter. An indirect hit or glancing blow creates a cleavage or abrasion fracture which effectively reduces particle sizes and generates fines. This unique crushing and milling action in the crushing chamber, repeated thousands of times per second, produces a superior product. (See opposite, fig. 2).

Material flowing in the cascade acts as a rock anvil curtain, absorbing the high energy of the particles exiting the rotor. The sudden energy transfer on violent impact results in high levels of crushing and grinding.

Optimum Crushing Action

Optimum crushing action takes place at maximum feed rates when the crushing chamber is relatively full of turbulent rock. Friable materials may be reduced in size with comparatively low power and rpm, but tough materials generally require higher speeds and power.

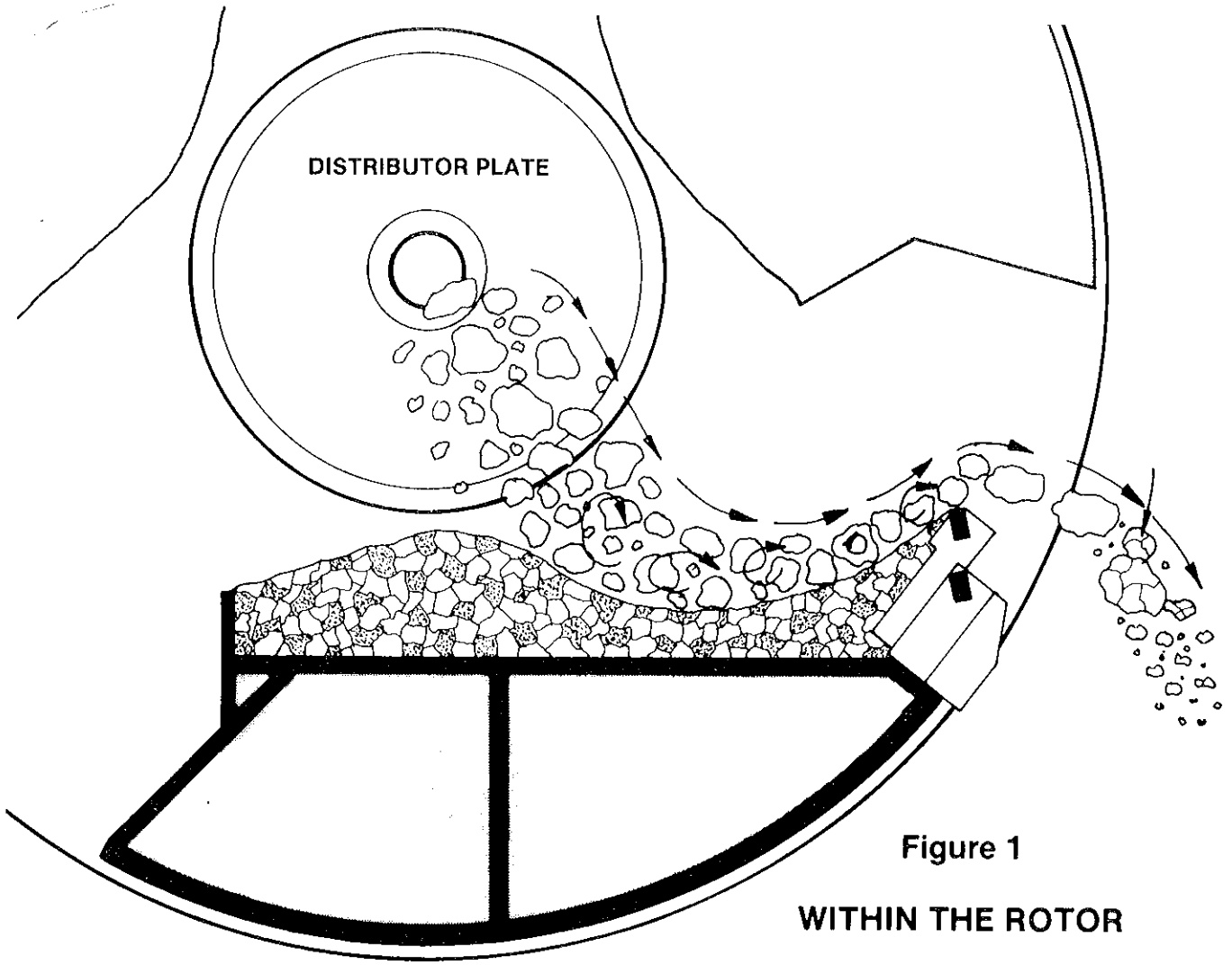


Figure 1

WITHIN THE ROTOR

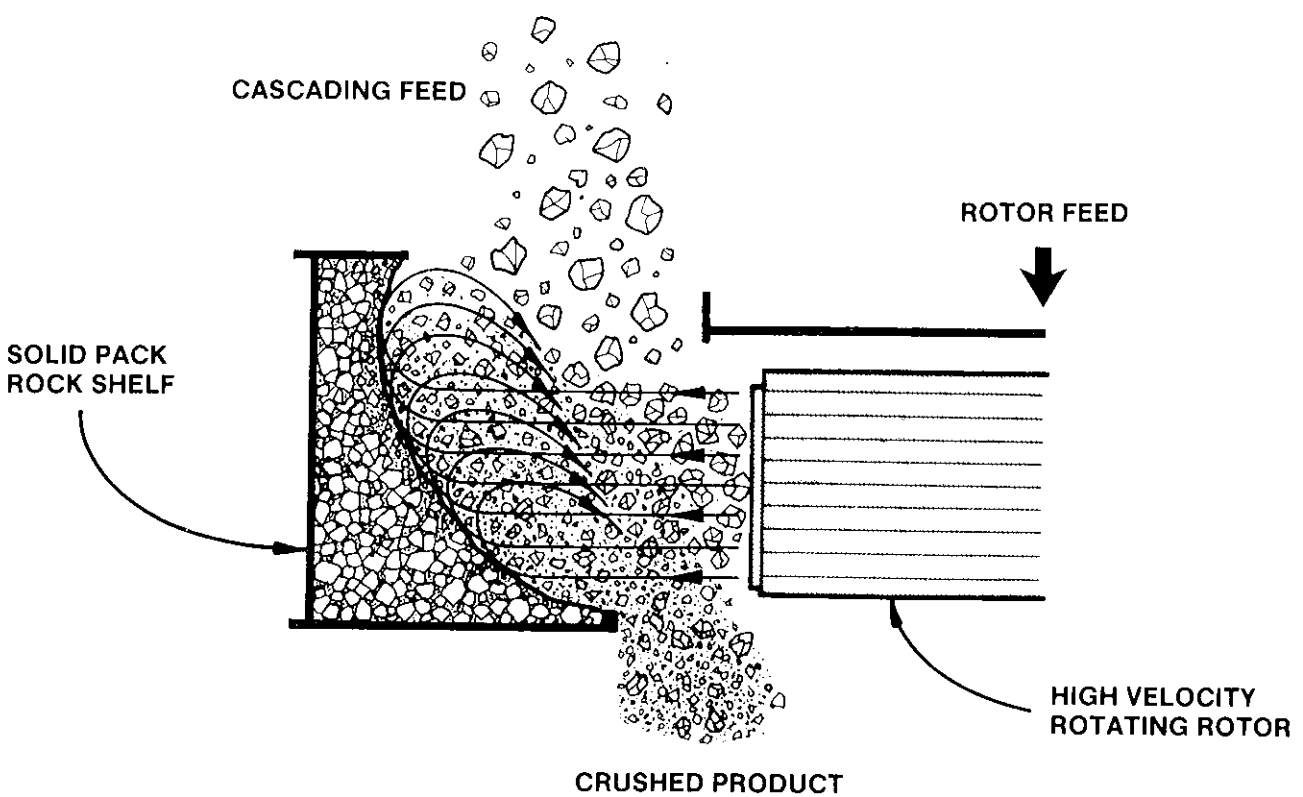


Figure 2 WITHIN THE CRUSHING CHAMBER

6900 DUOPACTOR CAPACITIES

6900 Duopactors can be supplied to cover a wide range of throughput capabilities to meet the various needs of quarrying, mining and industrial minerals industries.

The capacity of the 6900 Duopactor is dependent on a number of factors, including installed horsepower, rotational speed of rotor and cascade ratios.

Throughput capacity of the machine will also be influenced by the type and size of the feed material. Feed size should in all cases be no greater than 37mm (1½").

The flowability of feed material — its particle shape and grading — will also influence tonnages achieved. A well graded, rounded feed will flow through the rotor easier than a badly shaped, single size material and lead to increased throughputs. Maximum throughput tonnages are normally achieved with smaller feed sizes.

The horsepower required will depend on the material to be processed, throughput TPH and size reduction required. The machine has a gross capacity of 150 TPH and up to 150 hp drive.

THEORETICAL THROUGHPUT IN TONS/HOUR

6900 Duopactor

MODEL	6900 (Mk 1)			
MAXIMUM FEED SIZE	37mm (1½")			
ROTOR RPM RANGE	1300-2500			
CAPACITY TABLE				
HP RANGE	75	100	125	150
ROTOR ONLY FEED TPH	30-45	45-55	55-65	70-80
CASCADE FEED TPH	15-30	25-45	30-55	35-70
TOTAL THROUGHPUT TPH	45-75	70-100	85-120	105-150

- Capacities shown (short tons) are neither maximum or minimum, but are based on experience with hundreds of installations crushing a wide range of rocks worldwide. Tonnages shown are based on processing clean, friable rock having a specific gravity of 2.6 to 2.7, with the crusher operating in closed circuit with an adequately sized vibrating screen.
- This information is provided as an application aid to assist the operator in maximising the potential from the crusher. No performance guarantees are expressed or implied. To determine the effect of individual conditions, contact Tidco.

EFFECT OF MATERIAL CHARACTERISTICS ON PRODUCT

Every feed type has different breakage characteristics and careful analysis of these will aid in Duopactor set-up and tuning.

- **FEED HARDNESS**

Materials reputed to be very hard and difficult to crush in compression type crushers (such as granular or laminated rocks) may shatter quite easily in a Barmac. This is because the Barmac crushing process takes advantage of natural lines of weakness in the rock, which are not always presented in compression crushers.

Tough materials which withstand heavy impact (such as basalt) are hardest to crush and need higher rotor speeds.

Medium to soft materials with fine grain structure tend to produce large amounts of -4.75mm (-4 mesh).

Hard materials can also be efficiently liberated from a soft matrix by low speed 'scrubbing', e.g. river gravel from silt or conglomerate.

In any type of rock or mineral there are some sounder, more durable pieces that require more than one pass through the crusher before they are stressed enough to break. These sounder pieces act as grinding media on the new feed, significantly increasing net production. To take advantage of this feature the Duopactor should be set up in a balanced closed circuit.

- **FEED SHAPE**

The shape of the feed can have significant effect on hp/tonne of product. Naturally rounded or cubical material flows well and up to 15% more tonnes per hp can be processed than very angular or flat material.

At medium speeds the product from rounds and cubical particles remains cubical with a low proportion of -4.75mm (-4 mesh). Flats do not flow as well, but break easily and at medium to high speeds produce large proportions of -4.75mm (-4 mesh). In hard rock, secondary compression crushers will usually produce badly shaped particles, but the Barmac will convert this to a cubical product. The flow of angular or flat feed can be improved by the addition of cubical material.

• FEED SIZE

The maximum feed size for a 6900 Duopactor is 37mm (1½"). Feed material above this size may cause tip breakage, vibration, high power usage, scouring of the crushing chamber rill and general undue wear and tear.

The ideal feed is composed of a range of sizes with minimum fines, fed at a steady rate. A single size large feed (say 37mm (1½") may scour the rill out. Scouring of the rill may also result from intermittent, i.e. stop-start feeding. A single size small feed (say 7mm (¼") will generally need higher speed to achieve maximum breakage. Feed with a high proportion of fines has a 'cushioning' effect which can inhibit maximum breakage. When damp these fines can also cause undesirable build-ups.

When crushing hard gravel, it may be necessary to reduce the feed size to 25mm (1") or smaller, if the gravel tends to contain material which is elongated and has a one-way dimension in excess of 37mm (1½"). Torpedo shaped material can cause premature failure of the tungsten tips.

Tramp iron can severely damage tungsten tips, so every effort should be made to eliminate this risk.

• FEED PREPARATION

Typically Tidco Barmac crushers are used as third or fourth stage crushers. Maximum production with best power utilisation can be achieved when a controlled feed rate is used. A feed or surge bin preceding the crusher with an adjustable belt feeder is recommended in order to provide good operator control over the crusher's power demand. This will prevent power surges and overloads that can damage drive motors and the crusher.

• MOISTURE CONTENT

The Barmac Duopactor is more tolerant of high moisture and sticky material than most conventional crushers. Feed with a moisture content up to 4% has a beneficial effect. It assists in building a good rill in both the crushing chamber and rotor, reducing wear. Free water or moisture exceeding 8% may cause excess build-up throughout the crusher which must be carefully monitored to avoid interference with the rotor and feed tube. Very high build-up alters crushing chamber shape, making retention poor, decreasing the amount of crushing.

If a critical moisture content affects the desired build-up in machine then water can be added to get material to flow, although excessive moisture (slurries) can increase wear rates.

The Duopactor crushing action has a strong drying effect, and where a dry product is required, for example some asphalt plants, great savings can be made on drying costs.

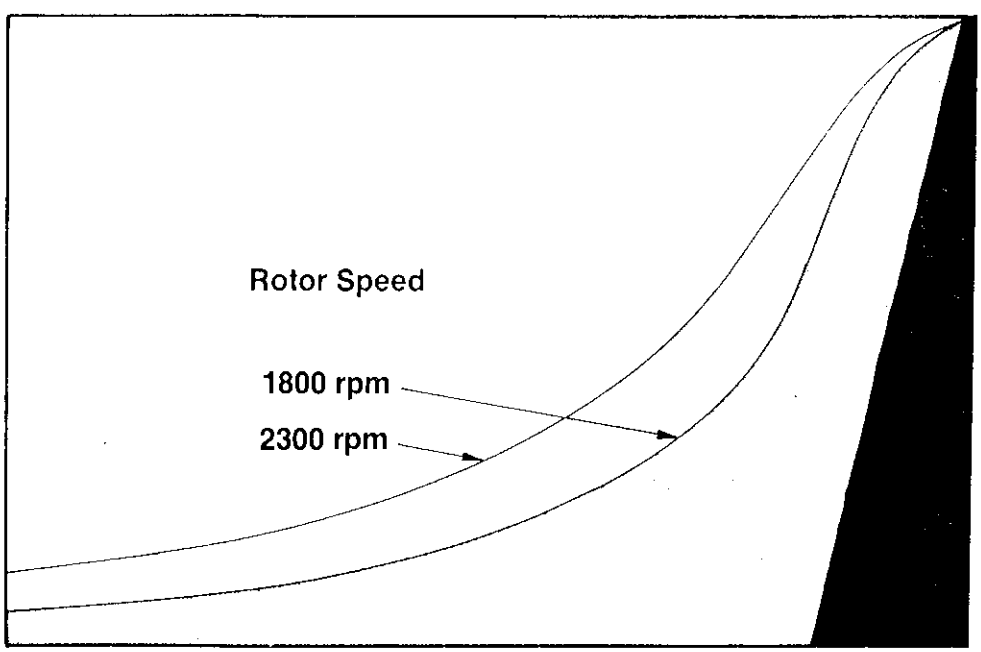
EFFECT OF ROTOR SPEED ON PRODUCT

Rotor speed for optimum production in the 6900 Duopactor will depend largely on material characteristics.

By controlling the rotor speed it is possible to adjust the velocity of material leaving the rotor. Higher peripheral speeds will provide a greater degree of impact crushing in the crushing chamber. This lifts the middle of the grading curve.

In general, low peripheral speeds are used for aggregate shaping, medium speeds for normal crushing applications and high speeds for the manufacture of sands, fines and micro-fines.

It is important to understand that the rotor functions as a rock pump, and (like a centrifugal water pump), for a particular drive power, its volumetric capacity REDUCES with increasing speed. This means that while particles will obviously impact at higher speeds, there will be fewer particles interacting within the crushing chamber. Accordingly, to generate a fine product grading, optimum results (in terms of grading and throughput) are often achieved at moderately high rpm rather than very high rpm.



EFFECT OF CASCADE ON PRODUCT

The most common method of feeding a Duopactor is to control rotor feed so that the motor draws maximum amps, and cascading the excess feed. Besides managing the excess feed, the cascaded material can be used to control product grading.

Cascaded feed is broken less than rotor feed, so as cascade volume increases, overall product grading becomes coarser. However, the actual tons production of all fractions increases.

Example:

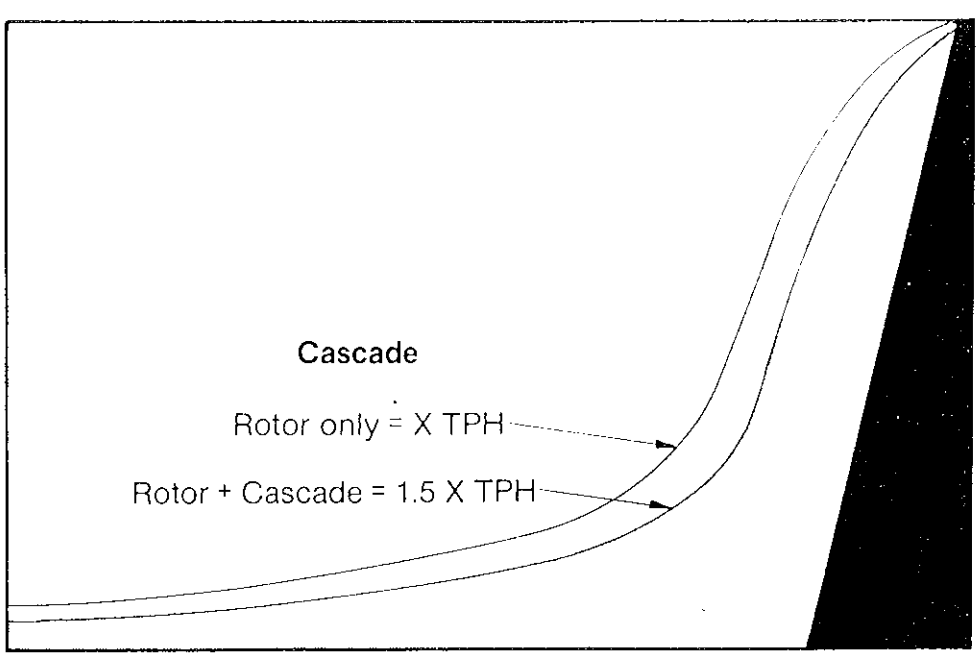
1. Say rotor throughput is 60 TPH of material.

   Product of 1 is 50% -10mm = 30 TPH.

2. If total feed is increased to 120 TPH (60 TPH through rotor + 60 TPH over cascade)

   Product of 2 is 33% -10mm = 40 TPH.

Best results are obtained when there is ample screening area and the Duopactor operates in closed circuit.



FOUNDATIONS

When used with a Tidco skid frame the Duopactor requires only a firm level pad as a foundation. A concrete foundation, such as that shown opposite, is also suitable for use with Tidco Barmac support legs.

For smooth running the Duopactor must be allowed to vibrate at low amplitude. If a very rigid foundation is used, e.g. heavily braced steelwork or a solid concrete block, the Duopactor must be mounted on a separate sub-frame such as the Tidco Barmac main support frame, and isolated from the rigid foundation with rubber mounts. Tidco recommend 'Trelleborg' SAW 125 Hardness B rubber mounts 150mm x 150mm x 50mm (6" x 6" x 2"), one at each corner of the support frame.

DYNAMIC FORCES

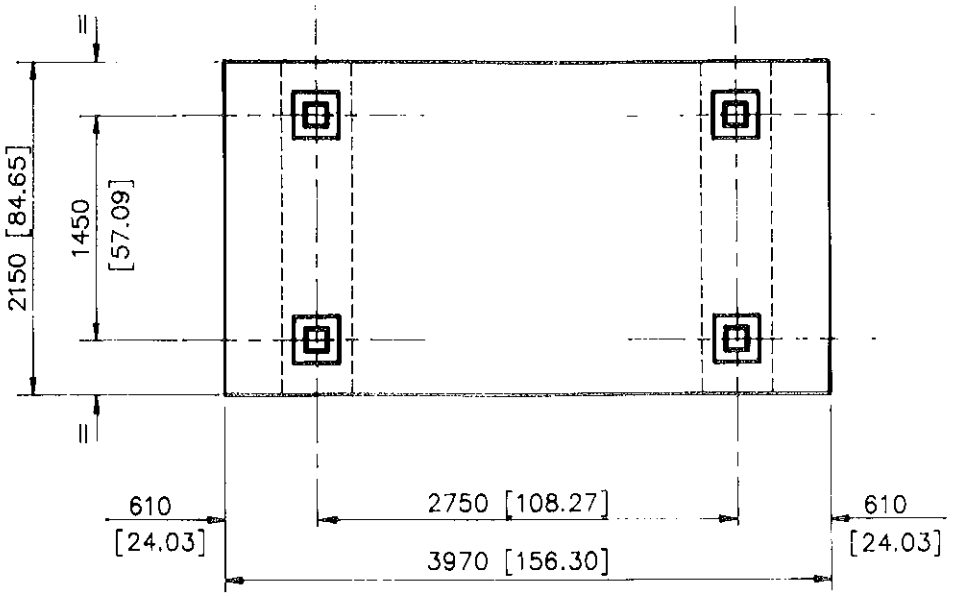
Due to the variety of rock densities and rotor speeds, it is not possible to give exact figures for Barmac dynamic forces.

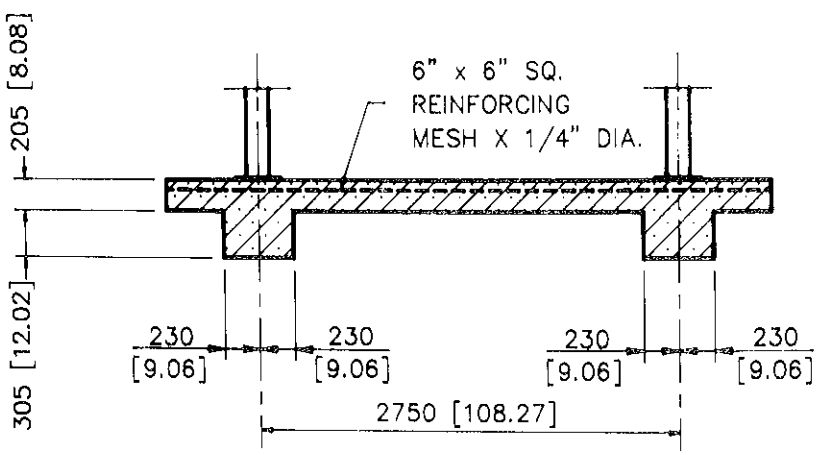
Given below are approximate maximums for a 6900 Duopactor with a 690mm (27") rotor at 1800 rpm.

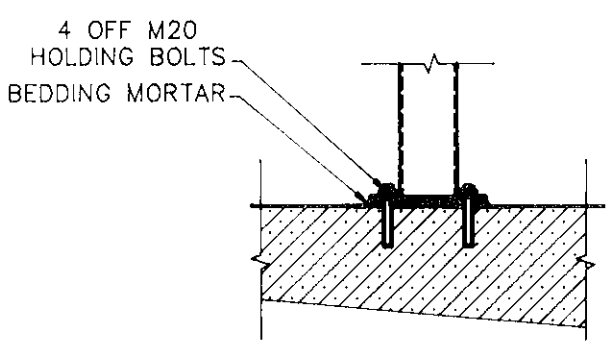
All loads are vibrational and limits of crusher deflection depend on support frame harmonics.

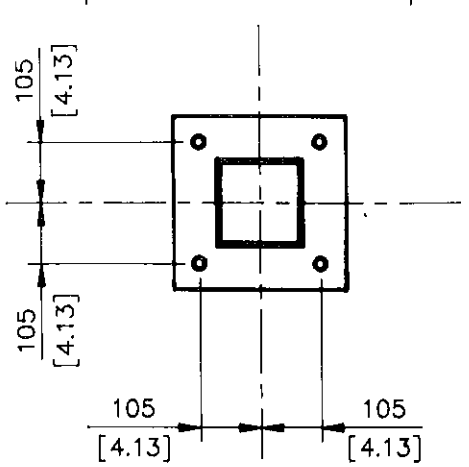
1. Torque = 0.7 kNm (511 lb ft) clockwise in plan on crusher.
2. Normal running = 5-8 kN (1125-1800 lbf) horizontally 200mm (8") above level of section A-A.
3. If rotor loses tip assembly (operator negligence) = 40-70 kN (9000-15750 lbf) horizontally, until vibration switch shuts down crusher.

As a guide, the Tidco main support structure shown on previous page, is adequate for any load condition.







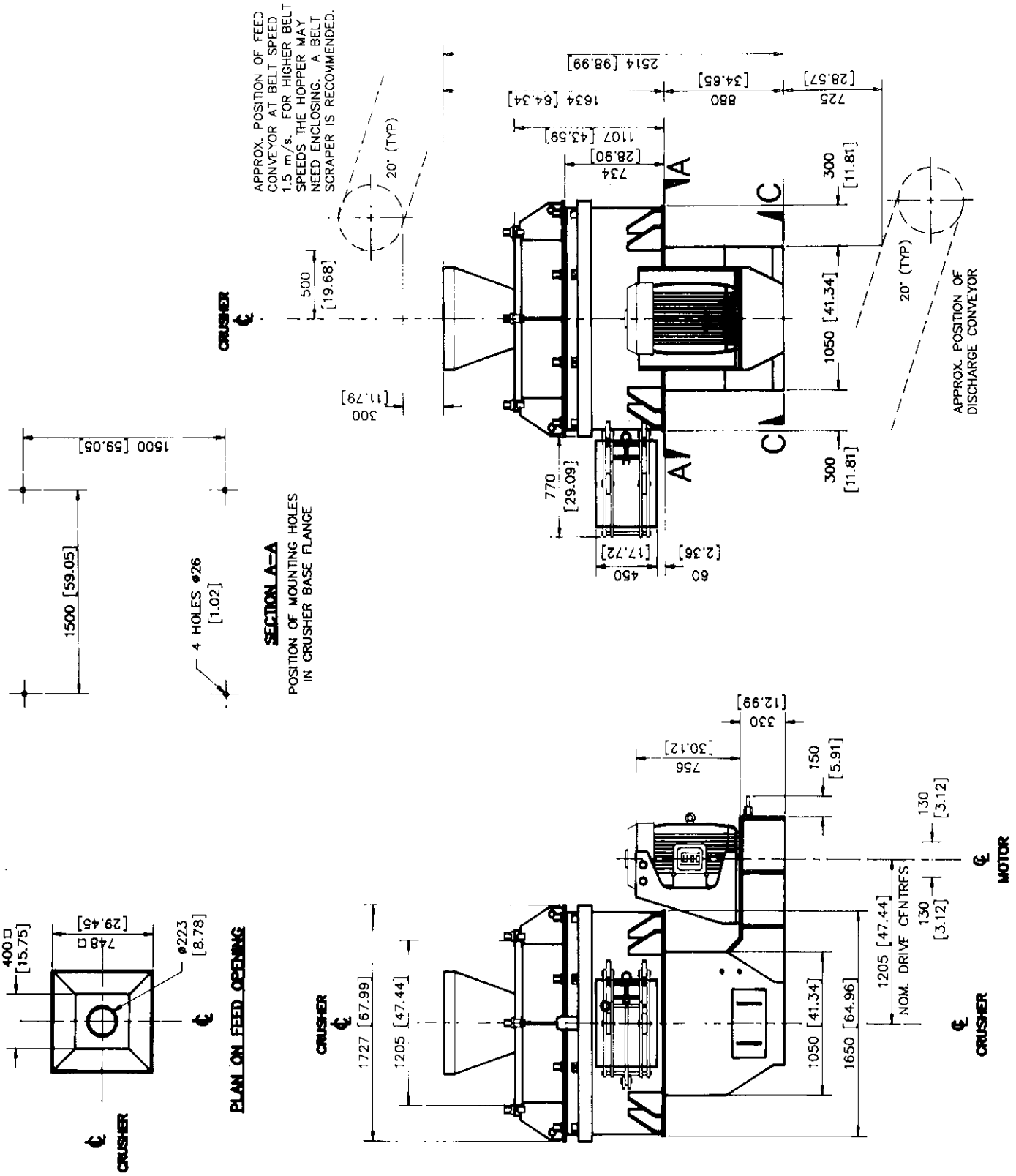


NOTES

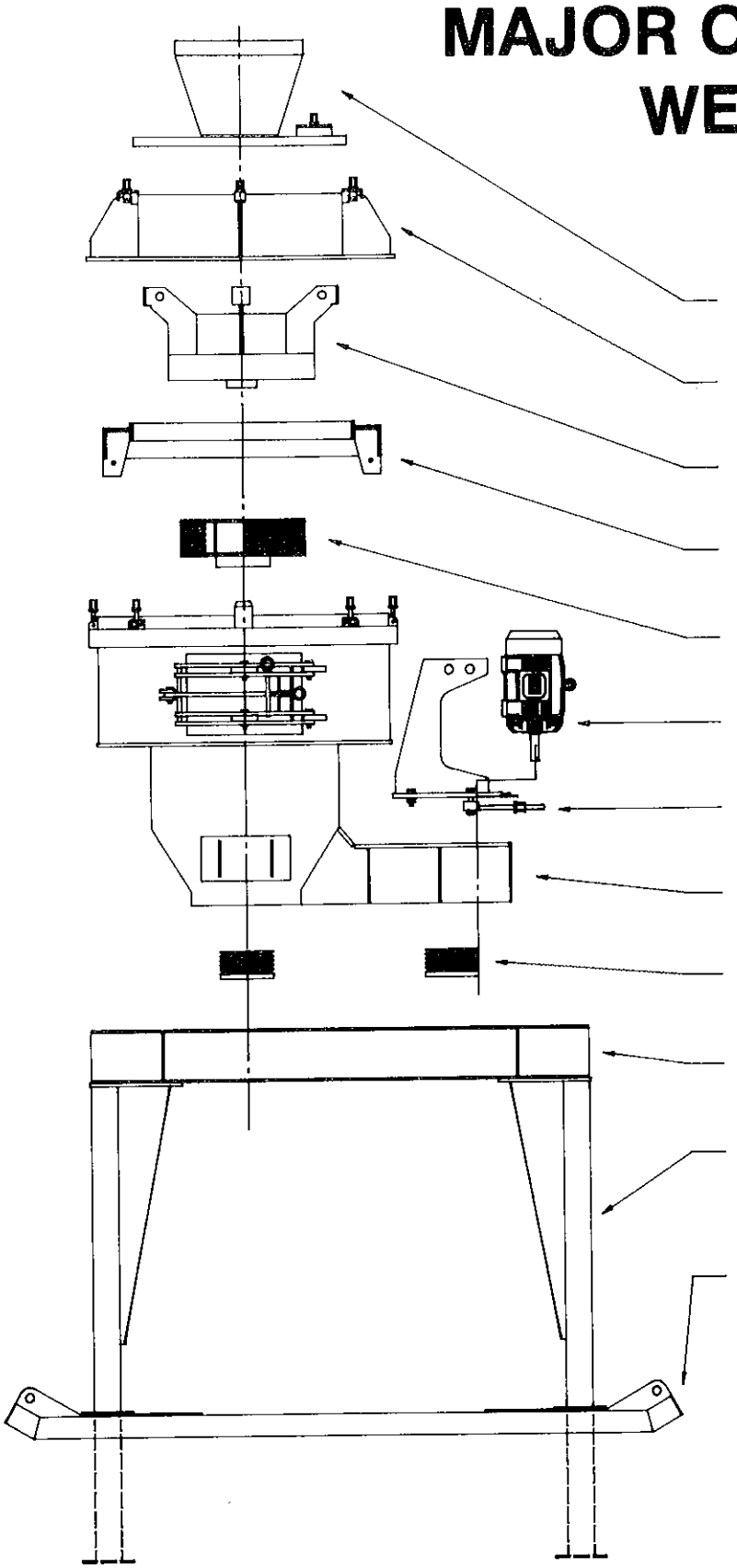
1. CONCRETE TO BE OF MEDIUM STRENGTH.
2. CONCRETE SPECIFICATIONS ARE THE MAXIMUM FOR POOR GROUND CONDITIONS. SIZES COULD BE REDUCED.

DETAILS AT BASE OF LEGS

DIMENSIONS — 6900 Duopactor



MAJOR COMPONENT WEIGHTS



Feed Hopper and Lid
235kg. (520 lb)
Crushing Chamber Roof
265kg. (580 lb)
Cascade
200kg. (440 lb)
Cavity Ring
345kg. (760 lb)
Rotor 690 Complete
345kg. (760 lb)
Motor 92 kW (115 HP)
725kg. (1595 lb)
Motor Mount
220kg. (485 lb)
Base / Chamber inc. Cartridge
1890kg. (4160 lb)
Sheave 8gr. 250mm.
ea. 150kg. (330 lb)
Support Frame
150kg. (330 lb)
Leg (Set of Four)
Short – 460kg. (1010lb)
Long – 600kg. (1320lb)
Skid Frame
490 kg. (1080lb)

TOTAL CRUSHER WEIGHT
(without retained rock)
4375kg. (9630 lb)
Retained Rock Approx 1800kg. (3960 lb)